HAZARD MITIGATION PLAN

Dauphin County, Pennsylvania

June 2021

Prepared By:
Tetra Tech, Inc.
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EXECUTIVE SUMMARY

The 2021 update to the Dauphin County Hazard Mitigation Plan (HMP) was prepared in accordance with the Disaster Mitigation Act of 2000 (DMA 2000). DMA 2000 requires states and local governments to prepare HMPs to remain eligible to receive pre-disaster mitigation grant funds and funds made available in the wake of federally declared disasters. Additionally, DMA 2000 effectively improves the disaster planning process by increasing hazard mitigation planning requirements for hazard events. DMA 2000 requires participating municipalities to (1) document their hazard mitigation planning process and (2) identify hazards; potential losses; and mitigation needs, goals, and strategies.

The Dauphin County HMP represents the work of citizens, elected and appointed government officials, business leaders, and volunteer and nonprofit groups to protect community assets, preserve economic viability of the community, and save lives. DMA 2000 regulations require formal updates and adoptions of local plans every 5 years, reassessing risks, and updating local strategies to manage and mitigate those risks. To comply, Dauphin County and inclusive jurisdictions actively participated in updating the county HMP. Extensive outreach efforts by Dauphin County's Department of Public Safety resulted in participation by 35 of the county's 40 municipalities. Upon completion and approval of the HMP, participating jurisdictions will continue to address and implement findings and recommendations of this plan update. This 2021 version is an update of the county HMP, with the previous HMP developed in 2015.

Table ES-1 identifies municipal governments that actively participated in the HMP update process.

Table ES-1. Participating Jurisdictions in the 2021 Dauphin County HMP Update

Participating Jurisdictions				
• Dauphin County	• Halifax Borough	• Londonderry Township	• Paxtang Borough	• Susquehanna Township
• Berrysburg Borough	• Halifax Township	• Lower Paxton Township	• Penbrook Borough	• Swatara Township
• Conewago Township	• City of Harrisburg	• Lower Swatara Township	• Pillow Borough	• Upper Paxton Township
• Dauphin Borough	• Highspire Borough	• Lykens Borough	• Reed Township	• Washington Township
• Derry Township	• Hummelstown Borough	• Middle Paxton Township	• Royalton Borough	• Wayne Township
• East Hanover Township	• Jackson Township	• Middletown Borough	• South Hanover Township	• West Hanover Township
• Elizabethville Borough	• Jefferson Township	• Millersburg Borough	• Steelton Borough	• Wiconisco Township
• Gratz Borough				
Non-Participating Jurisdictions				
• Lykens Township	• Mifflin Township	• Rush Township	• Williams Township	• Williamstown Borough

During the plan update process, Dauphin County and its participating municipalities engaged in the following planning process steps:

1. Identified and prioritized hazards that may affect the county and its municipalities.
2. Assessed the county's and each municipalities' vulnerabilities to these hazards.
3. Identified mitigation actions that can reduce those vulnerabilities.

4. Developed a strategy for implementing those actions, including identifying the agency (or agencies) responsible for each implementation.

Throughout the planning process, the general public was offered an opportunity to comment on the existing HMP and provide suggestions for the updated version. The county hosted a Planning Team meeting that was open to the public, during which residents could provide input on the HMP.

The following hazards were identified by the Planning Team as presenting the highest risk to the county and its municipalities:

- Opioid Addiction Response
- Floods, Flash Floods, and Ice Jams
- Environmental Hazards: Hazardous Materials Releases
- Pandemic and Infectious Disease
- Utility Interruption
- Hurricane, Tropical Storm, Nor'easter
- Subsidence, Sinkholes
- Cyber Attack
- Invasive Species
- Winter Storm
- Tornado, Windstorm
- Drought
- Transportation Accidents
- Wildfire

This HMP also includes hazard profiles for the following hazards (listed in order of risk factor analysis ranking):

- Radon Exposure
- Dam Failure
- Building or Structure Collapse
- Landslide

To mitigate the effects of those hazards, the Planning Team identified the following goals for hazard mitigation over the next 5 years:

1. **Goal 1:** Prevent injury/death, physical damage, and other impacts from hazards in Dauphin County.
2. **Goal 2:** Protect the citizens of Dauphin County as well as public and private property from the impacts of natural and human-caused hazards.
3. **Goal 3:** Protect and restore existing natural resources.
4. **Goal 4:** Educate officials and the public on the potential impacts of natural and non-natural hazards, and actions to reduce those impacts.

5. **Goal 5:** Plan for improved infrastructure to protect citizens and public and private property from natural and human-made hazards.

Objectives and actions to be implemented are discussed in the Mitigation Action Plan in Section 6.2 of this HMP.

Additionally, Planning Team members will meet annually to evaluate the status of plan implementation and prepare a summary report of HMP status and any needed updates. The mitigation evaluation will address changes as new hazard events occur, as the area develops, and as more information becomes available pertaining to hazards and their impacts. The evaluation will include an assessment of whether the planning process and actions have been effective, whether development or other issues warrant changes to the HMP or its priorities, if progress toward the communities' goals is satisfactory, and whether changes are warranted. The public is encouraged to give feedback (1) by directly contacting the County Hazard Mitigation Plan Coordinator, (2) during recurring review meetings, and (3) during the 5-year revision process.

To request information or provide comments regarding this plan, please contact the Dauphin County Department of Public Safety Office of Emergency Management. Contact information is provided below.

Mailing Address:	Hazard Mitigation Plan Coordinator c/o Dauphin County Department of Public Safety 911 Gibson Blvd Steelton, PA 17113
Contact Name:	Lexi Passaro, EMA Planning Specialist
E-mail Address:	apassaro@dauphinc.org
Telephone:	(717) 558-6821

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APPENDICES

CERTIFICATION OF ANNUAL REVIEW

The Dauphin County Hazard Mitigation Steering Committee and Planning Team have reviewed this Hazard Mitigation Plan (HMP). See Section 7 of this document for further details regarding this certification section. The HMP Coordinator hereby certifies the review.

Year	Date of Meeting	Public Outreach Addressed?*	Signature
2022			
2023			
2024			
2025			
2026			

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

RECORD OF CHANGES

Date	Description of Change Made, Mitigation Action Completed, or Public Outreach Performed	Change Made By (Print Name)	Change Made By (Signature)

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

SECTION 1 INTRODUCTION

This section presents background information, describes the purpose, and defines the scope of the 2021 update of the Dauphin County Hazard Mitigation Plan (HMP).

1.1 BACKGROUND

Across the United States, natural and human-caused disasters have led to increasing levels of deaths, injuries, property damage, and interruptions of business and government services. The time, money, and effort spent to recover from these disasters exhaust resources, diverting attention from important public programs and private efforts.

Dauphin County, Pennsylvania, has experienced a significant number of statewide or county-specific disaster declarations since 1955 (Federal Emergency Management Agency 2020). The emergency management community, citizens, elected officials, and other stakeholders in Dauphin County recognize the impact of disasters on their community and have concluded that proactive efforts need to be taken to reduce the impact of natural and human-caused hazards. To that purpose, Dauphin County is committed to updating and maintaining the Dauphin County HMP.

"Hazard mitigation" describes actions taken to prevent, reduce, or eliminate the long-term risks to life and property caused by a disaster (Federal Emergency Management Agency 2020). Pre-disaster mitigation actions are taken in advance of a hazard event. These actions are a key component to breaking the typical disaster cycle. Most communities sustain damage from storm events, rebuild the same way, and undergo damage again. With careful selection, mitigation actions can be long-term, cost-effective measures taken to reduce the risk of loss (Pennsylvania Emergency Management Agency 2019).

The Dauphin County Hazard Mitigation Steering Committee and Planning Team have participated in this HMP update. The Steering Committee was composed of officials from Dauphin County, the Tri-County Regional Planning Commission, municipalities, stakeholder organizations, commonwealth and federal agencies. The Planning Team was composed of additional Dauphin County officials, municipal representatives, emergency responders, and representatives from utility companies, commonwealth and federal agencies. Dauphin County contracted Tetra Tech, Inc. (Tetra Tech), to prepare the 2021 HMP update.

The HMP update is the result of several months of collaboration between the citizens and officials of the county and representatives from Tetra Tech to develop a pre-disaster, multi-hazard mitigation plan that will guide the county toward greater disaster resistance, while respecting the character and needs of the community.

1.2 PURPOSE

The purpose of this HMP is to minimize the effects that natural, technological, and man-made hazards have on the people, property, environment, and business operations within Dauphin County. This document exists to provide the background information and rationale for the mitigation actions that the Steering Committee, Planning Team, and municipal representatives have chosen to implement across the county.

The document is governed by the Disaster Mitigation Act of 2000 (DMA 2000) and its implementing regulations (Title 44 *Code of Federal Regulations* [CFR] §201.6, published February 26, 2002). Local jurisdictions must comply with DMA 2000 and these regulations to remain eligible for funding and technical assistance from state and federal hazard mitigation programs.

1.3 SCOPE

The implementation actions outlined within this HMP apply to Dauphin County and any municipalities within the county that adopt this plan. Only those municipalities that have participated in the plan update process may adopt this plan and will be eligible for state and federal hazard mitigation funding. For the purpose of this plan, municipal participation was defined as completion and submission of an Evaluation of Identified Hazards Worksheet, Capability Assessment Survey, National Flood Insurance Program (NFIP) Survey, and/or Mitigation Strategy 5-Year Plan Review Worksheet, and attendance by an official municipal representative at a planning or public meeting, or participation in individual outreach conducted as part of the planning process.

1.4 AUTHORITY AND REFERENCE

This HMP was prepared in accordance with the following regulations and guidance:

- FEMA "Local Mitigation Planning Handbook," March 2013
- FEMA "Integrating Hazard Mitigation into Local Planning," March 1, 2013
- FEMA "Plan Integration: Linking Local Planning Efforts," July 2015
- Local Mitigation Plan Review Guide, October 1, 2011
- DMA 2000 (Public Law 106-390), October 30, 2000
- 44 CFR Parts 201 and 206 (including Feb. 26, 2002, Oct. 1, 2002; Oct. 28, 2003; and Sept. 13, 2004 Interim Final Rules)
- FEMA "How-To Guide for Using HAZUS-MH for Risk Assessment" (Document No. 433), February 2004
- FEMA Mitigation Planning How-To Series (FEMA 386-1 through 4), 2002
  Available on-line at: http://www.fema.gov/fima/planhowto.shtm.
- FEMA "Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards," January 2013
- Commonwealth of Pennsylvania's All-Hazard Mitigation Planning Standard Operating Guide, 2020

Appendix A contains a full set of references used in updating this HMP.

SECTION 2 COUNTY PROFILE

Section 2 of the Dauphin County Hazard Mitigation Plan (HMP) discusses the geography and environment, community facts, population and demographics, and land use and development in Dauphin County.

2.1 GEOGRAPHY AND ENVIRONMENT

Dauphin County is located in the southcentral portion of Pennsylvania (Figure 2-1) and encompasses approximately 525 square miles. The county has 40 municipalities and is home to the state capital of Harrisburg (Dauphin County 2020). Dauphin County is bordered to the north by Northumberland County, to the east by Lebanon and Schuylkill Counties, to the south by Lancaster and York Counties, and to the west by Cumberland and Perry Counties. Dauphin County is naturally bordered to the west by the Susquehanna River.

Dauphin has a scenic landscape characterized by individual unique communities and farmlands. Dauphin County has a rich amount of natural resources, including Susquehanna River, streams, tributaries, mountains, and wetlands (Tri-County Regional Planning Commission 2017). Human impacts, such as urbanized areas and farming, along with varying topography and limestone (karst) geology contribute to the health of waterways in Dauphin County, ranging from good to poor (Dauphin County Conservation District 2010).

Dauphin County resides in the Lower Susquehanna Subbasin (Susquehanna River Basin Commission 2018) and contains 19 watersheds (Dauphin County Conservation District 2010). The geology of Dauphin County includes two physiographic provinces with five physiographic sections east of the Appalachian Mountain Range. These include the Ridge Valley Province Sections - Susquehanna Lowland, Anthracite Upland, Blue Mountain, Great Mountain, and in the Piedmont Province Section – Gettysburg-Newark Lowland (Pennsylvania Department of Conservation and Natural Resources 2013).

2.2 COMMUNITY FACTS

In 1729, an act of Assembly included a major portion of Dauphin County (known as Chester County) to be divided into Lancaster County. In 1782, John Harris, Jr. presented an appeal to the General Assembly for the inconvenience of business and court travel and proposed a new county around Harris' Ferry. On March 4, 1785, Dauphin County was established and was named after the King of France's first son, as France assisted the American colonies during the American Revolution. In 1791, the City of Harrisburg was named after its original founder John Harris, Jr., and became the county seat in 1785 and state capital under the Act of February 21,1810 (Dauphin County 2020).

Many of the routes in Dauphin County were established by the original Native American inhabitants, canals, Conestoga wagon, and stagecoaches and validated as a system of trade routes that evolved into well-traveled and interconnected roadways and air routes. John Harris, Sr. was one of the earliest immigrants to accompany William Penn and established the first ferry crossing across the Susquehanna River. John Harris, Sr. developed a large trade industry with the Native Americans and established numerous trading posts. Finally, in early agriculture for the region, John Harris, Sr. introduced the first plow and began small-scale farming (Dauphin County 2020). From the settlement efforts of John Harris, Sr. and his son, John Harris, Jr., areas of Dauphin County grew and prospered as new settlements and small towns appeared.

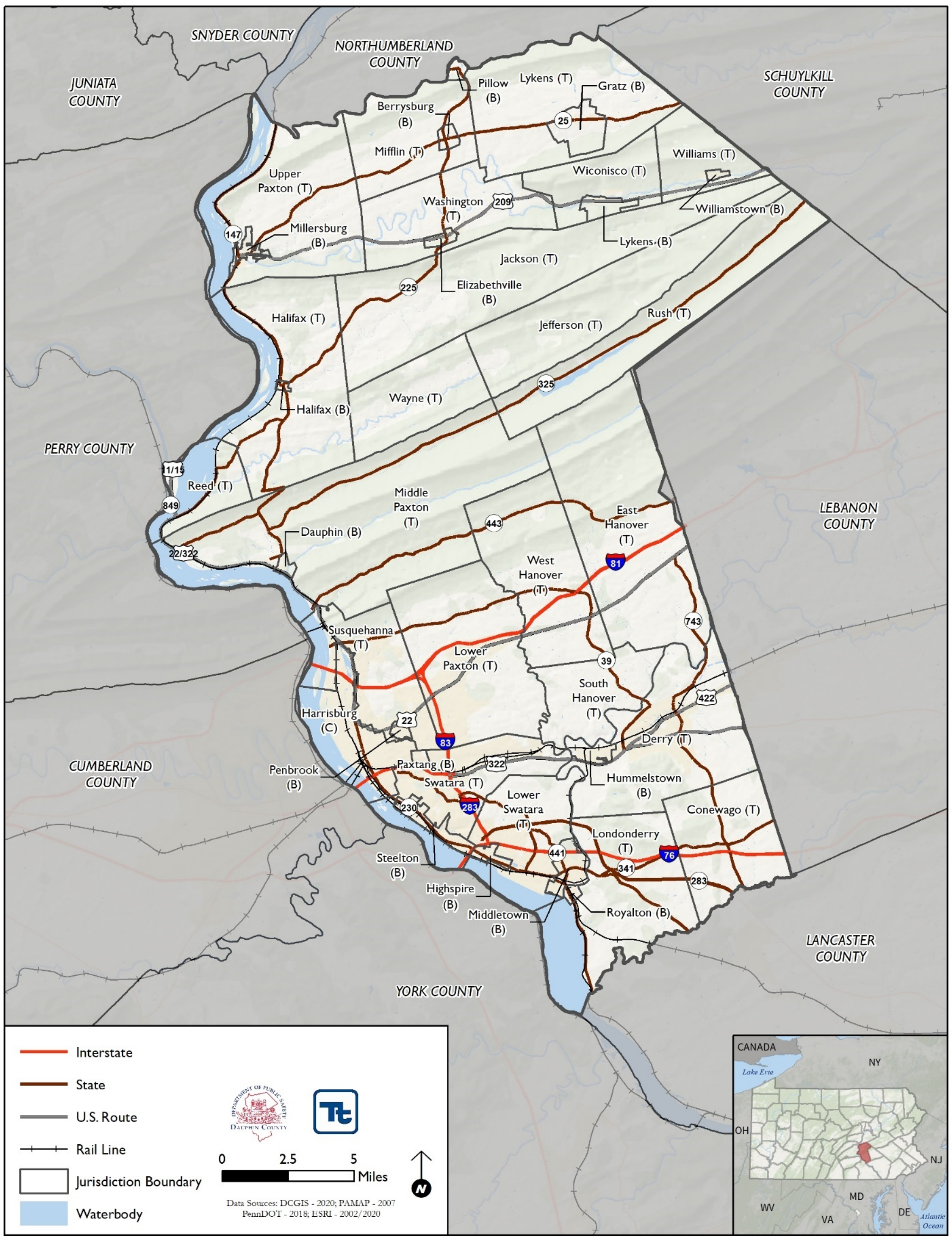
Dauphin County includes 23 townships, 16 boroughs, and the City of Harrisburg. Transportation routes in the northern portion of the county are concentrated on U.S. Route 209 and PA Routes 25, 147, 225, 325. The southern portion of Dauphin County contains major population centers interconnected by U.S. Interstates 76, 81, 83, and 283 and U.S. Routes 22, 322, and 422. PA Routes in the southern portion include 39, 230, 283, and 441 (Bing Maps, n.d.).

Several major population centers are located just outside of Dauphin County: the City of York, located approximately 32 miles south; the City of Lancaster, located approximately 33 miles southeast; the Greater

Philadelphia region, located approximately 107 miles southeast; Allentown–Bethlehem–Easton Area, located approximately 82 miles to the northeast; Williamsport, located approximately 94 miles north; and the Scranton–Wilkes-Barre area, located approximately 116 miles northeast (Bing Maps, n.d.).

Being known for its strength even in times of economic recession, Dauphin County has a strong economy due to its diversity (Tri-County Regional Planning Commission 2017). The transportation and trade industries form the largest workforce in Dauphin County, employing over 34,000 workers. The second-largest workforce is health care and social assistance, employing over 33,000 workers. Public administration forms the third largest workforce, with nearly 23,000 workers. Other larger employment industries include educational, accommodation and food, and manufacturing (Pennsylvania Department of Labor & Industries 2020).

Figure 2-1. Base Map of Dauphin County



2.3 POPULATION AND DEMOGRAPHICS

Population and demographic data provide baseline information about residents. Changes in demographics or population may be used to identify higher-risk populations. Maintaining up-to-date data on demographics will allow the county to better assess magnitudes of hazards and develop more specific mitigation plans. According to the 2010 U.S. Census, Dauphin County had a population of 268,100, which represents a 7.1 percent increase from the 2000 U.S. Census population of 251,848. Table 2-1 presents the population statistics for Dauphin County based on the 2000 and 2010 U.S. Census, and 2018 estimates (the most current available) data. Table 2-2 provides details regarding the demographics for Dauphin County.

Table 2-1. Dauphin County Population Statistics

Municipality	2000 Census	2010 Census	2018 ACS Estimate	Population Change 2000-2018	Population Change 2000-2018 (%)	Population Density Per Square Mile
Berrysburg Borough	354	368	323	-31	-9%	461
Conewago Township	2,847	2,997	3,069	222	8%	184
Dauphin Borough	773	791	855	82	11%	2,138
Derry Township	21,273	24,679	25,036	3,763	18%	920
East Hanover Township	5,322	5,718	5,919	597	11%	148
Elizabethville Borough	1,344	1,510	1,609	265	20%	3,218
Gratz Borough	676	765	805	129	19%	268
Halifax Borough	875	841	954	79	9%	3,180
Halifax Township	3,329	3,483	3,561	232	7%	128
Harrisburg City	48,950	49,528	49,230	280	1%	6,078
Highspire Borough	2,720	2,399	2,667	-53	-2%	3,810
Hummelstown Borough	4,360	4,538	4,650	290	7%	3,577
Jackson Township	1,728	1,941	1,727	-1	0%	44
Jefferson Township	327	362	302	-25	-8%	12
Londonderry Township	5,224	5,235	5,211	-13	0%	229
Lower Paxton Township	44,424	47,360	48,739	4,315	10%	1,734
Lower Swatara Township	8,149	8,268	8,788	639	8%	726
Lykens Borough	1,937	1,779	1,673	-264	-14%	1,287
Lykens Township	1,095	1,618	1,631	536	49%	62
Middle Paxton Township	4,823	4,976	5,067	244	5%	93
Middletown Borough	9,242	8,901	9,176	-66	-1%	4,588
Mifflin Township	662	784	727	65	10%	47
Millersburg Borough	2,562	2,557	2,546	-16	-1%	3,183
Paxtang Borough	1,570	1,561	1,650	80	5%	4,125
Penbrook Borough	3,044	3,008	2,981	-63	-2%	5,962
Pillow Borough	304	298	256	-48	-16%	512
Reed Township	182	239	209	27	15%	35
Royalton Borough	963	907	1,259	296	31%	4,197
Rush Township	180	231	305	125	69%	13
South Hanover Township	4,793	6,248	6,766	1,973	41%	594
Steelton Borough	5,858	5,990	5,954	96	2%	3,308

Municipality	2000 Census	2010 Census	2018 ACS Estimate	Population Change 2000-2018	Population Change 2000-2018 (%)	Population Density Per Square Mile
Susquehanna Township	21,895	24,036	24,857	2,962	14%	1,855
Swatara Township	22,661	23,362	24,685	2,024	9%	1,870
Upper Paxton Township	3,930	4,161	4,219	289	7%	162
Washington Township	2,047	2,268	2,166	119	6%	116
Wayne Township	1,184	1,341	1,365	181	15%	98
West Hanover Township	6,505	9,343	10,165	3,660	56%	438
Wiconisco Township	1,168	1,210	1,122	-46	-4%	111
Williams Township	1,135	1,112	1,104	-31	-3%	125
Williamstown Borough	1,433	1,387	1,187	-246	-17%	3,957
Dauphin County	**251,848**	**268,100**	**274,515**	**22,667**	**8%**	**492**

Sources: U.S. Census Bureau 2000, 2010, and ACS 2018

As shown in the tables above, Dauphin County's 2010 Census population was 268,100. Based on these data, the population density of Dauphin County is 492 persons per square mile, which is considerably higher than the Pennsylvania statewide average of 284 persons per square mile. The City of Harrisburg has the highest population density of all the municipalities in the county (6,078 persons per square mile) (U.S. Census ACS 2018). Most of the municipalities in Dauphin County have population densities above the statewide average. However, many municipalities in the county have low population density. A low population density means that people are spread throughout the county rather than clustered in groups. Dispersing information, instructions, and resources during a disaster response effort to residents in low-density areas is more difficult than in more densely populated areas because individuals are not centralized. Dauphin County 2010 population density data is illustrated on Figure 2-2.

While low-density areas provide challenges to disseminating hazard mitigation information, a low population density also means that hazards will not affect as many people. For example, diseases may not spread as quickly because citizens are in contact with fewer people. Similarly, fires are less likely to spread to other structures because of the large distances between them. The magnitude of an event is typically smaller in a less-populated area because each event affects fewer people and properties.

The Disaster Mitigation Act of 2000 (DMA 2000) requires that HMPs consider socially vulnerable populations. These populations can be more susceptible to hazard events based on several factors, including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. For the purposes of this study, vulnerable populations shall include (1) the elderly and younger populations (persons aged 65 and over; persons aged 5 and younger) and (2) those living in low-income households.

Approximately 17 percent of the county's total population is aged 65 and older (U.S. Census Bureau 2019). Older residents may have access and functional needs. For example, many may be unable to drive; therefore, special evacuation plans may be necessary. They may also have hearing or vision impairments that could make receiving emergency instructions difficult. Additionally, 6.2 percent of the county's total population is under the age of 5 years (U.S. Census Bureau 2019). Both older and younger populations have higher risks for contracting certain diseases. The county's combined population under 5 years of age and over 65 years of age represent approximately 23.2 percent of its total population.

Figure 2-3 and Figure 2-4 illustrate the distribution of these populations for Dauphin County.

Figure 2-2. Dauphin County 2010 Population Distribution

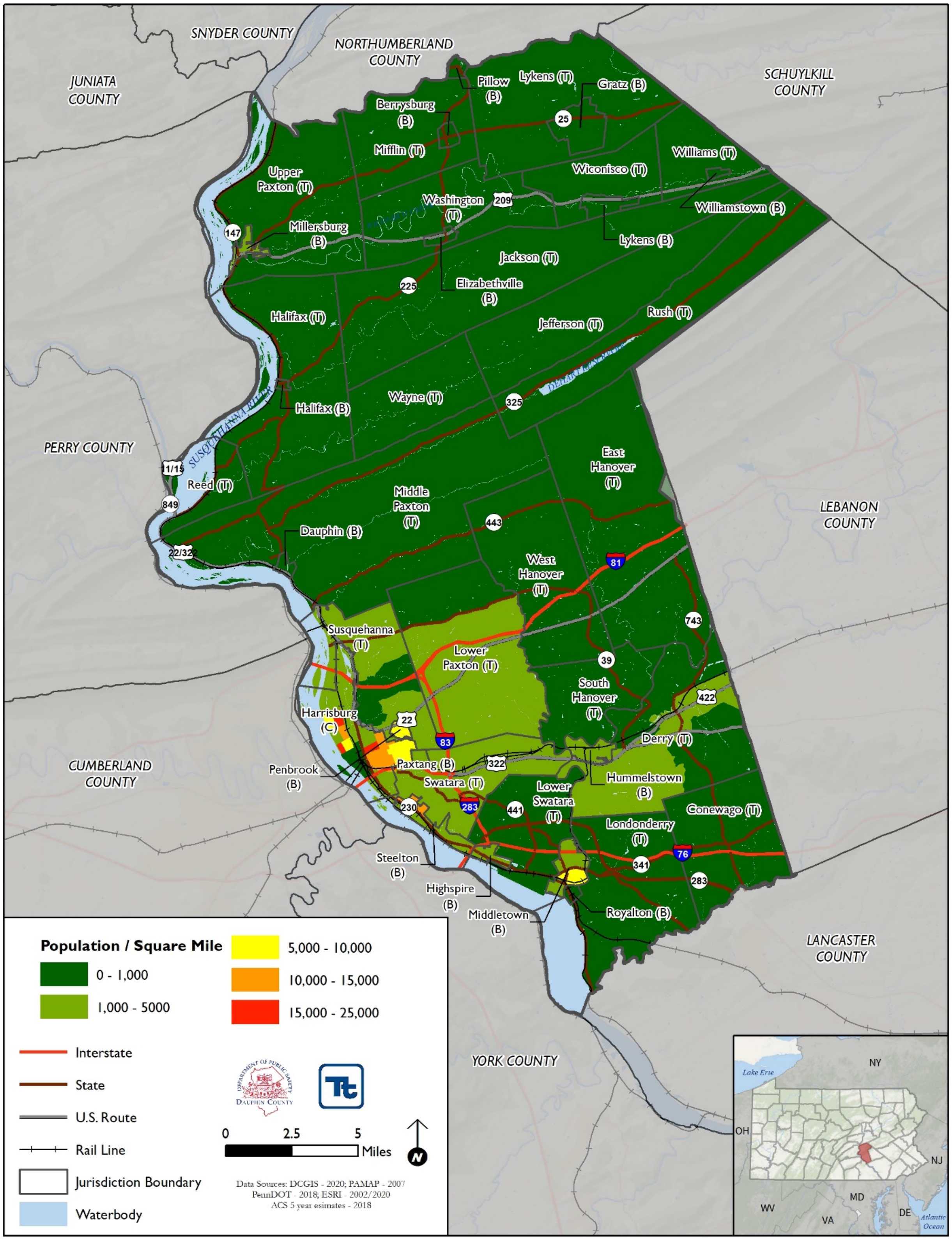


Figure 2-3. Dauphin County Population Over 65 Years

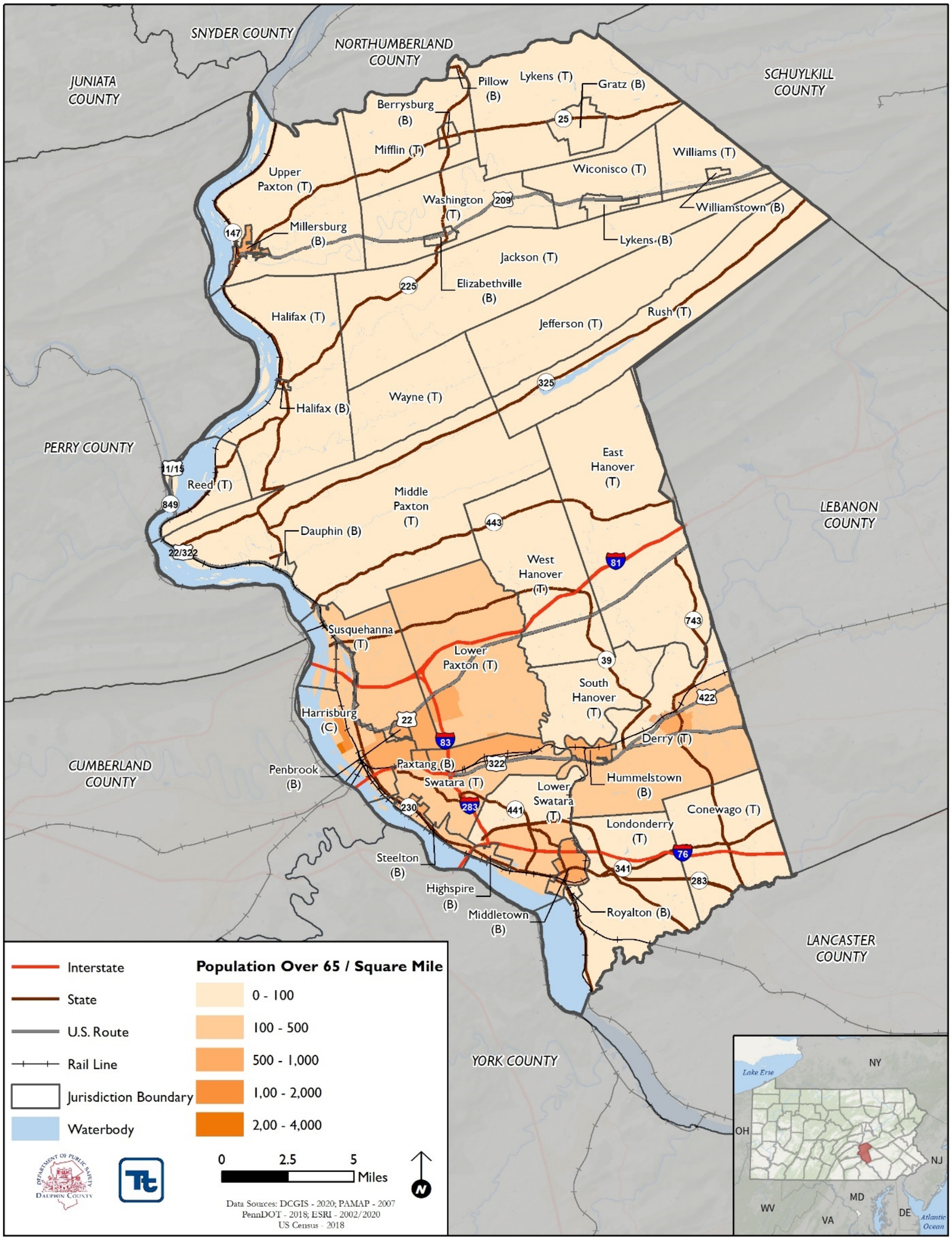


Figure 2-4. Dauphin County Population Under 5 Years

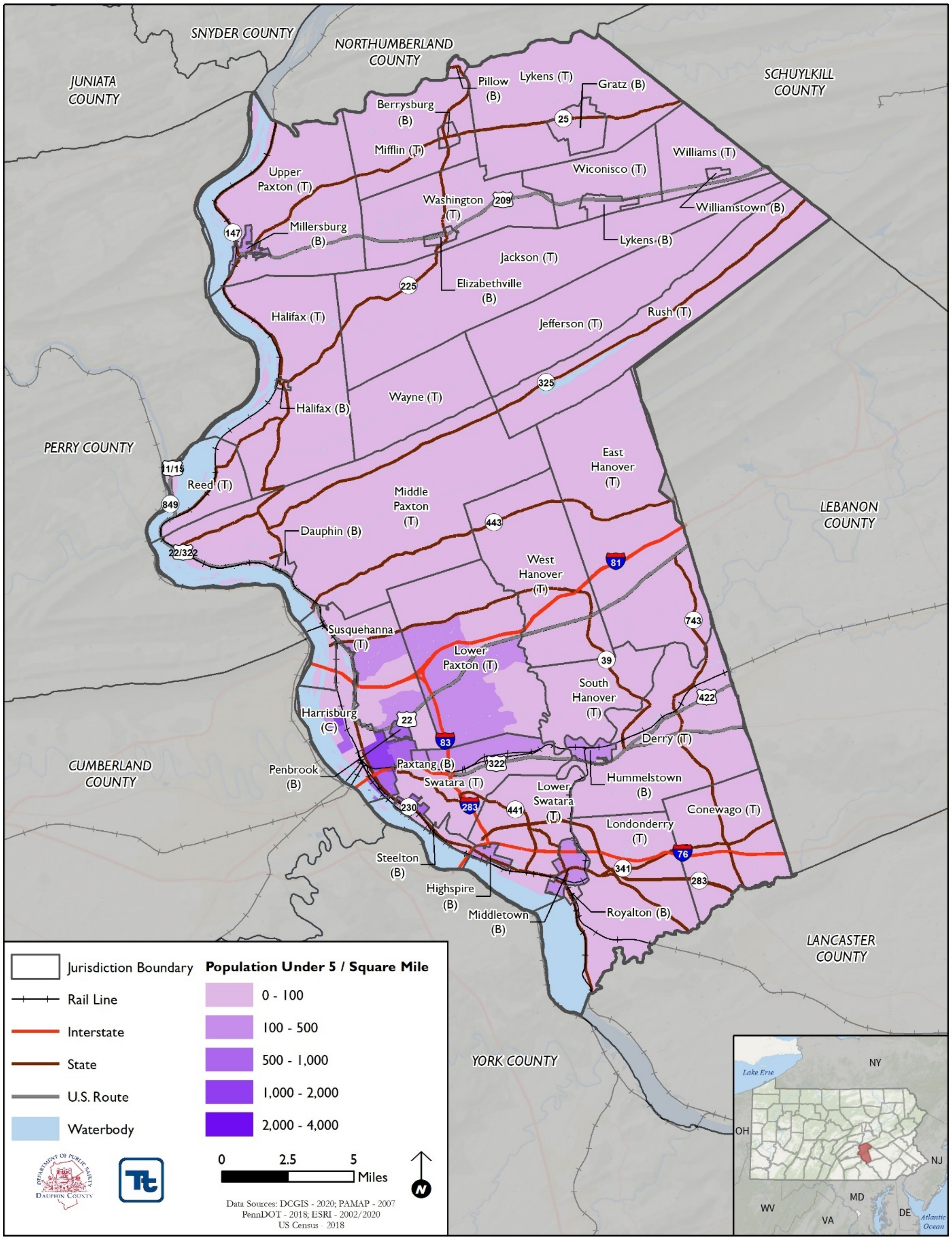


Table 2-2. Demographics for Dauphin County

Demographics	2010 Census	2018 ACS Estimate
Total population	268,100	274,515
Male	129,619	132,864
Female	138,481	141,651
Median age (years)	39.4	39.8
Under 5 years	16,794	17,182
18 years and over	205,885	212,762
65 years and over	35,844	44,262
Total households	120,406	123,740
Group quarters population	6,780	7,375

Source: U.S. Census Bureau 2010 and ACS 2018

Based upon Table 2-2, it is estimated only 2.7 percent of Dauphin County's population lives in group quarters. The term "group quarters" refers to people living in communal settings, which can include inmates in a prison, students in a dorm, or elderly or mentally disabled individuals living in group care homes. Residents living in group quarters are often special needs populations. It is important to ensure that each group quarter facility has its own emergency plan to account for the unique needs of its residents during a hazard event.

Table 2-3 provides population estimates and projections for each municipality in Dauphin County and for the County as a whole. The population of the entire county is estimated to be 313,620 by the year 2040, which represents a net population increase of 45,520 people in a 30-year period. As shown in the table below, 60 percent of municipalities in Dauphin County are projected to see an increase in population. The table also shows that 16 municipalities are projected to see a decrease in population. It should be noted that changes in population or demographics may be used to identify higher-risk populations. Maintaining up-to-date data on demographics will allow Dauphin County to better assess magnitudes of hazards and develop more specific mitigation plans and strategies.

Table 2-3. Dauphin County Population Projections by Municipality

Municipality	2000 Census	2010 Census	2020 Projection	2030 Projection	2040 Projection	Population Change Estimate	Projected Population Change 2010-2040 (%)
Berrysburg Borough	354	368	361	367	365	-3	-1%
Conewago Township	2,847	2,997	3,070	3,187	3,279	282	9%
Dauphin Borough	773	791	749	775	762	-29	-4%
Derry Township	21,273	24,679	27,776	31,049	34,222	9,543	39%
East Hanover Township	5,322	5,718	6,318	6,801	7,351	1,633	29%
Elizabethville Borough	1,344	1,510	1,511	1,606	1,647	137	9%
Gratz Borough	676	765	792	854	896	131	17%
Halifax Borough	875	841	806	771	737	-104	-12%
Halifax Township	3,329	3,483	3,480	3,567	3,603	120	3%
Harrisburg City	48,950	49,528	47,818	47,415	46,266	-3,262	-7%
Highspire Borough	2,720	2,399	2,291	2,085	1,935	-464	-19%
Hummelstown Borough	4,360	4,538	4,831	5,058	5,323	785	17%
Jackson Township	1,728	1,941	1,993	2,137	2,228	287	15%
Jefferson Township	327	362	344	356	351	-11	-3%

Municipality	2000 Census	2010 Census	2020 Projection	2030 Projection	2040 Projection	Population Change Estimate	Projected Population Change 2010-2040 (%)
Londonderry Township	5,224	5,235	5,410	5,491	5,626	391	7%
Lower Paxton Township	44,424	47,360	51,625	55,131	59,070	11,710	25%
Lower Swatara Township	8,149	8,268	8,934	9,288	9,820	1,552	19%
Lykens Borough	1,937	1,779	1,683	1,552	1,441	-338	-19%
Lykens Township	1,095	1,618	1,760	2,071	2,286	668	41%
Middle Paxton Township	4,823	4,976	4,875	4,886	4,833	-143	-3%
Middletown Borough	9,242	8,901	8,748	8,488	8,289	-612	-7%
Mifflin Township	662	784	828	917	980	196	25%
Millersburg Borough	2,562	2,557	2,459	2,415	2,340	-217	-8%
Paxtang Borough	1,570	1,561	1,541	1,527	1,509	-52	-3%
Penbrook Borough	3,044	3,008	3,137	3,172	3,261	253	8%
Pillow Borough	304	298	274	261	241	-57	-19%
Reed Township	182	239	219	244	243	4	2%
Royalton Borough	963	907	825	758	683	-224	-25%
Rush Township	180	231	241	274	294	63	27%
South Hanover Township	4,793	6,248	6,967	8,107	9,006	2,758	44%
Steelton Borough	5,858	5,990	6,450	6,723	7,102	1,112	19%
Susquehanna Township	21,895	24,036	26,816	29,231	31,854	7,818	33%
Swatara Township	22,661	23,362	25,370	26,659	28,359	4,997	21%
Upper Paxton Township	3,930	4,161	4,403	4,639	4,878	717	17%
Washington Township	2,047	2,268	2,495	2,718	2,943	675	30%
Wayne Township	1,184	1,341	1,578	1,769	1,986	645	48%
West Hanover Township	6,505	9,343	10,776	12,678	14,312	4,969	53%
Wiconisco Township	1,168	1,210	1,111	1,093	1,029	-181	-15%
Williams Township	1,135	1,112	1,096	1,076	1,058	-54	-5%
Williamstown Borough	1,433	1,387	1,324	1,271	1,212	-175	-13%
Dauphin County	**251,798**	**268,100**	**283,087**	**298,465**	**313,620**	**45,520**	**15%**

Sources: PA DEP, 2012

According to the 2018 American Community Survey, nearly 10 percent of the county's population speaks a language other than English, with 12.5 percent of the population speaking English less than "very well." While currently a low percentage, future hazard mitigation strategies should consider addressing language barriers to ensure that all residents can receive emergency instructions. Table 2-4 summarizes race and ethnicity population information for Dauphin County.

Table 2-4. Race and Ethnicity in Dauphin County

Race and Ethnicity	2010	% of Population	2018	% of Population
One race	259,816	96.9%	266,074	96.9%
White	194,910	72.7%	194,998	71.0%
Black or African American	48,386	18.0%	52,691	19.2%

Race and Ethnicity	2010	% of Population	2018	% of Population
American Indian and Alaska Native	578	0.2%	662	0.2%
Asian	8,580	3.2%	11,431	4.2%
Native Hawaiian and Other Pacific Islander	78	0.03%	79	0.03%
Some other race	7,284	2.7%	6,213	2.3%
Two or more races	8,284	3.1%	8,441	3.1%
Foreign born	14,206	5.3%	20,700	7.5%
Speak a language other than English	26,554	9.9%	33,459	12.5%
Hispanic or Latino	18,795	7.0%	24,440	8.9%

Source: U.S. Census Bureau 2010, U.S. Census Bureau 2019

Dauphin County has an estimated 123,740 housing units. These properties may be vulnerable to various natural hazards, particularly those located in defined hazard areas. Damage to residential properties is not only costly to repair or rebuild but devastating to the displaced residents.

According to the U.S. Census, approximately 9.7 percent of the county's residential properties are vacant; most vacancies are due to units available for rent. Vacant buildings are particularly vulnerable to arson and criminal activity. Because vacant properties are not inhabited year-round or may not be adequately maintained, many are structurally deficient and at risk of collapse.

Approximately 33.2 percent of the county's housing units are renter-occupied. Because renters are more transient than homeowners, communicating with renters may be more difficult than communicating with homeowners. Similarly, communications with tourists would be harder during an emergency event. Communication strategies should be developed to ensure that these populations receive proper notifications.

Table 2-5 summarizes characteristics of the residential properties in Dauphin County.

Table 2-5. Housing Characteristics in Dauphin County

Housing Characteristics	2010	2018
Total housing units	120,406	123,740
Owner-occupied housing units	71,491	70,603
Renter-occupied housing units	38,944	41,081
Vacant housing units	9,971	12,056
Median value (dollars)	158,800	165,200
Housing units with a mortgage	47,210	44,935
Housing units without a mortgage	23,231	25,668

Source: U.S. Census Bureau 2010; U.S. Census Bureau 2019

In 2018 (the most current data available), the median household income in the county was $58,916, which was slightly lower than the Commonwealth of Pennsylvania's estimated median household income of $59,445 (U.S. Census Bureau 2019). The county's 2018 estimated per capita income of $32,485 was lower than the Commonwealth's 2018 estimated per capita income of $32,889. Approximately 10 percent of families' incomes in Dauphin County were below poverty level, and 13.7 percent of its individuals' incomes were below poverty level. Emergency responders may have difficulty connecting with individuals within this economic bracket for several reasons, including less access to the Internet within these communities. Additionally, some low-income families and individuals may not own vehicles, and therefore could be more vulnerable during an evacuation. Table 2-6 summarizes economic characteristics of Dauphin County's population and population distribution of residents with incomes below the poverty level.

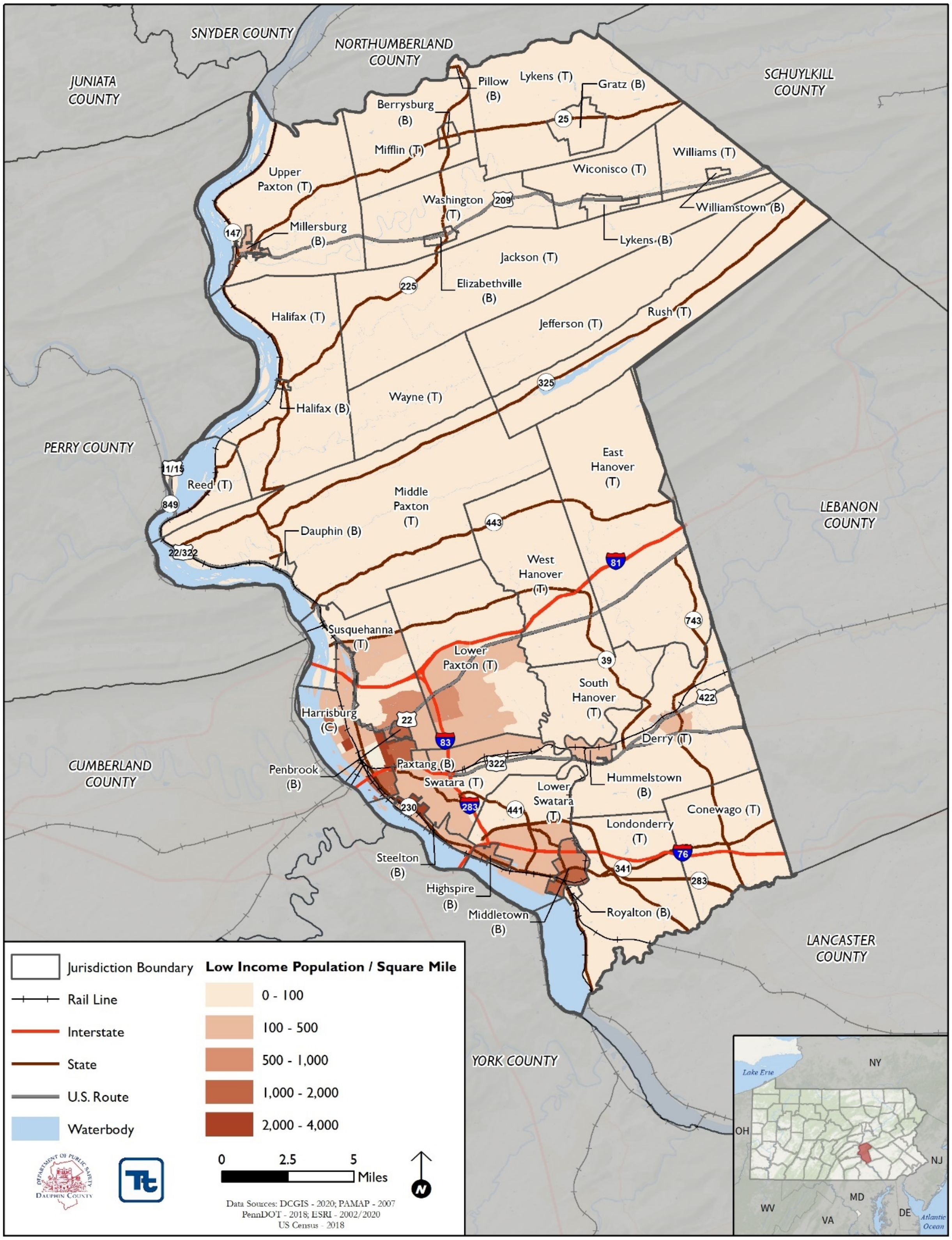
Table 2-6. Economic Characteristics in Dauphin County

Economic Characteristics	2010 Census	2016 Estimates
Median household income	$52,177	$58,916
Median family income	$62,499	$75,171
Per capita income	$28,031	$32,485
Families with income below the poverty level	10.9%	10.0%
Individuals with income below the poverty level	14.4%	13.7%

Source: U.S. Census Bureau, 2019

Figure 2-5 illustrates population distribution for residents with incomes below the poverty level.

Figure 2-5. Dauphin County Population Below the Poverty Level



2.4 LAND USE AND DEVELOPMENT

Dauphin County is a rural, agricultural community with urbanized centers more along major waterways, including the Susquehanna River. In the completion of the 2017 Dauphin County Comprehensive Plan, the county states historical, cultural, and agricultural importance by establishing "growing our communities" while "growing within our environment" (Dauphin County 2017). The county understands the historical and agricultural importance while growing economically through their designated growth areas.

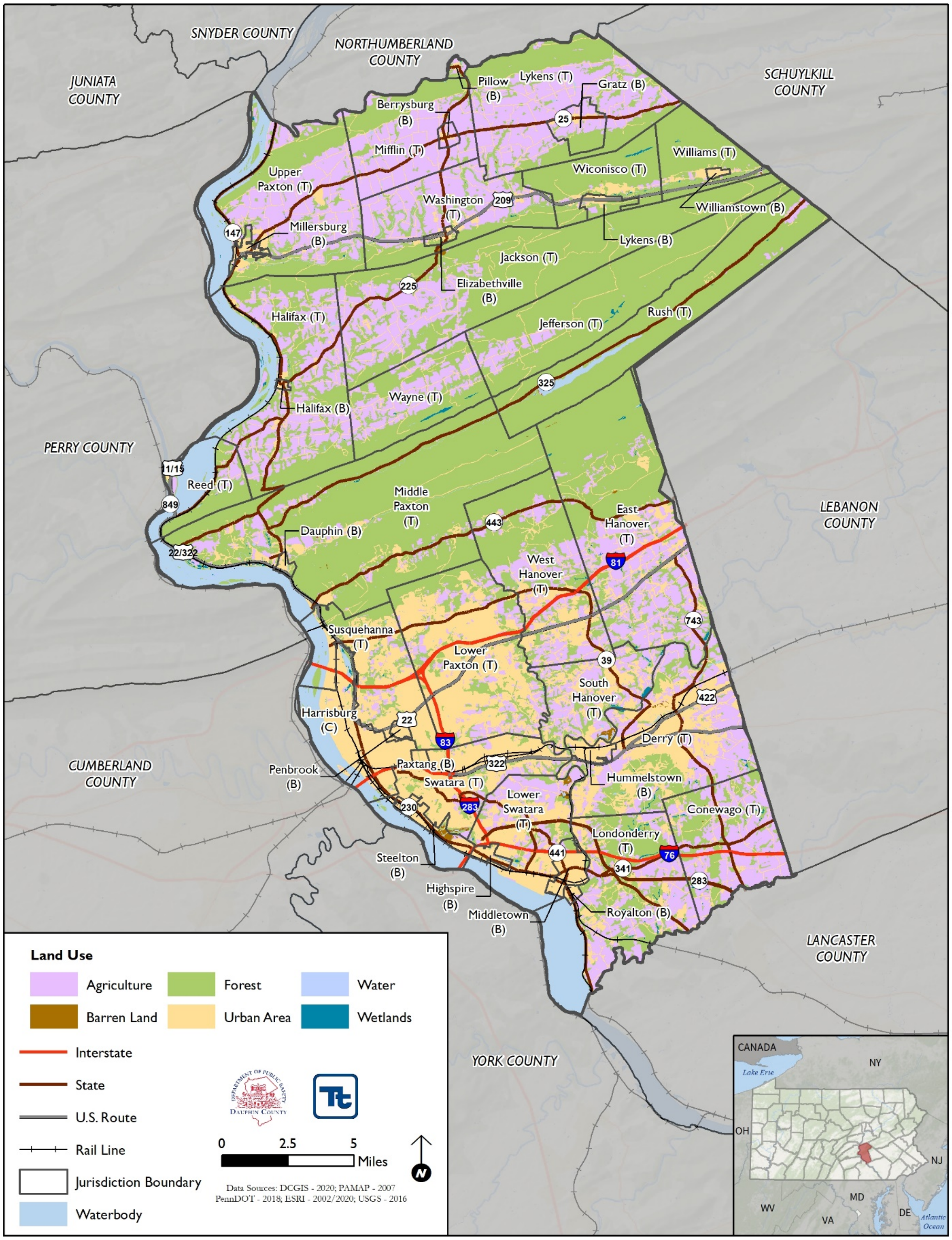
The northern, southern, and portions of the eastern part of the county contain a significant amount of agricultural activity. The county contains prime farmland and Soil Capability Class II and III land, which are classifications given by the Commonwealth for land that is still farmland of importance. The county contains over 91,000 acres of farmland spread across both the northern and southern parts of the county. While much of the county is considered urban, most urban development in the county is in the southern half. Agricultural lands and forests make up over 75 percent of the county. Land use in Dauphin County is listed in Table 2-7 and illustrated in Figure 2-6.

Table 2-7. Land Use Area in Dauphin County

Land Use Category	Total Acres	Percent of Total
Agricultural	91,733.1	27.4%
Barren Land	463.4	0.1%
Forest	169,305.6	50.5%
Urban Area	72,441.6	21.6%
Wetland	1,139.2	0.3%
Total	**335,082.9**	**100.0%**

Source: USGS 2016

Figure 2-6. Dauphin County Land Use and Land Cover



2.5 DATA SOURCES AND LIMITATIONS

The County Profile section of this HMP was developed with information from the following sources:

1. Dauphin County Comprehensive Plan (Tri-County Planning 2016)
2. Population Projection Report (PA DEP 2012)
3. U.S. Census Bureau, 2010
4. U.S. Census Bureau, "American Factfinder – 2010 American Community Survey Dauphin County"
5. U.S. Census Bureau, "American Factfinder – 2018 American Community Survey Dauphin County"

Data sources used to develop the HMP in general are listed in Section 1.4. Data sources used to perform geographic information system (GIS) analysis for the risk assessment are listed in Section 4.1. These sources were key in understanding the current demographic makeup of the community as well as in framing the foundation of the Plan. The sources listed provided the underlying context of the Plan and allowed the Planning Team to understand critical vulnerabilities in the County. Throughout the course of the planning process, the Planning Team continually sought additional data sources to augment the information included in the Plan. The Planning Team made multiple requests for existing jurisdictional documents (e.g., jurisdictional hazard mitigation plans and other relevant information). Despite multiple requests for municipal documents, the response was somewhat limited.

SECTION 3 PLANNING PROCESS

A successful planning process builds partnerships and brings together members representing government agencies, the public, and other stakeholders to reach consensus on ways the community will prepare for and respond to those hazards most likely to occur. Applying a comprehensive and transparent process adds validity to the Hazard Mitigation Plan (HMP). Participants involved in the HMP planning process gained better understanding of problems and issues, and helped devise solutions and actions for the community—resulting in a revised set of common community values and widespread support for directing financial, technical, and human resources to agreed-upon actions.

The planning process was an integral part of updating the Dauphin County HMP. This section describes the planning process used to update the HMP, with participation from 35 of the county's 40 municipalities. This section also describes the hazard mitigation Steering Committee, Planning Team, meetings and documentation, public and stakeholder participation, multi-jurisdictional planning, and existing planning mechanisms implemented during the HMP update process. Additional details about the process of updating each section of this HMP appear at the beginnings of those sections.

3.1 UPDATE PROCESS AND PARTICIPATION SUMMARY

In accordance with the Disaster Mitigation Act of 2000 (DMA 2000) requirements, this plan documents the following topics:

- Planning process
- Hazard identification
- Risk assessment
- Mitigation strategy: goals, actions, and projects
- Formal adoption by the participating jurisdictions
- Pennsylvania Emergency Management Agency (PEMA) and Federal Emergency Management Agency (FEMA) approval

The PEMA All-Hazard Mitigation Planning Standard Operating Guide lays out the standard planning process in Pennsylvania to create and update HMPs (including this HMP), and is cited in Appendix A, under Authorities and References. Hazard vulnerabilities and the risk assessment are described in Section 4 (Risk Assessment), and the mitigation strategy is described in Section 6 (Mitigation Strategy) of this HMP.

Public participation and planning meetings served as the main forum for gathering information to update the HMP. The Steering Committee and Planning Team were afforded access to information in relevant and approved plans, policies, and procedures for Dauphin County. Opportunities for public participation included a public meeting, distribution of information at municipal meetings, and chances to the review and comment on the draft HMP update. To develop all sections of the HMP, the Planning Team used meetings, e-mail correspondence, and teleconferences to solicit input from county, municipal, and other stakeholders, including members of the general public. Most information received for this update came from Dauphin County, its municipalities, and the Steering Committee. Through this planning process, the county established a comprehensive approach to reduce effects of hazards on the county and its municipalities.

3.2 THE PLANNING TEAM

Recognizing the need to manage risk within the county, and to meet the requirements of the DMA 2000, the Dauphin County Department of Public Safety led the update to the 2015 HMP. Ms. Lexi Passaro, Planning Specialist, developed a Steering Committee to provide guidance and direction to the planning effort, and to ensure the resulting document will be embraced both politically and by the constituency within the planning area. Ms. Passaro served as chair of the Steering Committee. Throughout the planning process, Ms. Passaro served as the lead planner and point of contact for the planning process. The Steering Committee was comprised of the following individuals:

- Lexi Passaro, Planning Specialist, Dauphin County Department of Public Safety
- Chris Fisher, Manager – Office of Emergency Management, Dauphin County Department of Public Safety
- Andy Megonnell, Emergency Management Agency (EMA) Training Specialist, Dauphin County Department of Public Safety
- Bob Stout, Emergency Management Specialist, Dauphin County Department of Public Safety
- Doug Brown, Deputy Director, Dauphin County Community and Economic Development
- Eric Naguski, Manager, Dauphin County Conservation District
- Bonnie Kent, Operations Manager/Community Liaison, Northern Dauphin Human Services Center, Dauphin County Human Services
- Andrew Woodring, IT Security Administrator, Dauphin County Office of Information Technology
- Gerard Duke, Dauphin County Planning Coordinator, Tri-County Regional Planning Commission (TCRPC)
- Brian Enterline, Fire Chief and Emergency Management Coordinator (EMC), City of Harrisburg
- Rhonda Hakundy, Pennsylvania Department of Environmental Protection (PA DEP) South Central Regional Office Source Water Protection
- Geoffrey Knight, Planning Director and Floodplain Administrator, City of Harrisburg
- Joe Ritchey, Risk Manager, Capital Region Water
- Bob Rusbatch, EMC, Dauphin Borough and Middle Paxton Township
- Bill Bradfield, National Flood Insurance Program (NFIP) Program Manager, Pennsylvania Emergency Management Agency (PEMA)
- Ernie Szabo, State Hazard Mitigation Planner, PEMA
- Alan Margraf, Director of Facilities Operation, Pennsylvania State System of Higher Education (PASSHE)
- Mari Radford, Community Planning Lead, Federal Emergency Management Agency (FEMA) Region III
- Tony Subbio, Project Manager, Tetra Tech, Inc. (Tetra Tech)

The Steering Committee was charged with the following tasks:

- Providing guidance and overseeing the planning process on behalf of the general planning partnership (Planning Team).
- Attending and participating in Steering Committee meetings.
- Assisting with the development and completion of certain planning elements, including:
    - Reviewing and updating the hazards of concern
    - Developing a public and stakeholder outreach program
    - Assuring the data and information used in the plan update process is best available
    - Reviewing and updating the hazard mitigation planning goals and objectives
    - Identifying and screening of appropriate mitigation strategies and activities
    - Reviewing and updating plan maintenance procedures
- Reviewing and commenting on plan documents prior to submission to PEMA and FEMA.

A Planning Team was assembled to represent each of the municipalities participating in the HMP update, as well as invited stakeholders and members of the Steering Committee. The following organizations were invited to participate on the Planning Team:

Dauphin County Jurisdictions				
• Dauphin County	• Halifax Township	• Lykens Borough	• Reed Township	• Wayne Township
• Berrysburg Borough	• Harrisburg C	• Lykens Township	• Royalton Borough	• West Hanover Township
• Conewago Township	• Highspire Borough	• Middle Paxton Township	• Rush Township	• Wiconisco Township
• Dauphin Borough	• Hummelstown Borough	• Middletown Borough	• South Hanover Township	• Williams Township
• Derry Township	• Jackson Township	• Mifflin Township	• Steelton Borough	• Williamstown Borough
• East Hanover Township	• Jefferson Township	• Millersburg Borough	• Susquehanna Township	
• Elizabethville Borough	• Londonderry Township	• Paxtang Borough	• Swatara Township	
• Gratz Borough	• Lower Paxton Township	• Penbrook Borough	• Upper Paxton Township	
• Halifax Borough	• Lower Swatara Township	• Pillow Borough	• Washington Township	
Educational Institutions				
• Bishop McDevitt	• Halifax Area School District	• Londonderry School	• Roman Catholic Diocese	• Sylvan Heights Science Charter School
• Capital Area Head Start	• Harrisburg Area Community College	• Lower Dauphin School District	• Saint Catherine Laboure	• Temple University – Downtown Harrisburg Campus
• Capital Area Intermediate Unit	• Harrisburg Catholic Elementary School	• Middletown Area School District	• Saint Joan of Arc Hershey	• The Capital Academy
• Capital Area School for the Arts	• Harrisburg Christian School	• Millersburg Area School District	• Saint Margret Mary School	• The Circle School
• Center for Safe Schools	• Harrisburg School District	• Milton Hershey School	• Saint Steven's Episcopal School	• The Samuel School
• Central Dauphin School District	• Hershey Christian Academy	• New Story School	• Seven Sorrows BVM	• The Silver Academy
• Covenant Christian Academy	• Holy Name of Jesus	• Northern Dauphin Christian School	• St Joan Of Hershey	• The Vista School
• Dauphin County Technical School	• Infinity Charter School	• PA Cyber School	• Steelton-Highspire School District	• Upper Dauphin Area School District
• Derry Township School District	• Juvenile Court Dauphin County	• Pennsylvania State System of Higher Education	• Susquehanna Township School District	• Williams Valley School District
Hospitals				
• Penn State Milton S Hershey Medical Center	• Pinnacle Health / UPMC Harrisburg Hospital	• UPMC Community Osteopath Hospital		
Fire Departments				
• Berrysburg Volunteer Fire Company	• Ft. Indiantown Gap Fire (Lebanon Co)	• Londonderry Volunteer Fire Company	• Paxtonia Volunteer Fire Company	• Steelton Volunteer Fire Company
• Carsonville Fire Company	• Grantville Volunteer Fire Company	• Lower Allen Township Fire (Cumberland)	• Penbrook Volunteer Fire Company	• Susquehanna Area Regional Airport Authority Fire (HIA)

Chemical Fire Company of Hummelstown	Gratz Volunteer Fire Company	Lower Swatara Volunteer Fire Company	Pillow Volunteer Fire Company	Susquehanna Volunteer Fire Company
Colonial Park Fire Company	Halifax Volunteer Fire Company	Middle Paxton Volunteer Fire Company	Progress Volunteer Fire Company	Swatara Township Fire Company
Dauphin County Hazardous Materials Response Team	Harrisburg Fire Department	Middletown Volunteer Fire Company	Reliance Hose Co. No. 1 of Elizabethville	Three Mile Island Fire
DCCA	Hershey Fire	Millersburg Volunteer Fire Company	River Rescue	West Hanover Fire Company
Duncannon (Perry County)	Highspire Volunteer Fire Company	PA 193rd SOW Fire Department	Royalton Volunteer Fire Company	Wiconisco Volunteer Fire Company
East Hanover Volunteer Fire Company	Liberty Hose Co. No. 2 of Lykens	Paxtang Volunteer Fire Company	South Hanover Volunteer Fire Company	Williamstown Volunteer Fire Company
Fisherville Fire Company	Linglestown Fire Company			
Police Departments				
Adult Probation Office	Derry Township Police Department	Hummelstown Borough Police Department	Middletown Borough Police Department	Royalton Borough Police Department
Capitol Police Department	Halifax Borough Police Department	Juvenile Probation Office	Millersburg Borough Police Department	Steelton Borough Police Department
Dauphin County Coroner	Harrisburg International Airport Police Department	Lower Paxton Township Police Department	Penbrook Borough Police Department	Susquehanna Township Police Department
Dauphin County Criminal Investigative Division	Harrisburg Police Department	Lower Swatara Township Police Department	Penn State University Middletown Police Department	Swatara Township Police Department
Dauphin County Sheriff	Highspire Borough Police Department	Lykens Borough Police Department	Pennsylvania State Police Harrisburg Barracks	Wiconisco Township Police Department
Emergency Medical Services (EMS) Agencies				
Halifax EMS	Life Lion	Londonderry EMS	Northwest EMS (Lancaster County)	Susquehanna Township EMS
Hersheypark EMS	Life Team	Millersburg EMS	South Central EMS	Williamstown EMS
Retirement, Personal Care, and Nursing Homes				
Aveanna Healthcare	Commonwealth Senior Living	Homeland Center	Jewish Home of Greater Harrisburg	Penn State Milton S. Hershey Medical Center
Brookdale Senior Living	Country Meadows	Homeland Center and Homeland Hospice	Middletown Home	Premier at Susquehanna
Butler Street Senior Living Personal Care Home	Country Meadows of Hershey	Homeland Hospice	Paxton Ministries	Spring Creek
Colonial Park Care Center	Frey Village	Hospice of Central PA	Penn State Health Transitional Care Unit	The Gardens at Blue Ridge

Neighboring Jurisdictions				
• Cumberland County DPS	• Lebanon County DES	• Northumberland County Department of Public Safety	• Schuylkill County Emergency Management Agency	• York County Office of Emergency Management
• Lancaster County EMA	• Perry County EMA			
Other Stakeholders				
• American Red Cross	• Harrisburg Regional Chamber	• Paxton Ministries	• Pennsylvania Public Transit Association	• Tri-County Regional Planning Commission
• Capital Area Transit	• Hershey Entertainment and Resort Company	• Pennsylvania American Water	• Pennsylvania Turnpike Commission	
• Capital Region Water	• Federal Emergency Management Agency	• Pennsylvania Department of Environmental Protection	• South Central Task Force	
• Harrisburg International Airport	• Jewish Federation of Greater Harrisburg	• Pennsylvania Emergency Management Agency	• Susquehanna Area Regional Airport Authority	

For a complete list of individual invitees, participants, attendance at meetings, completion of worksheets, or submission of comments, please refer to Appendices C through E.

The Planning Team acknowledged that important steps in developing a comprehensive HMP were identifying hazards that specifically affect Dauphin County, and assessing their likelihood of occurrence, along with potential damage to the people, property, and environment of the county. The Planning Team chose to focus on an all-hazards approach rather than to narrow the focus to natural disasters only.

As the contract consultant, Tetra Tech guided the Steering Committee and Planning Team through the HMP update planning process. More specifically, Tetra Tech was tasked with:

- Assisting with the organization of a Steering Committee and Planning Team
- Assisting with the development and implementation of a public and stakeholder outreach program
- Collecting data
- Facilitating and recording attendance at meetings
- Assisting with the review, update, and ranking of the hazards of concern, and hazard profiling, and risk assessment
- Assisting with the review and update of mitigation planning goals and objectives
- Assisting with the review of progress of past mitigation strategy
- Assisting with the screening of mitigation actions and the identification of appropriate actions
- Assisting with the prioritization of mitigation actions
- Authoring of the draft and final HMP documents

3.3 MEETINGS AND DOCUMENTATION

Tetra Tech assisted the county in drafting planning documents, preparing meeting materials, and facilitating meetings. The Steering Committee reviewed documentation, provided validation, and acted as an advocate for the HMP update.

Table 3-1 lists dates and descriptions of meetings held by the Dauphin County Steering Committee and Planning Team as part of the process of updating the Dauphin County HMP.

Table 3-1. Public and Planning Meetings

Date	Description of Meeting
September 3, 2020	Kickoff meeting with the Steering Committee
September 24, 2020	Kickoff Meeting with Planning Team members, including five-year plan review and plan update process, evaluation of identified hazards, capability assessment, and mitigation strategy review.
March 10, 2021	Planning Team Meeting to review the results of the risk assessment. The Planning Team members identified problem areas and issues throughout the County for each hazard.
March 11– April 16, 2021	Direct outreach and teleconference discussions with municipalities, to garner as much participation in the planning process as possible.
March 24, 2021	Mitigation Strategy Workshop to review mitigation goals, objectives, actions and current plan status with the Planning Team.
June 2, 2021	Public HMP Draft Review Meeting to receive comments on the draft HMP.
TBD	HMP adoption by County Commissioners.

The Steering Committee followed up each meeting with meeting notes that documented all agenda topics, decisions, and action items identified. The meeting minutes were posted to the project website. Documentation from all meetings is located in Appendix C.

Dauphin County residents were informed of the planning process through various sources, including newspaper-announced public notices and announcements on the Dauphin County HMP project website (dauphincountyhmp.com).

The Risk Assessment Review Meeting and Draft Review Meeting were advertised as a public meeting (see Figure 3-1). No members of the general public attended. Any subsequent supporting documentation provided by county residents will be included in Appendix E (Public and Stakeholder Participation).

Figure 3-1. Public Meeting Public Notices

Legal Ad

Dauphin County is updating its Hazard Mitigation Plan (HMP). The HMP documents the county's vulnerability to natural and manmade hazards, and the county's and municipalities' strategies to reduce that vulnerability. There will be an informational public webinar to discuss the hazards we face and the planning effort on March 10, 2021 from 6:00-8:00 p.m. All interested residents, businesses, and other stakeholders are invited to attend. Please visit https://www.dauphincountyhmp.com/ for the meeting link. Contact the Dauphin County Department of Public Safety, Office of Emergency Management at 717-558-6800 for more information.

By Order of the Dauphin County Department of Public Safety

Legal Ad

The 2021 Dauphin County Hazard Mitigation Plan (HMP) update is complete. The HMP documents the risks faced by the county and its communities, an analysis of stakeholder capabilities, and a set of goals, objectives, and actions to reduce vulnerability across the county. The draft HMP is available for review at www.dauphincountyhmp.com/. Please visit the site and review the documents posted there. There will be a public webinar to collect comments on the draft HMP on Wednesday, June 2, 2021, from 6:00-8:00 p.m. Details about the webinar can be found on the website above. Interested parties are invited to attend the webinar and provide comments. Contact Dauphin County Department of Public Safety Office of Emergency Management, at 717-558-6800 for more information.

Dauphin County Department of Public Safety
Office of Emergency Management

3.4 PUBLIC AND STAKEHOLDER PARTICIPATION

To maximize effectiveness of the HMP, the Planning Team fostered continual public and stakeholder engagement. Input was encouraged and collected through a variety of methods. Five worksheets/surveys— the Hazard/Risk Identification Survey, Capabilities Assessment Survey, NFIP Survey, Mitigation Strategy 5-Year Plan Review Worksheet (Mitigation Review Worksheet), and the Municipality Mitigation Strategy Review — were given to representatives from each municipality in Dauphin County. Of the county and 40 municipalities surveyed in Dauphin County, 36 jurisdictions (the county and 35 municipalities) provided information so that their input could be reviewed and incorporated into the updated HMP.

The following entities with vested interest in development of the updated HMP were given the opportunity to participate in the planning process by attending a Planning Team or public meeting, or by offering comments on the project website: local, state, and federal agencies; neighboring jurisdictions (i.e., Cumberland, Lancaster, Lebanon, Northumberland, Schuylkill, and York Counties in Pennsylvania; community leaders; educators; healthcare facilities; and other relevant private and nonprofit groups. Invitations to participate in meetings were sent to those stakeholders. Appendix E includes a copy of the Planning Team meeting invitation list and sample copies of invitation letters sent. Meeting invitations were also sent to all municipalities including elected officials and Emergency Management Coordinators. Additionally, direct outreach by phone or one-on-one meetings was conducted with municipalities who were unable to attend other meetings or who had questions about worksheets, participation requirements, the planning process, or mitigation project selection. 27 municipalities in Dauphin County had representatives attending at least one meeting; two more of the participating municipalities provided information through individual contact.

Through public notices published in the local newspapers, the groups listed in Section 3.2 and the general public were invited to visit the project website, review the draft county HMP update, and send comments to the Dauphin County Department of Public Safety. Copies of the public notices and other forms of public and stakeholder outreach are presented in Appendix E.

Throughout the course of the entire planning process, the following stakeholder organizations participated:

• American Red Cross	• Federal Emergency Management Agency (FEMA) Region III	• Lower Paxton Township Police Department	• South Central Task Force
• Berrysburg and Community Fire Company	• Halifax Area School District	• Millersburg Area Ambulance	• State Library of Pennsylvania
• Bishop McDevitt High School	• Halifax Fire Department	• Millersburg Police	• Steelton Fire Department
• Capital Area School for the Arts Charter School	• Harrisburg International Airport	• Paxtang Fire Company	• Steelton-Highspire School District
• Capital Region Water	• Harrisburg International Airport Fire Department	• Paxton Ministries	• Susquehanna Township School District
• Central Dauphin School District	• Hershey Entertainment and Resort Company	• Penn State Health System	• Sylvan Heights Science Charter School
• Citizens Fire Company	• Hershey Fire Department	• Penn State Milton S. Hershey Medical Center	• The Hospital and Healthsystem Association of Pennsylvania
• Colonial Park Care Center	• Highspire Police Department	• Penn State Milton S. Hershey Medical Center Life Lion Critical Care Transport	• Tri-County Regional Planning Commission (TCRPC)
• Colonial Park Fire Company	• Homeland Center and Homeland Hospice	• Pennsylvania Air National Guard, 193rd Special Operations Wing	• UPMC Pinnacle
• Country Meadows	• Hospice of Central PA	• Pennsylvania American Water	• Upper Dauphin Area School District

• Cumberland County DPS	• Hummelstown Borough Police Department	• Pennsylvania Department of Environmental Protection	• York County Planning Commission
• Cumberland County LEPC	• Jewish Federation of Greater Harrisburg	• Pennsylvania Emergency Management Agency (PEMA)	• West Hanover Township Fire Company
• Dauphin County Hazardous Materials Response Team	• Lebanon County Department of Emergency Services	• Pennsylvania State System of Higher Education (PASSHE)	• Williams Valley School District
• Dauphin Middle Paxton Fire Company	• Londonderry Fire Company	• PSP Lykens Station	
• Derry Township Police	• Lower Dauphin School District	• South Central Emergency Medical Services	

Section 3.5 of this HMP, Multi-Jurisdictional Planning, includes Table 3-2, showing overall municipal participation in the planning process.

3.5 MULTI-JURISDICTIONAL PLANNING

Dauphin County took a multi-jurisdictional approach to preparing the HMP, so that the HMP would apply to the county and all participating municipalities. The county was able to provide resources (e.g., data, geographic information system [GIS], etc.) to which the municipalities may not have had access. However, Dauphin County depended on municipal buy-in because the municipalities have the legal authority to enforce compliance with land use planning and development directives. Dauphin County undertook an intensive effort to involve all 40 municipalities in the update process.

Each municipality was given the opportunity to participate in this process. Municipal officials and representatives were invited to attend Planning Team and public meetings, were provided worksheets to update the hazards of concern capabilities and mitigation strategy and were asked to review and prioritize the mitigation actions. Municipal participation culminated in formal adoption of the HMP; copies of municipal adoption resolutions are in Appendix F. Table 3-2 indicates the ways each municipality participated in the planning process. In some cases, a municipality was unable to attend a Planning Team meeting; therefore, an individual follow-up meeting with each municipality was held by Dauphin County Steering Committee representatives to cover the meeting material and provide municipal support on the topics presented.

Table 3-2. Participation Matrix

Jurisdiction	Meetings: Planning Team Kick-Off Meeting	Meetings: Risk Assess. Meeting	Meetings: Mit. Strategy Work.	Meetings: HMP Draft Review Meeting	Indiv. Contact	Worksheets: Risk Assess. Survey	Worksheets: Mun. Risk Factor Form	Worksheets: Cap. Assess. Survey	Worksheets: NFIP Survey	Worksheets: Mit. Review Wksht.	2021 Plan Adoption Date
Dauphin County	x	x	x	x		x	N/A	x	N/A	x	TBD
Berrysburg Borough					x	*		*	*	*	TBD
Conewago Township						*		*	*	*	TBD
Dauphin Borough	x		x		x	x	*	*	*	x	TBD
Derry Township	x										TBD
East Hanover Township		x	x	x		x	x	x	x	x	TBD
Elizabethville Borough	x	x	x	x		x	x	x	x	x	TBD
Gratz Borough							x				TBD
Halifax Borough	x			x	x	*		*	*	*	TBD
Halifax Township	x			x	x	*	x	*	*	*	TBD
Harrisburg City		x	x	x	x	x	x	*	*	*	TBD
Highspire Borough		x				x		x			TBD
Hummelstown Borough	x	x	x				x				TBD
Jackson Township	x	x	x	x		x	x	x	x	x	TBD
Jefferson Township						x		x	x	x	TBD
Londonderry Township	x	x	x	x		x	x		x	x	TBD
Lower Paxton Township			x	x		x	x	x	x	x	TBD
Lower Swatara Township				x		x	x	x	x	x	TBD
Lykens Borough	x			x		x		x	x	x	TBD
Lykens Township											TBD
Middle Paxton Township	x		x								TBD
Middletown Borough	x		x	x		x	x			x	TBD
Mifflin Township											TBD
Millersburg Borough		x	x	x		x		x	x	x	TBD
Paxtang Borough			x			x		x	x	x	TBD
Penbrook Borough						x	x	x	x	x	TBD
Pillow Borough	x	x	x	x		x	x	x	x	x	TBD
Reed Township	x	x	x	x		x	x	x	x	x	TBD

Jurisdiction	Meetings				Indiv. Contact	Worksheets					2021 Plan Adoption Date
	Planning Team Kick-Off Meeting	Risk Assess. Meeting	Mit. Strategy Work.	HMP Draft Review Meeting		Risk Assess. Survey	Mun. Risk Factor Form	Cap. Assess. Survey	NFIP Survey	Mit. Review Wksht.	
Royalton Borough	x		x			x	x	x	x	x	TBD
Rush Township											TBD
South Hanover Township						x	x	x		x	TBD
Steelton Borough	x										TBD
Susquehanna Township	x	x	x	x	x	*	x	*	*	*	TBD
Swatara Township	x						x				TBD
Upper Paxton Township		x	x			x		x	x	x	TBD
Washington Township	x		x			x	x	x	x	x	TBD
Wayne Township	x	x	x	x		x	x	x	x	x	TBD
West Hanover Township				x			x				TBD
Wiconisco Township							x				TBD
Williams Township											TBD
Williamstown Borough											TBD

Notes:
EMC = Emergency Management Coordinator
Mun. = Municipal
TBD = To be determined after plan is approved-pending adoption by FEMA Region III.
* = Though the worksheet was not received, the related information was collected during an interview with municipal officials.

SECTION 4 RISK ASSESSMENT

4.1 UPDATE PROCESS AND PARTICIPATION SUMMARY

In accordance with the Federal Emergency Management Agency (FEMA) Local Mitigation Planning Handbook, risk is the potential for damage, loss, or other impacts created by the interaction of natural hazards with community assets. Dauphin County's risk assessment is organized into the following sections:

- Section 4.2 outlines the hazard identification process for both natural and human-caused hazards of concern for further profiling and evaluation.
- Section 4.3 profiles the hazards of concern (location and extent, range of magnitude, past occurrence, and future occurrence) and assesses vulnerability.
- Section 4.4 summarizes the risk assessment methodology, ranking results, potential losses, and future development and vulnerability.

The Steering Committee and Planning Team evaluated the 2015 Hazard Mitigation Plan (HMP) hazards of concern by examining the historic events that have taken place in the county since the last plan update and reviewing the Commonwealth's Hazard Mitigation Plan. In addition, the Steering Committee and Planning Team completed the risk assessment worksheet (Hazard Identification and Risk Evaluation Worksheet). The worksheet listed hazards profiled in the 2015 HMP and requested that participants identify whether the frequency of occurrence, magnitude of impact, and/or geographic extent of each hazard increased, decreased, or did not change since the preparation of the 2015 HMP. The worksheet also provided the opportunity to assess hazards not profiled in the HMP to determine if those hazards should be included as part of the update. Responses from the worksheets were reviewed by the Steering Committee to identify a list of hazards to profile in the 2021 HMP, including three additional hazards of concern. The new hazards of concern are cyber terrorism, invasive species, and opioid addiction response. Each hazard profile also includes an additional subsection that discusses the effect of climate change on vulnerability. Refer to copies of the completed worksheets in Appendix H.

4.2 HAZARD IDENTIFICATION

4.2.1 Disaster Declarations

In reviewing and updating Dauphin County's hazards of concern, the Steering Committee and Planning Team reviewed additional information and historical records from a wide range of sources. The following section discusses the Presidential Disaster and Emergency Declarations, Gubernatorial Disaster Declarations or Proclamations, and Small Business Administration Disaster Declarations that have affected Dauphin County.

Presidential Disaster and Emergency Declarations are issued when it has been determined that state and local governments need assistance in responding to a disaster event. Since 1955, declarations have been issued for various hazard events, including hurricanes or tropical storms, severe winter storms, and flooding. A unique Presidential Emergency Declaration, Emergency Declaration 3235, was issued in September 2005. Through this declaration, President George W. Bush declared a state of emergency existed for the Commonwealth of Pennsylvania and ordered federal aid to supplement Commonwealth and local response efforts to help people evacuate from their homes due to Hurricane Katrina. A summary of declarations affecting the county is provided in the tables below.

Table 4.2-1 lists Presidential Disaster and Emergency Declarations issued between 1972 through 2020 that have affected Dauphin County. Additional declarations can be found on the Federal Emergency Management Agency (FEMA) website at: https://www.fema.gov/disasters.

Table 4.2-1. Presidential Disaster and Emergency Declarations affecting Dauphin County

Declaration Number	Date	Event
DR-4506	March 2020	Covid-19 Pandemic
EM-3441	March 2020	Covid-19
DR-4267	March 2016	Severe Winter Storm and Snowstorm
DR-4099	January 2013	Hurricane Sandy
EM-3356	October 2012	Hurricane Sandy
DR-4030	September 2011	Tropical Storm Lee
EM-3340	September 2011	Remnants of Tropical Storm Lee
DR-1898	April 2010	Severe Winter Storms and Snowstorms
DR-1649	June 2006	Severe Storms, Flooding, and Mudslides
EM-3235	September 2005	Hurricane Katrina Evacuation
DR-1557	September 2004	Tropical Depression Ivan
EM-3180	March 2003	Snowstorm
DR-1298	September 1999	Tropical Depression Dennis and Flash Flooding
DR-1093	January 1996	Flooding
DR-1085	January 1996	Blizzard
DR-1015	March 1994	Winter Storm, Severe Storm
EM-3105	March 1993	Blizzard
DR-523	October 1976	Severe Storms, Flooding
DR-485	September 1975	Severe Storms, Heavy Rains, Flooding
DR-340	June 1972	Flood (Agnes)

Source: FEMA 2020

In addition to these Presidential Disaster and Emergency Declarations, 49 events warranted Gubernatorial Disaster Declarations or Proclamations. Table 4.2-2 lists Gubernatorial Disaster Declarations or Proclamations that have been issued for Dauphin County between 1958 and 2020, according to PEMA (PEMA 2020).

Table 4.2-2. Gubernatorial Disaster Declarations or Proclamations affecting Dauphin County

Date	Event
December 2020	Proclamation of Disaster Emergency – Winter Weather
November 2020	Amendment to Proclamation of Disaster Emergency – Coronavirus (COVID-19)
November 2020	Amendment to Proclamation of Disaster Emergency – Opioid Crisis
August 2020	Amendment to Proclamation of Disaster Emergency – Coronavirus (COVID-19)
August 2020	Amendment to Proclamation of Disaster Emergency – Opioid Crisis
June 2020	Amendment to Proclamation of Disaster Emergency – Coronavirus (COVID-19)
May 2020	Proclamation of Disaster Emergency
May 2020	Amendment to Proclamation of Disaster Emergency – Opioid Crisis
March 2020	Proclamation of Disaster Emergency – Coronavirus (COVID-19)
February 2020	Amendment to Proclamation of Disaster Emergency – Opioid Crisis
December 2019	Amendment to Opioid Crisis Emergency Proclamation
September 2019	Amendment to Opioid Crisis Emergency Proclamation
June 2019	Amendment to Opioid Crisis Emergency Proclamation
March 2019	Amendment to Opioid Crisis Emergency Proclamation
January 2019	Proclamation of Disaster Emergency for Severe Winter Event
December 2018	Amendment to Opioid Crisis Emergency Proclamation
September 2018	Amendment to the Opioid Crisis Emergency Proclamation
August 2018	Proclamation of Disaster Emergency for Severe Weather Event
June 2018	Amendment to Opioid Crisis Emergency Proclamation
April 2018	Amendment to Opioid Crisis Emergency Proclamation
January 2018	Opioid Crisis Emergency Proclamation
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 Disaster Emergency – Severe Winter Storms
February 2014	Proclamation of Disaster – Severe Winter Storms
January 2014	Proclamation of Disaster Emergency – Extreme Weather, Utility Interruption
June 2013	Proclamation of Emergency – High Winds, Thunderstorms, Heavy Rain, Tornado, Flooding
May 2013	Proclamation of Emergency – Dauphin Bridge Fire
October 2012	Proclamation of Emergency – Hurricane Sandy
April 2012	Proclamation of Emergency – Spring Winter Storms

Date	Event
August 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 and Water Shortage
July 1999	Drought
February 1978	Blizzard
January 1978	Heavy Snow
February 1974	Truckers' Strike
February 1972	Heavy Snow
January 1966	Heavy Snow
February 1958	Heavy Snow

Source: Dauphin County HMP 2015, PEMA 2020

Dauphin County has also received Small Business Administration Disaster Assistance for a number of disaster events. A Small Business Administration Disaster Declaration qualifies communities for access to affordable, timely, and accessible financial assistance. Table 4.2-3 lists Small Business Administration Disaster Declarations issued for Dauphin County between 1989 and 2020 (SBA 2020).

Table 4.2-3. Small Business Administration Disaster Declarations affecting Dauphin County

Date	Event
December 2018	Flooding
October 2018	Flooding
August 2018	Flooding
July 2018	Flooding
July 2016	Flash Flooding
July 2009	Fire
May 2004	Heavy Rain, High Winds and Flooding
February 1999	West Shore Farmer's Market Fire
July 1991	Drought
January 1990	Fire

Source: Dauphin County HMP 2015, SBA 2020

4.2.2 Summary of Hazards

As part of the plan update process, the Steering Committee and Planning Team reviewed the hazards of concern detailed in the 2015 version of the plan as well as those identified in the State HMP. They also considered the history of hazard events occurring in Dauphin County as well as events occurring after the completion of the 2015 version of the plan. This review of historical events included an evaluation of all emergency and disaster declarations in the Commonwealth, with a focus on those in which Dauphin County was designated for federal assistance.

Further, all jurisdictions participating in the plan update process were provided a *Hazard Identification/ Evaluation of Risk* worksheet to help identify the hazards—natural and non-natural—that each community believed posed significant risk to Dauphin County, including any that may not have been considered in either the 2015 version of the plan or the State HMP. Completed worksheets submitted by the municipalities are included in Appendix D. Following review of the 2015 hazards list and completion of the *Hazard Identification/Evaluation of Risk* worksheet, additional hazards were considered in need of a risk assessment. The Steering Committee and Planning Team decided to keep all 2015 hazards of concern and add the following hazards:

1. Invasive Species
2. Cyber Terrorism
3. Opioid Addiction Response.

Based on all available information and input from the municipalities, the Steering Committee and Planning Team selected the following natural and non-natural hazards for consideration in this plan:

Natural Hazards

- Drought
- Flood, Flash Flood, Ice Jam
- Hurricane, Tropical Storm, Nor'easter
- Invasive Species
- Landslide
- Pandemic and Infectious Disease
- Radon Exposure
- Subsidence and Sinkholes
- Tornado and Windstorm
- Wildfire
- Winter Storm

Non-Natural Hazards

- Building or Structure Collapse
- Cyber Terrorism
- Dam Failure
- Environmental Hazards: Hazardous Materials Releases
- Opioid Addiction Response
- Transportation Accidents
- Utility Interruption

These hazards have been profiled individually in Section 4.3 of this plan.

4.3 HAZARD PROFILES

The following sections profile and assess vulnerability for each hazard of concern. For each hazard, the profile includes: the hazard description; its location and extent; range of magnitude, past occurrence, future occurrence, and vulnerability assessment. The vulnerability assessment for each hazard includes: an overview of vulnerability and data and methodology used; the impact to life, health and safety; impact to general building stock and critical facilities; impact to the economy; impact to the environment; impact to future growth and development; and effect of climate change on vulnerability.

4.3.1 Building and Structure Collapse

This section provides a profile and vulnerability assessment for the building and structure collapse hazard for Dauphin County. According to the Pennsylvania Emergency Management Agency (PEMA), "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." (PEMA 2018)

The cause(s) of the collapse, the force on the structural collapse, the type of structure that collapsed, and the pattern of collapse all affect the overall collapse disaster event. The four main types of forces include tension, compression, bending, and shear. When a force is applied to an individual structural support, it produces a stress factor, and when great enough, it can collapse a structure. Four main types of structural collapse include lean-to, pancake, V, and cantilever (Federal Emergency Management Agency [FEMA 2012]). Any type of collapse can cause damage to safety, health, and welfare.

4.3.1.1 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 2017).

Most buildings constructed after 1961 in Dauphin County were built according to modern building codes with the most comprehensive building code in Pennsylvania being adopted in the Pennsylvania Uniform Construction Code in 2015. Table 4.3.1-1 shows the number of buildings constructed before 1969 in Dauphin County.

Table 4.3.1-1. Structures Built Before 1969

Municipality	Total Structures	Structures Built Before 1969	Percent of Total Structures Built Before 1969
Berrysburg Borough	168	139	82.74
Conewago Township	1152	324	28.13
Dauphin Borough	378	262	69.31
Derry Township	10518	3966	37.71
East Hanover Township	2383	760	31.89
Elizabethville Borough	700	495	70.71
Gratz Borough	356	241	67.70
Halifax Borough	414	340	82.13
Halifax Township	1529	721	47.16
Harrisburg	25450	20913	82.17
Highspire Borough	1267	1034	81.61
Hummelstown Borough	2227	1370	61.52
Jackson Township	734	238	32.43
Jefferson Township	174	66	37.93
Londonderry Township	2311	1087	47.04

Municipality	Total Structures	Structures Built Before 1969	Percent of Total Structures Built Before 1969
Lower Paxton Township	21935	7821	35.66
Lower Swatara Township	3715	1182	31.82
Lykens Borough	942	781	82.91
Lykens Township	534	273	51.12
Middle Paxton Township	2347	1168	49.77
Middletown Borough	4105	2882	70.21
Mifflin Township	268	124	46.27
Millersburg Borough	1438	1095	76.15
Paxtang Borough	699	654	93.56
Penbrook Borough	1305	1122	85.98
Pillow Borough	109	92	84.40
Reed Township	111	59	53.15
Royalton Borough	558	372	66.67
Rush Township	123	52	42.28
South Hanover Township	2679	555	20.72
Steelton Borough	2387	1938	81.19
Susquehanna Township	11239	4592	40.86
Swatara Township	9879	5044	51.06
Upper Paxton Township	1954	893	45.70
Washington Township	883	346	39.18
Wayne Township	526	129	24.52
West Hanover Township	4467	1479	33.11
Wiconisco Township	590	408	69.15
Williams Township	534	317	59.36
Williamstown Borough	652	573	87.88
Totals	**123,740**	**65,907**	**57.07**

Source: U.S. Census 2020

4.3.1.2 Range of Magnitude

Structural collapse severity can range from the failure of a single load-bearing element within or on a structure, (weakening the structure) to the failure of all load-bearing elements within a structure (bringing about the complete collapse of the structure). Overall, Dauphin County's vulnerability has not changed since the 2018 Pennsylvania Hazard Mitigation Plan (PA HMP) and the entire region continues to be exposed and vulnerable to the building collapse hazard.

The Occupational Safety and Health Administration (OSHA) states that "When internal load bearing structural elements fail, a building will collapse into itself and exterior walls are pulled into the falling structure. This scenario may be caused by construction activity, an earthquake, or fire, and may result in a dense debris field with a small footprint. Alternatively, if the structural failure is caused by an explosion or natural forces such as weather, the building may collapse in an outward direction, resulting in a less dense and more scattered debris field." (OSHA 2019)

All infrastructure, commercial and industrial businesses, and residential structures within Dauphin County are vulnerable to loss because of structural collapse, whether the collapse is from a cascading event or a catastrophic structural failure. This vulnerability is compounded because of the ground composition, which is prone to subsidence throughout the region. Vacant and abandoned buildings (both residential and commercial) pose a particular threat for structural collapse. According to the International Association of Arson Investigators (IAAI) and U.S. Fire Administration (USFA), vacant and abandoned buildings have two separate definitions, as described below (IAAI and USFA 2006):

- Vacant Buildings: When the owner is known, has kept taxes current, and the building is unoccupied
- Abandoned Buildings: When the owner is unknown, has not kept taxes current, and the building is not legally occupied

IAAI and USFA indicate that it is best to identify these buildings early enough before they go into disrepair. Once buildings and structures have been abandoned, it usually becomes a community issue to maintain and secure the structure. Many communities across the nation face inadequate laws to prevent or reduce vacancies and many do not have the funds for demolition to remove these structurally at-risk buildings.

Vacant and abandoned buildings have enormous negative impacts on neighborhoods and communities. Aesthetics of a community deteriorate, crime increases, and the public safety decreases as a result of social stressors (crime, economic decline, decrease in structural market value) and physical structural disrepair. As further identified by IAAI and USFA, “abandonment is a contagious phenomenon”. This problem can be seen in almost every community across the nation, including Dauphin County.

Bridges are also at risk for structural collapse and disrepair can critically affect the integrity of bridge structures. 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. Some structures only need deck replacement or a new superstructure, while others have substructure problems and should be entirely replaced. Dauphin County contains a total of 562 bridges, of which 35 are in poor condition (Pennsylvania Department of Transportation [PennDOT] 2021). Table 4.3.1-2 identifies these bridges in poor condition. In addition, three bridges participated in the PA Rapid Bridge Replacement program and replacements are complete. These bridges include NW Gratz bridge on Valley Drive Road in Lykens Township, W. Enders bridge on West Enders Road in Jackson Township, and Near Mountain Road bridge on SR 225 in Mifflin Township (PennDOT 2021).

Table 4.3.1-2. Dauphin County Bridges in Poor Condition

Locally (L) or State (S) Owned	Condition	Municipality	Year Built	Posting Status	Superstructure Condition (Deck Support)	Substructure Condition (Bridge Support)
L	Poor	Conewago Township	1940	Posted for load	3 - Serious	5 - Fair
S	Poor	Conewago Township	1974	Open, no restriction	4 - Poor	5 - Fair
L	Poor	Conoy Township	1985	Posted for load	4 - Poor	5 - Fair
S	Poor	Derry Township	1917	Open, no restriction	5 - Fair	4 -– Poor
L	Poor	East Hanover Township	1930	Posted for load	4 - Poor	5 - Fair
L	Poor	East Hanover Township	1973	Open, no restriction	4 - Poor	6 - Satisfactory

Locally (L) or State (S) Owned	Condition	Municipality	Year Built	Posting Status	Superstructure Condition (Deck Support)	Substructure Condition (Bridge Support)
L	Poor	Harrisburg City	1940	Open, no restriction	4 - Poor	4 - Poor
L	Poor	Harrisburg City	1900	Open, no restriction	4 - Poor	5 - Fair
L	Poor	Harrisburg City	1940	Open, no restriction	4 - Poor	6 - Satisfactory
L	Poor	Harrisburg City	1960	Open, no restriction	4 - Poor	6 - Satisfactory
L	Poor	Harrisburg City	1914	Open, no restriction	5 - Fair	4 - Poor
S	Poor	Harrisburg City	1940	Open, no restriction	4 - Poor	4 - Poor
S	Poor	Harrisburg City	1950	Open, no restriction	4 - Poor	5 - Fair
S	Poor	Harrisburg City, Wormleysburg Borough	1928	Open, no restriction	4 - Poor	5 - Fair
L	Poor	Jackson Township	1975	Open, no restriction	4 - Poor	5 - Fair
S	Poor	Jackson Township	1974	Open, no restriction	3 - Serious	6 - Satisfactory
S	Poor	Jackson Township	1920	Open, no restriction	4 - Poor	4 - Poor
S	Poor	Jackson Township	1974	Open, no restriction	4 - Poor	6 - Satisfactory
S	Poor	Jackson Township	1974	Open, no restriction	5 - Fair	2 - Critical
L	Poor	Londonderry Township	1910	Posted for load	4 - Poor	5 - Fair
L	Poor	Lower Paxton Township	1950	Posted for load	4 - Poor	6 - Satisfactory
L	Poor	Lower Paxton Township	1950	Open, no restriction	5 - Fair	4 - Poor
S	Poor	Lower Paxton Township	1959	Open, no restriction	3 - Serious	5 - Fair
S	Poor	Lower Paxton Township, South Hanover Township	1984	Open, no restriction	3 - Serious	5 - Fair
L	Poor	Lykens Borough	1981	Posted for load	3 - Serious	5 - Fair
S	Poor	Lykens Borough	1973	Open, no restriction	4 - Poor	5 - Fair
S	Poor	Lykens Township	1910	Bridge, closed to all traffic	4 - Poor	4 - Poor
L	Poor	Mifflin Township	1900	Closed to all traffic	1 - Imminent Failure	5 - Fair
L	Poor	Mount Joy Township	1946	Closed to all traffic	0 - Failed	5 - Fair
S	Poor	Unknown	1938	Open, no restriction	4 - Poor	6 - Satisfactory
S	Poor	Reed Township	1860	Open, no restriction	3 - Serious	4 - Poor

Locally (L) or State (S) Owned	Condition	Municipality	Year Built	Posting Status	Superstructure Condition (Deck Support)	Substructure Condition (Bridge Support)
S	Poor	Washington Township	1973	Posted for load	4 - Poor	6 - Satisfactory
L	Poor	Wayne Township	1975	Posted for load	4 - Poor	6 - Satisfactory
S	Poor	Wiconisco Township	1974	Open, no restriction	4 - Poor	6 - Satisfactory
L	Poor	Williams Township	1987	Open, no restriction	4 - Poor	5 - Fair

Source: PennDOT 2020

4.3.1.3 Past Occurrence

Currently, Dauphin County does not have a comprehensive record of building or structure collapses; however, several recent instances have made the local news. Table 4.3.1-3 lists structural or building collapses since June 2015.

Table 4.3.1-3. Building and Structure Collapse Reports between 2015 and 2020

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts
May 5, 2016 and June 25, 2016	Structural Retention Wall Collapse	NA	NA	MacFarland Wall Collapse: Located in Harrisburg, the MacFarland property, an 8-unit building complex, had a 107-year old retaining wall collapse unto Henry's Tire Shop. The wall had collapsed twice within a 2-month time span because of age, lack of infrastructure maintenance, and saturated soils. Upon the second collapse, the City of Harrisburg's Bureau of Codes conducted a structural inspection of the property, which revealed various violations according to the 2000 International Property Maintenance code. The City's Bureau of Codes further identified that the building structure and retaining wall were structurally deteriorated due to lack of maintenance. The building structure was identified as a fire hazard as well as an overall public health and safety hazard. On the same day as inspections, the City of Harrisburg issued a Condemnation Order, "which condemned the McFarland property as dangerous, unsafe, and unfit for human habitation." McFarland filed a Request for Hearing to disclaim any ownership of the collapsed wall, but it was eventually determined that McFarland did indeed own the wall. Since this determination, a civil lawsuit between McFarland and Henry is still ongoing as to who is responsible in cleaning up the debris and who should rebuild a new retaining wall, estimated to cost $500,000.
April 3, 2016	Building Fire, Roof Collapse	NA	NA	Holly Hall: Located in Middletown, the Holly Hall building of an apartment complex located in the Village of Pineford is primarily filled with college students or the elderly. In April 2016, the complex caught on fire with eventual roof collapse. During this incidence, firefighters had a difficult time keeping the flames under control due to strong winds.

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts
January 16, 2020	New Construction Building Collapse	NA	NA	Graceful Acres Therapeutic Riding (2020): Located in Halifax, Graceful Acres is a teaching facility for people with special needs in addition to using therapy horses to help special needs children. The building was under construction in 2020 and strong wind gusts knocked down most of the framework.

Sources: CBS Local News 2020, Dauphin County 2019, Fox 43 2016

4.3.1.4 Future Occurrence

As previously mentioned, Dauphin County does not record a comprehensive list of building collapse events. However, issues with building integrity can grow without proper maintenance and code enforcement, increasing the risk of building collapse in a community. Age of a structure also needs to be taken into consideration. As identified in the Pennsylvania's State Hazard Mitigation Plan, Dauphin County has 147 homes registered as a historic building as of Pennsylvania Historic Museum Commission 2018 data (PEMA 2018). Although many older homes may have been built to code compliance at the time of construction, now these homes may not be structurally stable, and may not conform to current enhanced International Building Codes. Other hazards events, such as winter storms, tropical storms, and fires, could create conditions for a collapse to occur. According the PA HMP, it is estimated that over 39,200 people and 15,500 buildings are vulnerable to structure collapse with nearly $4 billion of building value at risk. This includes 12 percent of the building stock value in Dauphin County. That said, the likelihood of a building or structure collapse in Dauphin County is considered to be *unlikely*.

4.3.1.5 Vulnerability Assessment

To understand risk, a community must evaluate the assets that are exposed or vulnerable in the area identified. The following sections discuss the potential impact of the building and structure collapse hazard on Dauphin County, including:

- Overview of vulnerability
- Impact on (1) life, health, and safety; (2) general building stock and critical facilities; (3) the economy; and (4) the environment
- Future growth and development
- Effect of climate change on vulnerability

Overview of Vulnerability

Structural collapse severity can range from the failure of a single load-bearing element within or on a structure (weakening the structure) to the failure of all load-bearing elements within a structure (bringing about the complete collapse of the structure). Overall, Dauphin County's vulnerability has not changed since the 2018 PA HMP and the entire county continues to be exposed and vulnerable to the building and structure collapse hazard.

Many factors influence vulnerability to a structure and building collapse. Age of structure, building materials, density of the area of the building location, maintenance, and enforceable measures. Older structures may not have been built with the same level of structural stability required by modern building codes and therefore may be more susceptible to collapse than a modern structure. More densely populated areas of Dauphin County face a higher vulnerability because of the proximity of residences to each other, commercial structures, and urban blight.

Impact on Life, Health, and Safety

As discussed in this section, with any type of collapse, additional effects must be anticipated. Structures can house transmission lines for gases; liquids; and other products, such as sheetrock dust, asbestos, etc., which could be released into the environment during a failure. In addition, the public, residents, or individuals trapped by the collapse may cause hysteria, creating the possibility of civil unrest.

Following the initial events of a structural collapse, residents and/or businesses may be displaced. Depending on the type of structural collapse, it could cause disruption to the local economy, housing, and healthcare access.

Impact on General Building Stock and Critical Facilities

All infrastructure, commercial and industrial businesses, and residential structures within Dauphin County are vulnerable to loss because of structural collapse, whether from cascading event or a catastrophic structural failure. This vulnerability is compounded because of the ground composition, which is prone to subsidence throughout the region.

Impact on the Economy

Structural and building collapse may cause impacts on the economy depending on the scale and severity of the collapse. Economic impacts of structural and building collapse may result in lost wages from temporarily or permanently closed businesses, destruction and damage involving business and personal assets, loss of tax base, recovery costs, and lost investments in destroyed property.

Impact on the Environment

Environmental impacts from a structural fire could occur if hazardous materials are released. Debris from fire can also contain chemicals or substances, which may also impact the environment.

Future Growth and Development

Areas targeted for potential future growth and development in the next 5 to 10 years have been identified across Dauphin County (further discussed in Section 2.4 of this HMP). Any areas of growth could be potentially impacted by the structural collapse hazard because Dauphin County is exposed and vulnerable to flooding, subsidence, and karst (limestone) features. Working with the Tri-County Regional Planning Commission (TCRPC), which provides planning services for Dauphin, Cumberland, and Perry counties, is key as TCRPC adopted a Regional Growth Management Plan (RGMP) in 2017.

Effect of Climate Change on Vulnerability

One trigger for structural collapse is a sinkhole. Climatologists expect an increase in annual precipitation amounts. This increase will coincide with an increased risk in sinkholes in vulnerable areas. As these areas become increasingly developed, the strain on underground aquifers will increase, especially during periods of drought. Precipitation is expected to increase over the next several decades. Annual precipitation has increased by nearly 10 percent since the early 20th century and is expected to increase by another 8 percent by 2050. Over 14 percent of the additional precipitation is expected to occur during the winter months (PA DEP 2018).This will pose an even greater threat for sinkholes in developed areas, resulting in a greater risk of structural collapse. For more information about subsidence and sinkholes, see Section 4.3.13 of this plan.

4.3.2 Cyber Attack

This section provides a profile and vulnerability assessment of the cyber attack hazard for the Dauphin County Hazard Mitigation Plan (HMP) update.

A cyber attack is the unlawful use of information technology, such as computer systems or telecommunications, to impact an individual or organization. This can include instances of cyber crime, such as using cyber attacks to steal or extort money from individuals or organizations or to cause property damage, as well as cyber terrorism. The term "cyber attack" often refers to an attack on information technology itself in a way that would radically disrupt networked services. For example, cyber attackers could disable networked emergency systems or hack into networks that house critical financial information. Cyber attacks can range from taking control of a host website to using networked resources to directly cause destruction and harm. A cyber attack is generally considered an act of cyber *terrorism* when the following conditions 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 a government or people to further a political objective, or to cause grave harm or severe economic damage (Rollins and Clay 2007).

The Pennsylvania Department of Homeland Security defines the following types and methods of cyber attacks, as listed in the table below.

Table 4.3.2-1. Pennsylvania Department of Homeland Security Cyber Attack Definitions

Threat	Description
Botnet	A collection of computers subject to control by an outside party without the knowledge of the owners, using secretly installed software robots. The robots are spread by trojan horses and viruses. The botnets can be used to launch denial-of-service attacks and to 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 account holder. Skimming can take place at an ATM, restaurants, axis, or other places where a user surrenders their 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	A code that can be used to attack a computer by spreading viruses, crashing networks, gathering intelligence, corrupting data, disturbing misinformation, and interfering with normal operations.
Pharming	The act of sending an email 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 email directs the user to visit a website where they are asked to update personal information. The website is only used to steal the user's information.
Phishing	Using a fake email 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 email that may contain malicious software. Spam is now said to account for around 81 percent of all email traffic
Spear Phishing	Focuses on a single user or department within an organization, addressed from someone within the company on a position of trust and requesting information such as login IDs and passwords. Once hackers get this information, they can enter secured networks.
Spoofing	Make a message or transaction appear to come from a source other than the originator.
Spyware	Software that collects information without a user's knowledge and transfers it to a third party.
Swatting	The action or practice of making a prank call to emergency services in an attempt to bring about the dispatch of a large number of armed police officers to a particular address.
Trojan Horse	A destructive program that acts as a benign application. Unlike viruses, Trojan horses do not replicate themselves, but they can be just as destructive. One of the most common types is a program that claims to rid your computer of viruses but instead introduced viruses onto your computer.

Threat	Description
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 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.

Source: Pennsylvania Department of Homeland Security (no date)

Cyber attackers 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 can effectively communicate over long distances without delay (Pennsylvania Hazard Mitigation Plan 2018). There is wide disagreement about the extent of the existing threat by cyber attackers.

Cyber attacks can cause severe disruptions to transportation, public safety, and utility services, all of which (as critical infrastructure) are highly dependent on information technology. Cyber attacks can take many forms (as shown above), are unpredictable, and can occur without warning.

4.3.2.1 Location and Extent

Nationally, cyber security incidents or attacks have impacted residents, business and industry, and public utilities to varying degrees, and those threats would continue and likely expand in the future. Cyber attacks can occur anywhere within Dauphin County depending on an individual's or organization's agenda. Any processes that are networked and controlled by a computer are vulnerable to a cyber attack. Dauphin County government, its municipalities, and stakeholders such as academia, healthcare, National Guard, conservancies, residents, travelers, and business & industry (i.e., the whole community), are potential targets for cyber attacks. Cyber attackers can overtake websites, steal information, and alter the content that is presented to the public. Any vulnerability that could allow access to sensitive data or processes should be addressed and any possible measures taken to harden those resources to attack. Even with required cyber security protection, damage to or disruption of government and business operations can still occur and profoundly impact Dauphin County and its communities.

4.3.2.2 Range of Magnitude

The magnitude of cyber attacks has become more significant in recent years. Cyber attacks can greatly impact the whole community to varying degrees. The magnitude varies based upon which specific system is affected by an attack, the ability to preempt an attack, and an attack's effect on operations. As shown in Table 4.3.2-1, there are many forms of cyber attack, so the overall range of the magnitude of a cyber attack can vary from a skimmer collecting financial information from people who use a particular gas pump to a large-scale cyberterrorist attack that aims to disrupt government functions. Additionally, vulnerability to cyber attacks is greater where there are higher concentrations of people, businesses, and critical infrastructure. Also, as the City of Harrisburg serves as both the county seat and state capital, cyber attacks targeting people and systems in the City of Harrisburg could have cascading impacts affecting all areas of the county and/or Commonwealth.

In response to the growing cybersecurity threat, the National Institute of Standards and Technology developed the "Framework for Improving Critical Infrastructure Cybersecurity" in 2018. This document is described in Section 5 (Capability Assessment).

One worst-case scenario for a cyber attack event in Dauphin County would be a hacker illicitly accessing government systems, disrupting normal operations, intercepting calls, and emails, and gaining access to personal financial and other sensitive information. Another worse-case scenario would be a virus affecting a large portion of the computer population of the county, stealing credit card information, and causing millions of dollars in damage.

4.3.2.3 Past Occurrence

Residents, government, and other stakeholders are regularly impacted by cybersecurity incidents involving release of Personal Identifiable Information (PII) and other data, due to cybersecurity data breaches, such as Peekaboo, MGM Resorts, Walgreens, the Small Business Administration, and Marriott International, in 2020 alone. The majority of these incidents go unreported through standard emergency management channels and mechanisms.

The 2018 Pennsylvania HMP identified two cyber attacks that affected the whole Commonwealth. The first attack was an international cyber attack in 2017, and the second was a cyber incident in 2018 (PEMA 2018). The Dauphin County Department of Public Safety (DPS) was aware of two cyber attacks in the last five years- a ransomware attack in 2019 and an attack in 2020 that exploited a known Windows security vulnerability. Details are not provided here due to security concerns.

4.3.2.4 Future Occurrence

Members of the whole community within Dauphin County do not typically inform the county when a cyber attack or attempt has occurred. However, cyber attacks happen in one form or another on an almost daily basis, so the future occurrence of cyber attack in Dauphin County can be considered *highly likely,* as defined by the Risk Factor Methodology probability criteria (discussed in Section 4.4).

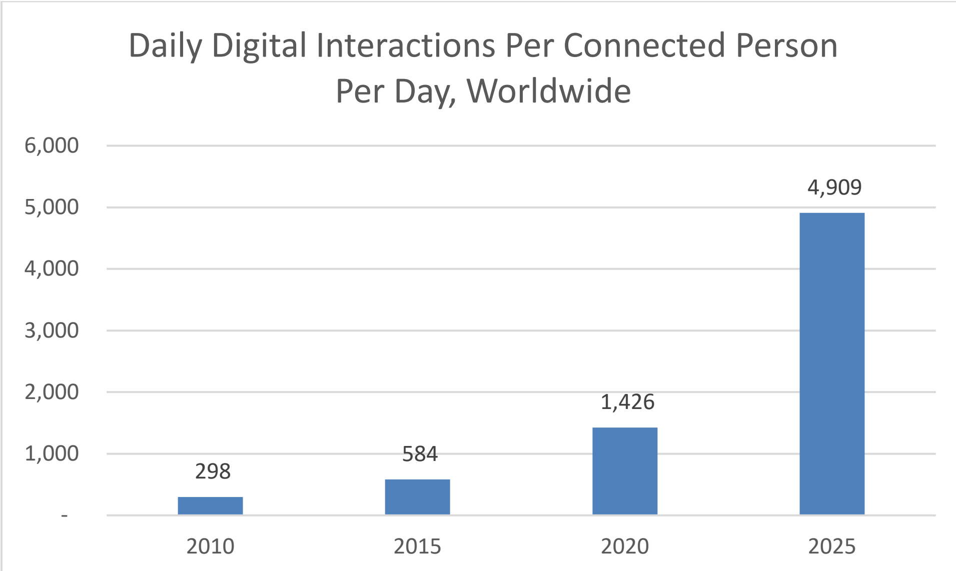
4.3.2.5 Vulnerability Assessment

To understand risk, the whole community must evaluate what assets are exposed or vulnerable in the area identified. The following sections discuss the potential impact of the cyber attack hazard in Dauphin County, including:

- Impact on (1) life, health, and safety; (2) general building stock; (3) critical facilities; (4) the economy; and (5) the environment
- Future growth and development
- Effect of climate change on vulnerability
- Additional data and next steps

As information technology evolves, so will the risk from cyber attacks. Cyber attacks today are largely based on existing operating system and network vulnerabilities. As the technology develops, cyber attackers will find new ways to exploit vulnerabilities. Vulnerabilities in the Internet of Things, including wearable devices (e.g. smart watches), smart homes and assistants (e.g., Alexa, Google Home, etc.), networked doorbells (e.g., Ring), etc. will increase the vulnerability to cyber attacks and provide new targets for malicious actors. The average person produces approximately 147 GB of data per day (Bulao 2021), and the average number of daily digital interactions per connected person worldwide is estimated to grow between 1,426 interactions in 2020 to 4,909 interactions in 2025 (Statista.com 2021), as shown in Figure 4.3.2-1. These statistics reflect the potential vulnerability to cyber attack across our society, including within Dauphin County.

Figure 4.3.2-1. Daily Digital Interactions Per Connected Person Per Day, Worldwide



Source: Statista.com 2021

Impact on Life, Health, and Safety

All 274,515 residents in Dauphin County are exposed to this hazard. Cyber attacks can impact the healthcare system (e.g., networked medical equipment may be vulnerable to hacking). Likewise, as autonomous vehicle technology progresses and autonomous vehicles become more common on Dauphin County's roadways, they are vulnerable to cyber attacks that could cause transportation accidents resulting in injuries or fatalities.

If the cyber attack targeted Pennsylvania's power or utility grid, vulnerable populations could be most impacted. For example, individuals with medical needs are vulnerable because many of the life-saving systems they rely on require power. Also, if an attack occurred during months of extreme hot or cold weather, the county's elderly population (those 65 years of age and older, i.e., 274,515 total persons in the county) would be vulnerable to the effects of the lack of climate control. These individuals would require shelter or admission to a hospital.

Furthermore, households located near vulnerable facilities could experience greater impacts of a cyber attack. If a cyber attack targeted a facility storing or manufacturing hazardous materials, individuals living adjacent to these facilities could be vulnerable to the secondary effects if the attack successfully caused a critical failure at that facility.

Impact on General Building Stock

Along with every home and business that is connected to the Internet, there are over 1,000 critical facilities in Dauphin County at risk of experiencing impacts from a cyber attack. A cyber attack can impact a building, ranging from annoyance to complete shutdown caused by infiltration of supervisory control and data acquisition (SCADA) systems. Secondary effects could disturb public welfare and property by denying services or providing false readings (NJOEM 2019). If services are disrupted by attacks, cyber incidents can cause damage to physical assets. If a cyber attack targeted a fire suppression system, these structures would likely be at a higher risk for structural fire.

Impact on Critical Facilities

Critical facilities and lifelines are vulnerable to cyber attacks based on the significance of the facilities and the potential to interrupt critical systems in the county. As previously mentioned, many critical facilities are reliant upon computer networks to monitor and control critical functions. This can include utilities, public safety facilities, medical facilities, or government buildings. A cyber attack could result in catastrophic failure of one of these facilities. The power grid is reliant upon computer systems to distribute power to the Commonwealth and an attack could disrupt power to thousands of Dauphin County residents. This is just one example of how critical facilities are vulnerable to cyber attacks. Given the importance of critical facilities to daily living activities, critical facilities are highly vulnerable to cyber attacks.

Impact on the Economy

Cyber attacks can have a damaging effect on public trust in systems that are traditionally considered stable and secure. Cyber attacks can also have extensive economic impacts. Companies and government services can lose large sums of unrecoverable revenue from site down-time and possible compromise of sensitive confidential data. Further, the cost of malicious cyber activity involves more than the loss of financial assets or intellectual property. Cyber crimes can cause damage to a company's brand and reputation, consumer losses from fraud, the opportunity costs of service disruption and "cleaning up" after cyber incidents, and the cost of increased spending on cyber security (McAfee 2013).

Individuals' personal information is also at risk. Commonly stolen personal information includes name, social security number, and drivers' license information. Because it is difficult to predict the particular target of cyber attack, assessing vulnerability to the hazard is also difficult. Generally, all populations who directly use a computer or those receiving services from automated systems are vulnerable to cyber attack. Although all individuals in Dauphin County are vulnerable to an attack, certain types of attacks would impact specific segments of the population.

Given the proliferation of electronic commerce and the reliance on electronics, virtually all elements of Dauphin County's economy are vulnerable to cyber attacks. The secondary impacts of a significant attack would be devastating to the economy. For example, an attack that caused the loss of power to hundreds of thousands of businesses during peak holiday shopping months could potentially cost millions of dollars in tax revenue if these businesses were closed. Additionally, a disruption in Dauphin County's manufacturing, agricultural, or tourism sectors would have devastating impacts on the economy. While it is difficult to quantitatively measure the economic impact of a cyber attack, it is safe to say that the impact would be great, thus the economy is vulnerable to cyber attacks.

According to FEMA, cyber attack victims in the United States lost a collective $1.33 billion to cyber actors in 2016 (FEMA 2019). However, this estimate could be understated. In the United States, the costs of cyber attacks are estimated somewhere between $24 billion and $120 billion annually. These costs represent approximately 0.2 percent to 0.8 percent of the total GDP in the United States (McAfee 2013).

Cyber crimes against banks and other financial institutions can cost many hundreds of millions of dollars every year. Cyber theft of intellectual property and business-confidential information can cost developed economies billions of dollars—how many billions is an open question. These losses could be considered simply the cost of doing business, or they could be a major new risk for companies and nations as these illicit acquisitions damage global economic competitiveness and undermine technological advantage (McAfee 2013).

Impact on the Environment

The impacts from a cyber attack are usually limited to infrastructure and people, as highlighted in earlier sections. In the same way that people living near facilities that store or manufacture hazardous materials could be impacted by a cyber attack affecting those facilities, those attacks could also release hazardous materials into the environment.

Future Growth and Development

Areas targeted for potential future growth and development in the next 5 to 10 years have been identified across Dauphin County (further discussed in Section 2.4 of this HMP). Any areas of growth could be potentially impacted by the cyber attack hazard because Dauphin County is exposed and potentially vulnerable.

Effects of Climate Change on Vulnerability

Because cyber attack is a human-caused hazard, climate change is not anticipated to affect vulnerability associated with cyber attacks.

Additional Data and Next Steps

Any additional information regarding localized concerns and past impacts will be collected and analyzed for the HMP update. These data will be developed to support future revisions to the plan.

4.3.3 Dam Failure

This section provides a profile and vulnerability assessment of the dam failure hazard in Dauphin County. A dam is an artificial barrier allowing storage of water, wastewater, or liquid-borne materials for many reasons (flood control, human water supply, irrigation, livestock water supply, energy generation, containment of mine tailings, recreation, or pollution control). Many dams fulfill a combination of these stated functions (Association of State Dam Safety Officials 2013). Dams are an important resource in the United States.

Man-made dams can be classified according to type of construction material used; methods applied in construction, slope, or cross-section of the dam; how a dam resists forces of water pressure behind it; means used to control seepage; and purpose of the dam. Materials used for construction of dams include earth, rock, tailings from mining or milling, concrete, masonry, steel, timber, miscellaneous materials (plastic or rubber), and any combination of these materials (Association of State Dam Safety Officials 2013).

More than a third of the country's dams are 50 or more years old. Approximately 14,000 of those dams pose a significant hazard to life and property if failure occurs. About 2,000 unsafe dams are dispersed throughout the United States in almost every state.

Dams typically fail when spillway capacity is inadequate and excess flow overtops the dam or when internal erosion (piping) through the dam or foundation occurs. Complete failure occurs if internal erosion or overtopping results in a complete structural breach, releasing a high-velocity wall of debris-filled water that rushes downstream, damaging or destroying anything in its path (Federal Emergency Management Agency [FEMA] 2015).

Dam failures can result from one or a combination of the following:

- Overtopping caused by floods that exceed capacity of the dam
- Deliberate acts of sabotage
- Structural failure of materials used in dam construction
- Movement or failure of the foundation supporting the dam
- Settling and cracking of concrete or embankment dams
- Piping and internal erosion of soil in embankment dams
- Inadequate maintenance and upkeep (FEMA 2015)

Regulatory Oversight of Dams

Potential for catastrophic flooding caused by dam failures led to enactment of the National Dam Safety Act (Public Law 92-367), which for 30 years has protected Americans from dam failures. The National Dam Safety Program (NDSP) is a partnership among states, federal agencies, and other stakeholders that encourages individual and community responsibility for dam safety. Under FEMA's leadership, state assistance funds have allowed all participating states to improve their programs through increased inspections, emergency action planning, and purchases of needed equipment. FEMA has also expanded existing and initiated new training programs. Grant assistance from FEMA provides support for improvement of dam safety programs that regulate most dams in the United States (FEMA 2013).

Pennsylvania Department of Environmental Protection

The Pennsylvania Department of Environmental Protection (PADEP) holds responsibility for dam safety. Hazard Potential Category 1 dams are those "where its failure could result in significant loss of life, excessive economic losses, and significant public inconvenience." Hazard Potential Category 2 dams are those "where its failure could result in the loss of a few lives, appreciable property damage, and short-duration public inconvenience" (PADEP 2009). Owners of dams classified as Hazard Categories 1 or 2 ("high-hazard" dams) are required to create an Emergency Action Plan (EAP) that describes the dam, the inundation area if the dam were to catastrophically fail, and procedures for responding to the dam failure (such as notification to the vulnerable population). Dauphin County receives copies of EAPs and inundation maps for high-hazard dams whose failure could impact local residents.

U.S. Army Corps of Engineers Dam Safety Program

The U.S. Army Corps of Engineers (USACE) is responsible for safety inspections of some federal and non-federal dams in the United States that meet the size and storage limitations specified in the National Dam Safety Act. USACE has inventoried dams and has surveyed each state's and federal agency's capabilities, practices, and regulations regarding design, construction, operation, and maintenance of the dams. USACE has also developed guidelines for inspection and evaluation of dam safety (USACE 2017). The USACE National Inventory of Dams (NID) provides the most recent dates of inspection of the following Dauphin County dams:

- Center Campus Pond No. 1: 9/14/2017
- DeHart Dam:11/21/2017
- Hidden Valley: 12/11/2017
- Jacobs Creek: 7/19/2016
- Manada Golf Club Pond: 7/19/2016
- Round top: 7/11/2016
- Swatara: 6/2/2016
- Wildwood Lake: 7/11/2016
- Yingst: 7/18/2016

Federal Energy Regulatory Commission Dam Safety Program

The Federal Energy Regulatory Commission (FERC) has the largest dam safety program in the United States. FERC cooperates with a large number of federal and state agencies to ensure and promote dam safety and, more recently, homeland security. FERC staff inspect hydroelectric projects on an unscheduled basis to investigate the following:

- Potential dam safety problems
- Complaints about constructing and operating a project
- Safety concerns related to natural disasters
- Issues concerning compliance with terms and conditions of a license (FERC 2017)

Every 5 years, an independent consulting engineer, approved by FERC, must inspect and evaluate projects with dams higher than 32.8 feet (10 meters) or with total storage capacity of more than 2,000 acre-feet (FERC 2017).

FERC monitors and evaluates seismic research in geographic areas where seismic activity is a concern. This information is applied to investigate and analyze structures of hydroelectric projects within these areas. FERC staff also evaluates effects of potential and actual large floods on safety of dams. FERC staff visit dams and licensed projects during and after floods, assess extents of damage, and direct any studies or remedial measures the licensee must undertake. FERC's *Engineering Guidelines for the Evaluation of Hydropower Projects* guides FERC engineering staff and licensees in evaluations of dam safety. The publication is frequently revised to reflect current information and methodologies (FERC 2017).

FERC requires licensees to prepare EAPs and conducts training sessions on developing and testing these plans. The plans outline an early warning system in the event of an actual or potential sudden release of water from a dam failure. The plans include operational procedures that may be implemented during regulatory measures, such as reducing reservoir levels and downstream flows as well as procedures for notifying affected residents and agencies responsible for emergency management. These plans are frequently updated and tested to ensure that all applicable parties are informed of the proper procedures in emergencies (FERC 2017).

4.3.3.1 Location and Extent

Forty-two dams are present throughout Dauphin County, as shown on Figure 4.3.3-1. The vast majority of these dams pose little risk; however, nine Hazard Category 1 high-hazard dams require EAPs. Table 4.3.3-1 lists dam classification definitions. Table 4.3.3-2 is a complete list of dams in Dauphin County with high-hazard dams listed first.

Figure 4.3.3-1. Dams in Dauphin County

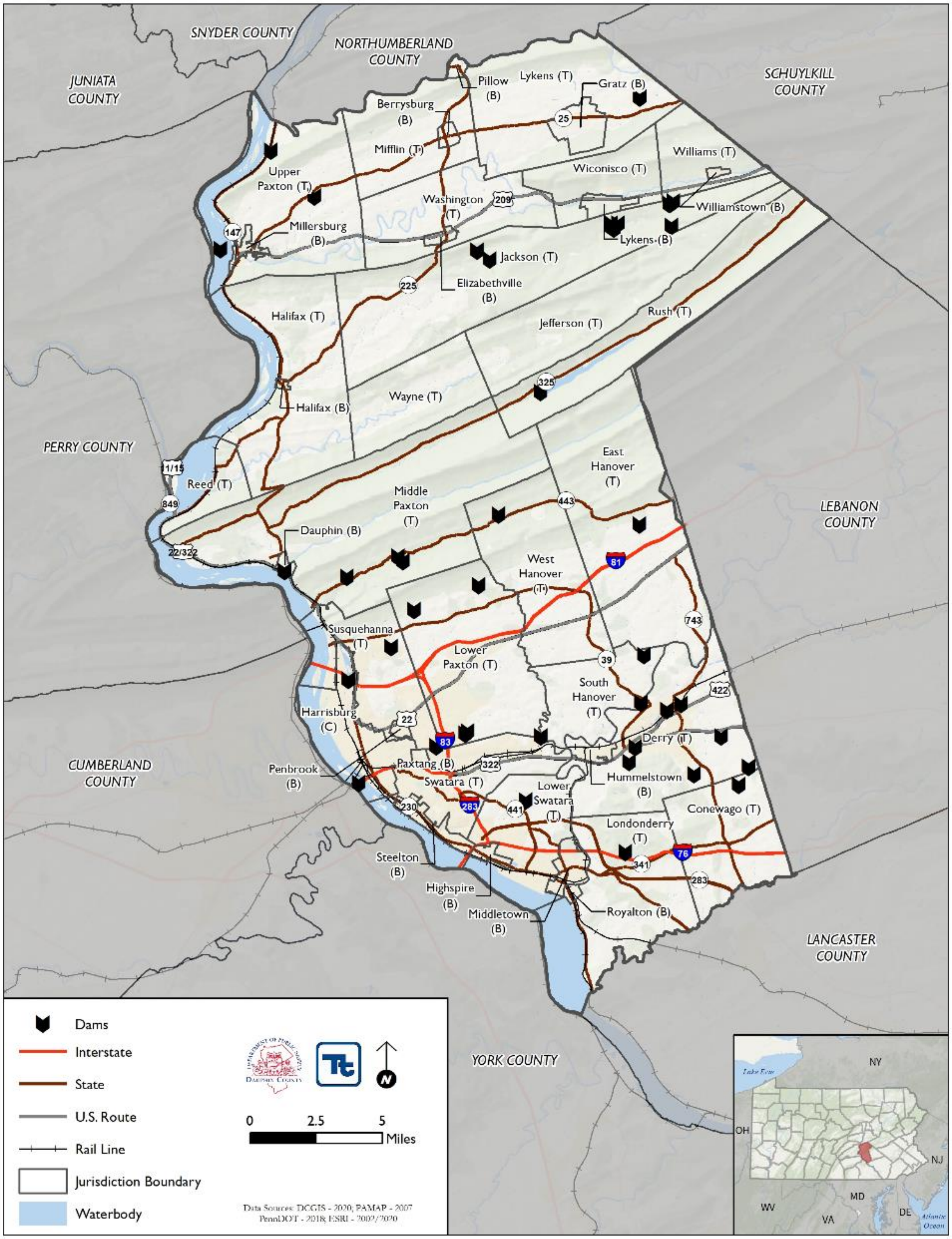


Table 4.3.3-1. Dam Classification Definitions

Size Category		
Category	Impoundment Storage (Acre-feet)	Dam Height (Feet)
A	Equal to or greater than 50,000	Equal to or greater than 100
B	Less than 50,000 but greater than 1,000	Less than 100 but greater than 40
C	Equal to or less than 1,000	Equal to or less than 40
Hazard Potential Category		
Category	**Population at Risk**	**Economic Loss**
1	Substantial (Numerous homes or small businesses or a large business or school)	Excessive, such as extensive residential, commercial, or agricultural damage, or substantial public inconvenience
2	Few (A small number of homes or small businesses)	Appreciable, such as limited residential, commercial, or agricultural damage, or moderate public inconvenience
3	None expected (no permanent structures for human habitation or employment)	Significant damage to private or public property and short-duration public inconvenience such as damage to storage facilities or loss of critical stream crossings
4	None expected (no permanent structures for human habitation or employment)	Minimal damage to private or public property and no significant public inconvenience

Source: Commonwealth of Pennsylvania 2011.

Table 4.3.3-2. Dams in Dauphin County

Dam Name	Municipality	Stream	Class	Permittee
High-Hazard Dams				
Center Campus Pond No. 1	Derry Township	Tr Swatara Creek	C-1	Pennsylvania State University
DeHart	Rush Township	Clarks Creek	A-1	City of Harrisburg, Bureau of Water
Hidden Valley	Middle Paxton Township	Tr Fishing Creek	C-1	Lawrence M. Cooney
Other dams				
Ayers Dam	Jackson Township	Armstrong Creek	C-4	Jan Ayers
Big Lick	Jefferson Township	Updegroves Run	C-4	Williamstown Borough Authority
Blue Meadow Farm Det Basin	Lower Paxton Township	Tr Beaver Creek	C-4	Triple Crown Corporation
Brook Drive	Derry Township	Spring Creek	C-4	Milton Hershey School
Bullfrog Valley Pond	Derry Township	Tr Swatara Creek	C-4	Derry Township
Dauphin	Dauphin Borough	Stony Creek	C-4	United Water of Pa
Dock Street	Harrisburg City	Susquehanna River	C-4	Harrisburg City
East Rattling Creek Res	Jackson Township	Rattling Run	C-4	Borough of Lykens
Felicita - Pond No. 4	Middle Paxton Township	Fishing Creek	C-4	King Drive Corporation
Felicita - Pond No. 6	Middle Paxton Township	Fishing Creek	C-4	King Drive Corporation
Feltys	Derry Township	Tr Spring Creek	C-4	Larry Moyer
Ferry Wall	Millersburg Borough	Susqhehanna River	C-4	Millersburg Ferry Boat Association
Glen Park	Lykens Borough	Rattling Creek	C-4	Borough of Lykens

Dam Name	Municipality	Stream	Class	Permittee
Hershey	Derry Township	Spring Creek	C-4	Unknown
Jacobs Creek	Derry Township	Tr Spring Creek	C-3	Jacobs Creek Homeowners Association
Keiser	Lower Paxton Township	Tr Paxton Creek	C-4	James F. & Albert L. Keiser
Lykens Reservoir	Jackson Township	Rattling Run	C-4	Borough of Lykens
Lykens Valley Golf Course	Upper Paxton Township	Unt Little Wiconisco Creek	C-4	Lykens Valley Golf Course
Lykens Water Supply	Jackson Township	Rattling Creek	C-4	Borough of Lykens
Manada Golf Club Pond	East Hanover Township	Bow Creek	C-3	Manada Golf Club, Inc.
Nine O'clock	Jackson Township	East Branch Rattling Run	C-4	Williamstown Borough Authority
Old Reliance Farm Detention Pond	Lower Swatara Township	Tr Swatara Creek	C-4	Daniel Brawley
Old Reliance Farm Detention Pond	Lower Swatara Township	Tr Swatara Creek	C-4	Mr. & Mrs. Daniel Brawley
Pines Association	Conewago Township	Tr Spring Creek	C-4	Mr. & Mrs. Steve Stanislawczyk
Round Top	Londonderry Township	Iron Run	C-4	Middletown Borough
Sandbeach Diversion	South Hanover Township	Manada Creek	C-4	Pa American Water Company
Schlegel	Upper Paxton Township	Tr Susquehanna River	C-4	Willard Schlegel
Spring Creek	Derry Township	Spring Creek	C-4	Hershey Park
Stehr	Lykens Township	Tr Pine Creek	C-4	Craig Stehr
Swatara	Derry Township	Swatara Creek	C-4	PA American Water Company
Toyer	Susquehanna Township	Tr Spring Creek	C-4	Ed Toyer
Twin Lakes Park Lower	Lower Paxton Township	Tr Spring Creek	C-4	Twin Lakes Park Community Association
Twin Lakes Park Upper	Lower Paxton Township	Tr Spring Creek	C-4	Twin Lakes Park Community Association
Unnamed	Lower Paxton Township	Beaver Creek	C-4	United Water of Pa
Upper Reservoir	Jackson Township	Tr Wiconisco Creek	C-4	Williamstown Borough Authority
White Oak Road	Jackson Township	Tr Armstrong Creek	C-4	DCNR
Widener University	Susquehanna Township	Tr Black Run	C-4	Widener University
Wildwood Lake	Harrisburg City	Paxton Creek	C-4	County of Dauphin
Yingst	West Hanover Township	Tr Fishing Creek	C-3	Richard & Cathy Yingst

Source: PADEP 2020

4.3.3.2 Range of Magnitude

Extent or magnitude of a dam failure event can be measured in terms of classification of the dam. FEMA has three classification levels of dam hazard potential: low, significant, and high. The classification levels build on each other. The hazard potential classification system should be used with the understanding that failure of any dam or water-retaining structure could represent a danger to downstream life and property (FEMA 2004).

Each FEMA classification level of dam hazard potential is described as follows:

- Low-hazard potential dams are those where failure or misoperation would result in no probable loss of human life and low economic or environmental losses. Losses are principally limited to the owner's property.
- Significant-hazard potential dams are those where failure or misoperation would result in no probable loss of human life but could cause economic loss, environmental damage, disruption of lifeline facilities, or impact other concerns. Significant-hazard potential dams are often located in predominantly rural or agricultural areas.
- High-hazard potential dams are those where failure or misoperation will probably cause loss of human life.

Table 4.3.3-3 lists USACE-developed classifications of hazard potentials of dam failures, based only on potential consequences of a dam failure. This classification does not take into account probability of failure.

Table 4.3.3-3. U.S. Army Corps of Engineers Hazard Potential Classification

Hazard Category[1]	Direct Loss of Life[2]	Lifeline Losses[3]	Property Losses[4]	Environmental Losses[5]
Low	None (rural location, no permanent structures for human habitation)	No disruption of services (cosmetic or rapidly repairable damage)	Private agricultural lands, equipment, and isolated buildings	Minimal incremental damage
Significant	Rural location, only transient or day-use facilities	Disruption of essential facilities and access	Major public and private facilities	Major mitigation required
High	Certain (one or more) extensive residential, commercial, or industrial development	Disruption of essential facilities and access	Extensive public and private facilities	Extensive mitigation cost or impossible to mitigate

1 Categories are assigned to overall projects, not individual structures at a project.

2 Loss-of-life potential is based on inundation mapping of area downstream of the project. Analysis of loss-of-life potential should take into account the population at risk, time of flood wave travel, and warning time.

3 Lifeline losses include indirect threats to life caused by the interruption of lifeline services from project failure or operational disruption; for example, loss of critical medical facilities or access to them.

4 Property losses include damage to project facilities and downstream property and indirect impact from loss of project services, such as impact from loss of a dam and navigation pool, or impact from loss of water or power supply.

5 Environmental impact downstream caused by the incremental flood wave produced by the project failure, beyond what would normally be expected for the magnitude flood event under which the failure occurs.

Source: USACE 2016

The EAPs associated with the Dauphin County high-hazard dams provide information concerning the estimated number of homes and residents vulnerable to a dam failure. The county considers the DeHart Dam, located in Rush Township, to be the most significant due to the potential impact of a failure from this dam. Failure of this dam would inundate an a bordered on the north by State Route 325 and on the south by Third and Middle Mountains from the DeHart Dam to the Susquehanna River. The number of vulnerable structures includes 112 homes, one daycare center, and 11 highway bridges. The number of vulnerable residents is approximately 1,000. (Capital Region Water 2018).

In addition to dams located within the county, Dauphin County considers the "high-hazard" Raystown Lake Dam, located in Huntingdon County, to be significant for potential impact. Raystown Lake Dam is located 68 miles northwest of Dauphin County on the Juniata River. According to the USACE Raystown Lake Master Plan, the lake covers 513,000 acre-feet of water and reaches roughly 30 river miles long. During flood stages, the lake can hold 761,000 acre-feet of water and reach roughly 34 river miles long. (USACE 2019). If a spillway failure were to occur at Raystown Dam, flood water would overflow the Susquehanna River banks for Dauphin County municipalities located south of the Juniata River confluence. According to the USACE, it would take 13.6 hours to begin experiencing increased flows and 24 hours to see peak flows after the dam failure. This is comparable to the Harrisburg 1996 Ice Jam flood event that occurred on the Susquehanna River (USACE 2012). As of 2019, the USACE identified that the engineering plans and specifications were approved, and the spillway gate rehabilitation construction was underway (USACE 2019). The rehabilitation work is anticipated for completion in July 2022 and costs about $12,000,000 (GOVTRIBE 2019).

4.3.3.3 Past Occurrence

One of the worst dam failures to occur in the U.S. took place in Johnstown, PA, (Cambria County) in 1889 and claimed 2,209 lives (Association of State Dame Safety Officials [ASDSO] 2015). Another dam failure took place in Austin, PA, (Potter County) in 1911 and claimed 78 lives (ASDSO 2015). To date, there have not been any impactful dam failures in Dauphin County's recent history as small issues are often not reported on smaller dams. However, there were concerns about dam integrity at the Speedwell Forge Lake Dam, located in Elizabeth Township. There was a possibility that this lake may have had to be partially drained to reduce the stress that was being placed on this structure. In June of 2005, this dam was inspected and deemed safe by state officials.

4.3.3.4 Future Occurrence

Likelihood of a dam failure in Dauphin County is difficult to predict. Dam failure events are infrequent and usually coincide with events that cause them, such as earthquakes, landslides, and excessive rainfall and snowmelt. However, the risk of such an event increases for each dam as the dam's age increases or frequency of maintenance decreases.

"Residual risk" to dams is risk that remains after implementation of safeguards. Residual risk to dams is associated with events beyond those that the facility was designed to withstand. However, probability of any type of dam failure is low in today's dam safety regulatory and oversight environment.

Based on Risk Factor Methodology Probability Criteria (further defined in Section 4.4), and assuming regular maintenance and inspections of the dams in Dauphin County, dam failures are considered *unlikely* in the county.

4.3.3.5 Vulnerability Assessment

To assess Dauphin County's risk to dam failure, a quantitative review was implemented referencing the probable maximum flood inundation areas for the Raystown Dam Sunny Day, Raystown Dam PMF, DeHart Dam, Jacobs Creek Dam, and Hershey Dam (Figure 4.3.3-2 through Figure 4.3.3-6).

Figure 4.3.3-2 Raystown Dam Sunny Day Inundation Area

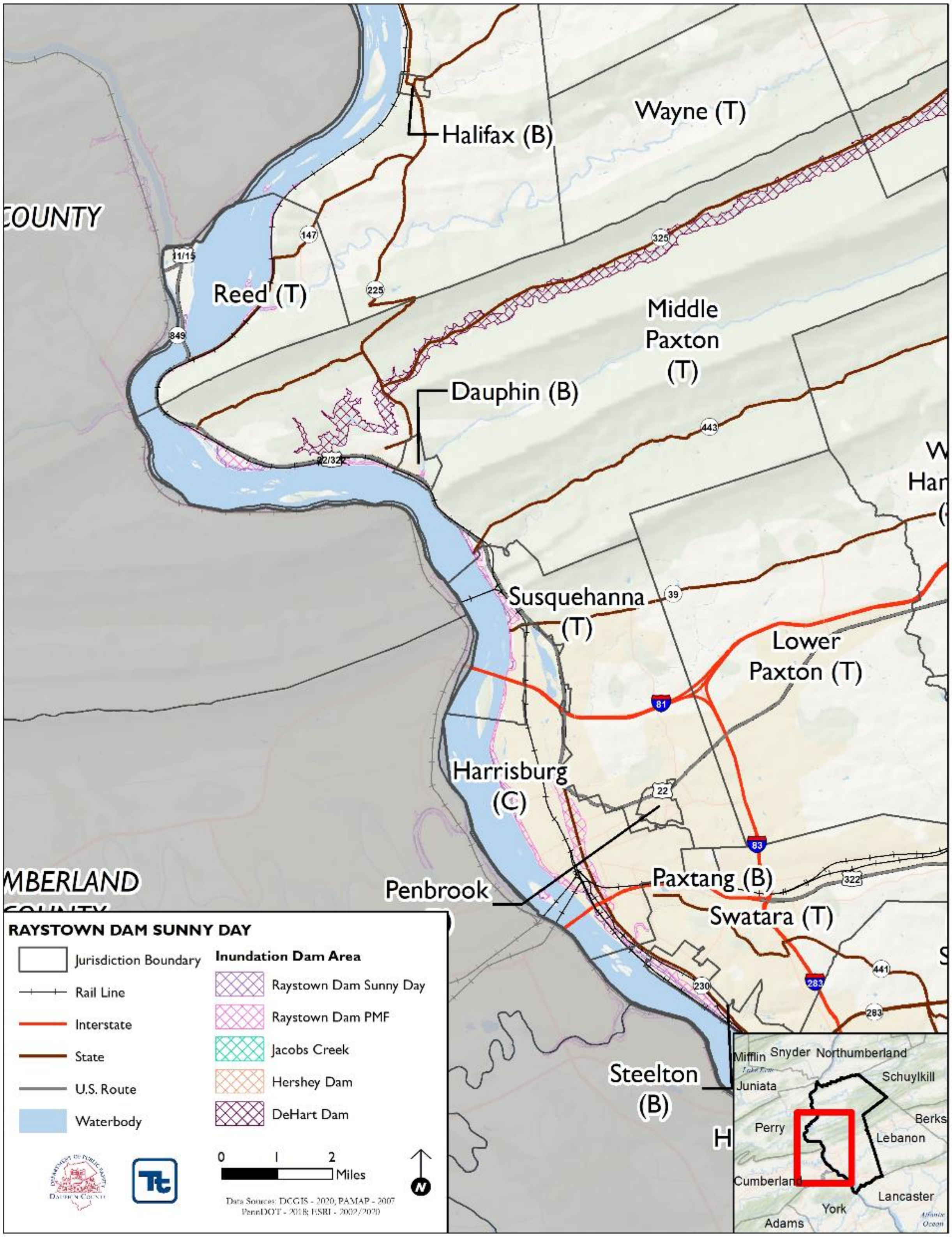


Figure 4.3.3-3 Raystown Dam PMF Inundation Area

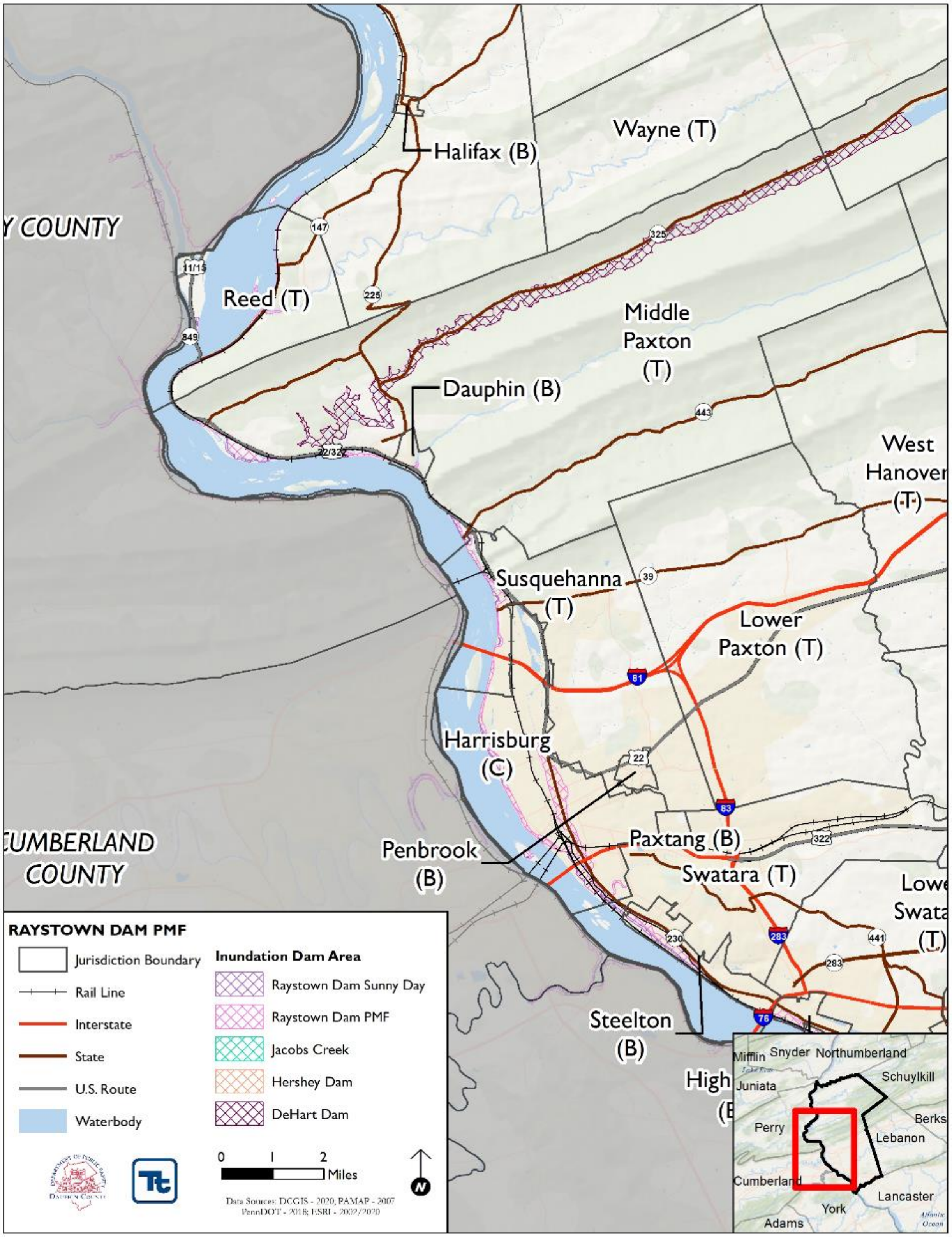


Figure 4.3.3-4 DeHart Dam Inundation Area

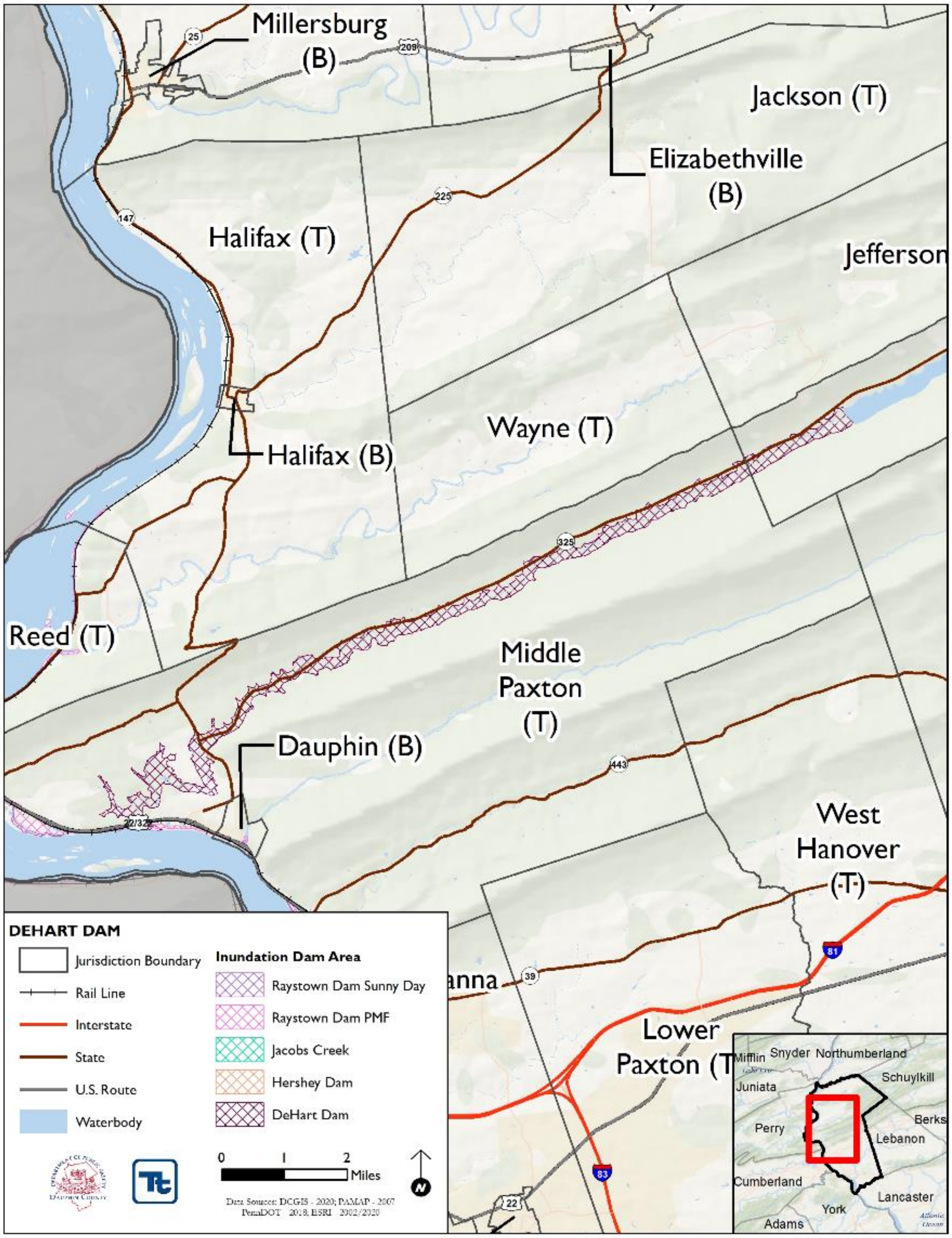


Figure 4.3.3-5 Jacobs Creek Dam Inundation Area

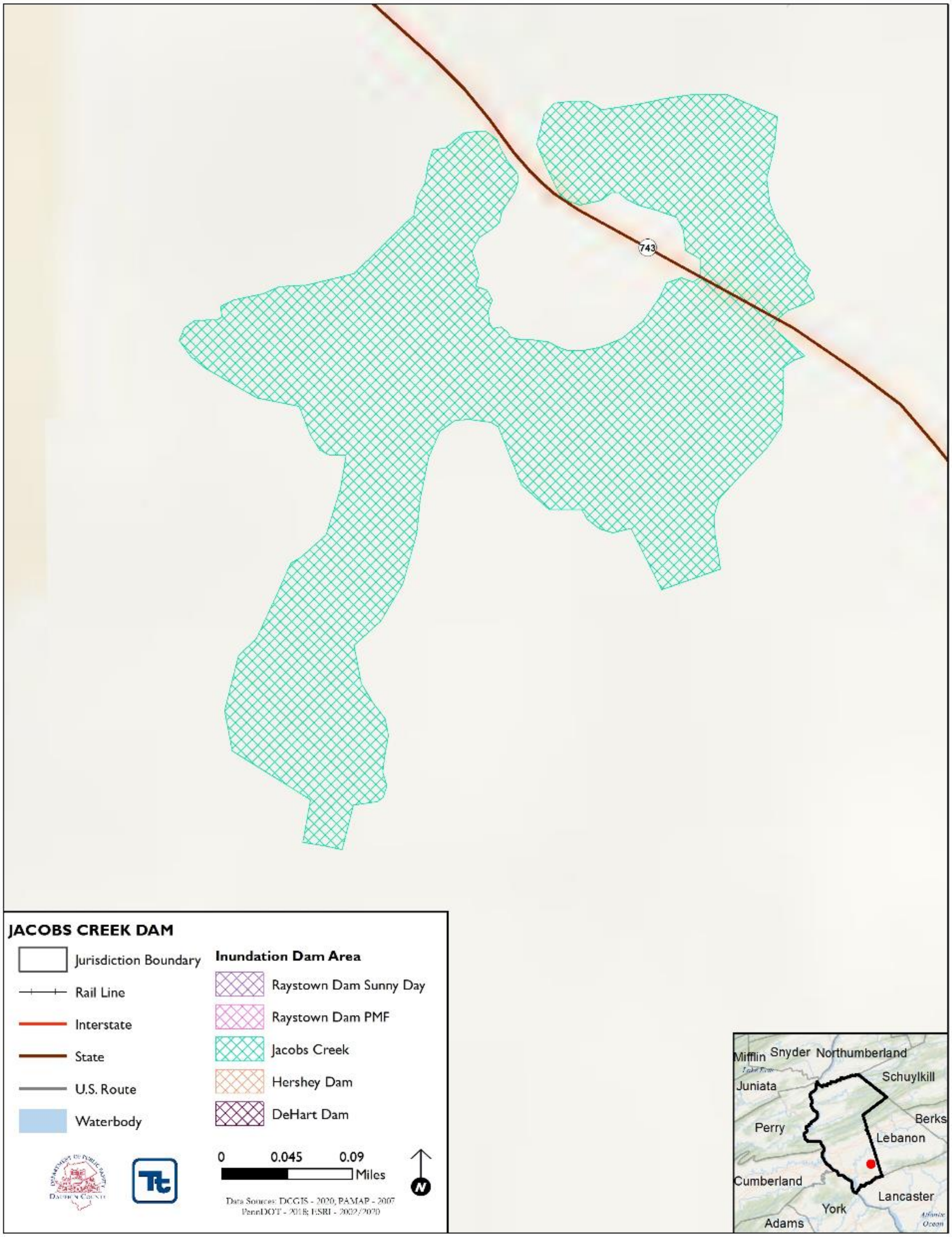
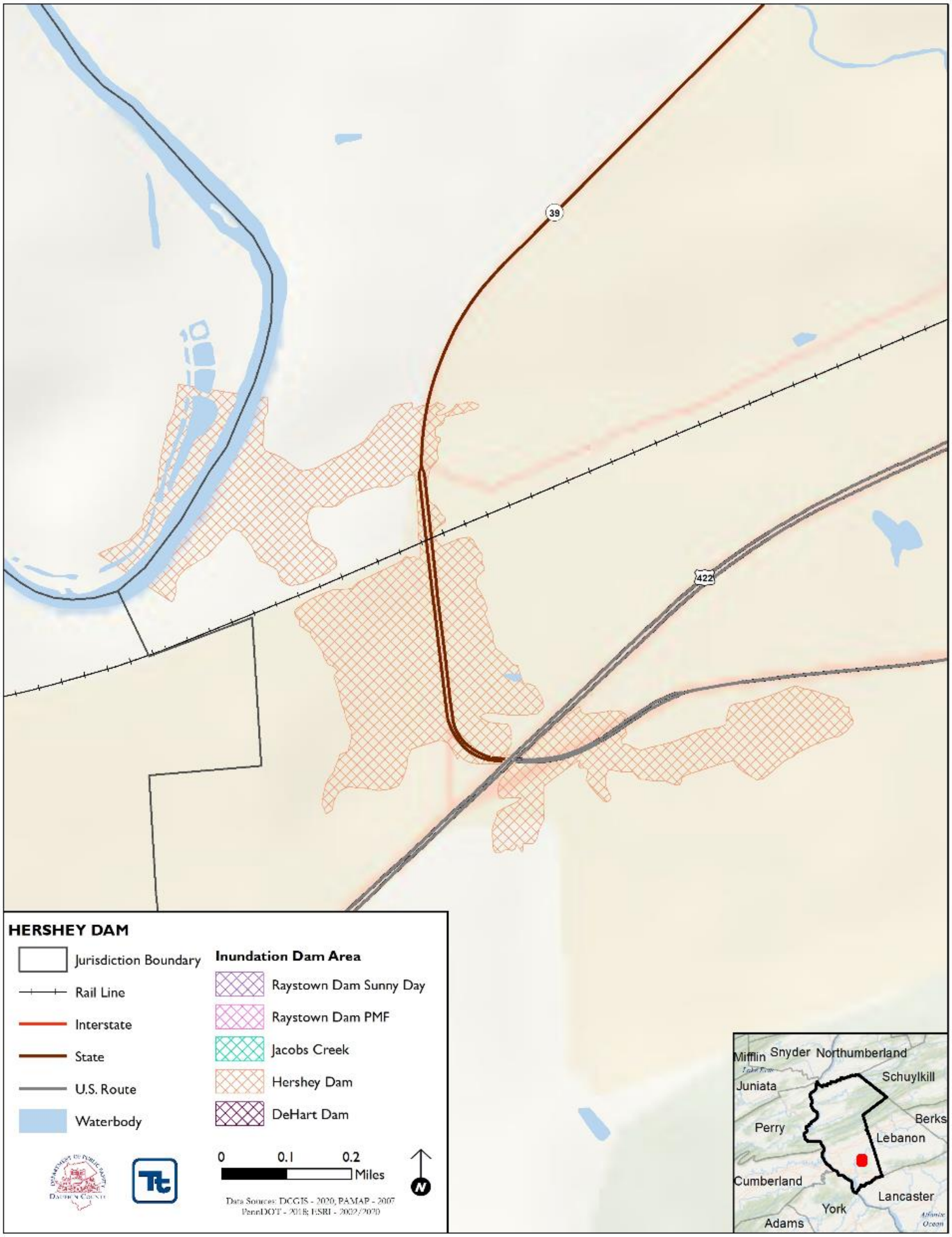


Figure 4.3.3-6. Hershey Dam Inundation Area



Impact on Life, Health, and Safety

The entire population residing within a dam failure inundation zone is considered exposed and vulnerable. Of the population exposed, the economically disadvantaged and the population over the age of 65 are the most vulnerable. Economically disadvantaged populations are more vulnerable because they are likely to evaluate their risk and make decisions to evacuate based on the net economic impact to their family. The population over the age of 65 is also highly vulnerable because they are more likely to seek or need medical attention that may not be available because of isolation during a flood event, and they may have more difficulty evacuating.

Other than the population in the dam failure inundation zone, the safety of the first responders on-scene is also at risk. First responders would be responsible for traffic control and responding to transportation accidents. There would be a higher than normal call volume and demand of first responders during a dam failure. Continuity of operations, including continued delivery of services, may be impeded, and additional personnel would potentially be needed due to the lack of fire and police personnel in the county.

Dam failure events are frequently associated with other natural hazard events such as earthquakes, landslides, or severe weather, which limits their predictability and compounds the hazard. Populations without adequate warning of the event are highly vulnerable to this hazard.

An exposure analysis assessed five probable maximum flood inundation areas within the county. Of the 39 participating jurisdictions in the county, eight have persons living in the probable maximum flood inundation areas. The greatest number of persons exposed to the probable maximum flood inundation area are in the Raystown Dam PMF inundation area (3,250 persons total within the inundation area). The remaining dam inundation areas have the following total number of persons exposed:

- Raystown Dam Sunny Day = 225 persons
- Jacobs Creek Dam = 15 persons
- Hershey Dam = 8 persons
- DeHart Dam = 303 persons

According to the U.S. Army Corps of Engineers “Emergency Action Plan for Raystown Lake”, the most vulnerable areas to hazard events are within public access areas around the lake and communities within downstream flooding locations (USACOE, 2012). Potential causes of downstream flooding include extreme storms, spillway erosion, and slope failure. The results of an extreme storm could cause large inflows causes the lake level to rise and discharge over the surface. In the event of slope failure, the embankment of the dam could be compromised causing a breach. During a spillway erosion, vegetation, soil and rock will be displaced and potentially cause a scour hole as well as restrict access to dam operations. The report indicates over 50 municipalities could be affected in a major breach. Evacuation plans are pertinent to protect the population of those communities. Additionally, maintenance and enhancement of infrastructure is important to reduce the risk of downstream flooding and impact on structures within the affected communities.

Impact on General Building Stock

All buildings and infrastructure located in the dam failure inundation zone are considered exposed and vulnerable. Property located closest to the dam inundation area has the greatest potential to experience the largest, most destructive surge of water. All transportation infrastructure in the dam failure inundation zone is vulnerable to damage and potentially cutting off evacuation routes, limiting emergency access, and creating isolation issues. Utilities such as overhead power lines, cable lines, and phone lines could also be vulnerable. Loss of these utilities could create additional isolation issues for the inundation areas.

Overall, the greatest number of structures exposed to the dam hazard areas are within the Raystown Dam PMF probable maximum flood inundation area (i.e., 1,769 buildings within the inundation area). These buildings have a total replacement cost value of approximately $3.2 billion. The remaining dam inundation areas have the following total number of structures exposed:

- Raystown Dam Sunny Day = 171 buildings, approximately $381 million
- Jacobs Creek Dam = 6 buildings, approximately $1.2 million
- Hershey Dam = 34 buildings, approximately $82.8 million
- DeHart Dam = 267 buildings, approximately $104.9 million

Dam failure can cause severe downstream flooding and may transport large volumes of sediment and debris, depending on the magnitude of the event. Widespread damage to buildings and infrastructure affected by an event would result in large costs to repair these locations. In addition to physical damage costs, businesses can be closed while flood waters retreat and utilities are returned to a functioning state.

Impact on Critical Facilities

Dam failures may also impact critical facilities and infrastructure located in the downstream inundation zone. Consequentially, dam failure can cut evacuation routes, limit emergency access, and/or create isolation issues. Dam failure can cause severe downstream flooding and may transport large volumes of sediment and debris, depending on the magnitude of the event. Widespread damage to buildings and infrastructure affected by an event would result in large costs to repair these locations. In addition to physical damage costs, businesses can be closed while flood waters retreat and utilities are returned to a functioning state. Further, utilities such as overhead power lines, cable lines, and phone lines could also be vulnerable. Loss of these utilities could create additional isolation issues for the inundation areas.

Out of the 1,729 critical facilities in Dauphin County, most of the critical facilities sit in the Raystown Dam PMF inundation area (95 critical facilities). Of those exposed, 86 are considered lifelines for the county. A majority of the exposed critical facilities are historic sites, hazardous material sites, and bridges.

The remaining dam inundation areas have the following total number of critical facilities and lifelines exposed:

- Raystown Dam Sunny Day = 6 critical facilities, 4 lifelines
- Jacobs Creek Dam = no critical facilities/lifelines
- Hershey Dam = 3 critical facilities, 2 lifelines
- DeHart Dam = 9 critical facilities, 4 lifelines

Impact on the Economy

Severe flooding that follows an event like a dam failure can cause extensive structural damage and withhold essential services. The cost to recover from flood damages after a surge will vary depending on the hazard risk of each dam. Severe flooding that follows an event like a dam failure can cause extensive damage to public utilities and disruptions to delivery of services. Loss of power and communications may occur, and drinking water and wastewater treatment facilities can become temporarily out of operation. Debris from surrounding buildings can accumulate should the dam mimic major flood events, such as the 1 percent annual chance flood event that is discussed in Section 4.3.6 (Flood, Flash Flood, Ice Jam).

Impact on the Environment

The environmental impacts of a dam failure can include significant water-quality and debris-disposal issues or severe erosion that can impact local ecosystems. Flood waters can back up sanitary sewer systems and inundate wastewater treatment plants, causing raw sewage to contaminate residential and commercial buildings and the flooded waterway. The contents of unsecured containers of oil, fertilizers, pesticides, and other chemicals may get added to flood waters. Hazardous materials may be released and distributed widely across the floodplain. Water supply and wastewater treatment facilities could be offline for weeks. After the flood waters subside, contaminated and flood-damaged building materials and contents must be properly disposed of. Contaminated sediment must be removed from buildings, yards, and properties.

The number of acres Dauphin County is exposed to the probable maximum flood inundation areas is shown in Table 4.3.3-4. The DeHart Dam probable maximum flood inundation area inundates the greatest acreage across the county.

Table 4.3.3-4. Number of Acres Dauphin County Exposed to the Probable Maximum Flood Inundation Areas

Total Number of Acres in Dauphin County	Dam Inundation Area	Acres in County	Percent of Total Land Area
355,048	Raystown Dam Sunny Day Inundation Area	173	<0.1%
	Raystown Dam PMF Failure Inundation Area	1,889	0.5%
	DeHart Dam Inundation Area	2,004	0.6%
	Jacobs Creek Inundation Area	56	<0.1%
	Hershey Dam Inundation Area	138	<0.1%
	Dauphin County (Total)	**4,261**	**1.2%**

Source: Dauphin County GIS 2020

Future Changes That May Impact Vulnerability

Understanding future changes that affect vulnerability can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. Several factors are examined in this section to assess hazard vulnerability.

Projected Development

As discussed and illustrated in Section 4.4 (Hazard Vulnerability Summary), areas targeted for future growth and development have been identified across the county. Any areas of growth could be potentially impacted by a dam or levee failure event if the structures are located within the flood protection area and mitigation measures are not considered. Therefore, it is the intention of the county and all participating municipalities to discourage development in vulnerable areas or to encourage higher regulatory standards at the local level.

Projected Changes in Population

Estimated population projections provided by the Center of Rural Pennsylvania indicates that Dauphin's population will continue to increase into 2040, increasing total population to approximately 296,766 persons (The Center of Rural Pennsylvania 2013). This is approximately a 10.6 percent increase from the county's 2010 population. As more persons move into flood zones, an increased amount of the population will be vulnerable to dam inundation hazards. Higher density can not only create issues for local residents during evacuation of a dam failure event but can also have an effect on commuters that travel into and out of the county for work. Refer to Section 2 (County Profile) for more information about population trends in the County.

Climate Change

The June 2009 Pennsylvania Climate Impact Assessment indicated that Pennsylvania is very likely to undergo increased temperatures and precipitation in the 21st century (PADEP 2009). Increased precipitation will occur in the form of heavy rainfalls, which have the potential to increase the risk to dam failures. Increases in precipitation may stress the dam wall. Existing dams may not be able to retain and manage increases in water flow from more frequent, heavy rainfall events. Heavy rainfalls may result in more frequent overtopping of these dams and flooding of the county's assets in adjacent inundation areas. However, the probable maximum flood used to design each dam may be able to accommodate changes in climate.

4.3.3.6 Change of Vulnerability Since 2015 Hazard Mitigation Plan (HMP)

Since the 2015 analysis, population statistics have been updated using the 5-Year 2014–2018 American Community Survey Population Estimates. The general building stock was also established using RS Means 2020 building valuations that estimated replacement cost value for each building in the inventory. Additionally, a critical facility dataset was provided from the county. Additionally, the probable maximum flood inundation areas for the Raystown Dam Sunny Day, Raystown Dam PMF, DeHart Dam, Jacobs Creek Dam, and Hershey Dam were provided for this analysis.

For future HMP updates, additional dam failure inundation areas can be delineated and used to spatially assess the asset exposure. A customized general building stock list could be generated in the Hazus model to assess future impacts at the structural level versus the census-block level. Depth grids could be generated for the inundation areas and used in Hazus to estimate potential losses similar to those listed in the flood profile (Section 4.3.6).

4.3.4 Drought and Water Supply Deficiencies

This section provides a profile and vulnerability assessment of the drought and water supply deficiencies hazard in Dauphin County. Drought is a period characterized by long durations of below-normal precipitation. Drought conditions occur in virtually all climatic zones, yet characteristics of drought vary significantly from one region to another, relative to normal precipitation within respective regions. Drought and water supply deficiencies can affect agriculture, water supply, aquatic ecology, wildlife, and plant life. Drought is a temporary irregularity in typical weather patterns and differs from aridity, which reflects low rainfall within a specific region and is a permanent feature of the climate of that area.

Drought can be defined or grouped into four categories:

- Meteorological drought is a measure of departure of precipitation from normal, defined solely by reference to relative degree of dryness. Because of climatic differences, dryness considered a drought at one location of the country may not be considered drought at another location.
- Agricultural drought links various characteristics of meteorological (or hydrological) drought to agricultural impacts, focusing on precipitation shortages, differences between actual and potential evapotranspiration, soil water deficits, reduced groundwater or reservoir levels, and other parameters. Agricultural drought occurs when not enough water is available for a particular crop to grow at a particular time. Agricultural drought is defined in terms of soil moisture deficiencies relative to water demands of plant life, primarily crops.
- Hydrological drought is associated with below-normal surface or subsurface water supply resulting from periods of precipitation shortfalls (including snowfall). Hydrological drought is related to effects of precipitation shortfalls on stream flows and water levels in reservoirs, lakes, and groundwater.
- Socioeconomic drought is associated with supply and demand of an economic good, with elements of meteorological, hydrological, and agricultural drought categories. This differs from the aforementioned types of drought because its occurrence depends on supply and demand to identify or classify droughts. Supplies of many economic goods such as water, silage, food grains, fish, and hydroelectric power depend on weather. Socioeconomic drought occurs when demand for an economic good exceeds supply as a result of a weather-related shortfall in water supply (National Drought Mitigation Center ([NDMC] 2017).

Drought and water supply deficiencies can affect many sectors of an economy and can reach beyond an area undergoing physical drought. Because water is essential for producing goods and providing services, drought can reduce crop yield, increase fire hazard, lower water levels, and damage wildlife and fish habitats. Further consequences include: reductions in crop yields, rangeland, and forest productivity that may lower incomes of farmers and agribusinesses; increase in prices of food and timber; increase in unemployment; reduction of tax revenues as expenditures decline; increase in crime, foreclosures, and migration; and depletion of disaster relief funds. The many impacts of drought can be categorized as economic, environmental, or social.

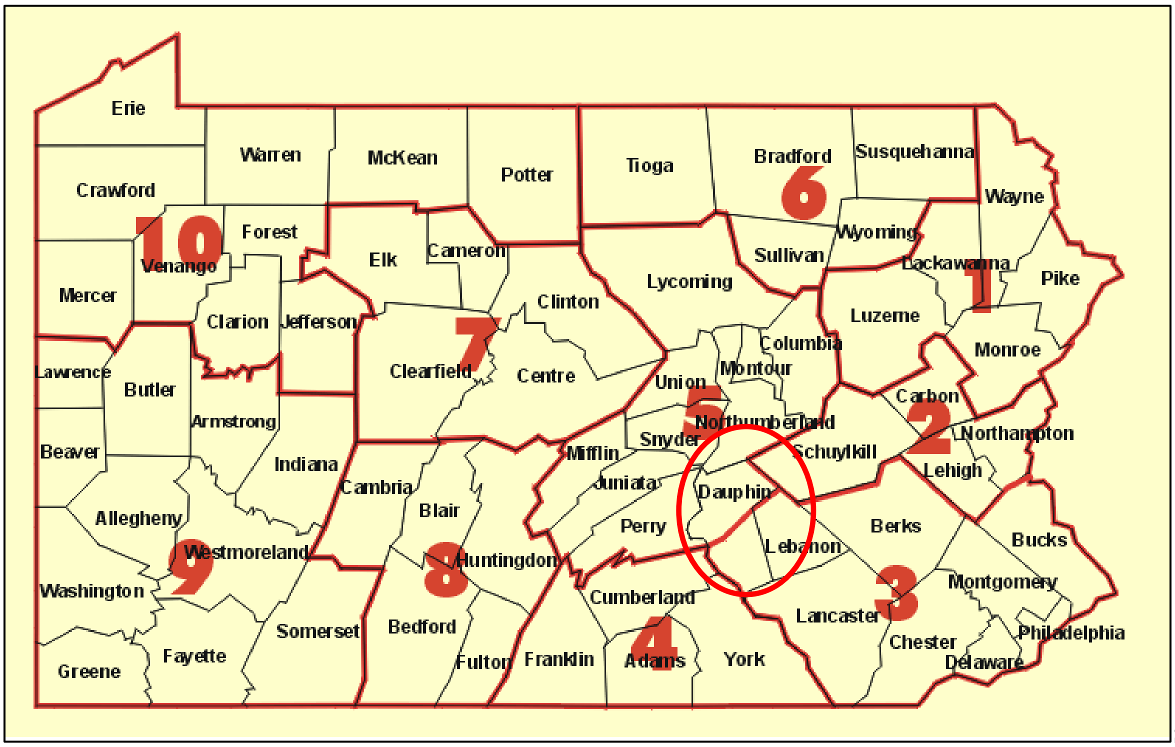
4.3.4.1 Location and Extent

Droughts and water supply deficiencies are regional in scope and may affect the entirety of Dauphin County rather than only individual municipalities within the county. Droughts and water supply deficiencies may also concurrently affect counties near Dauphin County, or even the entire Commonwealth. Generally, areas along waterways will reveal drought conditions later than areas away from waterways.

Climate divisions are regions within a state that are climatically homogenous. The National Oceanic and Atmospheric Administration (NOAA) has divided the United States into 359 climate divisions. The boundaries of these divisions typically coincide with county boundaries, except in the western United States where they are based largely on drainage basins (NWS 2005).

According to NOAA, Pennsylvania includes 10 climate divisions: Pocono Mountains, East Central Mountains, Southeastern Piedmont, Lower Susquehanna, Middle Susquehanna, Upper Susquehanna, Central Mountains, South Central Mountains, Southwest Plateau, and Northwest Plateau Climate Division (National Climatic Data Center [NCDC] 2012). Figure 4.3.4-1 shows the climate divisions of Pennsylvania. Dauphin County is within the Southeastern Piedmont and Middle Susquehanna climate divisions.

Figure 4.3.4-1. Climate Divisions of Pennsylvania



Source: NWS 2005

Note: Highlight added.
The climate divisions for Pennsylvania are: 1 = Pocono Mountains; 2 = East Central Mountains; 3 = Southeastern Piedmont; 4 = Lower Susquehanna; 5 = Middle Susquehanna; 6 = Upper Susquehanna; 7 = Central Mountains; 8 = South Central Mountains; 9 = Southwest Plateau; 10 = Northwest Plateau

Particularly at locations where citizens rely on wells for drinking water, water supplies are vulnerable to effects of drought and thus can impact the severity of a drought. Residents depending on well water can more easily handle short-term droughts without major inconveniences than can populations that rely on surface water. However, longer-term droughts inhibit groundwater aquifers from recharging and can thus extend the problems of well owners for an indeterminate amount of time. Dauphin County residents who depend on private domestic wells have this greater “hidden vulnerability” to droughts. According to the United States Geological Survey (USGS) National Water Information System, the average daily domestic self-supplied groundwater withdrawals of fresh water in Pennsylvania was 501 million gallons per day (Mgal) to 1 billion gallons per day in 2015 (USGS n.d.).

Table 4.3.4-1 lists the number of reported domestic wells within each municipality of Dauphin County. The well data were obtained from the Pennsylvania Groundwater Information System (PaGWIS). PaGWIS is maintained by PA DCNR and relies on voluntary submissions of well record data by well drillers; as a result, it is not a complete database of all domestic wells in the county. It is, however, the most complete dataset of domestic wells available.

Table 4.3.4-1. Domestic Wells in Dauphin County

Municipality	Number of Reported Domestic Wells	Municipality	Number of Reported Domestic Wells
Berrysburg Borough	13	Middletown Borough	6
Conewago Township	372	Mifflin Township	52
Dauphin Borough	12	Millersburg Borough	13
Derry Township	504	Paxtang Borough	0
East Hanover Township	738	Penbrook Borough	4
Elizabethville Borough	19	Pillow Borough	3
Gratz Borough	16	Reed Township	44
Halifax Borough	18	Royalton Borough	0
Halifax Township	184	Rush Township	30
Harrisburg City	58	South Hanover Township	545
Highspire Borough	15	Steelton Borough	20
Hummelstown Borough	9	Susquehanna Township	339
Jackson Township	146	Swatara Township	140
Jefferson Township	46	Upper Paxton Township	129
Londonderry Township	551	Washington Township	123
Lower Paxton Township	1053	Wayne Township	88
Lower Swatara Township	185	West Hanover Township	662
Lykens Borough	1	Wiconisco Township	33
Lykens Township	45	Williams Township	23
Middle Paxton Township	560	Williamstown Borough	1

Source: PA DCNR 2017

In addition to domestic wells in the county, residents may also receive their water from municipal water providers. The primary water source is the DeHart Reservoir and the secondary source is the mainstream of the Susquehanna River. The systems serve a population of approximately 67,000 people (Capital Region Water n.d.). The municipal water provider for the City of Harrisburg, Paxtang, Penbrook, and Steelton Boroughs, and Lower Paxton, Susquehanna, and Swatara Townships is Capital Region Water. Pennsylvania American Water serves portions of Derry, Londonderry, South Hanover, and West Hanover Townships. Loyalton Water Association serves Washington Township, Harrisburg International Airport Water Co serves Lower Swatara Township, and Lykens Borough Authority covers Lykens Borough and Wiconisco Township. Middletown Borough Authority serves Middletown Borough, a portion of Lower Swatara Township, and Royalton Borough. Millersburg Borough Authority serves Millersburg Borough and Upper Paxton Township, Pillow Borough Authority serves Pillow Borough, Steelton Borough Authority serves Steelton Borough, and Williamstown Borough Authority serves a portion of Williams Township and Williamstown Borough.

Jurisdictions that are designated for agricultural use are particularly vulnerable to drought. As of 2017, 81,252 acres of farmland were recorded in Dauphin County with 375 total acres of land in the county that need to be irrigated (Agricultural Census 2017). In Dauphin County, agricultural land is particularly prevalent in the northern portion of the county, but also in portions of the more urbanized southern region (Dauphin County

Comprehensive Plan "Growing Together" 2020). Areas designated for agricultural use are illustrated in Figure 2-5 in Section 2.

4.3.4.2 Range of Magnitude

Effects of droughts vary depending on their severity, timing, duration, and location. Some droughts may exert their greatest impact on agriculture, while others may have stronger effects on water supply or recreational activities. Droughts can adversely affect the following significantly:

- Public water supplies for human consumption
- Rural water supplies for livestock consumption and agricultural operations
- Water quality
- Natural soil water or irrigation water for agriculture
- Water for forests and for fighting forest fires
- Water for navigation and recreation

PADEP and Pennsylvania Emergency Management Agency (PEMA) manage water supply droughts according to the following four conditions of drought, as defined in the Commonwealth of Pennsylvania 2018 Standard Hazard Mitigation Plan (PA HMP):

- Drought Watch: This is a period to alert government agencies, public water suppliers, water users, and the public regarding potential for future drought-related problems. Drought watches are invoked when three or more drought indicators are present for a county or group of counties. The focus is on increased monitoring, awareness, and preparation for response in the event that conditions worsen. A request for voluntary water conservation is issued. The objective of voluntary water conservation measures during a drought watch is to reduce water use by 5 percent within the affected areas. Because of varying conditions, individual water suppliers or municipalities may propose more stringent conservation actions.

- Drought Warning: This is a drought stage involving 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 to 15 percent within the affected areas. Because of varying conditions, individual water suppliers or municipalities may propose more stringent conservation actions.

- Drought Emergency: During this drought stage, water management entities assemble all available resources to respond to actual emergency conditions, avoid depletion of water sources, ensure at least minimum water supplies to protect public health and safety, support essential and high-priority water uses, and avoid unnecessary economic upsets. If deemed necessary and if ordered by the Governor during this stage, imposition of mandatory restrictions on nonessential water usage could occur, as provided for in 4 *Pa. Code,* Chapter 119. Objectives of water use restrictions (mandatory or voluntary) and other conservation measures during a drought emergency are to reduce consumptive water use within the affected areas by 15 percent, and to reduce total use to the extent necessary to preserve public water system supplies, avoid or mitigate local or area shortages, and ensure equitable sharing of limited supplies.

- Local Water Rationing: This fourth condition of drought is not defined as a drought stage. Local municipalities may, with the approval of the PEMA Council, implement local water rationing to share a rapidly dwindling or severely depleted water supply within designated water supply service areas. These individual water rationing plans, authorized through provisions of 4 *Pa. 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 practices, procedures are specified for granting variances in consideration of individual hardships and economic dislocations (PEMA 2018).

Pennsylvania uses five parameters to assess drought conditions: precipitation deficits, stream flows, reservoir storage levels, groundwater levels, and a measure of soil moisture. These are described in detail below.

- Precipitation Deficits: As rainfall provides the basis for both groundwater and surface water resources, precipitation deficits are the earliest indicators of a potential drought. The National Weather Service (NWS) records "normal" monthly precipitation data for each county in Pennsylvania. These figures are generated from long-term monthly and decennial averages of precipitation and are updated at the end of each decade based on the most recent 30 years. Monthly totals with less than normal values represent precipitation deficits, which are then converted to percentages of the normal values. Table 4.3.4-2 lists the drought conditions (defined in the PA HMP and noted above) that are indicated by various precipitation deficit percentages (PEMA 2018).

Table 4.3.4-2. Precipitation Deficit Drought Indicators for Pennsylvania

Duration of Deficit Accumulation (Months)	Drought Watch (deficit as percent of normal precipitation)	Drought Warning (deficit as percent of normal precipitation)	Drought Emergency (deficit as percent of normal precipitation)
3	25%	35%	45%
4	20%	30%	40%
5	20%	30%	40%
6	20%	30%	40%
7	18.5%	28.5%	38.5%
8	17.5%	27.5%	37.5%
9	16.5%	26.5%	36.5%
10	15%	25%	35%
11	15%	25%	35%
12	15%	25%	35%

Source: PEMA 2018

Table 4.3.4-3 lists normal monthly and annual precipitation from 1981 to 2010 (the most current three-decade data available) at the three NOAA weather stations in Dauphin County. Data from the NOAA weather stations are available through the NCEI, which compiles monthly and annual normal total precipitation (inches) data retrieved from both NWS Cooperative Network (COOP) and Principal Observation (First-Order) locations throughout the United States.

Table 4.3.4-3. Normal Monthly and Annual Precipitation (total in inches) from 1981 to 2010 at NOAA Weather Stations in Dauphin County

Station Name	January	February	March	April	May	June	July	August	September	October	November	December	ANNUAL
Dehart Dam	3.50	2.65	3.88	3.99	4.39	5.04	4.75	4.20	5.19	4.09	3.60	3.86	49.14
Harrisburg 1NE	2.93	3.06	3.54	3.49	4.15	4.04	4.26	3.61	4.36	3.40	3.45	3.34	43.63
Middletown Harrisburg International Airport	2.93	2.73	3.30	3.41	4.05	3.67	3.63	3.69	3.64	3.33	3.37	3.17	40.92

Source: Arguez et al. 2010

- Stream Flows: Stream flows, which typically lag up to 2 months behind normal precipitation amounts in signaling a drought, offer the second earliest indication of drought conditions. PADEP uses 61 USGS-maintained stream gauges throughout the Commonwealth as its drought monitoring network, computing 30-day average stream flow values for each stream gauge based on the entire period of record for each gauge. The USGS drought status is determined from stream flows based on exceedances rather than percentages. The various stages of drought watch, warning, and emergency conditions are indicated, respectively, by 75 percent, 90 percent, and 95 percent exceedances of 30-day average flows (PEMA 2018). The National Weather Service tracks stream gauges throughout the Commonwealth and provides real-time information. Detailed descriptions of these data collection methods appear in the PA HMP.

- Reservoir Storage Levels: Water level storage in several large public water supply reservoirs (especially three New York City reservoirs in the Upper Delaware River Basin) is the fifth indicator that the PA DEP uses for drought monitoring. Depending on the total quantity of storage and the length of the refill period for the various reservoirs, PA DEP uses varying percentages of storage draw down to indicate the three drought stages for each of the reservoirs (PEMA 2018).

- Groundwater Levels: Groundwater levels for each day are used to calculate the average level of the preceding 30 days. This 30-day value is compared to the values derived from historical records yielding a percentile indicating how much time the groundwater levels have been below the historical average levels. The USGS also maintains a network of groundwater monitoring wells. Groundwater is used to indicated drought status in a manner similar to stream flows. Groundwater level exceedances of 75, 90, and 95 percent are used to indicate watch, warning, and emergency status. The 30-day average depth to groundwater is measured and monitored in relation to long-term 30-day averages, based on the period of record for each county well (PEMA 2018).

- Soil Moisture: Soil moisture is measured using an algorithm (calibrated for relatively homogenous regions) that measures dryness based on temperature and precipitation in the area according to information provided by the National Oceanic and Atmospheric Administration (NOAA). This generates a value called the Palmer Drought Severity Index (PDSI), which is compiled by the Climate Prediction Center of the National Weather Service on a weekly basis. A PDSI of -4.00 or less indicates a drought emergency; a value between -3.00 and -3.99 indicates a drought warning, and a value between -2.00 and -2.99 indicates a drought watch (PEMA 2018).

Table 4.3.4-4 lists PDSI classifications. The PDSI uses 0 to reflect normal status, and negative numbers indicate droughts. For example, 0 is no drought, -2 is moderate drought, and -4 is extreme drought. Positive numbers signify excess precipitation (NDMC 2013).

Table 4.3.4-4. Palmer Drought Severity Index (PDSI) Classifications

Severity Category	PDSI Value	Drought Status
Extremely wet	4.0 or more	None
Very wet	3.0 to 3.99	None
Moderately wet	2.0 to 2.99	None
Slightly wet	1.0 to 1.99	None
Incipient wet spell	0.5 to 0.99	None
Near normal	0.49 to -0.49	None
Incipient dry spell	-0.5 to -0.99	None
Mild drought	-1.0 to -1.99	None
Moderate drought	-2.0 to -2.99	Watch
Severe drought	-3.0 to -3.99	Warning
Extreme drought	-4.0 or less	Emergency

Source: NDMC 2013; PEMA 2018

The availability and management of water supply are discussed in the 2009 Pennsylvania State Water Plan (PADEP 2009b), a joint effort by the Statewide Water Resources Committee and PADEP. In 2009, the PADEP Secretary approved an updated State Water Plan to guide management of Pennsylvania's water resources over a 15-year planning horizon. As a functional planning tool for all Pennsylvania municipalities, counties, and regional planning partnerships, the State Water Plan profiles drought and resource constraints and encourages implementation of new technology and use policies to facilitate reduced water uses and resource demands at critical peak times. The State Water Plan provides inventories of water availability and an assessment of current and future water use demands and trends. It also offers strategies for improving management of water resources and waterway corridors that aim to reduce damage from extreme drought and flooding conditions (PADEP 2009b).

4.3.4.3 Past Occurrence

Historical information has been drawn from many sources regarding previous occurrences and losses associated with drought events throughout Pennsylvania and Dauphin County. Because so many sources were reviewed for the purpose of developing this plan, loss and impact information pertaining to many events could vary depending on the source. Therefore, accuracy of cited monetary values is based only on the available information identified during research for this plan.

According to NOAA's National Centers for Environmental Information storm events database, Dauphin County underwent four drought events between January 1, 1950, and July 30, 2020. No Commonwealth-wide crop or property losses were reported because of the droughts; statewide losses would have included damages in other counties.

Since 1930, the Commonwealth of Pennsylvania has undergone 10 significant droughts. Since 1955, the Commonwealth has undergone 12 drought events that resulted in a Governor's proclamation or a Federal Emergency Management Agency (FEMA)-declared disaster or emergency. Dauphin County was not included in any of the events. In addition to these events, between 1980 and 2017, PADEP indicated that Dauphin County has undergone 34 drought watch declarations, 12 drought warning declarations, and 9 drought emergency declarations (PADEP 2020).

According to FEMA, between 1954 and 2020, Pennsylvania underwent one drought-related disaster (DR) or emergency (EM) classified as one or a combination of the following disaster types: drought or water shortage. Because these disaster types generally cover a wide region of the Commonwealth, this single disaster may have impacted many counties. However, not all counties were included in the disaster declaration. FEMA, PEMA, and other sources indicate that Dauphin County has not been declared a disaster area as a result of a drought-related event (FEMA 2017).

Based on all sources researched, drought events between 1980 and 2020 that have affected Dauphin County are identified in Table 4.3.4-5. However, not all sources have been identified or researched, and therefore Table 4.3.4-5 may not include all events that have occurred throughout the county.

Table 4.3.4-5. Past Occurrences of Drought Events from 1980 to 2020

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts / PDSI Value
November 1980-April 1982	Emergency	N/A	N/A	Not listed
April-July 1985	Water	N/A	N/A	Not listed
July-October 1985	Watch	N/A	N/A	Not listed
October 1985	Watch	N/A	N/A	Not listed
October-December 1985	Watch	N/A	N/A	Not listed
July-August 1988	Watch	N/A	N/A	Not listed
August-December 1988	Watch	N/A	N/A	Not listed
June-July 1991	Warning	N/A	N/A	Not listed
July-August 1991	Emergency	N/A	N/A	Not listed
August-September 1991	Emergency	N/A	N/A	Not listed
September-October 1991	Emergency	N/A	N/A	Not listed
October 1991-Janauray 1992	Warning	N/A	N/A	Not listed
January-April 1992	Emergency	N/A	N/A	Not listed
April-June 1992	Warning	N/A	N/A	Not listed
September 1995	Warning	N/A	N/A	Not listed
September-November 1995	Warning	N/A	N/A	Not listed
November-December 1995	Watch	N/A	N/A	Not listed
July-October 1997	Watch	N/A	N/A	Not listed
October- November 1997	Watch	N/A	N/A	Not listed
November 1997-January 1998	Watch	N/A	N/A	Not listed
December 1998	Watch	N/A	N/A	Not listed
December 1998	Warning	N/A	N/A	Not listed
December 1998-January 1999	Waring	N/A	N/A	Not listed
January-March 1999	Warning	N/A	N/A	Not listed
March-June 1999	Watch	N/A	N/A	Not listed
June 1999	Warning	N/A	N/A	Not listed
June- July 1999	Warning	N/A	N/A	Not listed
July-September 1999	Emergency	N/A	N/A	Not listed
September-December 1999	Watch	N/A	N/A	Not listed
December 1999-February 2000	Watch	N/A	N/A	Not listed
February-May 2000	Watch	N/A	N/A	Not listed
August 2001	Watch	N/A	N/A	Not listed
August-November 2001	Watch	N/A	N/A	Not listed
November-December 2001	Warning	N/A	N/A	Not listed
December 2001- February 2002	Warning	N/A	N/A	Not listed
February- May 2002	Emergency	N/A	N/A	Not listed
May-June 2002	Emergency	N/A	N/A	Not listed
June-August 2002	Watch	N/A	N/A	Not listed
August-September 2002	Watch	N/A	N/A	Not listed
September-November 2002	Emergency	N/A	N/A	Not listed
November-December 2002	Watch	N/A	N/A	Not listed
April-June 2006	Watch	N/A	N/A	Not listed
August-September 2007	Watch	N/A	N/A	Not listed
September-October 2007	Watch	N/A	N/A	Not listed
October 2007-Janaury 2008	Watch	N/A	N/A	Not listed
January-February 2008	Watch	N/A	N/A	Not listed
September- November 2010	Watch	N/A	N/A	Not listed
August-September 2011	Watch	N/A	N/A	Not listed
August - September 2016	Watch	N/A	N/A	Not listed
September-November 2016	Watch	N/A	N/A	Not listed

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts / PDSI Value
November-December 2016	Watch	N/A	N/A	Not listed
December 2016- February 2017	Watch	N/A	N/A	Not listed
February- April 2017	Watch	N/A	N/A	Not listed
April-May 2017	Watch	N/A	N/A	Not listed

Sources: PADEP 2020, NOAA NCEI 2020, Drought Reporter 2020

Notes:
FEMA Federal Emergency Management Agency
N/A Not applicable
PDSI Palmer Drought Severity Index

Table 4.3.4-6 lists the crop loss insurance payments on claims in Dauphin County caused by drought events since 2012.

Table 4.3.4-6. Crop Loss Insurance Claims Due to Drought, 2012 to 2020

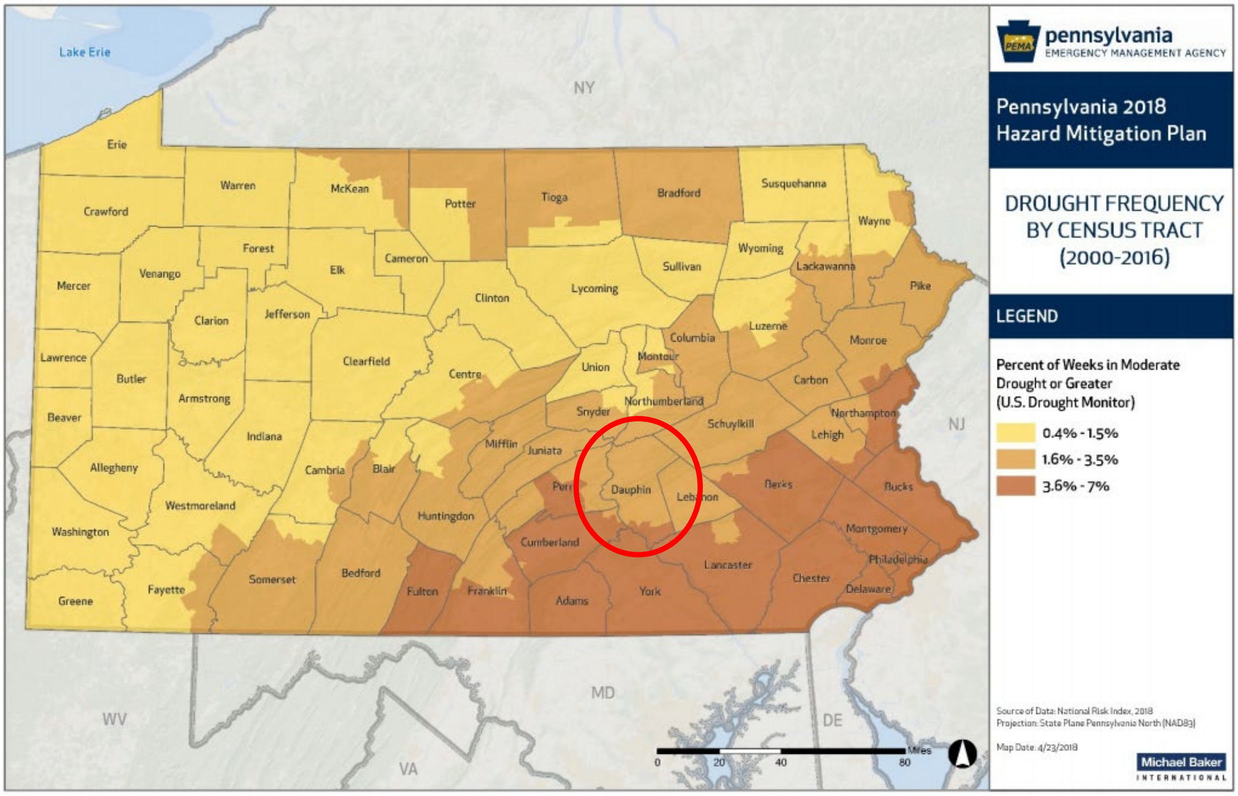
Crop Year	Total Claims	Crop Year	Total Claims
2012	$479,943	2017	$0
2013	$32,123	2018	$0
2014	$10,950	2019	$29,384
2015	$34,903	2020	$501,956
2016	$798,780		

Source: U.S. Department of Agriculture (USDA) 2020

4.3.4.4 Future Occurrence

Frequency of droughts is difficult to forecast. Based on data from a 16-year period, the majority of Dauphin County underwent severe or extreme drought conditions less than 3.5 percent of the time, whereas the southern portion of the county underwent severe or extreme drought conditions less than 7 percent of the time (illustrated on Figure 4.3.4-2). Based on the drought conditions listed in Table 4.3.4-5, future occurrences of drought events are considered *likely*, as defined by the Risk Factor Methodology probability criteria (described in Section 4.4).

Figure 4.3.4-2. Percentage of Weeks with Moderate Drought or Greater



Source: PEMA 2018
Note: Dauphin County circled in red

4.3.4.5 Vulnerability Assessment

To understand risk, a community must evaluate assets exposed and vulnerable within the identified hazard area. For the drought hazard, all of Dauphin County has been identified as the hazard area. Therefore, all assets (population, structures, critical facilities, and lifelines) described in the County Profile (Section 2) are potentially vulnerable to a drought. This section evaluates and estimates potential impacts of the drought hazard on Dauphin County in the following subsections:

- Overview of vulnerability
- Data and methodology used for the evaluation
- Impacts on (1) life, health, and safety; (2) general building stock; (3) critical facilities; (4) economy; and (5) future growth and development
- Effects of climate change on vulnerability
- Further data collections that will assist in understanding this hazard over time.

Overview of Vulnerability

Dauphin County is vulnerable to drought. Assets at particular risk include any open land or structures along the wildland/urban interface (WUI) that could become vulnerable to the wildfire hazard caused by extended periods of low rain and high heat, usually associated with drought. In addition, water supply resources could be impacted by extended periods of low rain. Finally, vulnerable populations could be particularly susceptible to the drought hazard and cascading impacts because of age, health conditions, and limited ability to mobilize to shelter, cooling, and medical resources.

Data and Methodology

At the time of this plan update, insufficient data were available to model long-term potential impacts of a drought on Dauphin County. Over time, additional data will be collected to allow better analysis of this hazard. Preliminary assessments based on available data are provided below.

Impact on Life, Health, and Safety

Drought conditions can cause a shortage of water available for human consumption and can reduce local firefighting capabilities. Social impacts of a drought include mental and physical stress, public safety threats (increased threat from forest/grass fires), health threats, conflicts among water users, reduced quality of life, and inequities in distribution of impacts and disaster relief. The infirm, young, and elderly are particularly susceptible to drought and extreme temperatures, sometimes associated with drought conditions, because of their age; health conditions; and limited ability to mobilize to shelters, cooling centers, and medical sources. Impacts on the economy and environment may have social implications as well (New York State Disaster Preparedness Commission [NYSDPC] 2011). For the purposes of this plan, the entire population of the county is considered vulnerable to drought events.

Impact on General Building Stock and Critical Facilities

A drought is not expected to directly affect any structures, and all are expected to be operational during a drought event. However, droughts contribute to conditions conducive to wildfires. Risk to life and property is greatest in regions where forested areas adjoin urbanized areas (high-density residential, commercial, and industrial), also known as the WUI. Therefore, all assets in and adjacent to the WUI zone, including population, structures, critical facilities, lifelines, and businesses, are considered vulnerable to wildfire.

Impact on the Economy

A prolonged drought can exert serious direct and indirect economic impacts on a community or across the county. A summary of impacts on the economy is presented in Table 4.3.4-7.

Table 4.3.4-7. Impacts on the Economy

Losses to Agricultural Producers	Losses to Livestock Producers	Losses of Timber Production
Annual and perennial crop losses	Reduced productivity of rangeland	Wildland fires
Damage to crop quality	Reduced milk production	Tree disease
Income loss for farmers because of reduced crop yields	Forced reduction of foundation stock	Insect infestation
Reduced productivity of cropland (wind erosion, long-term loss of organic matter, etc.)	High cost/unavailability of water for livestock	Impaired productivity of forest land
Insect infestation	Cost of new or supplemental water resource development (wells, dams, pipelines)	Direct loss of trees, especially young ones
Plant disease	High cost/unavailability of feed for livestock	**Losses to Transportation Industry**
Wildlife damage to crops	Increased feed transportation costs	Loss from impaired navigability of streams, rivers, and canals
Increased irrigation costs	High livestock mortality rates	**Decline in Food Production/Disrupted Food Supply**
Cost of new or supplemental water resource development (wells, dams, pipelines)	Disruption of reproduction cycles (delayed breeding, more miscarriages)	Increase in food prices
Losses of Fishery Production	Decreased stock weights	Increased importation of food (higher costs)
Damage to fish habitat	Increased predation	**Losses to Water Suppliers**

Losses to Agricultural Producers	Losses to Livestock Producers	Losses of Timber Production
Loss of fish and other aquatic organisms because of decreased flows	Grass fires	Revenue shortfalls and/or windfall profits
Losses to Recreation and Tourism Industry	**Energy-Related Effects**	Cost of water transport or transfer
Loss to manufacturers and sellers of recreational equipment	Increased energy demand and reduced supply because of drought-related power curtailments	Cost of new or supplemental water resource development
Losses related to curtailed activities: hunting and fishing, bird watching, boating, etc.	Costs to energy industry and consumers associated with substituting more expensive fuels (oil) for hydroelectric power	

Source: NYSDPC 2011

Loss estimates are based on lost agricultural revenues throughout Pennsylvania. Table 4.3.4-8 below enumerates the county's farmland acreage exposure to the drought hazard as well as the annual market value of all agricultural products sold, as documented in the 2017 USDA Census of Agriculture. If the county loses its agricultural yield because of drought, total losses could amount to nearly $93 million. Table 4.3.4-9 details the potential losses associated with county livestock by providing livestock totals for the county and their associated market value. Livestock, poultry, and associated products have a potential loss value of nearly $66 million (USDA 2017).

Table 4.3.4-8. Estimated County Losses Relating to Agricultural Production

Impacted Farmland Acreage	Market Value of All Agricultural Products
81,252	$93,074,000

Source: USDA 2017

Table 4.3.4-9. Estimated County Losses Relating to Agricultural Production

Livestock and Poultry	Inventory	Market Value of All Livestock, Poultry, and Their Products
Broilers and other meat-type chickens	847,299	**$65,913,000**
Cattle and Calves	15,335	
Hogs and Pigs	4,744	
Layers	636,663	
Horses and ponies	1,821	
Goats	1,451	
Pullets	262,567	
Sheep and Lambs	1,103	
Total	**1,770,893**	

Source: USDA 2017
Note: Market value of livestock and poultry is only provided by total value and not available by category.

Impact on the Environment

As summarized in the PA HMP (2018), environmental impacts of drought include:

- Hydrologic effects – lower water levels in reservoirs, lakes, and ponds; reduced streamflow; loss of wetlands; estuarine impacts; groundwater depletion and land subsidence; and effects on water quality, such as increases in salt concentration and water temperature

- Damage to animal species – lack of feed and drinking water; disease; loss of biodiversity; migration or concentration; and reduction and degradation of fish and wildlife habitat
- Reduced stream flow
- Loss of wetlands
- Increased groundwater depletion, land subsidence, and reduced groundwater recharge
- Water quality impacts like salinity, water temperature increases, pH changes, dissolved oxygen, or turbidity
- Loss of biodiversity

Future Growth and Development

Areas targeted for potential future growth and development within the next 5 to 10 years have been identified across the county (further discussed in Section 2.4 of this HMP). Exposure of any new development and new residents to the drought hazard is anticipated.

Effect of Climate Change on Vulnerability

Climate is defined not simply as average temperature and precipitation but also by type, frequency, and intensity of weather events. Both globally and at the local level, climate change can alter prevalence and severity of weather extremes, such as droughts. While predicting changes in drought events under a changing climate is difficult, understanding vulnerabilities to potential changes is a critical part of estimating effects of future climate change on human health, society, and the environment (U.S. Environmental Protection Agency [EPA] 2006).

According to the Pennsylvania Climate Impacts Assessment 2015 Update, the likelihood for drought will decrease by the middle of the 21st century as months with above-normal precipitation increase; however, drying of surface soil across the coterminous United States in all seasons is still projected because of enhanced evapotranspiration. Soil moisture at root depth of crops is more useful for estimating agricultural drought. Resolution constraints and lack of detailed evapotranspiration process representation will lead to lower confidence in projections with the soil moisture budget being less constrained (Wehner et al. 2017).

4.3.5 Environmental Hazards – Hazardous Materials Releases

This section describes the location and extent, range of magnitude, past occurrence, future occurrence, and vulnerability assessment for the environmental hazards – hazardous materials releases (HazMat) hazard for the Dauphin County Hazard Mitigation Plan (HMP).

The U.S. Department of Transportation (DOT) categorizes HazMat into the following nine classes based on chemical characteristics producing the risk:

- Class 1: Explosives
- Class 2: Gases
- Class 3: Flammable liquids
- Class 4: Flammable solids
- Class 5: Oxidizers and organic pesticides
- Class 6: Poisons and etiologic materials
- Class 7: Radioactive materials
- Class 8: Corrosives
- Class 9: Miscellaneous.

Dauphin County currently has 34 HazMat waste Superfund sites that utilize, ship, or house chemicals considered hazardous. 11 of those 18 are listed on the National Priorities List for Superfund Cleanup. There are 97 SARA Title III planning facilities and 141 other reporting facilities in Dauphin County. Product release into the local environment can derive from a fixed facility or occur at any location along a route of travel and may be the result of carelessness, technical failure, external incidents, or an intentional act against the facility or container. Volatility of products stored or transported, along with potential impact on a local community, may increase the risk of intentional acts against a facility or transport vehicle. Release of certain products considered HazMat can immediately and adversely impact the general population, ranging from the inconvenience of evacuations to personal injury and even death. Moreover, any release can compromise the local environment through contamination of soil, groundwater, or local flora and fauna.

4.3.5.1 Location and Extent

Based on past occurrences, HazMat releases within Dauphin County have been accidental and have not been considered terrorist or criminal acts. While past occurrences have not been deemed intentional, an intentional release of any of these products in large quantity would pose a threat to the local population, economy, and environment resulting in lost revenue, injuries, and deaths.

Dauphin County is home to 1,988 miles of roadways, including 81 miles of interstate, 205 miles of state highway, 107 miles of federal highways, and 1,595 miles of secondary and tertiary roads. With a variety of roadways linking more-populated areas with rural communities, the gridwork of roadways facilitates free movement of HazMat throughout the region.

While permitted, identified hazardous substance travel routes are not maintained by the county or regional planning entities. The primary roadways in Dauphin County are listed as follows (and shown in green on Figure 4.3.5-1):

- Pennsylvania Turnpike (I-76)
- Interstate 81 (I-81)
- Interstate 83 (I-83)
- Interstate 283 (I-283)
- U.S. Highway 22 (US-22)
- U.S. Highway 209 (US-209)
- U.S. Highway 322 (US-322)

- State Highway 25 (PA-25)
- State Highway 225 (PA-225)
- State Highway 283 (PA-283)
- State Highway 341 (PA-341)
- State Highway 441(PA-441)

Rail lines that transport HazMat follow the Susquehanna River on the county's western border and run north and south along the river and traverse the middle of the county east to west.

In addition to the major routes of transportation, each fixed facility identified within Dauphin County poses a potential threat to the surrounding community. The U.S. Environmental Protection Agency (EPA) tracks management of over 650 toxic chemicals that pose a threat to human health and the environment through the Toxic Release Inventory (TRI). Facilities in certain industries that use or house these chemicals in amounts exceeding specified levels must submit annual reports on how each chemical is managed through recycling, energy recovery, treatment, and releases to the environment. A "release" of a chemical means emission to the air or water or placement in some type of land disposal. EPA publishes all TRI data in a publicly accessible database in Envirofacts. In 2020, 42 TRI facilities in Dauphin County reported to EPA (EPA 2020).

Figure 4.3.5-1. Major Roadways Used to Transport HazMat in Dauphin County

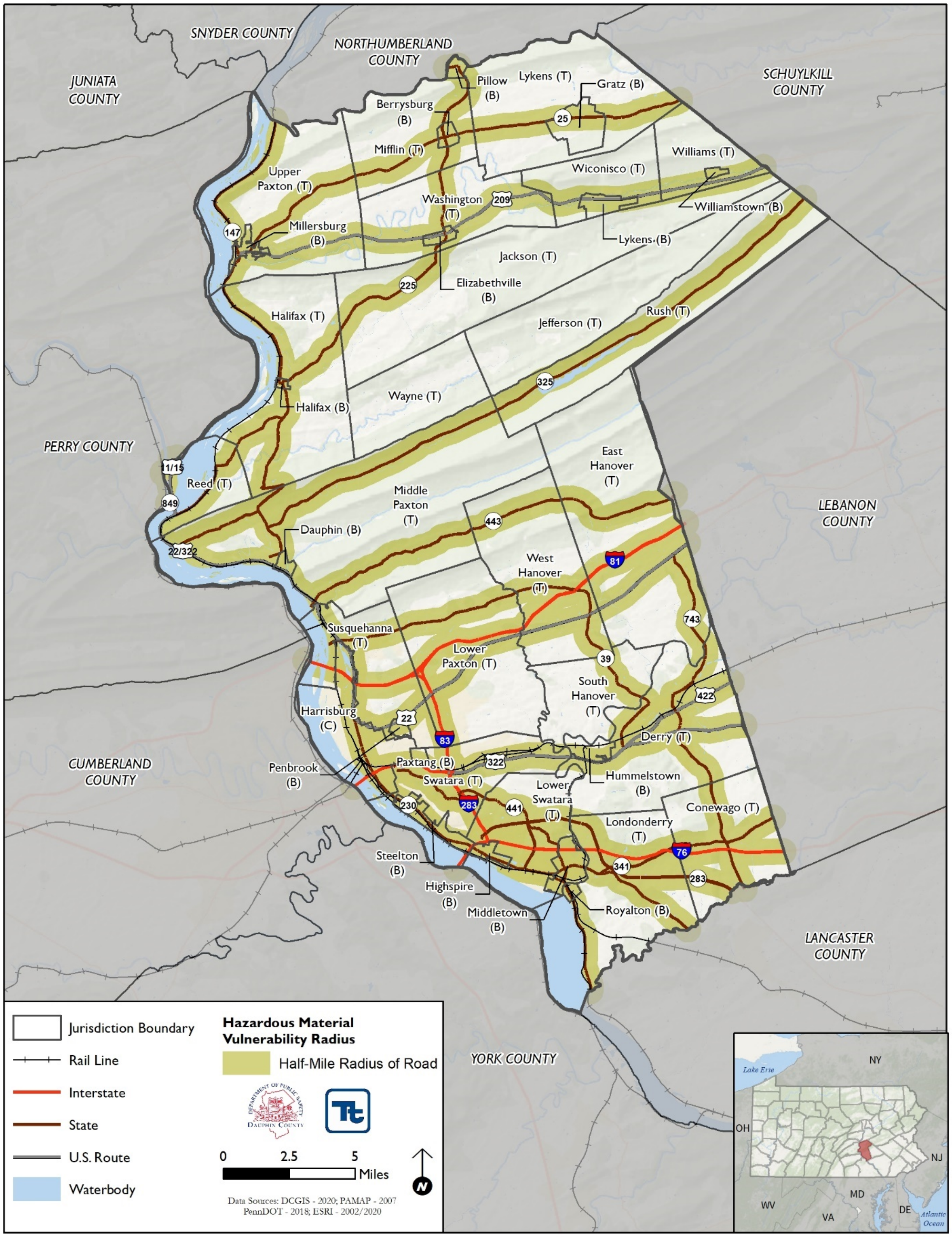


Figure 4.3.5-2. Rail Lines that Transport HazMat in Dauphin County, Pennsylvania

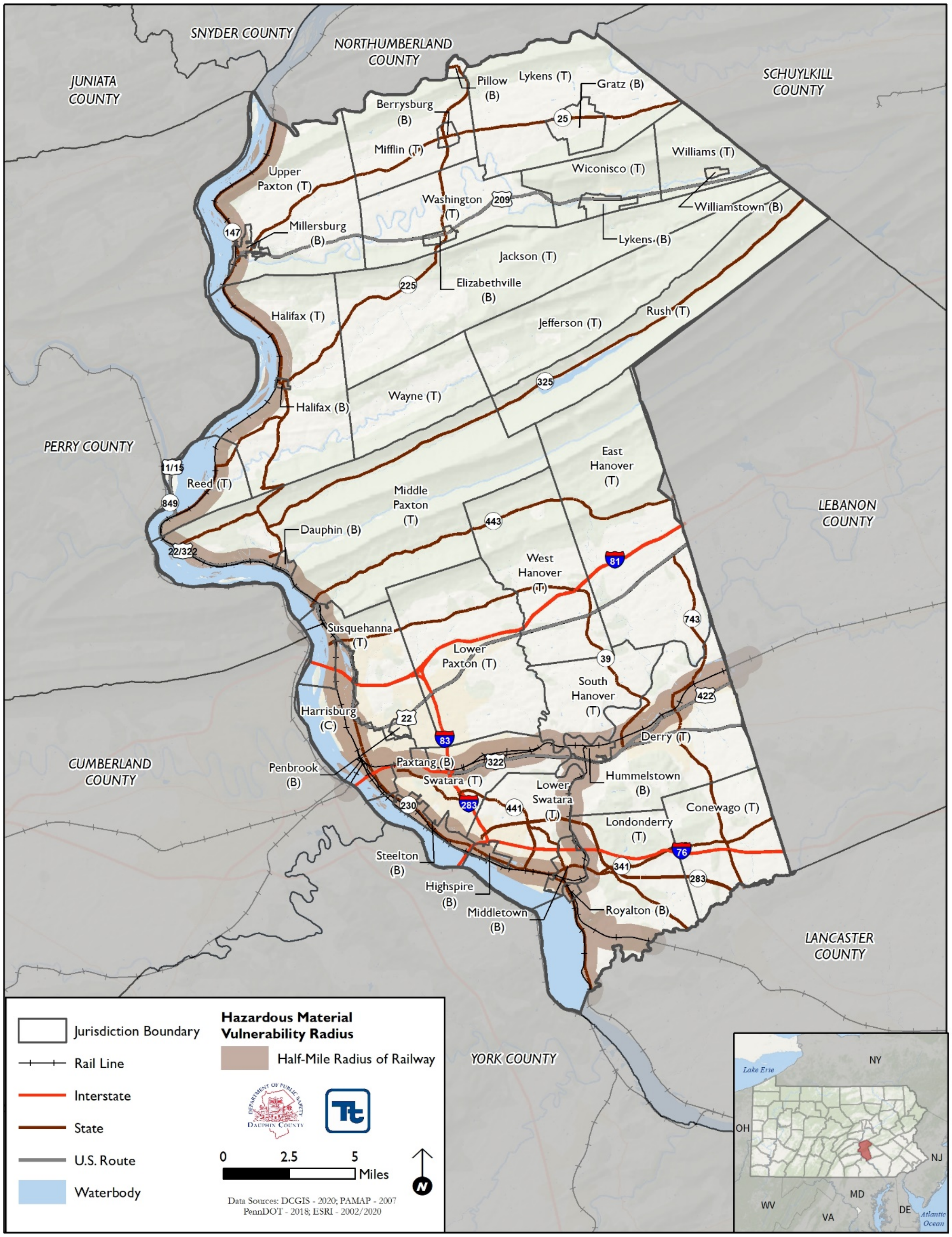


Figure 4.3.5-3. SARA Site Locations in Dauphin County

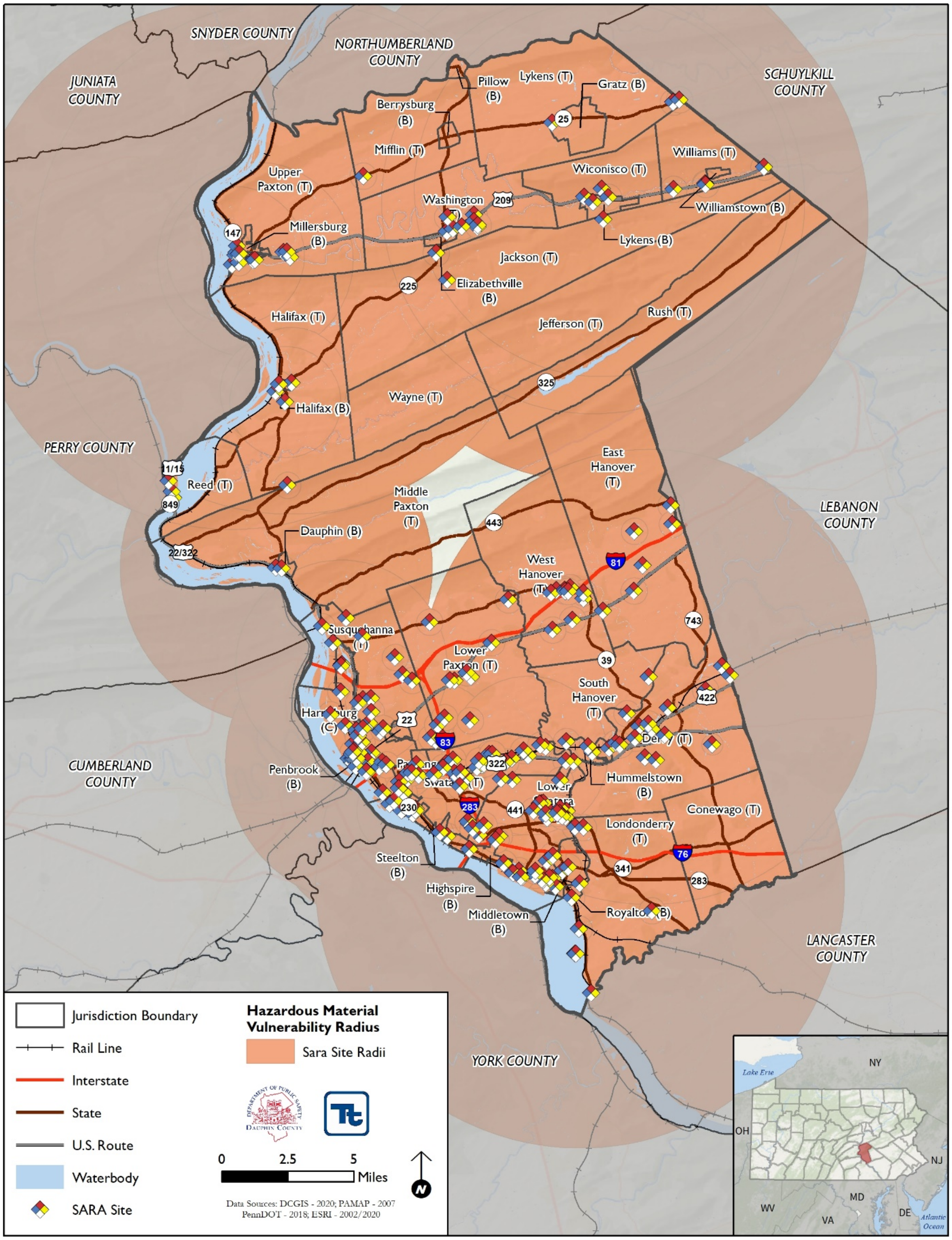
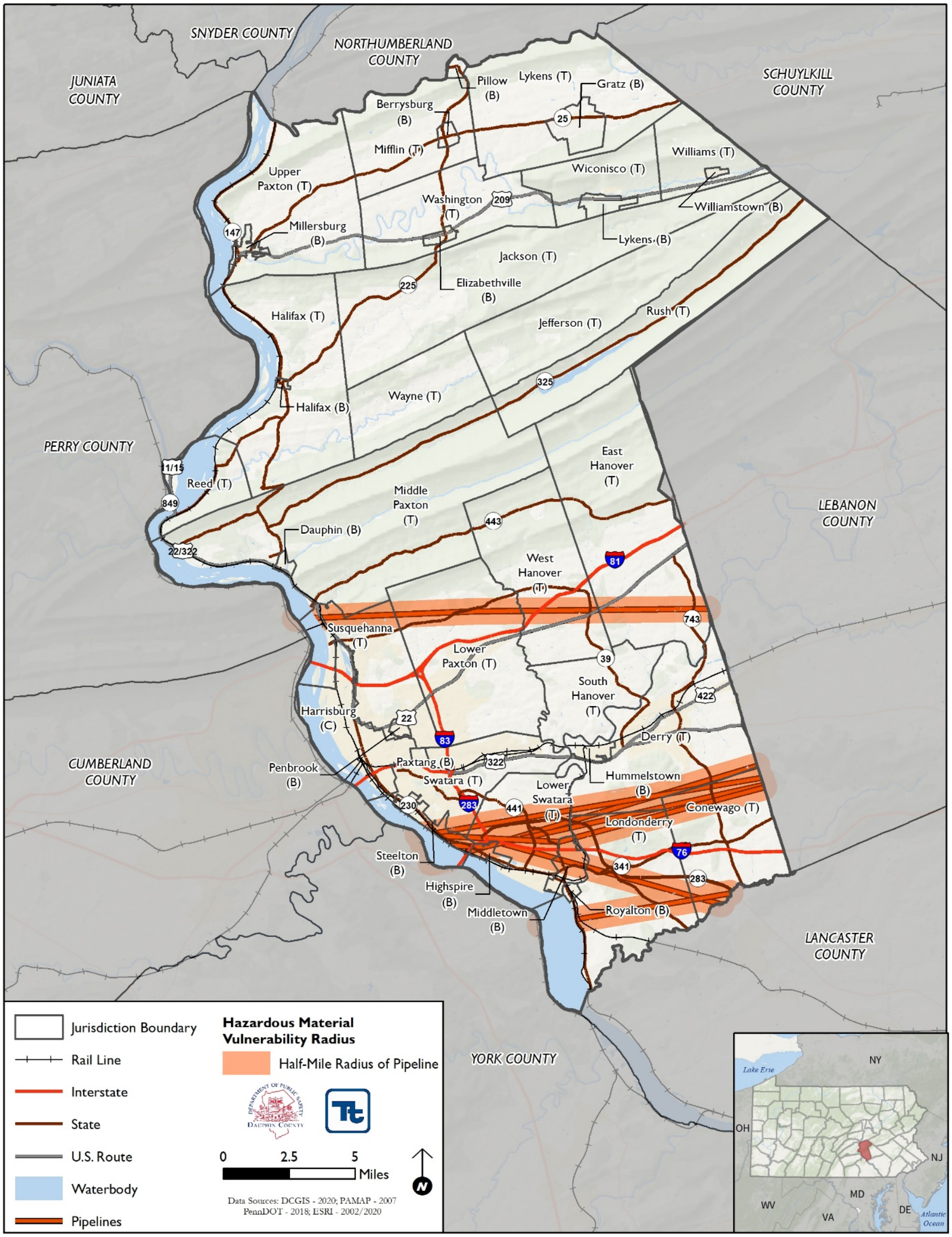


Figure 4.3.5-4. Pipelines Used to Transport HazMat in Dauphin County



4.3.5.2 Range of Magnitude

Environmental hazard incidents within Dauphin County could range from minor petroleum spills to large, facility-based incidents that could lead to loss of life and damage to property, environment, and economy. Severity of an incident varies with type of material released and distance and related response time for emergency response teams. Areas within closest proximity to the releases are generally at the greatest risk; however, depending on the material, a release can travel great distances or persist over a long time (e.g., nuclear radiation), resulting in far-reaching effects on people and the environment.

A HazMat release, whether accidental or intentional, can be exacerbated or mitigated by specific circumstances surrounding the event. Exacerbating conditions are characteristics that can enhance or magnify effects of a hazard, and mitigating conditions are characteristics of the target and its physical environment that can reduce effects of a hazard. These conditions are described below.

- Non-compliance with applicable codes (e.g., fire and building codes) and maintenance failures (e.g., fire protection and containment features) – can substantially increase damage to a facility and to surrounding buildings.
- Geographic location of HazMat site – if occurring within a Special Flood Hazard Area (SFHA), a materials release could cause large-scale water contamination during a flood incident, or a flood incident could compromise production and storage of hazardous chemicals. Stormwaters and floodwaters can also move toxic chemicals swiftly across great distances.
- Weather conditions – affect how the hazard develops.
- Micro-meteorological effects of buildings and terrain – alter dispersion of materials.
- Shielding in the form of sheltering-in-place – protects people and property from harmful effects.

The worst-case scenario would be a large, uncontrolled release of a toxic gas within a major urban area. In Dauphin County, this could take the form of an accident and major rupture of a tanker hauling a toxic or flammable gas in or near a populated city like the City of Harrisburg. While little physical property damage is likely from this type of event, the potential for injury and death to people up to one-half mile from the scene is significant. This event would likely overwhelm the medical care capacity within the county and possibly the region. The population vulnerable to such a release includes the 49,230 people in the City of Harrisburg alone. In addition, an event such as this would likely close county and Commonwealth offices, causing a major disruption to government operations. The most likely scenario would be a transportation accident resulting in a rupture of a truck's fuel tank, spilling a small quantity of diesel fuel onto the roadway.

4.3.5.3 Past Occurrence

The county has undergone HazMat release accidents at facilities and along roadways. For most incidents, the County HazMat Team's representative is contacted by the on-scene fire department for technical advice about addressing the HazMat. The county receives notifications through the Dauphin County Emergency Communications (911) Center, and the Hazardous Materials Response Team responds to incidents if needed. Since 2015, there have been 387 HazMat incidents in the county. Harrisburg City had the most cases, with 112 total incidents (Dauphin County DPS 2021).

One significant incident occurred in Steelton Borough, PA, on July 29, 2017, where 62 people were evacuated from their residences in the borough after a large propane leak due to a valve malfunction was discovered. The residents said they smelled gas and immediately contacted local authorities. The Red Cross shelter was temporarily set up inside Steelton Elementary School, where 16 people stayed as the propane leak was addressed (Rodrigues Lima 2017). Table 4.3.5-1 shows HazMat incidents by municipality from 2015 to 2020.

Table 4.3.5-1. Past Hazardous Incidents 2015–2020

Municipality	2015	2016	2017	2018	2019	2020
Berrysburg Borough	1	1	0	0	1	1
Conewago Township	0	0	0	0	0	0
Dauphin Borough	2	0	0	0	0	2
Derry Township	5	7	3	7	4	2
East Hanover Township	2	1	0	0	3	2
Elizabethville Borough	0	0	0	0	0	2
Gratz Borough	0	0	0	0	0	0
Halifax Borough	1	1	4	1	1	1
Halifax Township	0	0	0	0	0	0
Harrisburg City	17	19	30	18	19	9
Highspire Borough	1	0	1	0	2	0
Hummelstown Borough	1	0	0	1	0	1
Jackson Township	0	1	0	1	0	1
Jefferson Township	1	0	0	0	0	0
Londonderry Township	2	1	2	5	3	3
Lower Paxton Township	3	4	4	7	6	5
Lower Swatara Township	2	2	3	4	6	1
Lykens Borough	0	0	0	0	0	0
Lykens Township	0	0	0	0	1	0
Middle Paxton Township	5	0	0	2	1	3
Middletown Borough	2	1	1	2	1	2
Mifflin Township	0	0	0	0	0	0
Millersburg Borough	2	1	0	1	0	1
Paxtang Borough	2	1	0	0	0	0
Penbrook Borough	0	0	1	0	2	0
Pillow Borough	0	0	0	0	0	0
Reed Township	2	2	0	3	0	1
Royalton Borough	0	0	0	0	1	0
Rush Township	0	0	0	0	0	1
South Hanover Township	1	0	0	1	2	0
Steelton Borough	0	0	1	0	0	0
Susquehanna Township	3	2	5	6	2	2
Swatara Township	11	10	15	11	6	5
Upper Paxton Township	0	1	0	1	0	0
Washington Township	0	0	0	0	0	0
Wayne Township	0	0	0	0	1	0
West Hanover Township	1	2	5	1	2	6
Wiconisco Township	0	0	0	0	0	0
Williams Township	0	0	0	0	1	0
Williamstown Borough	0	0	0	0	0	0
Dauphin County	**67**	**57**	**75**	**72**	**65**	**51**

Source: Dauphin County DPS 2021

4.3.5.4 Future Occurrence

Because of the wide scope of definition of environmental hazards, ranging from a small spill to a large release of a highly volatile or toxic HazMat, incidents can and will happen at any time. Additionally, the county is home to 238 SARA facilities (EPA 2020). Although these facilities follow applicable safety and health regulations and best practices, the proximities of the facilities to population centers is a concern for the county.

HazMats are also transported via rail and along I-76, I-81, I-83, US-209, PA-22, PA-25, PA-225, PA-283, PA-322, PA-341, and PA-441. Transportation of HazMat on highways involves tanker trucks or trailers; not surprisingly, trucks are responsible for the greatest number of HazMat incidents. At several points, these transportation routes cross streams within the watersheds that are part of the county's domestic water supply. While HazMat release incidents in Dauphin County have occurred in the past, they are generally considered difficult to predict. Smaller incidents, such as fuel spills, will affect the county many times each year, most likely along I-76 or during refilling of home heating oil tanks, and may not be reported. Although the county does not anticipate severe releases on any regular basis, the possibility of a significant release should not be discounted. Based on Risk Factor Methodology Probability Criteria, likelihood of future occurrences within Dauphin County remains *highly likely*.

4.3.5.5 Vulnerability Assessment

To understand risk, a community must evaluate assets exposed or vulnerable within the identified hazard area. To assess effects of and risk from environmental hazards, locations of SARA Title III facilities, railways, major roadways, and pipelines are examined. The following sections evaluate and estimate potential impacts in Dauphin County, presenting specifically:

- Overview of vulnerability
- Data and methodology used for the evaluation
- Impacts on (1) life, health, and safety; (2) general building stock, critical facilities, and the economy; and (3) future growth and development

Overview of Vulnerability

To understand risk, a community must evaluate the assets exposed and vulnerable in the identified hazard area. A spatial analysis was conducted using various lengths of buffer radii around HazMat facilities, pipelines, and transportation networks. If a HazMat incident occurred in or on the facility, pipeline, or transportation network, these buffers would represent the toxin or radiation release area. For the purposes of the assessment, an asset (population, structures, critical facilities, and lifelines) is considered exposed and potentially vulnerable to the HazMat hazard if it is located within these HazMat buffer areas. The analysis looked at four different HazMat areas:

1. Half-mile from a major highway
2. Half-mile from a rail line
3. Half-mile from a pipeline
4. Unique radius for each SARA Title III planning facility, or half-mile from each reporting facility

Facilities that produce, use, or ship HazMat within the Commonwealth of Pennsylvania are required to comply with regulations set forth within the federal SARA and the Emergency Planning and Community Right to Know Act (EPCRA), and the Commonwealth of Pennsylvania reporting requirements under the Hazardous Materials Emergency Planning and Response Act (Act 165). The county has 238 SARA Title III facilities.

As stated above, HazMat are transported via rail, pipeline, and along major roadways in the county, including three interstates (I-76, I-81, I-283), U.S. Highways along (US-22, US-322, US-422) and State Highway (PA-283). Accidents on these routes can result in HazMat spills that can contaminate and impact surrounding populations and environment.

Impact on Life, Health, and Safety

Environmental hazards exert the greatest impact on the residential population in Dauphin County (Table 4.3.5-2 below). Out of the four HazMat areas, the Sara Title III buffer areas cover the greatest population. However, if an incident were to occur, it would likely be within a specific site and would not impact the entire exposed population (273,443 people).

Table 4.3.5-2. Estimated Dauphin County Population Vulnerable to Environmental Hazards

Jurisdiction	American Community Survey (2014-2018) Population	Estimated Population within a Half-Mile of Major Roadways		Estimated Population within a Half-Mile of Railways		Estimated Population within a Half-Mile of Pipelines		Estimated Population Exposed to HazMat Facility Incident Zones	
		Persons Exposed	Percent of Total	Persons Exposed	Percent of Total	Persons Exposed	Percent of Total	Persons Exposed	Percent of Total
Berrysburg (B)	323	323	100.0%	0	0.0%	0	0.0%	323	100.0%
Conewago (T)	3,069	1,532	49.9%	0	0.0%	1,608	52.4%	3,069	100.0%
Dauphin (B)	855	855	100.0%	691	80.9%	0	0.0%	855	100.0%
Derry (T)	25,036	13,105	52.3%	10,225	40.8%	3,892	15.5%	25,036	100.0%
East Hanover (T)	5,919	4,193	70.8%	0	0.0%	1,165	19.7%	5,919	100.0%
Elizabethville (B)	1,609	1,609	100.0%	0	0.0%	0	0.0%	1,609	100.0%
Gratz (B)	805	748	92.9%	0	0.0%	0	0.0%	805	100.0%
Halifax (B)	954	954	100.0%	936	98.1%	0	0.0%	954	100.0%
Halifax (T)	3,561	2,529	71.0%	1,015	28.5%	0	0.0%	3,561	100.0%
Harrisburg (C)	49,230	23,382	47.5%	34,551	70.2%	0	0.0%	49,230	100.0%
Highspire (B)	2,667	2,667	100.0%	2,586	97.0%	2,008	75.3%	2,667	100.0%
Hummelstown (B)	4,650	3,417	73.5%	4,641	99.8%	0	0.0%	4,650	100.0%
Jackson (T)	1,727	502	29.1%	0	0.0%	0	0.0%	1,727	100.0%
Jefferson (T)	302	0	0.0%	0	0.0%	0	0.0%	302	100.0%
Londonderry (T)	5,211	3,076	59.0%	883	17.0%	3,387	65.0%	5,211	100.0%
Lower Paxton (T)	48,739	24,931	51.2%	20	0.0%	8,399	17.2%	48,205	98.9%
Lower Swatara (T)	8,788	8,229	93.6%	1,558	17.7%	6,298	71.7%	8,788	100.0%
Lykens (B)	1,673	1,673	100.0%	0	0.0%	0	0.0%	1,673	100.0%
Lykens (T)	1,631	652	40.0%	0	0.0%	0	0.0%	1,631	100.0%
Middle Paxton (T)	5,067	3,747	73.9%	1,036	20.4%	35	0.7%	4,609	91.0%
Middletown (B)	9,176	9,176	100.0%	7,650	83.4%	6,870	74.9%	9,176	100.0%
Mifflin (T)	727	455	62.6%	0	0.0%	0	0.0%	727	100.0%
Millersburg (B)	2,546	2,546	100.0%	1,823	71.6%	0	0.0%	2,546	100.0%
Paxtang (B)	1,650	1,607	97.4%	1,624	98.4%	0	0.0%	1,650	100.0%
Penbrook (B)	2,981	2,832	95.0%	0	0.0%	0	0.0%	2,981	100.0%
Pillow (B)	256	256	100.0%	0	0.0%	0	0.0%	256	100.0%
Reed (T)	209	178	85.0%	132	63.2%	0	0.0%	209	100.0%
Royalton (B)	1,259	1,259	100.0%	1,259	100.0%	0	0.0%	1,259	100.0%
Rush (T)	305	300	98.3%	0	0.0%	0	0.0%	305	100.0%
South Hanover (T)	6,766	2,596	38.4%	691	10.2%	0	0.0%	6,766	100.0%
Steelton (B)	5,954	5,941	99.8%	5,831	97.9%	1,223	20.5%	5,954	100.0%
Susquehanna (T)	24,857	17,917	72.1%	3,415	13.7%	3,518	14.2%	24,857	100.0%
Swatara (T)	24,685	17,242	69.8%	13,535	54.8%	535	2.2%	24,685	100.0%
Upper Paxton (T)	4,219	3,360	79.6%	1,190	28.2%	0	0.0%	4,219	100.0%
Washington (T)	2,166	1,775	81.9%	0	0.0%	0	0.0%	2,166	100.0%

Jurisdiction	American Community Survey (2014-2018) Population	Estimated Population within a Half-Mile of Major Roadways		Estimated Population within a Half-Mile of Railways		Estimated Population within a Half-Mile of Pipelines		Estimated Population Exposed to HazMat Facility Incident Zones	
		Persons Exposed	Percent of Total	Persons Exposed	Percent of Total	Persons Exposed	Percent of Total	Persons Exposed	Percent of Total
Wayne (T)	1,365	0	0.0%	0	0.0%	0	0.0%	1,365	100.0%
West Hanover (T)	10,165	7,578	74.5%	0	0.0%	2,541	25.0%	10,085	99.2%
Wiconisco (T)	1,122	884	78.8%	0	0.0%	0	0.0%	1,122	100.0%
Williams (T)	1,104	837	75.8%	0	0.0%	0	0.0%	1,104	100.0%
Williamstown (B)	1,187	1,087	91.6%	0	0.0%	0	0.0%	1,187	100.0%
Dauphin County (Total)	**274,515**	**175,949**	**64.1%**	**95,293**	**34.7%**	**41,480**	**15.1%**	**273,443**	**99.6%**

Sources: ACS 2014-2018 U.S. Census; Dauphin County GIS 2020; EIA – 2020; PennDOT - 2018
Notes: B – Borough; C – City; T – Township; % - Percent
SARA - Superfund Amendments and Reauthorization Act

Impacts on General Building Stock

Potential losses to the general building stock caused by a hazardous substance's incident are difficult to quantify. The degree of damages to the general building stock depends on the scale of the incident. Potential losses may include inaccessibility, loss of service, contamination, and/or potential structural and content losses if an explosion occurs. The closure of waterways, railroads, airports, and highways because of a hazardous substance incident has the potential to impact the ability to deliver goods and services efficiently. Potential impacts may have local, regional, or statewide effects depending on the magnitude of the event and level of service disruptions.

To estimate the buildings exposed to a HazMat event, the HazMat buffer areas were overlaid upon the building level. The replacement cost value of the structures with their center in the buffer areas were totaled (Table 4.3.5-3 and Table 4.3.5-4). The area with the largest exposure to replacement cost value are those buffer areas that extend out from HazMat sites. However, if a HazMat release were to occur, the incident would not be located along all hazardous sites, but solely from one. Similarly, a railway, pipeline, or roadway HazMat incident would not occur in all areas of the structure, but instead only along one section or within one site. Therefore, the total exposure does not represent a complete vulnerability, should a hazard event occur.

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Table 4.3.5-3. Total Building Exposed to a Highway or Railroad HazMat Incident

Jurisdiction	Number of Buildings	Total Replacement Cost Value	Estimated Building Stock within a Half-Mile of Major Roadways				Estimated Building Stock within a Half-Mile of Railways			
			Number of Buildings	Percent of Total	Replacement Cost Value (RCV)	Percent of Total	Number of Buildings	Percent of Total	Replacement Cost Value (RCV)	Percent of Total
Berrysburg (B)	366	$131,114,498	366	100.0%	$131,114,498	100.0%	0	0.0%	$0	0.0%
Conewago (T)	2,495	$1,131,218,434	1,372	55.0%	$607,096,004	53.7%	0	0.0%	$0	0.0%
Dauphin (B)	456	$160,174,274	456	100.0%	$160,174,274	100.0%	374	82.0%	$136,702,879	85.3%
Derry (T)	11,617	$13,980,976,171	6,625	57.0%	$10,857,007,409	77.7%	4,880	42.0%	$5,178,026,232	37.0%
East Hanover (T)	5,054	$2,617,412,647	3,569	70.6%	$2,069,327,274	79.1%	0	0.0%	$0	0.0%
Elizabethville (B)	949	$396,035,763	949	100.0%	$396,035,763	100.0%	0	0.0%	$0	0.0%
Gratz (B)	715	$432,294,298	660	92.3%	$417,167,016	96.5%	0	0.0%	$0	0.0%
Halifax (B)	469	$181,049,719	469	100.0%	$181,049,719	100.0%	461	98.3%	$178,305,848	98.5%
Halifax (T)	3,457	$1,457,192,513	2,283	66.0%	$1,044,916,844	71.7%	874	25.3%	$414,711,302	28.5%
Harrisburg (C)	18,718	$15,182,832,338	9,179	49.0%	$8,222,232,025	54.2%	13,393	71.6%	$12,191,991,631	80.3%
Highspire (B)	1,374	$550,466,766	1,374	100.0%	$550,466,766	100.0%	1,335	97.2%	$538,836,441	97.9%
Hummelstown (B)	2,337	$1,082,835,134	1,691	72.4%	$772,417,148	71.3%	2,330	99.7%	$1,079,448,767	99.7%
Jackson (T)	2,371	$776,111,853	695	29.3%	$226,902,871	29.2%	0	0.0%	$0	0.0%
Jefferson (T)	666	$230,110,295	1	0.2%	$429,053	0.2%	0	0.0%	$0	0.0%
Londonderry (T)	5,080	$2,360,384,847	2,871	56.5%	$1,446,012,237	61.3%	1,008	19.8%	$803,169,961	34.0%
Lower Paxton (T)	20,948	$14,635,453,846	11,057	52.8%	$9,183,374,603	62.7%	8	<0.1%	$1,524,497	<0.1%
Lower Swatara (T)	4,771	$5,522,875,069	4,428	92.8%	$5,029,486,292	91.1%	1,033	21.7%	$1,855,329,713	33.6%
Lykens (B)	1,322	$517,534,065	1,322	100.0%	$517,534,065	100.0%	0	0.0%	$0	0.0%
Lykens (T)	2,155	$941,126,374	787	36.5%	$357,334,583	38.0%	0	0.0%	$0	0.0%
Middle Paxton (T)	4,093	$1,462,655,724	2,998	73.2%	$1,102,188,478	75.4%	789	19.3%	$271,099,728	18.5%
Middletown (B)	3,582	$1,981,507,138	3,575	99.8%	$1,965,182,708	99.2%	3,007	83.9%	$1,754,968,615	88.6%
Mifflin (T)	1,125	$603,453,937	684	60.8%	$372,055,280	61.7%	0	0.0%	$0	0.0%
Millersburg (B)	1,439	$770,504,424	1,435	99.7%	$752,132,344	97.6%	1,062	73.8%	$551,592,737	71.6%
Paxtang (B)	869	$403,915,987	840	96.7%	$376,661,297	93.3%	851	97.9%	$381,883,190	94.5%

Jurisdiction	Number of Buildings	Total Replacement Cost Value	Estimated Building Stock within a Half-Mile of Major Roadways				Estimated Building Stock within a Half-Mile of Railways			
			Number of Buildings	Percent of Total	Replacement Cost Value (RCV)	Percent of Total	Number of Buildings	Percent of Total	Replacement Cost Value (RCV)	Percent of Total
Penbrook (B)	1,525	$602,189,726	1,451	95.1%	$580,694,990	96.4%	0	0.0%	$0	0.0%
Pillow (B)	301	$101,661,910	301	100.0%	$101,661,910	100.0%	0	0.0%	$0	0.0%
Reed (T)	299	$117,139,877	254	84.9%	$103,780,525	88.6%	160	53.5%	$52,802,219	45.1%
Royalton (B)	630	$196,935,626	630	100.0%	$196,935,626	100.0%	630	100.0%	$196,935,626	100.0%
Rush (T)	343	$71,032,585	337	98.3%	$69,686,045	98.1%	0	0.0%	$0	0.0%
South Hanover (T)	3,972	$1,935,844,099	1,514	38.1%	$859,319,858	44.4%	376	9.5%	$123,312,886	6.4%
Steelton (B)	2,721	$2,111,932,612	2,716	99.8%	$2,109,802,081	99.9%	2,674	98.3%	$2,098,655,799	99.4%
Susquehanna (T)	11,785	$8,633,889,539	8,603	73.0%	$6,735,000,507	78.0%	1,754	14.9%	$1,097,296,529	12.7%
Swatara (T)	11,354	$8,581,237,561	8,205	72.3%	$7,289,502,612	84.9%	6,451	56.8%	$5,470,412,786	63.7%
Upper Paxton (T)	3,560	$1,473,328,502	2,684	75.4%	$1,157,437,753	78.6%	898	25.2%	$310,746,684	21.1%
Washington (T)	2,270	$1,106,223,564	1,738	76.6%	$911,321,188	82.4%	0	0.0%	$0	0.0%
Wayne (T)	1,324	$398,741,088	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%
West Hanover (T)	6,505	$3,228,343,376	4,782	73.5%	$2,671,515,334	82.8%	0	0.0%	$0	0.0%
Wiconisco (T)	995	$297,597,257	778	78.2%	$228,750,563	76.9%	0	0.0%	$0	0.0%
Williams (T)	957	$390,058,854	736	76.9%	$318,602,342	81.7%	0	0.0%	$0	0.0%
Williamstown (B)	908	$345,185,743	835	92.0%	$323,284,376	93.7%	0	0.0%	$0	0.0%
Dauphin County (Total)	**145,877**	**$97,100,578,032**	**95,250**	**65.3%**	**$70,395,594,259**	**72.5%**	**44,348**	**30.4%**	**$34,687,754,068**	**35.7%**

Sources: Dauphin County GIS 2020; RS Means 2020; PennDOT - 2018
Notes: B – Borough; C – City; T – Township; % - Percent

Table 4.3.5-4. Total Building Exposed to a SARA Site or Pipeline HazMat Incident

Jurisdiction	Number of Buildings	Total Replacement Cost Value	Estimated Building Stock within a Half-Mile of Pipelines				Estimated Building Stock Exposed to HazMat Facility Incidence Zones			
			Number of Buildings	Percent of Total	Replacement Cost Value (RCV)	Percent of Total	Number of Buildings	Percent of Total	Replacement Cost Value (RCV)	Percent of Total
Berrysburg (B)	366	$131,114,498	0	0.0%	$0	0.0%	366	100.0%	$131,114,498	100.0%
Conewago (T)	2,495	$1,131,218,434	1,196	47.9%	$576,378,581	51.0%	2,495	100.0%	$1,131,218,434	100.0%
Dauphin (B)	456	$160,174,274	0	0.0%	$0	0.0%	456	100.0%	$160,174,274	100.0%
Derry (T)	11,617	$13,980,976,171	1,622	14.0%	$806,740,689	5.8%	11,617	100.0%	$13,980,976,171	100.0%
East Hanover (T)	5,054	$2,617,412,647	928	18.4%	$378,696,755	14.5%	5,054	100.0%	$2,617,412,647	100.0%
Elizabethville (B)	949	$396,035,763	0	0.0%	$0	0.0%	949	100.0%	$396,035,763	100.0%
Gratz (B)	715	$432,294,298	0	0.0%	$0	0.0%	715	100.0%	$432,294,298	100.0%
Halifax (B)	469	$181,049,719	0	0.0%	$0	0.0%	469	100.0%	$181,049,719	100.0%
Halifax (T)	3,457	$1,457,192,513	0	0.0%	$0	0.0%	3,457	100.0%	$1,457,192,513	100.0%
Harrisburg (C)	18,718	$15,182,832,338	0	0.0%	$0	0.0%	18,718	100.0%	$15,182,832,338	100.0%
Highspire (B)	1,374	$550,466,766	1,041	75.8%	$415,131,350	75.4%	1,374	100.0%	$550,466,766	100.0%
Hummelstown (B)	2,337	$1,082,835,134	0	0.0%	$0	0.0%	2,337	100.0%	$1,082,835,134	100.0%
Jackson (T)	2,371	$776,111,853	0	0.0%	$0	0.0%	2,371	100.0%	$776,111,853	100.0%
Jefferson (T)	666	$230,110,295	0	0.0%	$0	0.0%	666	100.0%	$230,110,295	100.0%
Londonderry (T)	5,080	$2,360,384,847	3,013	59.3%	$1,012,640,907	42.9%	5,080	100.0%	$2,360,384,847	100.0%
Lower Paxton (T)	20,948	$14,635,453,846	3,670	17.5%	$1,953,984,989	13.4%	20,729	99.0%	$14,542,017,582	99.4%
Lower Swatara (T)	4,771	$5,522,875,069	3,311	69.4%	$3,829,452,408	69.3%	4,771	100.0%	$5,522,875,069	100.0%
Lykens (B)	1,322	$517,534,065	0	0.0%	$0	0.0%	1,322	100.0%	$517,534,065	100.0%
Lykens (T)	2,155	$941,126,374	0	0.0%	$0	0.0%	2,155	100.0%	$941,126,374	100.0%
Middle Paxton (T)	4,093	$1,462,655,724	52	1.3%	$19,898,994	1.4%	3,724	91.0%	$1,327,893,214	90.8%
Middletown (B)	3,582	$1,981,507,138	2,586	72.2%	$1,358,717,820	68.6%	3,582	100.0%	$1,981,507,138	100.0%
Mifflin (T)	1,125	$603,453,937	0	0.0%	$0	0.0%	1,125	100.0%	$603,453,937	100.0%
Millersburg (B)	1,439	$770,504,424	0	0.0%	$0	0.0%	1,439	100.0%	$770,504,424	100.0%
Paxtang (B)	869	$403,915,987	0	0.0%	$0	0.0%	869	100.0%	$403,915,987	100.0%
Penbrook (B)	1,525	$602,189,726	0	0.0%	$0	0.0%	1,525	100.0%	$602,189,726	100.0%

Jurisdiction	Number of Buildings	Total Replacement Cost Value	Estimated Building Stock within a Half-Mile of Pipelines				Estimated Building Stock Exposed to HazMat Facility Incidence Zones			
			Number of Buildings	Percent of Total	Replacement Cost Value (RCV)	Percent of Total	Number of Buildings	Percent of Total	Replacement Cost Value (RCV)	Percent of Total
Pillow (B)	301	$101,661,910	0	0.0%	$0	0.0%	301	100.0%	$101,661,910	100.0%
Reed (T)	299	$117,139,877	0	0.0%	$0	0.0%	299	100.0%	$117,139,878	100.0%
Royalton (B)	630	$196,935,626	0	0.0%	$0	0.0%	630	100.0%	$196,935,626	100.0%
Rush (T)	343	$71,032,585	0	0.0%	$0	0.0%	343	100.0%	$71,032,585	100.0%
South Hanover (T)	3,972	$1,935,844,099	0	0.0%	$0	0.0%	3,972	100.0%	$1,935,844,099	100.0%
Steelton (B)	2,721	$2,111,932,612	584	21.5%	$457,979,899	21.7%	2,721	100.0%	$2,111,932,612	100.0%
Susquehanna (T)	11,785	$8,633,889,539	1,587	13.5%	$706,137,357	8.2%	11,785	100.0%	$8,633,889,539	100.0%
Swatara (T)	11,354	$8,581,237,561	257	2.3%	$237,783,649	2.8%	11,354	100.0%	$8,581,237,561	100.0%
Upper Paxton (T)	3,560	$1,473,328,502	0	0.0%	$0	0.0%	3,560	100.0%	$1,473,328,502	100.0%
Washington (T)	2,270	$1,106,223,564	0	0.0%	$0	0.0%	2,270	100.0%	$1,106,223,564	100.0%
Wayne (T)	1,324	$398,741,088	0	0.0%	$0	0.0%	1,324	100.0%	$398,741,088	100.0%
West Hanover (T)	6,505	$3,228,343,376	1,555	23.9%	$797,095,802	24.7%	6,451	99.2%	$3,211,249,258	99.5%
Wiconisco (T)	995	$297,597,257	0	0.0%	$0	0.0%	995	100.0%	$297,597,257	100.0%
Williams (T)	957	$390,058,854	0	0.0%	$0	0.0%	957	100.0%	$390,058,854	100.0%
Williamstown (B)	908	$345,185,743	0	0.0%	$0	0.0%	908	100.0%	$345,185,743	100.0%
Dauphin County (Total)	**145,877**	**$97,100,578,032**	**21,402**	**14.7%**	**$12,550,639,201**	**12.9%**	**145,235**	**99.6%**	**$96,855,285,140**	**99.7%**

Sources: Dauphin County GIS 2020; RS Means 2020; EIA - 2020
Notes: B – Borough; C – City; T – Township; % - Percent

Impacts on Critical Facilities

Potential losses of critical facilities caused by a HazMat incident are difficult to quantify. Potential losses may include inaccessibility, loss of service, contamination, and/or potential structural and content losses if an explosion occurs. Table 4.3.5-5 summarizes critical facilities and lifelines located within the HazMat buffer areas. There is a total of 1,729 critical facilities in Dauphin County, 1,149 of which are considered lifelines. Overall, 195 critical facilities are exposed to a pipeline HazMat event, 1,321 critical facilities are exposed to a roadway hazardous material event, 788 critical facilities are exposed to a rail line HazMat event, and 1,728 critical facilities are exposed to a SARA Site HazMat facility event. Dams are the critical facility with the greatest exposure to a Hazmat event.

Table 4.3.5-5. Critical Facilities Vulnerable to Environmental Hazards

Jurisdiction	Total Critical Facilities (Lifelines)	Half-Mile Buffer of HazMat Facility Incidence Zones Critical Facilities (Lifelines)	Half-Mile Buffer of Roadways Critical Facilities (Lifelines)	Half-Mile Buffer of Railways Critical Facilities (Lifelines)	Half-Mile Pipeline Critical Facilities (Lifelines)
Berrysburg (B)	6 (5)	6 (5)	6 (5)	0 (0)	0 (0)
Conewago (T)	12 (7)	12 (7)	6 (4)	0 (0)	5 (1)
Dauphin (B)	27 (23)	27 (23)	27 (23)	27 (23)	0 (0)
Derry (T)	122 (74)	122 (74)	99 (62)	58 (38)	7 (3)
East Hanover (T)	41 (29)	41 (29)	31 (21)	0 (0)	6 (6)
Elizabethville (B)	12 (9)	12 (9)	12 (9)	0 (0)	0 (0)
Gratz (B)	9 (7)	9 (7)	9 (7)	0 (0)	0 (0)
Halifax (B)	8 (7)	8 (7)	8 (7)	8 (7)	0 (0)
Halifax (T)	37 (24)	37 (24)	31 (19)	14 (8)	0 (0)
Harrisburg (C)	371 (271)	371 (271)	214 (169)	307 (234)	0 (0)
Highspire (B)	15 (9)	15 (9)	15 (9)	15 (9)	11 (5)
Hummelstown (B)	33 (23)	33 (23)	25 (16)	29 (22)	0 (0)
Jackson (T)	26 (15)	26 (15)	8 (2)	0 (0)	0 (0)
Jefferson (T)	8 (6)	8 (6)	0 (0)	0 (0)	0 (0)
Londonderry (T)	47 (31)	47 (31)	36 (22)	22 (18)	29 (16)
Lower Paxton (T)	149 (73)	149 (73)	97 (51)	1 (1)	24 (12)
Lower Swatara (T)	94 (75)	94 (75)	88 (69)	43 (41)	53 (39)
Lykens (B)	22 (17)	22 (17)	22 (17)	0 (0)	0 (0)
Lykens (T)	16 (10)	16 (10)	8 (4)	0 (0)	0 (0)
Middle Paxton (T)	38 (23)	37 (22)	30 (18)	10 (5)	3 (3)
Middletown (B)	48 (27)	48 (27)	47 (26)	45 (25)	21 (12)
Mifflin (T)	11 (8)	11 (8)	8 (5)	0 (0)	0 (0)
Millersburg (B)	28 (16)	28 (16)	28 (16)	23 (15)	0 (0)
Paxtang (B)	14 (9)	14 (9)	14 (9)	14 (9)	0 (0)
Penbrook (B)	16 (5)	16 (5)	16 (5)	0 (0)	0 (0)
Pillow (B)	7 (4)	7 (4)	7 (4)	0 (0)	0 (0)
Reed (T)	8 (7)	8 (7)	7 (6)	4 (3)	0 (0)
Royalton (B)	12 (9)	12 (9)	12 (9)	12 (9)	0 (0)
Rush (T)	6 (5)	6 (5)	6 (5)	0 (0)	0 (0)
South Hanover (T)	25 (17)	25 (17)	16 (10)	3 (1)	0 (0)

Jurisdiction	Total Critical Facilities (Lifelines)	Half-Mile Buffer of HazMat Facility Incidence Zones Critical Facilities (Lifelines)	Half-Mile Buffer of Roadways Critical Facilities (Lifelines)	Half-Mile Buffer of Railways Critical Facilities (Lifelines)	Half-Mile Pipeline Critical Facilities (Lifelines)
Steelton (B)	34 (17)	34 (17)	34 (17)	34 (17)	7 (4)
Susquehanna (T)	112 (72)	112 (72)	86 (54)	15 (11)	6 (5)
Swatara (T)	146 (95)	146 (95)	131 (85)	98 (69)	3 (3)
Upper Paxton (T)	37 (25)	37 (25)	30 (18)	6 (4)	0 (0)
Washington (T)	34 (27)	34 (27)	26 (19)	0 (0)	0 (0)
Wayne (T)	9 (8)	9 (8)	0 (0)	0 (0)	0 (0)
West Hanover (T)	48 (31)	48 (31)	42 (27)	0 (0)	20 (11)
Wiconisco (T)	15 (11)	15 (11)	14 (10)	0 (0)	0 (0)
Williams (T)	16 (12)	16 (12)	16 (12)	0 (0)	0 (0)
Williamstown (B)	10 (6)	10 (6)	9 (5)	0 (0)	0 (0)
Dauphin County (Total)	**1,729 (1,149)**	**1,728 (1,148)**	**1321 (876)**	**788 (569)**	**195 (120)**

Sources: Dauphin County GIS 2020; EIA - 2020; PennDOT - 2018
Notes: B – Borough; C – City; Twp. – Township; % - Percent

Impact on the Economy

If a significant HazMat incident occurs, not only would life, safety, and building stock be at risk, but the economy of Dauphin County would also be affected. A significant incident within an urban area may force businesses to close for an extended period of time because of contamination or because of direct damage caused by an explosion. Exact impacts on the economy are difficult to predict, given the uncertainty of the size and scope of potential incidents.

HazMat incidents can lead to closures of major transportation routes in Dauphin County. Closures of waterways, railroads, airports, and highways as a result of these incidents can hinder delivery of goods and services. Potential impacts may be local, regional, or statewide depending on the magnitude of the event and the extent of disruptions to services. In 2019, the United States experienced nearly $1 billion of damages in HazMat transportation incidents (PHMSA 2019).

Impact on the Environment

HazMat sites near bodies of water are at high risk if an extreme storm or high-water levels approach. Such events could release toxins, waste, and other pollutants into the water and greatly impact surrounding habitats (EPA 2020). Many of these sites were intentionally constructed in locations believed to be removed from potential contamination or exposure-increasing factors, but floodplain boundary change increases the likelihood that water may reach HazMat and waste sites.

Cascading Impacts to Other Hazards

Hazardous substance events can cause utility failure. If a spill or other release occurred, water quality and supply could stop or drastically decrease while the facility restored service. HazMat events can also occur along transportation networks. In 2019, the United States experienced over 250 incidents of derailments and accidents from HazMat spills (PHMSA 2019). While HazMat transportation along railroads has traditionally been reliable, a HazMat spill along any transportation network could result in disruption and accidents (Barkan, C. Kawprasert A. 2008). See Sections 4.3.15 (Transportation Accident) and 4.3.16 (Utility Interruption) for more information.

Future Changes that May Impact Vulnerability

Understanding future changes that affect vulnerability in the county can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The county considered the following factors to examine potential conditions that may affect hazard vulnerability:

- Potential or projected development
- Projected changes in population
- Other identified conditions as relevant and appropriate, including the impacts of climate change

Projected Development

An increase in development and population can increase likelihood of a hazardous substance incident. Future migration to larger jurisdictions may also increase the likelihood of an incident. The tables and hazard maps included in the jurisdictional annexes contain additional information regarding the specific areas of development that would increase county vulnerability to the HazMat incident hazard.

Projected Changes in Population

Estimated population projections provided by the Center of Rural Pennsylvania indicate that Dauphin's population will continue to increase into 2040, increasing total population to approximately 296,766 persons (The Center of Rural Pennsylvania 2013). This is approximately a 10.6 percent increase from the county's 2010 population. Persons that move into HazMat exposure areas are at greater risk to be impacted if there is a spill or toxin release.

Climate Change

As temperatures change, excessive heat on containers that contain HazMat may alter the material properties. In addition, hazardous substances stored at fixed locations in the floodplain may experience an increase in flood events due to the project changes in increased precipitation events, magnitude, and frequency.

Change of Vulnerability Since the 2015 HMP

Since the 2015 analysis, population statistics have been updated using the 5-Year 2014-2018 American Community Survey Population Estimates. The general building stock was also established using RS Means 2020 building valuations that estimated RCV for each building in the inventory. Additionally, a critical facility dataset was provided from the County. This HMP was enhanced by applying a half-mile buffer to pipelines, roads, and railways. Furthermore, unique radii were applied to all HazMat facilities. Overall, exposure and vulnerability of the entire county to HazMat incidents will continue.

4.3.6 Flood, Flash Flood, Ice Jam

This section provides a profile and vulnerability assessment of the flood hazard in Dauphin County. Floods are one of the most common natural hazards in the United States and are the most prevalent type of natural disaster occurring in Pennsylvania. Over 94 percent of the Commonwealth's municipalities have been designated as flood-prone areas. Both seasonal and flash floods have been caused millions of dollars in annual property damage, loss of lives, and disruption of economic activities (Pennsylvania Emergency Management Agency [PEMA] 2018).

The Federal Emergency Management Agency's (FEMA) definition of flooding is "a general and temporary condition of partial or complete inundation of two or more acres of normally dry land area or of two or more properties from the overflow of inland or tidal waters or the rapid accumulation of runoff of surface waters from any source" (FEMA 2015).

Most floods fall into three categories: riverine, coastal, and shallow (FEMA 2015). Other types of floods may include ice jam floods, flash floods, stormwater floods, alluvial fan floods, dam failure floods, and floods associated with local drainage or high groundwater (as indicated in the previous flood definition). For the purpose of this plan and as deemed appropriate by the Planning Team, riverine, flash, ice jam, and stormwater flooding are the main flood types of concern for Dauphin County. These types of floods are further discussed below.

Riverine Floods

Riverine floods are the most common flood type and occur along a channel. Channels are defined features on the ground that carry water through and out of a watershed. They may be called rivers, creeks, streams, or ditches. When a channel receives too much water, the excess water flows over its banks and inundates low-lying areas. These floods usually occur after heavy rains, heavy thunderstorms, or snowmelt, and can be slow or fast-rising, and generally develop over a period of hours to days (FEMA 2015; Illinois Association for Floodplain and Stormwater Management 2006).

Flash Floods

According to the National Weather Service (NWS), flash floods are a rapid and extreme flow of high water into a normally dry area, or a rapid water level rise in a stream or creek above a predetermined flood level, beginning within 6 hours of the causative event (e.g., intense rainfall, dam failure, or ice jam) (NWS 2015).

Flash floods can occur very quickly and with very little warning. This type of flood can be deadly because it produces rapid rises in water levels and has devastating flow velocities. Urban areas are more susceptible to flash floods because a high percentage of the surface area is impervious (PEMA 2018). The time elapsed before flash flooding occurs varies in different parts of the country. Ongoing flooding can intensify to flash flooding where intense rainfall results in a rapid surge of rising flood waters (NWS 2015). A flash flood can have a dangerous wall of roaring water that carries rocks, mud, and other debris, and can sweep away most things in its path. Flash floods usually result from intense storms dropping large amounts of rain within a brief period with little or no warning and can reach their peak within only a few minutes. They normally occur in the summer during the thunderstorm season. The most severe flooding conditions usually occur when direct rainfall is augmented by snowmelt. If the soil is saturated or frozen, stream flow may increase because of inability of the soil to absorb additional precipitation (FEMA 2008).

Ice Jam Floods

An ice jam is an accumulation of ice that acts as a natural dam and restricts flow of a body of water. Ice jams occur when warm temperatures and heavy rains cause rapid snow melt. The melting snow, combined with the heavy rain, causes frozen rivers to swell. The rising water breaks the ice layers into large chunks, which float downstream and often pile up near narrow passages and obstructions (bridges and dams). Ice jams may build up to a thickness great enough to raise the water level and cause flooding (Northeast States Emergency Consortium [NESEC] Date Unknown; U.S. Army Corps of Engineers [USACE] 2002).

Ice jams are of two different types: freeze-up and breakup. Freeze-up jams occur in the early to mid-winter when floating ice may slow or stop because of a change in water slope as it reaches an obstruction to movement. Breakup jams occur during periods of thaw, generally in late winter and early spring. The ice cover breakup is usually associated with a rapid increase in runoff and corresponding river discharge caused by a heavy rainfall, snowmelt, or warmer temperatures (USACE 2002).

Dam Failure Floods

A dam is an artificial barrier that can impound water, wastewater, or any liquid-borne material for the purpose of storage or control of water (FEMA 2010). Dams are man-made structures built across a stream or river that impound water and reduce flow downstream (FEMA 2003). They are built for purposes of power production, agriculture, water supply, recreation, and flood protection. Dam failure is any malfunction or abnormality outside of the design that adversely affects a dam's primary function of impounding water (FEMA 2015). Dams can fail for one or a combination of the following reasons:

- Overtopping caused by floods that exceed capacity of the dam (inadequate spillway capacity)
- Prolonged periods of rainfall and flooding
- Deliberate acts of sabotage (terrorism)
- Structural failure of materials used in dam construction
- Movement and/or failure of the foundation supporting the dam
- Settlement and cracking of concrete or embankment dams
- Piping and internal erosion of soil in embankment dams
- Inadequate or negligent operation, maintenance, and upkeep
- Failure of upstream dams on the same waterway
- Earthquake (liquefaction/landslides) (FEMA 2015)

Flooding can occur when a dam fails or breaks, producing effects similar to flash floods. Areas most susceptible to effects of floods are low-lying areas near water or downstream from a dam (FEMA 2015).

Flooding caused by dam failure is addressed in Section 4.3.3 of this plan.

4.3.6.1 Location and Extent

Flooding in Pennsylvania is typically associated with abnormally high and intense rainfall amounts. It can also be caused by sudden snowmelt, landslides, or dam failures. In Pennsylvania, flooding usually occurs in the summer; however, flooding has occurred during the winter months as well.

Floodplains are found in lowland areas adjacent to rivers, streams, creeks, lakes, or other bodies of water that become inundated during a flood. The size of a floodplain depends on the recurrence interval of a given flood. A 1 percent annual chance floodplain is smaller than the floodplain associated with a flood that has a 0.2 percent annual chance of occurring (PEMA 2018).

Dauphin County's greatest flooding threat is along the Susquehanna River corridor. Other major waterways within the county include Clarks Creek, Mahantago Creek, Paxton Creek, Powells Creek, Rattling Creek, Spring Creek, Swatara Creek, and Wiconisco Creek.

Most municipalities in Dauphin County have flood-prone areas because they are located along streams, creeks, or lakes. In addition, community development of the floodplain has resulted in frequent flooding. For inland areas, excess water from snowmelt or rainfall accumulates and overflows onto stream banks and adjacent floodplains.

Table 4.3.6-1 lists total land areas within the 1 percent and 0.2 percent annual chance flood zones calculated via a spatial analysis referencing the 2012 Digital Flood Insurance Rate Map (DFIRM).

Table 4.3.6-1. Total Land Areas in the 1 Percent and 0.2 Percent Annual Chance Flood Zones (Acres)

Jurisdiction	Total Acres	Estimated Land Exposed to Flood Hazard Areas			
		1 Percent Annual Chance Flood Hazard Event Area		0.2 Percent Annual Chance Flood Hazard Event Area	
		Acres	Percent of Total	Acres	Percent of Total
Berrysburg (B)	388	0	0.0%	0	0.0%
Conewago (T)	10,684	366	3.4%	367	3.4%
Dauphin (B)	283	28	9.8%	57	20.0%
Derry (T)	17,468	1,017	5.8%	1,155	6.6%
East Hanover (T)	25,501	930	3.6%	1,188	4.7%
Elizabethville (B)	349	3	0.8%	3	0.8%
Gratz (B)	1,926	104	5.4%	104	5.4%
Halifax (B)	112	6	5.4%	10	8.7%
Halifax (T)	20,079	3,419	17.0%	3,606	18.0%
Harrisburg (C)	7,415	3,514	47.4%	3,940	53.1%
Highspire (B)	453	185	40.8%	324	71.6%
Hummelstown (B)	838	116	13.9%	129	15.3%
Jackson (T)	25,639	238	0.9%	246	1.0%
Jefferson (T)	15,602	457	2.9%	457	2.9%
Londonderry (T)	17,222	4,175	24.2%	4,610	26.8%
Lower Paxton (T)	17,997	988	5.5%	1,027	5.7%
Lower Swatara (T)	9,412	1,863	19.8%	2,612	27.7%
Lykens (B)	782	153	19.5%	248	31.8%
Lykens (T)	16,869	1,302	7.7%	1,302	7.7%
Middle Paxton (T)	37,664	4,470	11.9%	4,760	12.6%
Middletown (B)	1,316	257	19.5%	366	27.8%
Mifflin (T)	9,874	132	1.3%	151	1.5%
Millersburg (B)	491	78	15.9%	108	22.0%
Paxtang (B)	246	33	13.3%	37	15.1%
Penbrook (B)	273	0	0.0%	0	0.0%
Pillow (B)	345	82	23.7%	83	24.0%
Reed (T)	5,488	2,412	44.0%	2,641	48.1%
Royalton (B)	221	60	27.1%	95	43.1%
Rush (T)	15,390	1,126	7.3%	1,126	7.3%
South Hanover (T)	7,448	698	9.4%	792	10.6%
Steelton (B)	1,194	368	30.9%	504	42.2%
Susquehanna (T)	9,778	1,677	17.1%	1,851	18.9%
Swatara (T)	9,866	1,950	19.8%	2,047	20.7%
Upper Paxton (T)	19,411	4,406	22.7%	4,584	23.6%
Washington (T)	11,332	981	8.7%	981	8.7%
Wayne (T)	8,882	230	2.6%	230	2.6%
West Hanover (T)	14,764	310	2.1%	495	3.4%
Wiconisco (T)	6,229	417	6.7%	461	7.4%

Jurisdiction	Total Acres	Estimated Land Exposed to Flood Hazard Areas			
		1 Percent Annual Chance Flood Hazard Event Area		0.2 Percent Annual Chance Flood Hazard Event Area	
		Acres	Percent of Total	Acres	Percent of Total
Williams (T)	5,652	344	6.1%	344	6.1%
Williamstown (B)	165	14	8.2%	14	8.2%
Dauphin County (Total)	**355,048**	**38,906**	**11.0%**	**43,054**	**12.1%**

Source: FEMA 2012
Note: B – Borough; C – City; T – Township; Areas listed include areas of inland waterways

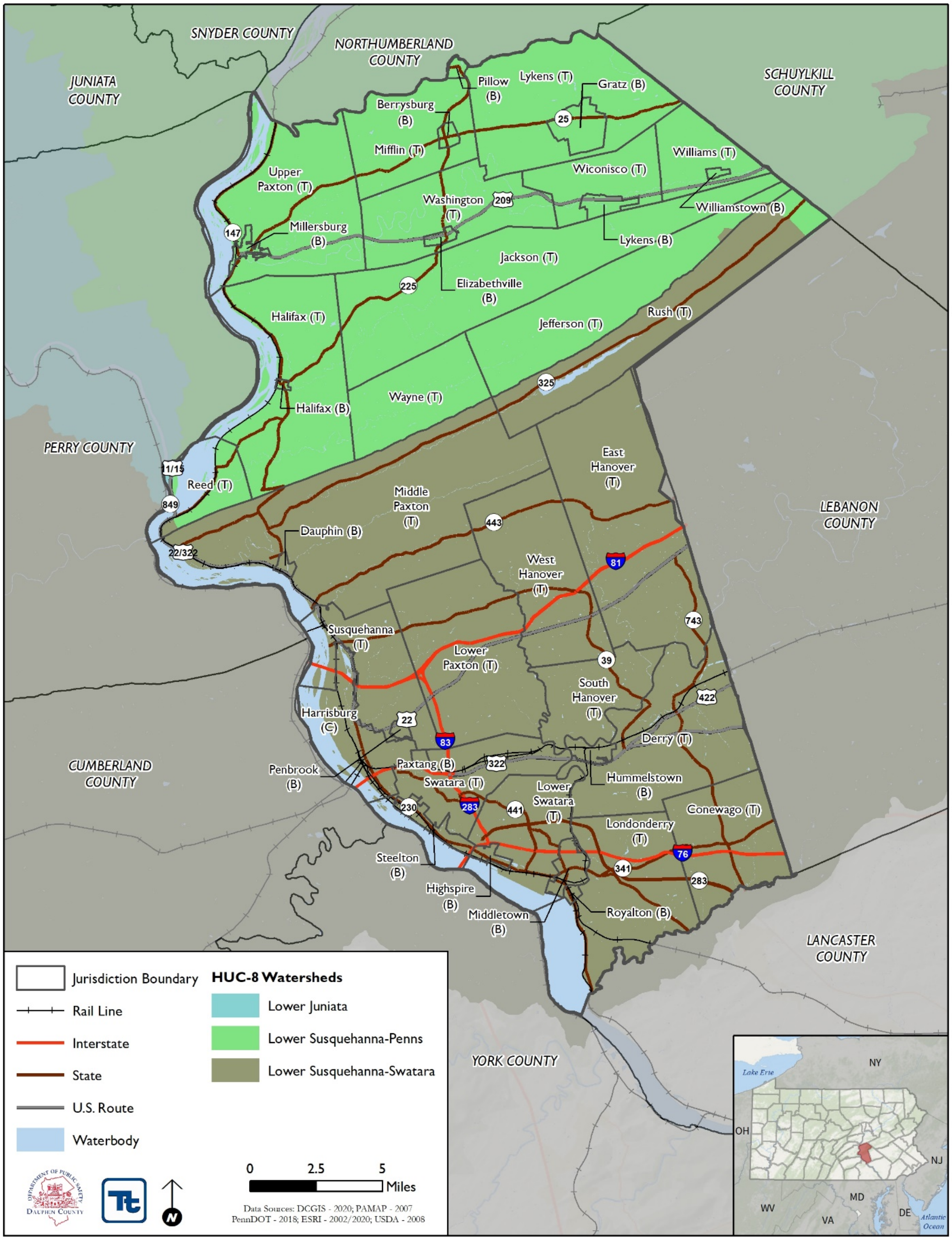
In accordance with the 1978 Pennsylvania Stormwater Management Act (Act 167), counties are required to prepare stormwater management plans on a watershed-by-watershed basis that provide for improved management of stormwater impacts associated with development of land. In 2010, Dauphin County developed and implemented "Dauphin County -Act 167- Stormwater Management Plan." The goals of this plan for the five regional planning areas are to maintain and/or restore the following six elements within Dauphin County:

- Channel Stability
- Groundwater Recharge
- Base Flows
- Flooding
- Water Quality
- Stream Biology

Figure 4.3.6-1 shows Pennsylvania Department of Environmental Protection (PADEP)-designated watersheds with critical facilities in Dauphin County.

The 2012 FEMA Flood Insurance Study (FIS) for Dauphin County also documents the major flooding problems in the County. According to the report, flooding is a widespread problem for the county except for the Boroughs of Berrysburg and Penbrook; the FIS identifies these boroughs as not being located in a Special Flood Hazard Area (FEMA 2012).

Figure 4.3.6-1. PA DEP-Designated Watersheds



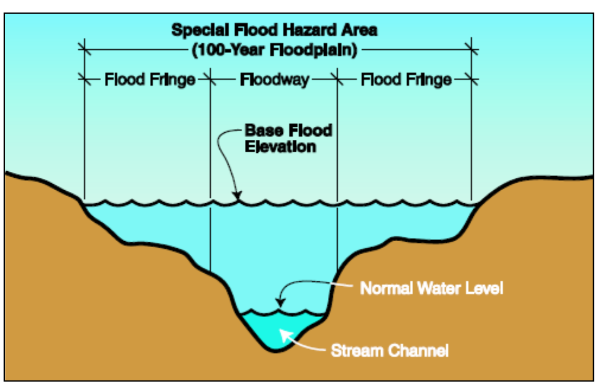
FEMA Regulatory Flood Zones

According to FEMA, flood hazard areas are defined as areas on a map shown to be inundated by a flood of a given magnitude. These areas are determined by use of statistical analyses of records of river flow, storm tides, and rainfall; information obtained through consultation with the community; floodplain topographic surveys; and hydrologic and hydraulic analyses. Flood hazard areas are delineated on FEMA's Flood Insurance Rate Maps (FIRM), which are official maps of a community on which the Federal Insurance and Mitigation Administration has delineated both Special Flood Hazard Areas (SFHA) and the risk premium zones applicable to the community. These maps identify SFHAs, location of a specific property in relation to the SFHA, the base flood elevation (BFE) (1 percent annual chance) at a specific site, the magnitude of a flood hazard within a specific area, undeveloped coastal barriers where flood insurance is not available, and regulatory floodways and floodplain boundaries (1 percent and 0.2 percent annual chance floodplain boundaries) (FEMA 2003, 2005, 2008). Dauphin County's FIRMs can be accessed online via the FEMA Flood Map Service Center (https://msc.fema.gov/portal).

The SFHA included on a FIRM is considered the land area covered by flood waters of the base flood. It is the area where the NFIP's floodplain management regulations must be enforced, and the area where mandatory purchase of flood insurance applies. This regulatory boundary is a convenient tool for assessing vulnerability and risk in flood-prone communities because many communities have maps showing the extent of the base flood and likely depths that will occur.

The 1 percent annual chance flood is referred to as the base flood. As defined by NFIP, the BFE on a FIRM is the elevation of a base flood event, or a flood that has a 1 percent chance of occurring in any given year. The BFE describes the exact elevation of the water that will result from a given discharge level, which is one of the most important factors used in estimating potential damage within that area. A structure within a 1 percent annual chance floodplain has a 26 percent chance of undergoing flood damage during the term of a 30-year mortgage. The 1 percent annual chance flood is a regulatory standard used by federal agencies and most states to administer floodplain management programs. The 1 percent annual chance flood is used by NFIP as the basis for insurance requirements nationwide. FIRMs also depict 0.2 percent annual chance flood designations (FEMA 2016). Figure 4.3.6-2 depicts the SFHA, the BFE, the flood fringe, and the floodway areas of a floodplain for the 1 percent annual chance flood.

Figure 4.3.6-2. Floodplain Illustration

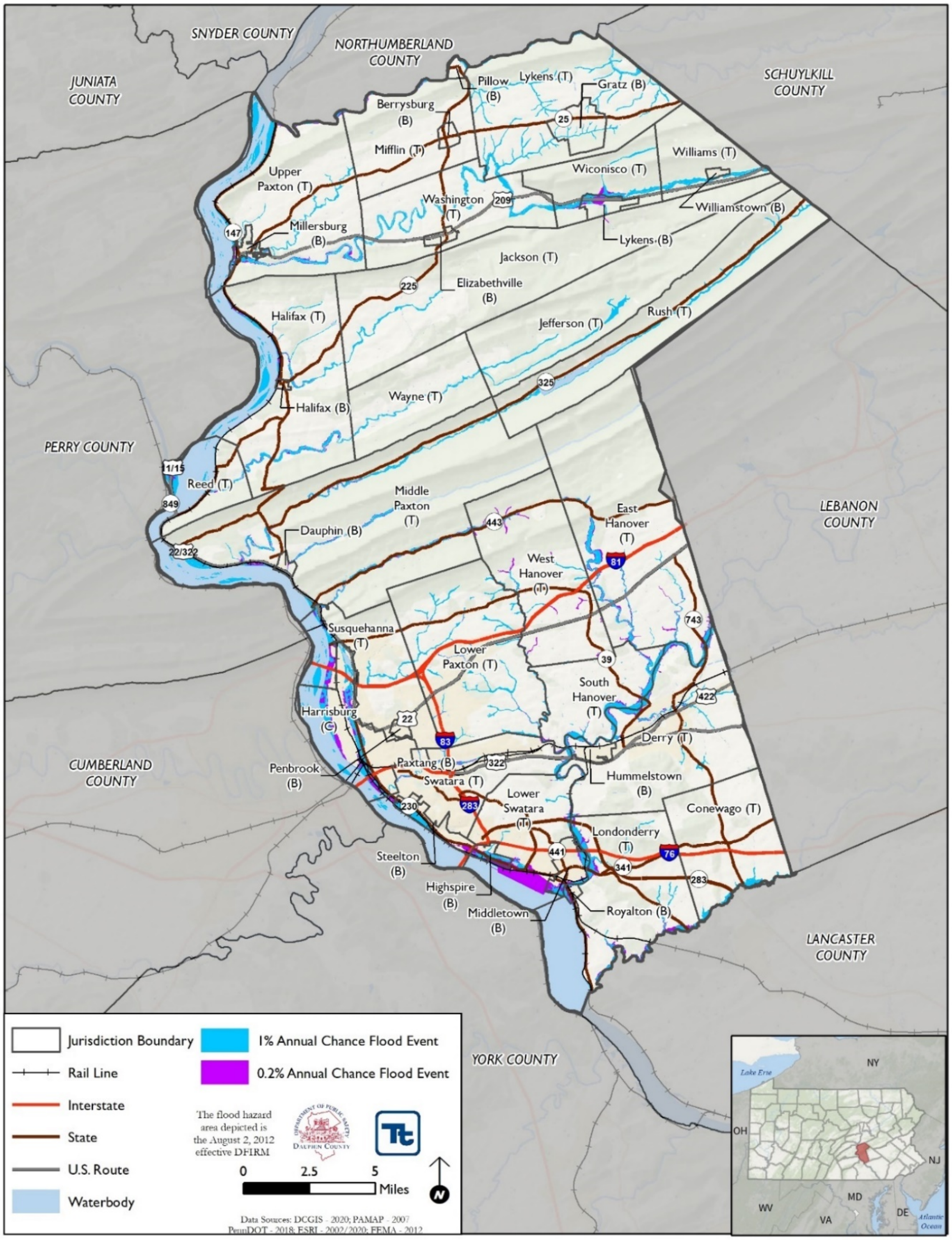


Source: PEMA 2018

The SFHA serves as the primary regulatory boundary used by FEMA and Pennsylvania. Digitized Flood Insurance Rate Maps (DFIRM), FIRMs, and other flood hazard information can be referenced to identify the expected spatial extent of flooding from a 1 percent annual chance event and 0.2 percent annual chance event.

At the time this plan was written, the August 2012 DFIRMs were considered the best available and were used for the risk analysis. Figure 4.3.6-3 illustrates flood zones in Dauphin County. Municipal flood hazard maps are shown at the end of this hazard profile.

Figure 4.3.6-3. Floodplains in Dauphin County



While the FIRMs provide a creditable source to document extent and location of the flood hazard, accuracy of data reflected on these maps has limitations. Notably, FIRMs are based on existing hydrological conditions at the time of map preparation. FIRMs are not set up to account for possible changes in hydrology over time.

Flood Insurance Study

In addition to FIRM and DFIRMs, FEMA also conducts Flood Insurance Studies of entire counties and individual jurisdictions. These studies aid in administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. They are narrative reports of countywide flood hazards, including descriptions of flood areas studied and engineered methods used, principal flood problems, flood protection measures, and graphic profiles of flood sources (FEMA 2016). FEMA completed the countywide FIS for Dauphin County in 2012, at the same time as the DFIRM revisions. Below are identified principal flood problems of each listed municipality from the 2012 FIS.

Township of Derry: Principal sources of flooding in Derry are Swatara Creek and Spring Creek. Considerable damage to the township was caused by the floods of 1935, 1965, and 1972.

Township of East Hanover: Bow Creek, Manada Creek, Swatara Creek, and their tributaries are the principal sources of flooding in the township, with Swatara Creek being the most serious source of flooding. The most severe flooding in the township is generally attributed to rainfall, but snowmelt and moving ice have compounded floods. Tropical storms have also been the cause of major floods in the late summer and fall.

Borough of Halifax: The principal source of flooding in the Borough is the Susquehanna River. Major flooding occurred in 1886, 1936, and 1972. The flood of 1972 was the worst with river flow downstream measuring 1,020,000 cubic feet per second (cfs).

Township of Halifax: Flooding of small tributaries from local thunderstorms typically affects Armstrong Creek, Gurdy Run, and Powells Creek. Larger, area-wide storms have resulted in flooding on the Susquehanna River. In the past 100 years, four major floods have occurred on the Susquehanna River in the reach between the Juniata River and Penns Creek, which includes Halifax.

City of Harrisburg: Principal sources of flooding are Paxton Creek and the Susquehanna River. The Susquehanna River will reach flood stage on average of about every 4 years in Harrisburg; serious flooding is much less frequent. In the southwest portion of the city, Spring Creek is also a source of flooding problems.

Borough of Highspire: The principal source of flooding is the Susquehanna River. Portions of the borough also experience flooding from Burd Run. The Susquehanna River will reach flood stage on average of about every 4 years in Highspire; serious flooding is much less frequent.

Borough of Hummelstown: Swatara Creek is the principal source of flooding to the low-lying areas in the borough.

Township of Londonderry: The Susquehanna River and Swatara Creek are the principal sources of flooding to the township. Conewago Creek East and Iron Run have also caused flooding problems. The flood of 1972, which resulted from Tropical Storm Agnes, damaged roads, bridges, and culverts.

Township of Lower Paxton: Sources of flooding to the township have been noted from Beaver Creek, Nyes Run, the tributary leading to Paxton Creek, and the tributaries to Goose Valley Run and Spring Creek. Low-lying areas are the most susceptible and notable floods occurred in 1936, 1972, and 1975. Common flood damage included damage to the sewage pumping station structure, roadway facilities, and structures at the southeastern end of Nyes Run.

Township of Lower Swatara: The principal sources of flooding to the township are the Susquehanna River and Swatara Creek. Burd Run has also caused flooding problems in the past. Severe flooding of the Susquehanna River occurred in March 1936 and June 1972.

Borough of Lykens: The principal sources of flooding to the borough are the Rattling and Wiconisco Creeks. The flood of 1972 destroyed six highway bridges and their foundations, eroded stream banks, and, coupled with heavy stream debris and extensive sedimentation, caused blockage of the stream channel at the Edwards and Market Street bridges. In the years 1905, 1927, 1936, 1946, 1955, and 1976 other serious flooding occurred, and stream channel blockage was reported during some of these storms.

Township of Middle Paxton: The principal source of flooding in the township is the Susquehanna River. In 1972, flood waters caused extensive damage to permanent and summer homes, severe runoff producing high flows on local streams and tributaries, and disruption of utility services and transportation facilities.

Borough of Middletown: The principal sources of flooding in the borough are the Susquehanna River and Swatara Creek. The Susquehanna Valley suffered damage and loss to agriculture, roads, and water and sewage treatment plants in the flood of September 1975.

Borough of Millersburg: The principal source of flooding in the borough is the Susquehanna River. Major flooding occurred in 1889, 1936, and 1972. In the flood of 1972, several roads were washed out, utility services were disrupted, and several residential homes were damaged on the west side of town.

Borough of Paxtang: Severe flooding is attributed to rainfall and has been compounded by snowmelt and moving ice. Flooding problems in the past have been increased by Derry Street Bridge and the Conrail box culvert and embankment. The embankment acts as a storage dam retarding flow and causing severe upstream flooding.

Borough of Pillow: The floodplains of Mahantango Creek are commonly the location of severe flooding in the borough.

Township of Reed: The principal sources of flooding in the township are the Juniata River and the Susquehanna River. The flood of June 1972 resulted in heavy damage to residential and commercial land on Duncan Island. The flood made a segment of Route 147 between Clarks Perry Bridge and Inglenook impassable and flooded the basements and first floors of homes in this area. Previous major floods also occurred in 1889 and 1936.

Township of South Hanover: The principal source of flooding for the township is Swatara Creek. Beaver, Kellock, and Manada Creeks are also sources of flooding because of backwater from Swatara Creek.

Borough of Steelton: The principal source of flooding for the borough is the Susquehanna River. Notable floods occurred in June 1889 and May 1894.

Township of Susquehanna: The principal source of flooding, primarily in the western portion of the Township, is the Susquehanna River. A minor flooding source is the tributary to Paxton Creek. Previous major floods in the township occurred in March 1902, March 1936, and June 1972.

Township of Swatara: The principal sources of flooding in the township are the Susquehanna River; and Swatara Creek. Beaver Creek, Spring Creek, and the West Branch Spring Creek. Their tributaries have also contributed to flooding. The past history of flooding along the streams within the township indicates that floods may be experienced in any season of the year; however, the possibility of flooding is greatly reduced during the winter months. Although most severe floods have been attributed to rainfall alone, the spring floods have been compounded by melting snow and moving ice. The major floods in late summer and fall have been associated with tropical storms moving up the Atlantic coastline.

Township of Upper Paxton: The principal source of flooding in the township is the Susquehanna River. Mahantango Creek and Wiconisco Creek also contribute to flooding problems. The flood of 1972 caused severe runoff conditions producing high flow on local streams and tributaries. A residential development near the Wiconisco Creek banks destroyed several homes as the homes were washed from their foundations and totally destroyed. Throughout the township, soil erosion and crop damage occurred, contributing to agricultural losses. In the Lenkerville section, serious damage to residential and commercial structures occurred when backwater from the Susquehanna River combined with Wiconisco Creek.

Township of Washington: The principal source of flooding for the township is Wiconisco Creek.

Township of West Hanover: The principal source of flooding in the township is high groundwater, and not surface flooding. Beaver Creek has been the cause of major flooding in the vicinity of Devonshire Heights Road, with minor surface flooding on other streams. Previous major floods occurred in March 1936, June 1972, and September 1975. The flood in June 1972 caused the greatest damage with interruption of utilities, basement flooding, and inundation of farmland.

Township of Wiconisco: Notable floods affecting the township of occurred in 1905, 1927, 1936, 1946, 1955, 1972, 1975, and 1976. The flood of 1972 created stream flow that destroyed highway bridges and foundations. Also, during past flooding events, stormwater runoff exceeded bank capacity on the two creeks in the township, creating flooding and backwater ponding along the light, sporadic developments near the creeks.

Problem Areas Identified by Stakeholders

Table 4.3.6-5 identifies areas of flooding known by the community, which were recorded through public outreach surveys in December 2020.

Table 4.3.6-2. Public Comment of Identified Known Issues and Locations

Problem Type	Name of Location	Describe the Location	Description of the Problem
Road Ponding	Harrisburg - Cameron and Maclay	On Maclay Street, in front of the Maclay Street entrance to Farm show, near where it meets w/ Cameron,	"Flooding / ponding on roadway after rainfall. The more rain per hour, the higher the ponding. Every couple years the ponding is deep enough that cars cannot pass through the area."
Road Ponding	Route 209 and Park Drive	4000 block of US-Route 209	"When it rains, heavy water completely covers travel lanes with up to a foot of water"
Bridge Flooding	Williamstoen Borough and Williams Township	Roadway floods at Dauphin Schuylkill County line on Market St, Railroad Street bridge, Water Street bridge, bridge and roadways from Dayton to Wiconisco Township line on Market Street.	"Bridges flood and low lying roadways flood quick with rain. South Street in Williams Township also floods and we have to use a 5 ton to get them out of their homes. Williamstown always becomes an island. Sewer drains near Williamstown EMS (Water Street and West Street) pop their tops and flow everywhere. Just to name a few."
Road Washout	2nd and Geiger Streets	Intersection of 2nd and Geiger Streets	"Any rain or snow and the storm drain backs up and the entire intersection is flooded. "
Road Washout	Right corner of alley way	Herr and Plum Street	"Major water buildup in alley every time it rains... Seems like it could become a sinkhole if not taken care of."
Road Ponding	Grayson Road - Swatara Township near Feeser's Food	5500 Block of Grayson Road - Swatara Township	"Roadway becomes flooded and impassible during heavy rain events"
Road Ponding	Steelton Borough at L Street	Steelton Borough at L Street	"Heavy rain and drainage issues."
Road Ponding	Manada Bottom Road	1100 block of Manada Bottom. Road	"State came in and paved the road twice after the casino was completed. Raised the crown of the road causing flooding.

Problem Type	Name of Location	Describe the Location	Description of the Problem
	just south of Furnace Lane		Water has no place to run over to the creek now. Neighbors and I complained to the state several times. No results"
Road Ponding	Market Street (Harrisburg City)	1400-block of Market Street (Harrisburg City)	"During heavy rains, water ponds on the entire road, and even gets high enough to encompass the sidewalks on both sides of the street."
Bridge Flooding	Lykens Boro	600 block North Street, 200 block Market Street, 200, 300, 400, 500 blocks of North Street	"Wiconisco creek floods at spruce and north streets during heavy rain events, causing major flooding along north street and the 200 block of Market street"
Stormwater Flooding	Sidewalk and culvert behind our house	2700 block of Woodrow Ave. Harrisburg, PA. 17112	"When they built the houses in the Estates of Forest Hills, the water runoff moves down the sidewalk on Continental Drive behind our house. It is eroding the sidewalks and cascades over the bank into the culvert behind our house. Please note the waterfall in the attached picture. It knocked loose a retaining fence aimed to keep people from falling over the edge. It also eroded the land beside the culvert. The township made a halfhearted attempt to fix it years ago. I am worried the fence will eventually fall causing a safety hazard. Furthermore, the sidewalks will all eventually need replaced. Please help. "

Ice Jam Hazard Areas

Ice jams are common in northeastern United States, and the Commonwealth of Pennsylvania is not an exception. The ice jam database, maintained by the Ice Engineering Group at the USACE Cold Regions Research and Engineering Laboratory (CRREL), currently consists of nearly 26,000 records from across the United States. According to the USACE-CRREL, Dauphin County underwent or may have been impacted by 33 historical ice jam incidents between 1780 and 2020 (USACE 2021). Ice jams have formed along the Susquehanna River, Juniata River, East Mahantango Creek, and Stony Creek. Historical events are further mentioned in the "Previous Occurrences" section of this hazard profile.

4.3.6.2 Range of Magnitude

Both localized and widespread floods are considered hazards when people and property are affected. Injuries and deaths can occur when people are swept away by flood currents, or bacteria and disease are spread by moving or stagnant flood waters. Most property damage results from inundation by sediment-filled water. A large amount of rainfall over a short period of time can result in flash floods. Small amounts of rain can also cause flooding in areas with frozen soil or saturated soils from a previous event, or if the rain is concentrated in areas with impervious surfaces (PEMA 2018).

Several factors determine severity of floods, including intensity and duration, topography, ground cover, and rate of snowmelt. Water runoff is greater in areas with steep slopes and little or no vegetative ground cover. Many areas in Pennsylvania have relatively steep slopes that promote quick surface water runoff. Most storms track from west to east; however, some originate in the Great Lakes or the Atlantic Ocean (PEMA 2018).

Rainfall in Pennsylvania is about average for the eastern United States. Amounts of precipitation can be divided into the following six categories:

- Very light rain – precipitation rate of less than0.01 inch per hour
- Light rain – precipitation rate between 0.01 inch and 0.04 inch per hour
- Moderate rain – precipitation rate between 0.04 inch and 0.16 inch per hour
- Heavy rain – precipitation rate between 0.16 inch and 0.63 inch per hour
- Very heavy rain – precipitation rate between 0.63 inch and 2 inches per hour
- Extreme rain – precipitation rate greater than 2 inches per hour (PEMA 2018)

The severity of a flood depends not only on the amount of water that accumulates within a period of time, but also on the land's ability to manage that water. The size of rivers and streams in an area contribute to a flood's severity, but an equally important factor is the land's absorbency. When it rains, soil acts as a sponge. When the land is saturated or frozen, infiltration into the ground slows, and any more water that accumulates must flow as runoff (Harris 2008).

In the case of riverine or flash flooding, once a river reaches flood stage, the flood extent or severity categories used by NWS include minor flooding, moderate flooding, and major flooding. Each category has a definition based on property damage and public threat:

- Minor Flooding – minimal or no property damage, but possibly some public threat or inconvenience.
- Moderate Flooding – some inundation of structures and roads near streams. Some evacuations of people and/or transfer of property to higher elevations are necessary.
- Major Flooding – extensive inundation of structures and roads. Significant evacuations of people and/or transfer of property to higher elevations are necessary (NWS 2011).

Historically, the most severe flood incident occurred in June 1972 as a result of heavy rainfall from Hurricane Agnes. The Susquehanna River measured a record 1,020,000 cfs in Harrisburg, which was characterized as a 450-year return period event (FEMA 2016). Flooding from the storm resulted in 11 deaths and millions of dollars in property loss. Statewide, there were 48 deaths and $2.8 billion in economic losses. Recently, the most significant flood event occurred as a result of Tropical Storm Lee in 2011. The county experienced record rainfall and flooding was exacerbated because the soils were already saturated from Hurricane Irene the previous week (NWS 2012). In addition, 2018 proved to be a record year of rainfall. Although no particular storm event occurred, Pennsylvania saw record rain fall that surpassed Hurricane Agnes in 1972. In Dauphin County, the NWS indicated a total of 67.03 inches fell in Harrisburg, which was 2 feet above the average rainfall of 40.74 inches (Penn Live 2019).

4.3.6.3 Past Occurrence

Dauphin County has a long history of flooding events. While flooding is often localized to streets and small neighborhoods, the county has historically experienced periodic storm events that affect multiple communities over a large area. Past building practices often resulted in homes being constructed in FEMA-designated floodplains, exacerbating flooding problems within certain communities.

A gauge at Harrisburg (HARP1) monitors hydrologic conditions on the Susquehanna River. A gauge at Dalmatia (DALP1) monitors conditions on East Mahantango Creek. A gauge at Glenwood (GLWP1) monitors conditions on Paxton Creek. Two gauges at Hershey (HERP1) and Middletown (MTLP1) monitor conditions on Swatara Creek. Two gauges at Falmouth (FALP1) and Bellarie (CCBP1) monitor conditions on Conewago Creek. The NWS uses flood categories as forecast points that describe the severity of flood impacts in the river/stream reach. Table 4.3.6-2 summarizes the flood categories in feet at recorded gauges. Table 4.3.6-3 summarizes the top historic crests at recorded locations.

Table 4.3.6-3. Flood Categories at the Harrisburg (HARP1), Hershey (HERP1), and Middletown (MTLP1) Gauges

Flood Category	Flood Category Definition	Harrisburg (in feet)	Hershey (in feet)	Middletown (in feet)
Major Flood Stage	Life-threatening and extensive inundation of structures and roads; significant evacuations are expected at this stage.	23	14	18

Flood Category	Flood Category Definition	Harrisburg (in feet)	Hershey (in feet)	Middletown (in feet)
Moderate Flood Stage	Inundation of buildings usually begins at this stage; roads are likely to be closed and some areas cut off (evacuations may be necessary).	20	10	15
Flood Stage	Gauge height above which a rise in water surface level begins to create a hazard to lives, property, or commerce; issuance of flood warnings is linked to flood stage.	17	7	11
Action Stage	Level where the NWS needs to take some type of mitigation action in preparation for possible significant hydrologic activity.	11	6	10

Source: NWS 2021

Table 4.3.6-4. Historic Crests at the Harrisburg (HARP1), Dalmatia (DALP1), Hershey (HERP1), and Middletown (MTLP1) Gauges

Harrisburg		Dalmatia		Hershey		Middletown	
Feet	*Date*	*Feet*	*Date*	*Feet*	*Date*	*Feet*	*Date*
33.27	6/24/1972	26.62	6/22/1972	26.8	9/8/2011	23.29	9/9/2011
29.23	3/19/1936	17.47	1/19/1996	17.08	7/26/2018	16.36	3/12/2011
26.8	6/2/1889	-	-	16.12	6/29/2006	16.19	7/26/2018
25.7	5/22/1894	-	-	15.36	9/27/1975	13.68*	12/26/2020
25.17	9/9/2011	-	-	14.43	1/25/1979	12.67	3/8/2011
25.08	1/20/1996	-	-	14.3	1/20/1996	12.63	4/18/2011
24.66	1/21/1996	-	-	14.27	9/19/2004	11.81	1/14/2014
24.4	9/19/2004	-	-	10.97	3/12/2011	11.76	9/12/2018
23.81	9/27/1975	-	-	10.33	11/29/1993	9.97	11/24/2011
21.8	5/29/1946	-	-	10.24	1/21/1996	8.87	10/2/2010

**Preliminary value subject to further review*
Source: NWS 2021

According to the National Oceanic and Atmospheric Administration's National Climatic Data Center (NOAA NCDC) storm event database, Dauphin County experienced 35 flood events between January 1, 1950, and December 31, 2020 (the date range of data availability). These events resulted in over $150.7 million in property damage.

Between 1954 and 2020, the Commonwealth of Pennsylvania underwent 51 FEMA-declared, flood-related disaster declarations (DR) or emergencies classified as one or a combination of the following disaster types: severe storms, mudslides, flash flooding, tropical storms, tropical depressions, high winds, and rains. Typically, these disasters covered a wide region of the Commonwealth; therefore, they may have impacted many counties. However, not all counties were included in the disaster declarations (FEMA 2021). Dauphin County was included in 15 of the declarations, as listed in Table 4.3.6-4.

Based on all sources researched, known flooding events that resulted in property damage affecting Dauphin County and its municipalities since 1996 are listed in Table 4.3.6-4. Five deaths caused by flooding have been recorded in Dauphin County; no injuries were reported. With flood documentation for the Commonwealth of Pennsylvania so extensive, not all sources have been identified or researched. Therefore, Table 4.3.6-4 may not include all events that have occurred throughout the county.

Table 4.3.6-5. Flooding Events between 1996 and 2020 in Dauphin County

Date of Event	Event Type	Location	FEMA Declaration Number (if applicable)	County Designated?	Losses/Impacts
January 19, 1996	Flash Flood	Countywide	DR-1093-PA	Yes	No data was provided.
October 8, 1996	Flash Flood	Borough of Steelton	N/A	N/A	Route 441 was flooded and closed in Swatara Township near Steelton south of Harrisburg.
May 5, 1998	Flash Flood	South Portion	N/A	N/A	Nearly 2 inches of rain fell in little more than an hour, flooding roads and small streams.
June 13, 1998	Flash Flood	Hershey	N/A	N/A	2.5 inches of rain fell in 45 minutes, flooding roads and small streams in the Hershey area.
June 23, 1998	Flash Flood	Harrisburg Area	N/A	N/A	Heavy rains flooded roadways and small streams in the Harrisburg area.
September 6, 1999	Flash Flood	West End	DR-1298-PA	Yes	$50,000 in property damage was reported. Heavy rain from Dennis fell across the area, closing roads and flooding basements. In Swatara Township, up to 8 feet of water was reported and one neighborhood was evacuated.
September 16, 1999	Flash Flood	Countywide	N/A	N/A	$30,000 in property damage was reported.
September 19, 2000	Flash Flood	Borough of Middletown	N/A	N/A	$10,000 in property damage was reported. Heavy rains caused small stream poor drainage.
July 25, 2001	Flash Flood	City of Harrisburg	N/A	N/A	Widespread urban flooding was reported with many roads closed in Harrisburg. Over 3 inches of rain was reported over portions of the Harrisburg metropolitan area.
August 16, 2003	Flash Flood	City of Harrisburg	N/A	N/A	Heavy rains caused flash flooding in Dauphin county. Widespread reports of flooded roads and basements were received. One water rescue was performed, and a warehouse roof collapsed from the weight of water. Four vehicles were stranded in the intersection of 18th and Derry streets, where over 4 feet of water filled the roadway. Four homes were evacuated because of flooding.
September 23, 2003	Flood, Flash Flood	Harrisburg Area	N/A	N/A	Heavy rain caused flooding in Harrisburg, Halifax, and Elizabethville. Two water rescues were performed. A spotter at Dehart Dam in northern Dauphin County reported 4.80 inches of rain overnight.
September 23, 2003	Flood	Countywide	N/A	N/A	Heavy rainfall caused flash flooding across much of Dauphin County shortly after midnight on the night of the 23rd. Although flash flooding ended, high water and flooding continued into the early afternoon. High water closed roads, along with the closure of the Dehart Dam Bridge, about 3 miles east of the Route 325/225 interchange. Clarks Creek also continued to overflow its banks into the early afternoon.
December 11, 2003	Flood	Hershey, Borough of Middletown	N/A	N/A	Heavy rainfall caused Swatara Creek to exceed flood stage at Hershey and Middletown.
July 14, 2004	Flash Flood	Borough of Steelton	N/A	N/A	Heavy rain from thunderstorms caused flash flooding in Dauphin County, especially in Swatara Township. Flooding occurred behind a local shopping mall, and a road was washed out in Steelton.
July 22, 2004	Flash Flood	Colonial Park	N/A	N/A	Thunderstorms with heavy rain produced flash flooding in Linglestown and the Colonial Park area of Dauphin County. Multiple vehicles were stranded in flood waters in Lower Paxton Township, especially near Colonial Park. Several roads were also closed because of high water.
July 23, 2004	Flash Flood	Linglestown	N/A	N/A	Heavy rain produced flash flooding in Linglestown, Colonial Park and Harrisburg. Flooding closed several roads there were many reports of flooded basements.

Date of Event	Event Type	Location	FEMA Declaration Number (if applicable)	County Designated?	Losses/Impacts
August 1, 2004	Flash Flood	Borough of Highspire	N/A	N/A	Heavy rain caused flash flooding in the Highspire and Middletown areas of southern Dauphin County, resulting in the closing of several roads. One house sustained flood damage in Lower Swatara Township.
September 18, 2004 – October 1, 2004	Tropical Depression, Flood	South Portion	DR-1557-PA	Yes	Tropical Depression Ivan impacted all of Pennsylvania. In Dauphin County, heavy rain caused the Susquehanna River and Swatara Creek to rise.
January 15, 2005	Flood	Hershey, Borough of Middletown	N/A	N/A	Heavy rain caused flooding along Swatara Creek at Hershey and Middletown.
March 28, 2005	Flood	South Portion	N/A	N/A	Heavy rain caused the Susquehanna River at Harrisburg and Swatara Creek at Middletown and Hershey to flood. This event was an on-off-on event over a week period.
June 25, 2006	Severe Storms, Flash Flood, Flooding, Mudslides	Countywide	DR-1649-PA	Yes	Heavy rain caused flash flooding throughout Dauphin County over 3 days. Especially affected was Middle Paxton Township where Route 441 was closed at several interchanges because of flooding from Fishing Creek. Heavy rain caused Swatara Creek at Middletown to flood.
November 16, 2006	Flash Flood	Harrisburg Area	N/A	N/A	Heavy rain caused flash flooding in Dauphin County and flooding closed Route 230 for over 4 hours. A strong cold front crossing the region triggered widespread severe weather and flash flooding across Central Pennsylvania during the afternoon.
June 1, 2007	Flash Flood	Hershey	N/A	N/A	$500,000 in property damage was reported. Heavy rain produced by slow moving thunderstorms caused flash flooding in Dauphin County in Derry Township, mainly south of Hershey. Seven residential structures were affected. Two homes sustained major damage, while another five sustained minor damage. Five additional reports of flooded basements were received. In addition, seven vehicle rescues were performed. A state of emergency was declared in Derry Township by local emergency management officials.
May 2, 2010	Flash Flood	City of Harrisburg	N/A	N/A	Heavy rain resulted in flash flooding over portions of the City of Harrisburg. Several roads were flooded and closed, including Cameron Street, Berryhill Road, Arsenal Boulevard, Locust Lane and Elmerton Avenue. Four water rescues were performed when vehicles became stranded in flood waters.
August 12, 2010	Flash Flood	City of Harrisburg	N/A	N/A	$10,000 in property damage was reported. Heavy thunderstorms produced significant flash flooding throughout the City of Harrisburg. The flooding closed multiple roads, including a portion of the I-283/83 interchange. The urbanized areas of the Harrisburg metro area bore the brunt of the flooding, mainly because of the intensity of the rain and because the concrete and other impervious surfaces did not allow water to soak into the ground. There were numerous road closures because of high water and several people were rescued from stranded vehicles. High water also forced the evacuation of 40 residents on 19th and Rollerston Streets.
March 10, 2011	Flood	Countywide	N/A	N/A	Numerous road closures resulted from flooding of low-lying areas and small streams and creeks overflowing their banks. Multiple water rescues and isolated evacuations were reported along with one drowning fatality.
April 16, 2011	Flash Flood	Pleasant Hills	N/A	N/A	Very heavy, short duration rainfall resulted in small stream flooding and several road closures near Linglestown. A dynamic area of low pressure and trailing frontal zone moved across southeastern Pennsylvania during the late afternoon and evening, producing intense lines of heavy showers and thunderstorms. Deep moisture and very strong wind fields ahead of the frontal system produced torrential rains, flash flooding and localized wind damage across the Lower Susquehanna Valley.
April 28, 2011	Flash Flood	Piketown	N/A	N/A	Above normal soil moisture from recent heavy rains combined with high stream-flows and intense short duration rainfall contributed to flash flooding. Flooding was reported on Route 443.

Date of Event	Event Type	Location	FEMA Declaration Number (if applicable)	County Designated?	Losses/Impacts
August 6, 2011	Flash Flood	Estherton	N/A	N/A	Excessive rainfall rates between 1-2 inches per hour were observed and resulted in localized rainfall amounts of 3-7 inches in a few hours impacted south-central Dauphin County. The flash flooding closed numerous roads and caused extensive basement flooding. A small cluster of regenerating thunderstorms produced localized flash flooding in the vicinity of the Harrisburg Metro area east-southeast along and north of Interstate 76 toward Mt. Gretna in southern Lebanon County.
September 3, 2011 – October 15, 2011	Tropical Storm, Flood	Countywide	DR-4030-PA EM-3340-PA	Yes Yes	$150,000,000 property damage and $700,000 in crop damage were reported. Heavy rainfall from the remnants of Tropical Storm Lee produced widespread flooding, flash flooding, and river flooding mainly near and to the east of the Susquehanna Valley from September 4-10. Several locations in the Susquehanna Basin came close to records set by Hurricane Agnes (June 1972) and Hershey set new floods of record. Flooding along Swatara Creek resulted in property damage and several deaths. The rainfall associated with the remnants of Lee produced the 4th largest flood of record in the Mid-Atlantic Region. The five-day storm rainfall totals for September 5 to 9 were generally in the 5-8 inch range over the mid-section of central Pennsylvania and in the 8-12 inch range in the Susquehanna Valley region. There were local amounts reported in excess of 15 inches east of the Susquehanna River. The local climate sites in Harrisburg (KMDT) reported 13.44 inches. On September 7, 2011, both KMDT sites set an all-time daily (24-hour) rainfall for the month of September at 7.71 inches.
June 22, 2012	Flash Flood	Borough of Middletown	N/A	N/A	Heavy thunderstorms produced localized flash flooding in the Middletown area. A police vehicle was trapped in flooded waters below an underpass. Minor flooding persisted into the late evening across southeastern Dauphin County near the Dauphin County line, where radar estimated rainfall was between 3-4 inches in four hours.
June 27, 2013	Flash Flood	Borough of Penbrook	N/A	N/A	Heavy rains caused urbanized flash flooding around Harrisburg and Penbrook. Further north, flash flooding closed a section of Route 209 in Upper Paxton Township.
October 10, 2013	Flood	Countywide	N/A	N/A	Excessive rainfall between 5-10 inches produced widespread significant flooding causing multiple road closures. Spring Creek came out of its banks and caused flooding and road closures in Swatara Township and Paxtang Borough. Portions of the Farm Show Complex parking lots were under water. Flooding and stranded vehicles were reported along McClay Street. Flooding in Derry Township included the Hershey/Hershey Park area. Minor river flooding occurred on the Swatara Creek at Hershey with a crest of 7.54 feet.
April 30, 2014	Flood	Countywide	N/A	N/A	Heavy rains across southeastern Pennsylvania flooded and closed roads in Dauphin County. A few small creeks and streams overflowed their banks and inundated surrounding areas. A very moist southerly flow combined with a slow-moving low pressure system produced heavy rainfall (3-5+ inches) across southeastern Pennsylvania over a two-day period. The heavy rain lead to considerable flooding of roadways and small streams across portions of the Lower Susquehanna Valley. Minor flood stages were exceeded on Swatara Creek at Hershey.
July 23, 2017	Flash Flood	Enhaut	N/A	N/A	Heavy rainfall brought flash flooding to Dauphin County with record rainfall event with 4.27 inches in 1 hour and 4.71 inches total. Many roads were flooded and impassible during the event. Several water rescues were performed, both in cars and residences. Residential apartments and a mobile home park were evacuated, and shelters were opened. A total of 28 residents were displaced from the retirement living community.
July 23, 2018	Flood, Flash Flood	Countywide	N/A	N/A	A persistent upper level flow of moist southerly air brought over 4 inches of rain that produced flooding and flash flooding in the region. Significant flooding was reported across eastern portions of the area. Two deaths were also reported, one person was washed away attempting to cross a stream, while a motorist was swept away in flood waters.

Sources: NOAA 2021; FEMA 2021; Public Outreach

DR	*Federal Disaster Declaration*
EM	*Emergency Management*
EMA	*Emergency Management Agency*
FEMA	*Federal Emergency Management Agency*
NCEI	*National Centers for Environmental Information*
NOAA	*National Oceanic Atmospheric Administration*
N/A	*Not applicable/not available*
SBA	*Small Business Administration*
US	*United States*

Based on review of the CRREL database, Table 4.3.6-6 lists the ice jam events that have occurred in or near the county between 1904 and 2020. Events that occurred outside of the county were also included because they were close enough to the county borders to cause possible flooding impacts on Dauphin County. Information regarding losses associated with these reported ice jams was limited.

Table 4.3.6-6. Ice Jam Events in Dauphin County between 1904 and 2020

City (Additional Geographic Identifier)	River	Jam Date	Water Year	Gauge Number	Impact
Harrisburg	Susquehanna River	January 14, 2018	2018	6275000	No Data Available
Harrisburg	Susquehanna River	February 20, 2015	2015	1570500	No Data Available
Middletown	Susquehanna River	January 8, 2014	2014	-	No Data Available
Harrisburg	Susquehanna River	February 3, 2009	2009	-	No Data Available
Dauphin	Susquehanna River	March 2, 2007	2007	-	No Data Available
Dauphin	Susquehanna River	January 22, 2004	2004	-	No Data Available
Harrisburg	Susquehanna River	February 5, 2004	2004	-	No Data Available
Duncannon	Juniata River	January 4, 2001	2001	-	No Data Available
Dauphin	Susquehanna River	January 4, 2001	2001	-	No Data Available
Fort Hunter	Susquehanna River	January 4, 2001	2001	-	No Data Available
Harrisburg	Susquehanna River	January 4, 2001	2001	-	No Data Available
Harrisburg	Susquehanna River	January 27, 2000	2000	1570500	No Data Available
Harrisburg	Susquehanna River	January 20, 1996	1996	1570500	No Data Available
Dalmatia	East Mahantango Creek	February 1, 1982	1982	1555500	No Data Available
Harrisburg	Susquehanna River	February 5, 1982	1982	1570500	No Data Available
Dalmatia	East Mahantango Creek	February 2, 1981	1981	1555500	No Data Available
Dalmatia	East Mahantango Creek	February 24, 1979	1979	1555500	$100K USD
Dalmatia	East Mahantango Creek	February 13, 1971	1971	1555500	No Data Available
Dauphin	Stony Creek	February 13, 1971	1971	1569000	No Data Available
Highspire	Susquehanna River	February 16, 1971	1971	-	No Data Available
Steelton	Susquehanna River	February 10, 1971	1971	-	No Data Available
Dalmatia	East Mahantango Creek	February 2, 1970	1970	1555500	No Flooding
Harrisburg	Susquehanna River	February 2, 1969	1969	1570500	No Data Available
Dalmatia	East Mahantango Creek	January 31, 1968	1968	1555500	No Data Available
Dalmatia	East Mahantango Creek	February 13, 1966	1966	1555500	No Data Available
Dalmatia	East Mahantango Creek	February 8, 1965	1965	1555500	No Data Available
Harrisburg	Susquehanna River	February 9, 1965	1965	1570500	No Data Available
Dalmatia	East Mahantango Creek	February 19, 1961	1961	1555500	No Data Available
Dalmatia	East Mahantango Creek	January 21, 1959	1959	1555500	No Data Available
Harrisburg	Susquehanna River	February 2, 1939	1939	1570500	No Data Available
Dalmatia	East Mahantango Creek	March 4, 1934	1934	1555500	No Data Available
Harrisburg	Susquehanna River	November 29, 1930	1931	1570500	No Data Available
Duncannon	Juniata River	March 3, 1904	1904	-	No Data Available

Source: USACE 2021

Notes: Although events were reported for Dauphin County, information pertaining to every event was not easily ascertained; therefore, this table may not list all ice jams in the county.

4.3.6.4 Future Occurrence

Floods are described in terms of their extent (including the horizontal area affected and the vertical depth of flood waters) and the related probability of occurrence. The NFIP uses historical records to determine the probability of occurrence for different extents of flooding. The probability of occurrence is expressed in percentages as the chance of a flood of a specific extent occurring in any given year.

The NFIP recognizes the 1 percent annual chance flood, also known as the *base flood*, as the standard for identifying properties subject to federal flood insurance purchase requirements. A 1 percent annual chance flood is a flood that has a one percent chance of occurring over a given year. The DFIRMs identify areas subject to the 1 percent and 0.2 percent annual chance flooding. Areas subject to 2 percent and 10 percent annual chance events are not shown on maps; however, water surface elevations associated with these events are included in the flood source profiles contained in the Flood Insurance Study Report. Table 4.3.6-7 shows a range of flood recurrence intervals and associated probabilities of occurrence.

Table 4.3.6-7. Recurrence intervals and associated probabilities of occurrence

Flood Recurrence Interval	Chance of Occurrence in Any Given Year (%)	Flows
5 year	20	Extreme
10 year	10	Heavy to extreme
25 year	4	Moderate
50 year	2	Light to moderate
100 year	1	Light
500 year	0.2	Mild

Based on the historic and more recent flood events in Dauphin County, it is clear that the county has a high probability of flooding for the future. The fact that the elements required for flooding exist and that both major and minor flooding has occurred throughout the county in the past, suggests that many people and properties are at risk from the flood hazard in the future.

For the 2021 HMP update, the most up-to-date data was collected to calculate the probability of future occurrence of flooding events for Dauphin County. Information from NOAA-NCEI storm events database, FEMA, Pennsylvania State Climatologist, and the CRREL ice jam database were used to identify the number of flood events that occurred between 1950 and 2020. Using these sources ensures the most accurate probability estimates possible. The table below shows these statistics, as well as the annual average number of events and the estimate percent chance of an incident occurring in a given year.

Table 4.3.6-8. Probability of Future Flooding Events

Hazard Type	Number of Occurrences Between 1950 and 2020	Recurrence Interval (in Years) (# Years/Number of Events)	Percent Chance of Occurrence in Any Given Year
Flash Flood	35	2.02	49.29%
Flood	35	2.02	49.29%
Ice Jam	33	2.15	46.47%

Sources: NOAA-NCEI 2017; USACE 2021

It is estimated that Dauphin County will continue to experience direct and indirect impacts of flooding events annually and that these events may induce secondary hazards, such as infrastructure deterioration or failure; utility failures; power outages; water quality and supply concerns; and transportation delays, accidents, and inconveniences. Therefore, the future occurrence of floods in Dauphin County has been adjusted and characterized as *moderately likely,* when taking into consideration flash flooding, as defined by the Risk Factor Methodology probability criteria (see Table 4.4-1).

4.3.6.5 Vulnerability Assessment

The 1 and 0.2 percent annual chance flood events were examined to evaluate Dauphin County's flood risk. Polygons representing the 1 and 0.2 percent annual chance events from the FEMA Risk Map products dated August 2012 were used to estimate exposure. Figure 4.3.6-3 presented earlier in this section illustrates the flood boundaries used for the vulnerability assessment. The 1 percent annual chance flood depth grid generated for the FEMA Risk Map program was imported into FEMA's Hazus model and a riverine analysis was processed to estimate potential losses. The results are summarized below.

Impact on Life, Health, and Safety

Impacts of flooding on life, health, and safety depend on several factors, including severity of the event and whether or not adequate warning time is provided to residents. Assumedly, the population living in or near floodplain areas that could be impacted by a flood would be exposed. However, exposure should not be limited only to those who reside within a defined hazard zone, but everyone who may be affected by a hazard event (e.g., people are at risk while traveling in flooded areas, or their access to emergency services is compromised during an event); the degree of that impact varies and is not strictly measurable.

Based on the spatial analysis, there are an estimated 9,943 people living in the Special Flood Hazard Area (SFHA) or 1 percent annual chance event floodplain) and an estimated 18,937 people located in the 0.2 percent annual chance flood event floodplain (Table 4.3.6-9). In the event of a flood hazard, these residents could be displaced from their homes, requiring them to seek temporary shelter with friends, family, or emergency shelters. The City of Harrisburg has the greatest estimated number of individuals residing in the floodplain—approximately 3,354 people in the 1 percent and 7,201 people in the 0.2 percent chance flood boundaries, respectively. The Borough of Lykens has the highest percentage of population within the 1 percent and 0.2 percent annual chance floodplains (41.4 percent and 82.4 percent, respectively, of its 692 total borough population). For this project, the potential population exposed is used as a guide for planning purposes.

Table 4.3.6-9. Estimated Dauphin County Population Exposed to the 1 Percent and 0.2 Percent Flood Hazard Area

Jurisdiction	American Community Survey (2014-2018) Population	Estimated Population Exposed to the Flood Hazard Areas			
		1 Percent Annual Chance Flood Hazard Event Area		0.2 Percent Annual Chance Flood Hazard Event Area	
		Number of People	Percent of Total	Number of People	Percent of Total
Berrysburg (B)	323	0	0.0%	0	0.0%
Conewago (T)	3,069	6	0.2%	6	0.2%
Dauphin (B)	855	23	2.6%	55	6.5%
Derry (T)	25,036	278	1.1%	291	1.2%
East Hanover (T)	5,919	119	2.0%	240	4.1%
Elizabethville (B)	1,609	12	0.8%	12	0.8%
Gratz (B)	805	2	0.2%	2	0.2%
Halifax (B)	954	0	0.0%	54	5.7%
Halifax (T)	3,561	61	1.7%	114	3.2%
Harrisburg (C)	49,230	3,354	6.8%	7,201	14.6%

Jurisdiction	American Community Survey (2014-2018) Population	Estimated Population Exposed to the Flood Hazard Areas			
		1 Percent Annual Chance Flood Hazard Event Area		0.2 Percent Annual Chance Flood Hazard Event Area	
		Number of People	Percent of Total	Number of People	Percent of Total
Highspire (B)	2,667	687	25.8%	1,721	64.5%
Hummelstown (B)	4,650	54	1.2%	83	1.8%
Jackson (T)	1,727	6	0.3%	6	0.3%
Jefferson (T)	302	14	4.5%	14	4.5%
Londonderry (T)	5,211	446	8.6%	561	10.8%
Lower Paxton (T)	48,739	488	1.0%	526	1.1%
Lower Swatara (T)	8,788	271	3.1%	685	7.8%
Lykens (B)	1,673	692	41.4%	1,379	82.4%
Lykens (T)	1,631	76	4.6%	76	4.6%
Middle Paxton (T)	5,067	425	8.4%	577	11.4%
Middletown (B)	9,176	803	8.7%	1,243	13.6%
Mifflin (T)	727	5	0.7%	8	1.1%
Millersburg (B)	2,546	69	2.7%	255	10.0%
Paxtang (B)	1,650	153	9.3%	196	11.9%
Penbrook (B)	2,981	0	0.0%	0	0.0%
Pillow (B)	256	2	0.8%	2	0.8%
Reed (T)	209	23	10.9%	36	17.1%
Royalton (B)	1,259	226	17.9%	378	30.0%
Rush (T)	305	11	3.7%	11	3.7%
South Hanover (T)	6,766	124	1.8%	235	3.5%
Steelton (B)	5,954	115	1.9%	403	6.8%
Susquehanna (T)	24,857	628	2.5%	1,381	5.6%
Swatara (T)	24,685	547	2.2%	850	3.4%
Upper Paxton (T)	4,219	100	2.4%	172	4.1%
Washington (T)	2,166	18	0.8%	18	0.8%
Wayne (T)	1,365	0	0.0%	0	0.0%
West Hanover (T)	10,165	73	0.7%	98	1.0%
Wiconisco (T)	1,122	5	0.5%	22	2.0%
Williams (T)	1,104	26	2.3%	26	2.3%
Williamstown (B)	1,187	0	0.0%	0	0.0%
Dauphin County (Total)	**274,515**	**9,943**	**3.6%**	**18,937**	**6.9%**

Sources: American Community Survey 2018 5-year estimates; FEMA 2012
Note: B – Borough; C – City; T – Township

Of the population exposed, the most vulnerable include the economically disadvantaged and the population over the age of 65. Economically disadvantaged populations are more vulnerable because they are likely to evaluate their risk and make decisions to evacuate based on net economic impact on their families. The population over the age of 65 is also more vulnerable because they are more likely to seek or need medical attention that may not be available because of isolation during a flood event, and they may have more difficulty evacuating. They also may need to seek or need medical attention that may not be available due to isolation during a flood event. Within Dauphin County, there are approximately 44,262 people over the age of 65 and 34,158 people below the poverty level. The City of Harrisburg, which has the most people in the floodplain, has a low-income population of 13,492 and an elderly population of 4,966.

The Centers for Disease Control and Prevention (CDC) 2016 Social Vulnerability Index (SVI) ranks U.S. Census tracts on socioeconomic status, household composition and disability, minority status and language, and housing and transportation. Dauphin County's overall score is 0.5199, indicating that its communities have moderate to high vulnerability (CDC 2016).

Using 2010 U.S. Census data, Hazus estimates the potential sheltering needs as a result of a 1 percent annual chance flood event. For the 1 percent flood event, Hazus estimates 9,951 persons will be displaced, and 1,529 people will seek short-term sheltering. The City of Harrisburg would have the greatest displaced population

(3,508 people) and the greatest number of persons seeking short-term shelter (220 people). These statistics, by jurisdiction, are presented in Table 4.3.6-10. The estimated displaced population and number of persons seeking short-term sheltering differs from the number of persons exposed to the 1 percent annual chance flood, because the displaced population numbers take into consideration that not all residents will be significantly impacted enough to be displaced or to require short-term sheltering during a flood event.

Table 4.3.6-10. Estimated Population Displaced or Seeking Short-Term Shelter from the 1 Percent Annual Chance Flood Event

Municipality	American Community Survey (2014-2018) Population	1 Percent Annual Chance Flood Event Area	
		Persons Seeking Short-Term Sheltering	Displaced Population
Berrysburg (B)	323	0	0
Conewago (T)	3,069	11	7
Dauphin (B)	855	5	11
Derry (T)	25,036	65	276
East Hanover (T)	5,919	71	102
Elizabethville (B)	1,609	5	3
Gratz (B)	805	9	15
Halifax (B)	954	5	4
Halifax (T)	3,561	58	60
Harrisburg (C)	49,230	220	3,508
Highspire (B)	2,667	56	577
Hummelstown (B)	4,650	9	97
Jackson (T)	1,727	14	9
Jefferson (T)	302	18	9
Londonderry (T)	5,211	64	121
Lower Paxton (T)	48,739	127	992
Lower Swatara (T)	8,788	38	238
Lykens (B)	1,673	49	440
Lykens (T)	1,631	54	66
Middle Paxton (T)	5,067	71	355
Middletown (B)	9,176	43	588
Mifflin (T)	727	7	13
Millersburg (B)	2,546	28	98
Paxtang (B)	1,650	21	138
Penbrook (B)	2,981	0	0
Pillow (B)	256	4	6
Reed (T)	209	22	18
Royalton (B)	1,259	13	108
Rush (T)	305	5	6
South Hanover (T)	6,766	39	239
Steelton (B)	5,954	41	223
Susquehanna (T)	24,857	60	554
Swatara (T)	24,685	78	735
Upper Paxton (T)	4,219	80	146
Washington (T)	2,166	46	32
Wayne (T)	1,365	18	10
West Hanover (T)	10,165	41	71
Wiconisco (T)	1,122	14	36
Williams (T)	1,104	15	39
Williamstown (B)	1,187	5	2
Dauphin County (Total)	**274,515**	**1,529**	**9,951**

Sources: Hazusv4.2; FEMA 2012
Note: B – Borough; C – City; T – Township

Total number of injuries and casualties resulting from typical riverine flooding is generally limited because of advance weather forecasting, blockades, and warnings. Therefore, injuries and deaths generally are not anticipated if proper warning occurs and precautions are in place. Warning time for flash flooding is often limited. Flash flood events are frequently associated with other natural hazard events such as earthquakes, landslides, or severe weather, which limits their predictability and compounds the hazard. Populations without adequate warning of the event are highly vulnerable to this hazard. Ongoing mitigation efforts should help to avoid the most likely cause of injury—persons trying to cross flooded roadways or channels. Mitigation action items addressing this issue are included in Section 6 (Mitigation Strategy) of this plan.

Cascading impacts may also include exposure to pathogens, such as mold. After flood events, excess moisture and standing water contribute to growth of mold in buildings. Mold may present a health risk to building occupants, especially those with already compromised immune systems, such as infants, children, the elderly, and pregnant women. The degree of impact will vary and is not strictly measurable. Molds can grow in as short a period as 24 to 48 hours in wet and damaged areas of buildings that have not been properly cleaned. Very small mold spores can easily be inhaled, creating potential for allergic reactions, asthma episodes, and other respiratory problems. Buildings should be properly cleaned and dried out to safely prevent mold growth (Centers for Disease Control and Prevention [CDC] 2020).

Molds and mildews are not the only public health risk associated with flooding. Flood waters can be contaminated by pollutants such as sewage, human and animal feces, pesticides, fertilizers, oil, asbestos, and rusting building materials. Common public health risks associated with flood events also include:

- Unsafe food
- Contaminated drinking and washing water and poor sanitation
- Mosquitos and animals
- Carbon monoxide poisoning
- Secondary hazards associated with re-entering/cleaning flooded structures
- Mental stress and fatigue.

Current loss estimation models, such as Hazus, are not equipped to measure public health impacts. The best mitigation measures for these impacts is to be aware that they can occur, educate the public on prevention, and be prepared to deal with these vulnerabilities in responding to flood events.

Impact on General Building Stock

After consideration of the population exposed and vulnerable to the flood hazard, the built environment was evaluated. Exposure to the flood hazard includes those buildings within the flood zone. Potential damage is the modeled loss that could occur to the exposed inventory, including structural and content value.

The potential damage caused by flood events is the modeled loss that could occur to the exposed building stock measured by the structural and content replacement cost value. Table 4.3.6-11 summarizes these results. In total, 7,129 structures, or 4.9 percent of the building stock, are within the 1 percent annual chance flood zone; and 11,862 structures, or 8.1 percent of the building stock, are within the 0.2 percent flood zone. Approximately $6.8 billion of building/contents are within the 1 percent annual chance flood zone in Dauphin County. This represents approximately 7.0 percent of the county's total general building stock replacement value inventory ($97.1 billion). Also, an estimated $12.5 billion of building/contents is within the 0.2 percent annual chance flood zone (12.9 percent of the county's total replacement cost value).

Furthermore, Hazus estimated potential damage to buildings in Dauphin County for the 1 percent annual chance flood event. Table 4.3.6-12 summarizes these results. In total, Hazus estimates $1.2 billion in potential building damage, which equates to 1.3 percent of the total replacement cost value in the county. Most of the loss would occur for commercial structures (i.e., $876.3 million), which is approximately 2.4 percent of the total replacement cost value for commercial structures in the county. Hazus also estimates $142.5 million in residential building loss, which is 0.3 percent of the total replacement cost value for residential structures in the county.

Table 4.3.6-11. Estimated General Building Stock Exposure to the 1 Percent and 0.2 Percent Annual Chance Flood Event – All Occupancies

Jurisdiction	Number of Buildings	Total Replacement Cost Value (RCV)	Estimated Building Stock Exposed to the Flood Hazard Areas (All Occupancies)							
			1 Percent Annual Chance Flood Hazard Event Area				0.2 Percent Annual Chance Flood Hazard Event Area			
			Number of Buildings	Percent of Total	Replacement Cost Value (RCV)	Percent of Total	Number of Buildings	Percent of Total	Replacement Cost Value (RCV)	Percent of Total
Berrysburg (B)	366	$131,114,498	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%
Conewago (T)	2,495	$1,131,218,434	6	0.2%	$6,788,471	0.6%	6	0.2%	$6,788,471	0.6%
Dauphin (B)	456	$160,174,274	14	3.1%	$4,899,378	3.1%	35	7.7%	$13,053,099	8.1%
Derry (T)	11,617	$13,980,976,171	256	2.2%	$215,085,178	1.5%	292	2.5%	$265,756,731	1.9%
East Hanover (T)	5,054	$2,617,412,647	106	2.1%	$22,267,071	0.9%	195	3.9%	$44,751,243	1.7%
Elizabethville (B)	949	$396,035,763	8	0.8%	$4,166,937	1.1%	8	0.8%	$4,166,937	1.1%
Gratz (B)	715	$432,294,298	3	0.4%	$438,888	0.1%	3	0.4%	$438,888	0.1%
Halifax (B)	469	$181,049,719	5	1.1%	$1,626,620	0.9%	27	5.8%	$7,328,829	4.0%
Halifax (T)	3,457	$1,457,192,513	75	2.2%	$23,239,042	1.6%	127	3.7%	$37,781,283	2.6%
Harrisburg (C)	18,718	$15,182,832,338	1,691	9.0%	$3,032,360,114	20.0%	3,083	16.5%	$5,679,203,878	37.4%
Highspire (B)	1,374	$550,466,766	420	30.6%	$245,857,615	44.7%	952	69.3%	$445,475,339	80.9%
Hummelstown (B)	2,337	$1,082,835,134	48	2.1%	$21,107,608	1.9%	60	2.6%	$25,263,232	2.3%
Jackson (T)	2,371	$776,111,853	11	0.5%	$4,049,611	0.5%	11	0.5%	$4,049,611	0.5%
Jefferson (T)	666	$230,110,295	24	3.6%	$3,825,905	1.7%	24	3.6%	$3,825,905	1.7%
Londonderry (T)	5,080	$2,360,384,847	680	13.4%	$459,430,697	19.5%	856	16.9%	$850,530,177	36.0%
Lower Paxton (T)	20,948	$14,635,453,846	350	1.7%	$317,336,895	2.2%	378	1.8%	$334,303,906	2.3%
Lower Swatara (T)	4,771	$5,522,875,069	209	4.4%	$45,865,125	0.8%	532	11.2%	$1,085,438,085	19.7%
Lykens (B)	1,322	$517,534,065	533	40.3%	$189,725,355	36.7%	1,090	82.5%	$440,411,529	85.1%
Lykens (T)	2,155	$941,126,374	146	6.8%	$54,375,790	5.8%	146	6.8%	$54,375,790	5.8%
Middle Paxton (T)	4,093	$1,462,655,724	371	9.1%	$120,221,383	8.2%	489	11.9%	$157,625,330	10.8%
Middletown (B)	3,582	$1,981,507,138	356	9.9%	$272,230,205	13.7%	548	15.3%	$422,818,746	21.3%
Mifflin (T)	1,125	$603,453,937	8	0.7%	$2,294,413	0.4%	10	0.9%	$3,083,591	0.5%
Millersburg (B)	1,439	$770,504,424	65	4.5%	$40,093,562	5.2%	184	12.8%	$107,518,477	14.0%
Paxtang (B)	869	$403,915,987	115	13.2%	$77,382,196	19.2%	140	16.1%	$85,603,997	21.2%
Penbrook (B)	1,525	$602,189,726	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%
Pillow (B)	301	$101,661,910	6	2.0%	$2,524,952	2.5%	8	2.7%	$3,246,702	3.2%
Reed (T)	299	$117,139,877	60	20.1%	$34,969,030	29.9%	77	25.8%	$38,923,285	33.2%
Royalton (B)	630	$196,935,626	116	18.4%	$31,836,514	16.2%	201	31.9%	$57,599,961	29.2%
Rush (T)	343	$71,032,585	24	7.0%	$6,910,893	9.7%	24	7.0%	$6,910,893	9.7%
South Hanover (T)	3,972	$1,935,844,099	99	2.5%	$38,352,835	2.0%	168	4.2%	$57,465,606	3.0%
Steelton (B)	2,721	$2,111,932,612	273	10.0%	$973,125,301	46.1%	466	17.1%	$1,320,996,636	62.5%
Susquehanna (T)	11,785	$8,633,889,539	403	3.4%	$293,773,958	3.4%	777	6.6%	$494,147,775	5.7%

Jurisdiction	Number of Buildings	Total Replacement Cost Value (RCV)	Estimated Building Stock Exposed to the Flood Hazard Areas (All Occupancies)							
			1 Percent Annual Chance Flood Hazard Event Area				0.2 Percent Annual Chance Flood Hazard Event Area			
			Number of Buildings	Percent of Total	Replacement Cost Value (RCV)	Percent of Total	Number of Buildings	Percent of Total	Replacement Cost Value (RCV)	Percent of Total
Swatara (T)	11,354	$8,581,237,561	315	2.8%	$174,874,184	2.0%	489	4.3%	$314,786,854	3.7%
Upper Paxton (T)	3,560	$1,473,328,502	147	4.1%	$48,006,575	3.3%	215	6.0%	$69,189,038	4.7%
Washington (T)	2,270	$1,106,223,564	35	1.5%	$14,267,196	1.3%	35	1.5%	$14,267,196	1.3%
Wayne (T)	1,324	$398,741,088	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%
West Hanover (T)	6,505	$3,228,343,376	67	1.0%	$16,849,108	0.5%	100	1.5%	$31,693,310	1.0%
Wiconisco (T)	995	$297,597,257	37	3.7%	$21,436,850	7.2%	59	5.9%	$29,143,391	9.8%
Williams (T)	957	$390,058,854	41	4.3%	$9,502,118	2.4%	41	4.3%	$9,502,118	2.4%
Williamstown (B)	908	$345,185,743	6	0.7%	$9,240,620	2.7%	6	0.7%	$9,240,620	2.7%
Dauphin County (Total)	**145,877**	**$97,100,578,032**	**7,129**	**4.9%**	**$6,840,338,191**	**7.0%**	**11,862**	**8.1%**	**$12,536,706,455**	**12.9%**

Source: FEMA 2012; Dauphin County GIS 2020; RS Means 2020
Note: B – Borough; C – City; T – Township

Table 4.3.6-12. Estimated General Building Stock Potential Loss to the 1 Percent Annual Chance Flood Event

		All Occupancies		Residential			Commercial			Agricultural, Industrial, Religious, Education and Government		
Jurisdiction	Total Replacement Cost Value	Estimated Loss	Percent of Total	Total Replacement Cost Value (Residential Occupancy Class)	Estimated Loss	Percent of Total	Total Replacement Cost Value (Commercial Occupancy Class)	Estimated Loss	Percent of Total	Total Replacement Cost Value (All Other Occupancy Classes)	Estimated Loss	Percent of Total
Berrysburg (B)	$131,114,498	$0	0.0%	$78,778,337	$0	0.0%	$25,956,539	$0	0.0%	26,379,622	$0	0.0%
Conewago (T)	$1,131,218,434	$16,785	<0.1%	$659,691,025	$16,785	<0.1%	$139,630,448	$0	0.0%	331,896,961	$0	0.0%
Dauphin (B)	$160,174,274	$395,873	0.2%	$127,055,178	$395,873	0.3%	$15,692,838	$0	0.0%	17,426,258	$0	0.0%
Derry (T)	$13,980,976,171	$25,091,818	0.2%	$4,668,633,464	$2,699,611	<0.1%	$7,030,460,551	$16,729,671	0.2%	2,281,882,155	$5,662,537	0.2%
East Hanover (T)	$2,617,412,647	$1,260,921	<0.1%	$1,238,617,319	$922,262	<0.1%	$857,405,026	$0	0.0%	521,390,302	$338,659	0.1%
Elizabethville (B)	$396,035,763	$0	0.0%	$243,562,160	$0	0.0%	$136,104,618	$0	0.0%	16,368,985	$0	0.0%
Gratz (B)	$432,294,298	$267	<0.1%	$141,885,712	$0	0.0%	$90,632,780	$0	0.0%	199,775,806	$267	<0.1%
Halifax (B)	$181,049,719	$0	0.0%	$137,854,350	$0	0.0%	$30,774,275	$0	0.0%	12,421,094	$0	0.0%
Halifax (T)	$1,457,192,513	$23,193,446	1.6%	$639,154,049	$2,124,571	0.3%	$386,854,712	$16,764,025	4.3%	431,183,752	$4,304,850	1.0%
Harrisburg (C)	$15,182,832,338	$606,513,776	4.0%	$4,753,470,963	$41,549,356	0.9%	$7,828,345,173	$452,581,671	5.8%	2,601,016,201	$112,382,748	4.3%
Highspire (B)	$550,466,766	$16,475,785	3.0%	$369,089,479	$4,300,285	1.2%	$139,985,410	$8,644,063	6.2%	41,391,877	$3,531,438	8.5%
Hummelstown (B)	$1,082,835,134	$3,234,875	0.3%	$704,439,087	$349,954	<0.1%	$211,818,502	$1,936,142	0.9%	166,577,545	$948,780	0.6%
Jackson (T)	$776,111,853	$177,915	<0.1%	$389,430,725	$50,358	<0.1%	$58,057,393	$0	0.0%	328,623,734	$127,557	<0.1%
Jefferson (T)	$230,110,295	$272,071	0.1%	$94,409,254	$223,758	0.2%	$18,179,648	$0	0.0%	117,521,392	$48,313	<0.1%
Londonderry (T)	$2,360,384,847	$228,626,984	9.7%	$900,057,558	$18,604,253	2.1%	$1,064,145,995	$198,558,741	18.7%	396,181,294	$11,463,990	2.9%
Lower Paxton (T)	$14,635,453,846	$6,739,671	<0.1%	$8,886,888,076	$5,787,075	<0.1%	$4,742,693,239	$568,188	<0.1%	1,005,872,532	$384,408	<0.1%
Lower Swatara (T)	$5,522,875,069	$6,766,225	0.1%	$1,321,538,034	$2,699,453	0.2%	$3,202,186,326	$2,388,108	0.1%	999,150,709	$1,678,664	0.2%
Lykens (B)	$517,534,065	$18,079,547	3.5%	$318,350,529	$7,518,776	2.4%	$116,841,875	$6,032,122	5.2%	82,341,661	$4,528,649	5.5%
Lykens (T)	$941,126,374	$4,303,473	0.5%	$331,416,795	$1,711,953	0.5%	$87,529,328	$0	0.0%	522,180,251	$2,591,519	0.5%
Middle Paxton (T)	$1,462,655,724	$21,333,516	1.5%	$1,119,293,027	$18,217,138	1.6%	$150,795,760	$2,110,032	1.4%	192,566,937	$1,006,347	0.5%
Middletown (B)	$1,981,507,138	$66,825,410	3.4%	$1,164,311,248	$5,470,876	0.5%	$643,359,674	$60,024,319	9.3%	173,836,216	$1,330,215	0.8%
Mifflin (T)	$603,453,937	$667,141	0.1%	$197,621,455	$416,052	0.2%	$84,884,536	$0	0.0%	320,947,945	$251,088	<0.1%

Jurisdiction	Total Replacement Cost Value	All Occupancies		Residential			Commercial			Agricultural, Industrial, Religious, Education and Government		
		Estimated Loss	Percent of Total	Total Replacement Cost Value (Residential Occupancy Class)	Estimated Loss	Percent of Total	Total Replacement Cost Value (Commercial Occupancy Class)	Estimated Loss	Percent of Total	Total Replacement Cost Value (All Other Occupancy Classes)	Estimated Loss	Percent of Total
Millersburg (B)	$770,504,424	$1,362,706	0.2%	$405,438,862	$357,802	<0.1%	$196,935,839	$163,141	0.1%	168,129,724	$841,763	0.5%
Paxtang (B)	$403,915,987	$13,729,126	3.4%	$236,427,047	$3,466,165	1.5%	$125,390,826	$10,262,961	8.2%	42,098,113	$0	0.0%
Penbrook (B)	$602,189,726	$0	0.0%	$400,173,191	$0	0.0%	$141,260,273	$0	0.0%	60,756,261	$0	0.0%
Pillow (B)	$101,661,910	$901,348	0.9%	$67,958,532	$901,348	1.3%	$19,065,202	$0	0.0%	14,638,177	$0	0.0%
Reed (T)	$117,139,877	$10,877,531	9.3%	$50,612,075	$850,867	1.7%	$33,470,277	$7,561,973	22.6%	33,057,526	$2,464,690	7.5%
Royalton (B)	$196,935,626	$1,402,744	0.7%	$154,580,084	$1,402,744	0.9%	$22,808,604	$0	0.0%	19,546,939	$0	0.0%
Rush (T)	$71,032,585	$2,061,499	2.9%	$54,544,224	$70,945	0.1%	$10,370,788	$1,965,220	18.9%	6,117,574	$25,334	0.4%
South Hanover (T)	$1,935,844,099	$7,538,347	0.4%	$1,405,842,149	$3,293,688	0.2%	$158,098,409	$3,923,431	2.5%	371,903,540	$321,229	<0.1%
Steelton (B)	$2,111,932,612	$126,778,655	6.0%	$673,914,210	$1,542,017	0.2%	$768,820,598	$63,872,934	8.3%	669,197,803	$61,363,704	9.2%
Susquehanna (T)	$8,633,889,539	$28,781,240	0.3%	$4,538,564,442	$10,019,534	0.2%	$2,727,854,781	$15,944,217	0.6%	1,367,470,317	$2,817,489	0.2%
Swatara (T)	$8,581,237,561	$5,836,773	0.1%	$4,021,887,014	$3,516,813	<0.1%	$3,628,102,002	$1,977,702	0.1%	931,248,545	$342,258	<0.1%
Upper Paxton (T)	$1,473,328,502	$8,587,528	0.6%	$817,495,412	$3,008,604	0.4%	$221,081,499	$2,472,793	1.1%	434,751,590	$3,106,130	0.7%
Washington (T)	$1,106,223,564	$1,972,876	0.2%	$441,832,486	$218,904	<0.1%	$247,657,176	$788,787	0.3%	416,733,902	$965,184	0.2%
Wayne (T)	$398,741,088	$0	0.0%	$267,177,630	$0	0.0%	$1,569,086	$0	0.0%	129,994,372	$0	<0.1%
West Hanover (T)	$3,228,343,376	$1,260,826	<0.1%	$2,090,591,529	$289,723	<0.1%	$833,312,851	$241,236	<0.1%	304,438,996	$729,867	0.2%
Wiconisco (T)	$297,597,257	$857,423	0.3%	$210,850,528	$101,121	<0.1%	$37,269,062	$591,767	1.6%	49,477,666	$164,536	0.3%
Williams (T)	$390,058,854	$3,269,834	0.8%	$186,708,126	$392,394	0.2%	$52,168,431	$203,141	0.4%	151,182,297	$2,674,298	1.8%
Williamstown (B)	$345,185,743	$0	0.0%	$233,480,131	$0	0.0%	$70,561,059	$0	0.0%	41,144,554	$0	0.0%
Dauphin County (Total)	**$97,100,578,032**	**$1,245,193,956**	**1.3%**	**$44,743,625,496**	**$142,491,061**	**0.3%**	**$36,358,131,410**	**$876,306,384**	**2.4%**	**15,998,821,126**	**$226,396,511**	**1.4%**

Sources: Hazusv4.2; FEMA 2012; Dauphin County GIS 2020; RS Means 2020
Note: B – Borough; C – City; T – Township; % - Percent

NFIP Statistics

In addition to total building stock modeling, individual data available regarding flood policies, claims, and repetitive loss (RL) properties were analyzed. Severe repetitive loss (SRL) properties do not appear in Dauphin County data. According to Section 1361A of the National Flood Insurance Act (NFIA), as amended, 42 *United States Code* (U.S.C.) 4102a, the definition of an severe repetitive loss (SRL) property is a residential property covered by an NFIP flood insurance policy, and for which at least one of the following sets of claim payments have occurred:

- At least four NFIP claim payments (including building and contents) over $5,000 each, with the cumulative amount of these claims' payments exceeding $20,000
- At least two separate claims payments (building payments only), with the cumulative amount of the building portion of these claims' payments exceeding the market value of the building

Moreover, for both of the above, at least two of the referenced claims must have occurred within any 10-year period and must have been submitted separately on dates more than 10 days apart.

An RL property is defined by FEMA's Flood Mitigation Assistance (FMA) Program as an NFIP-insured structure that incurred flood-related damage on two occasions, and for which the cost of repair equaled or exceeded 25 percent of the market value of the structure at the time of each such flood.

Dauphin County has 2,798 RL properties throughout the county. Table 4.3.6-13 summarizes NFIP policies and claims, and numbers of RL properties, for Dauphin County's municipalities.

Table 4.3.6-13. NFIP Policies, Claims, and Repetitive Loss Statistics

Jurisdiction	Number of Policies	Number of Claims (Losses) Since 1978	Number of Repetitive Loss (RL) Properties	Total Loss Payments Since 1978
Berrysburg (B)	N/A	N/A	N/A	N/A
Conewago (T)	0	4	0	$29,048
Dauphin (B)	8	76	39	$676,467
Derry (T)	114	89	26	$2,362,646
East Hanover (T)	16	26	12	$404,799
Elizabethville (B)	N/A	N/A	N/A	N/A
Gratz (B)	N/A	N/A	N/A	N/A
Halifax (B)	2	16	1	$19,965
Halifax (T)	8	28	15	$373,344
Harrisburg (C)	743	1,883	1,022	$28,456,400
Highspire (B)	109	247	111	$2,572,550
Hummelstown (B)	24	68	30	$1,930,535
Jackson (T)	1	0	0	$0
Jefferson (T)	1	2	0	$1,068
Londonderry (T)	46	597	305	$12,375,132
Lower Paxton (T)	77	61	7	$173,176
Lower Swatara (T)	30	103	56	$2,511,370
Lykens (B)	80	77	30	$574,282
Lykens (T)	3	7	5	$17,749
Middle Paxton (T)	105	304	187	$4,463,111
Middletown (B)	100	375	186	$10,022,216
Mifflin (T)	N/A	N/A	N/A	N/A
Millersburg (B)	32	41	17	$276,961
Paxtang (B)	25	36	21	$209,173
Penbrook (B)	N/A	N/A	N/A	N/A

Jurisdiction	Number of Policies	Number of Claims (Losses) Since 1978	Number of Repetitive Loss (RL) Properties	Total Loss Payments Since 1978
Pillow (B)	0	2	0	$1,310
Reed (T)	6	42	18	$558,999
Royalton (B)	60	93	44	$1,383,517
Rush (T)	N/A	N/A	N/A	N/A
South Hanover (T)	41	117	82	$6,599,889
Steelton (B)	48	162	79	$1,098,765
Susquehanna (T)	196	564	300	$6,102,435
Swatara (T)	184	338	157	$4,866,815
Upper Paxton (T)	20	79	27	$605,678
Washington (T)	4	9	6	$217,045
Wayne (T)	0	1	0	$3,381
West Hanover (T)	22	28	15	$363,331
Wiconisco (T)	2	3	0	$12,941
Williams (T)	N/A	N/A	N/A	N/A
Williamstown (B)	N/A	N/A	N/A	N/A
Dauphin County (Total)	**2,107**	**5,478**	**2,798**	**$89,264,098**

Source: FEMA 2020
Note: B – Borough; C – City; T – Township

Impact on Land Uses

An exposure analysis was completed to determine the acres of developed residential land and developed non-residential land use types located in the 1 percent and 0.2 percent flood hazard areas. To estimate exposure for developed residential and non-residential land use types to the 1 percent flood hazard area, the floodplain boundary was overlaid upon land use data. Across Dauphin County, residential land use has the highest percentage of acres located in flood areas. Approximately 7.4 percent and 12.2 percent of residential land use are in the 1 percent and 0.2 percent annual chance flood zones, respectively. Non-residential land has the greatest amount of land located in flood areas. Approximately 16,061 acres of non-residential land are in the 1 percent annual chance flood zone and 18,034 acres of non-residential land are in the 0.2 percent annual chance flood zone. Refer to Table 4.3.6-14 for a complete summary of this analysis.

Table 4.3.6-14. Developed Residential and Non-Residential Land Use Exposed to 1 Percent and 0.2 Percent Annual Chance Flood Event Hazard Area

Land Use Type	Total Acres for County	1 Percent Annual Chance Flood Hazard Event Area		0.2 Percent Annual Chance Flood Hazard Event Area	
		Acres	Percent of Total	Acres	Percent of Total
Residential Land	44,154	3,271	7.4%	5,398	12.2%
Non-Residential Land	290,269	16,061	5.5%	18,034	6.2%
Natural Land	170,467	11,034	6.5%	11,905	7.0%
Dauphin County (Total Acres)	**334,423**	**19,332**	**5.8%**	**23,432**	**7.0%**

Sources: FEMA 2012, Dauphin County GIS 2020, NLCD 2016
Note: Land use areas do not include areas of water. Non-residential land = Agriculture, Barren, Developed – Open Space, Forest, Wetlands; This analysis does not incorporate areas delineated as water. Residential land = Developed – low intensity, Developed – medium intensity, and Developed – high intensity.
%-Percent

Impact on Critical Facilities

It is important to determine the critical facilities and infrastructure within the county that may be at risk to flooding (riverine, dam failure, flash/stormwater flooding), and identify those who may be impacted should damage occur. Critical services during and after a flood event may not be available if critical facilities are directly damaged or transportation routes to access these critical facilities are impacted. Roads that are blocked or damaged can isolate residents and can prevent access to service providers that need to get into vulnerable population areas to make repairs. Utilities, such as overhead power, cable, and phone lines, could also be vulnerable because of utility poles damaged by standing water or the surge of water from a dam failure event. Loss of these utilities could create additional isolation issues for the inundation zones.

Major roadways that may be impacted by the 1 percent annual chance flood event include Interstates I-76, I-81, I-83; US Routes US-209, US-22, US-322, US-11/15, US-422; and State Routes PA-147, PA-225, PA-230, PA-25, PA-283, PA-325, PA-39, PA-441, PA-443, PA-743, PA-849. Approximately 5.3 percent of all Dauphin County roadways are located in the 1 percent annual chance flood event and 8.2 percent are located in the 0.2 percent annual chance flood event. Table 4.3.6-15 summarizes the total number of miles of exposed roadways. There are several issues associated with transportation route flooding, including isolation caused by bridges being washed out or blocked by floods or debris, health problems caused by water and sewer systems that are flooded or backed up, drinking water contamination caused by floodwaters carrying pollutants in water supplies, and localized urban flooding caused by culverts blocked with debris.

Table 4.3.6-15. Roadways Located in the 1 Percent Annual Chance Flood Area

Road Type	Total Miles for County	Roadway Miles Exposed to Flood Hazard Areas			
		1 Percent Annual Change Flood Hazard Event Area		0.2 Percent Annual Change Flood Hazard Event Area	
		Miles	Percent of Total	Miles	Percent of Total
Interstate	81	7	8.2%	8	9.6%
U.S. Highways	107	7	6.2%	14	12.8%
State Highways	205	14	6.6%	24	11.5%
Local Roads	1,595	79	4.9%	117	7.4%
Dauphin County (Total)	**1,988**	**106**	**5.3%**	**163**	**8.2%**

Sources: FEMA 2012, Dauphin County GIS 2020, PennDOT 2018
%=Percent

Additionally, critical facility exposure to the 1 percent and 0.2 percent annual chance flood hazard events was examined. Of the 239 critical facilities located in the 1 percent annual chance flood event boundary, 218 are considered county lifelines and out of the 355 critical facilities located in the 0.2 percent annual chance flood event boundary, 309 are considered county lifelines. Table 4.3.6-16 and Table 4.3.6-17 summarize the distribution of critical facilities and utilities within the 1 percent annual chance flood event and the 0.2 percent annual chance flood event, respectively. Table 4.3.6-18 and Table 4.3.6-19 summarize the number of critical facilities and lifelines exposed to the 1 percent and 0.2 percent flood inundation areas by jurisdiction, respectively. The City of Harrisburg has the greatest number of critical facilities exposed to the flood hazard area (80 critical facilities, 71 of which are considered lifelines). The Town of Wayne has the greatest percentage of critical facilities located in the flood hazard area (66.7 percent).

In cases where short-term functionality is impacted by flooding, other facilities of neighboring municipalities may need to increase support response functions during a disaster event. Mitigation planning should consider means to reduce flood impacts to critical facilities and ensure sufficient emergency and school services remain when a significant event occurs. Actions addressing shared services agreements are included in Section 6 (Mitigation Strategies) of this HMP update.

Table 4.3.6-16. Distribution of Critical Facilities that Intersect the 1 Percent Annual Chance Flood Event

Jurisdiction	Critical Facilities Exposed to the 1 Percent Annual Chance Flood Hazard Event Area																								
	Bridge	Communication	Dam	District Magistrate	Drug and Alcohol Treatment	Electric Power	EMS	EOC	Evacuation Shelters	Fire Station	Hazardous Material Facility	Higher Education	Historic Sites	Homeless Shelters	Hospitals and Medical Centers	Municipal Office	Police Station	Polling Site	Post Office	Potable Water	Primary School	Rail	Religious	Senior Facility	Wastewater
Berrysburg (B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Conewago (T)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dauphin (B)	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Derry (T)	2	0	2	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1
East Hanover (T)	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elizabethville (B)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gratz (B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Halifax (B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Halifax (T)	4	0	0	0	0	0	0	0	0	0	1	0	3	0	0	0	0	0	0	1	0	0	0	0	0
Harrisburg (C)	14	0	2	1	6	1	1	0	0	1	7	1	27	3	1	0	0	1	1	0	2	1	8	1	1
Highspire (B)	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	1	0	0	0	1	1	0
Hummelstown (B)	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Jackson (T)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jefferson (T)	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Londonderry (T)	4	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Lower Paxton (T)	8	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Lower Swatara (T)	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lykens (B)	3	0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	1
Lykens (T)	1	0	1	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0	0
Middle Paxton (T)	3	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Middletown (B)	1	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0

Jurisdiction	Critical Facilities Exposed to the 1 Percent Annual Chance Flood Hazard Event Area																								
	Bridge	Communication	Dam	District Magistrate	Drug and Alcohol Treatment	Electric Power	EMS	EOC	Evacuation Shelters	Fire Station	Hazardous Material Facility	Higher Education	Historic Sites	Homeless Shelters	Hospitals and Medical Centers	Municipal Office	Police Station	Polling Site	Post Office	Potable Water	Primary School	Rail	Religious	Senior Facility	Wastewater
Mifflin (T)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Millersburg (B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paxtang (B)	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	2	1	1	0	0	0	0	0	0	0
Penbrook (B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pillow (B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Reed (T)	1	0	0	0	0	0	0	0	0	0	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Royalton (B)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rush (T)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
South Hanover (T)	2	0	1	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	1
Steelton (B)	0	0	0	0	0	0	0	0	0	0	3	0	1	0	0	0	0	0	0	1	0	0	0	0	0
Susquehanna (T)	2	0	0	0	0	0	0	0	0	0	1	0	2	0	0	0	0	0	0	1	0	0	2	0	1
Swatara (T)	2	1	0	0	0	0	0	0	1	0	3	0	1	0	0	0	0	0	0	0	0	0	0	0	2
Upper Paxton (T)	4	0	2	0	0	0	0	0	0	0	2	0	1	0	0	0	0	0	0	1	0	0	0	0	0
Washington (T)	6	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Wayne (T)	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
West Hanover (T)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wiconisco (T)	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0
Williams (T)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Williamstown (B)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dauphin County (Total)	**87**	**1**	**12**	**1**	**6**	**1**	**3**	**1**	**2**	**2**	**27**	**1**	**49**	**3**	**1**	**4**	**2**	**3**	**2**	**6**	**2**	**1**	**12**	**2**	**8**

Source: Dauphin County GIS 2020, FEMA 2012
Note: B – Borough; C – City; T – Township

Table 4.3.6-17. Distribution of Critical Facilities that Intersect the 0.2 Percent Annual Chance Flood Event

Jurisdiction	Critical Facilities Exposed to the 0.2 Percent Annual Chance Flood Hazard Event Area																															
	Airport	Bridge	Bus	Communication	Dam	Day Care	District Magistrate	Drug and Alcohol Treatment	Electric Power	EMS	EOC	Evacuation Shelters	Fire Station	Hazardous Material Facility	Higher Education	Historic Sites	Homeless Shelters	Hospitals and Medical Centers	Library	Military Facility	Municipal Office	Nuclear Facility	Police Station	Polling Site	Post Office	Potable Water	Primary School	Rail	Religious	Senior Facility	State Building	Wastewater
Berrysburg (B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Conewago (T)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dauphin (B)	0	2	0	0	1	0	0	0	0	0	0	0	0	1	0	4	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
Derry (T)	0	2	0	1	2	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
East Hanover (T)	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elizabethville (B)	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gratz (B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Halifax (B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Halifax (T)	0	4	0	0	0	0	0	0	0	0	0	0	0	1	0	3	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Harrisburg (C)	0	14	1	0	2	0	2	8	1	1	1	0	1	8	2	42	3	1	1	0	0	0	0	4	1	0	3	2	11	1	0	1
Highspire (B)	0	1	0	0	0	0	0	0	0	0	1	2	1	1	0	1	0	0	0	0	1	0	1	1	1	0	0	0	3	1	0	0
Hummelstown (B)	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Jackson (T)	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jefferson (T)	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Londonderry (T)	0	4	0	0	1	0	0	0	2	0	0	0	0	3	0	1	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0
Lower Paxton (T)	0	8	0	0	2	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lower Swatara (T)	1	1	0	0	0	0	0	0	0	1	0	0	2	14	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	1	1
Lykens (B)	0	3	0	0	0	0	0	0	0	1	1	0	1	3	0	5	0	0	1	0	1	0	0	2	1	0	0	0	0	0	0	1
Lykens (T)	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Middle Paxton (T)	0	4	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Middletown (B)	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0
Mifflin (T)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Millersburg (B)	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Paxtang (B)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	2	0	1	1	0	0	0	0	0	0	0	0
Penbrook (B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pillow (B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Reed (T)	0	1	0	0	0	0	0	0	0	0	0	0	0	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Jurisdiction	Critical Facilities Exposed to the 0.2 Percent Annual Chance Flood Hazard Event Area																														
	Airport	Bridge	Bus	Communication	Dam	Day Care	District Magistrate	Drug and Alcohol Treatment	Electric Power	EMS	EOC	Evacuation Shelters	Fire Station	Hazardous Material Facility	Higher Education	Historic Sites	Homeless Shelters	Hospitals and Medical Centers	Library	Military Facility	Municipal Office	Nuclear Facility	Police Station	Polling Site	Post Office	Potable Water	Primary School	Rail	Religious	Senior Facility	State Building	Wastewater
Royalton (B)	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Rush (T)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
South Hanover (T)	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Steelton (B)	0	0	0	0	0	1	0	0	0	0	0	0	0	4	0	1	0	0	0	0	0	0	0	0	0	1	0	0	2	0	0	0
Susquehanna (T)	0	2	0	0	0	0	0	0	0	0	0	0	0	2	0	3	0	0	0	0	0	0	1	0	0	2	0	0	3	0	0	1
Swatara (T)	0	2	0	1	0	0	0	0	0	0	0	1	0	4	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Upper Paxton (T)	0	4	0	0	2	0	0	0	0	0	0	0	0	2	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Washington (T)	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wayne (T)	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
West Hanover (T)	0	2	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wiconisco (T)	0	1	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0	1	0	1	2	0	0	0	0	0	0	0	1
Williams (T)	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Williamstown (B)	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dauphin County (Total)	**1**	**89**	**1**	**2**	**15**	**1**	**3**	**8**	**3**	**5**	**4**	**3**	**6**	**51**	**2**	**77**	**3**	**1**	**2**	**1**	**6**	**1**	**5**	**12**	**3**	**8**	**3**	**2**	**22**	**2**	**1**	**12**

Source: Dauphin County GIS 2020, FEMA 2012
Note: B – Borough; C – City; T – Township

Table 4.3.6-18. Number of Critical Facilities and Lifelines that Intersect the 1 Percent Annual Chance Event

Jurisdiction	Total Critical Facilities Located in Jurisdiction	Total Lifelines Located in Jurisdiction	Number of Critical Facilities and Lifeline Facilities Exposed to 1 Percent Annual Chance Flood Hazard Event Area			
			Critical Facilities	Percent of Total Critical Facilities	Lifelines	Percent of Total Lifelines
Berrysburg (B)	6	5	0	0.0%	0	0.0%
Conewago (T)	12	7	0	0.0%	0	0.0%
Dauphin (B)	27	23	2	7.4%	2	8.7%
Derry (T)	122	74	7	5.7%	7	9.5%
East Hanover (T)	41	29	10	24.4%	10	34.5%
Elizabethville (B)	12	9	1	8.3%	1	11.1%
Gratz (B)	9	7	0	0.0%	0	0.0%

Jurisdiction	Total Critical Facilities Located in Jurisdiction	Total Lifelines Located in Jurisdiction	Number of Critical Facilities and Lifeline Facilities Exposed to 1 Percent Annual Chance Flood Hazard Event Area			
			Critical Facilities	Percent of Total Critical Facilities	Lifelines	Percent of Total Lifelines
Halifax (B)	8	7	0	0.0%	0	0.0%
Halifax (T)	37	24	9	24.3%	9	37.5%
Harrisburg (C)	371	271	80	21.6%	71	26.2%
Highspire (B)	15	9	7	46.7%	4	44.4%
Hummelstown (B)	33	23	3	9.1%	3	13.0%
Jackson (T)	26	15	2	7.7%	2	13.3%
Jefferson (T)	8	6	3	37.5%	3	50.0%
Londonderry (T)	47	31	7	14.9%	6	19.4%
Lower Paxton (T)	149	73	11	7.4%	11	15.1%
Lower Swatara (T)	94	75	2	2.1%	2	2.7%
Lykens (B)	22	17	7	31.8%	7	41.2%
Lykens (T)	16	10	5	31.3%	3	30.0%
Middle Paxton (T)	38	23	5	13.2%	4	17.4%
Middletown (B)	48	27	3	6.3%	3	11.1%
Mifflin (T)	11	8	0	0.0%	0	0.0%
Millersburg (B)	28	16	0	0.0%	0	0.0%
Paxtang (B)	14	9	6	42.9%	5	55.6%
Penbrook (B)	16	5	0	0.0%	0	0.0%
Pillow (B)	7	4	0	0.0%	0	0.0%
Reed (T)	8	7	5	62.5%	5	71.4%
Royalton (B)	12	9	1	8.3%	1	11.1%
Rush (T)	6	5	1	16.7%	1	20.0%
South Hanover (T)	25	17	6	24.0%	6	35.3%
Steelton (B)	34	17	5	14.7%	5	29.4%
Susquehanna (T)	112	72	9	8.0%	7	9.7%
Swatara (T)	146	95	10	6.8%	9	9.5%
Upper Paxton (T)	37	25	10	27.0%	9	36.0%
Washington (T)	34	27	8	23.5%	8	29.6%
Wayne (T)	9	8	6	66.7%	6	75.0%
West Hanover (T)	48	31	2	4.2%	2	6.5%
Wiconisco (T)	15	11	4	26.7%	4	36.4%
Williams (T)	16	12	1	6.3%	1	8.3%
Williamstown (B)	10	6	1	10.0%	1	16.7%
Dauphin County (Total)	**1,729**	**1,149**	**239**	**13.8%**	**218**	**19.0%**

Source: Dauphin County GIS 2020, FEMA 2012
Note: B – Borough; C – City; T – Township; % - Percent

Table 4.3.6-19 Number of Critical Facilities and Lifelines that Intersect the 0.2 Percent Annual Chance Event

Jurisdiction	Total Critical Facilities Located in Jurisdiction	Total Lifelines Located in Jurisdiction	Number of Critical Facilities and Lifeline Facilities Exposed to 0.2 Percent Annual Chance Flood Hazard Event Area			
			Critical Facilities	Percent of Total Critical Facilities	Lifelines	Percent of Total Lifelines
Berrysburg (B)	6	5	0	0.0%	0	0.0%
Conewago (T)	12	7	0	0.0%	0	0.0%
Dauphin (B)	27	23	10	37.0%	9	39.1%
Derry (T)	122	74	8	6.6%	8	10.8%
East Hanover (T)	41	29	10	24.4%	10	34.5%
Elizabethville (B)	12	9	1	8.3%	1	11.1%
Gratz (B)	9	7	0	0.0%	0	0.0%
Halifax (B)	8	7	1	12.5%	1	14.3%
Halifax (T)	37	24	9	24.3%	9	37.5%
Harrisburg (C)	371	271	111	29.9%	95	35.1%
Highspire (B)	15	9	15	100.0%	9	100.0%
Hummelstown (B)	33	23	3	9.1%	3	13.0%
Jackson (T)	26	15	2	7.7%	2	13.3%
Jefferson (T)	8	6	3	37.5%	3	50.0%
Londonderry (T)	47	31	13	27.7%	12	38.7%
Lower Paxton (T)	149	73	11	7.4%	11	15.1%
Lower Swatara (T)	94	75	24	25.5%	24	32.0%
Lykens (B)	22	17	20	90.9%	17	100.0%
Lykens (T)	16	10	5	31.3%	3	30.0%
Middle Paxton (T)	38	23	6	15.8%	5	21.7%
Middletown (B)	48	27	6	12.5%	3	11.1%
Mifflin (T)	11	8	0	0.0%	0	0.0%
Millersburg (B)	28	16	2	7.1%	2	12.5%
Paxtang (B)	14	9	6	42.9%	5	55.6%
Penbrook (B)	16	5	0	0.0%	0	0.0%
Pillow (B)	7	4	0	0.0%	0	0.0%
Reed (T)	8	7	5	62.5%	5	71.4%
Royalton (B)	12	9	3	25.0%	2	22.2%
Rush (T)	6	5	1	16.7%	1	20.0%
South Hanover (T)	25	17	7	28.0%	7	41.2%
Steelton (B)	34	17	9	26.5%	6	35.3%
Susquehanna (T)	112	72	14	12.5%	11	15.3%
Swatara (T)	146	95	11	7.5%	10	10.5%
Upper Paxton (T)	37	25	10	27.0%	9	36.0%
Washington (T)	34	27	8	23.5%	8	29.6%
Wayne (T)	9	8	6	66.7%	6	75.0%

Jurisdiction	Total Critical Facilities Located in Jurisdiction	Total Lifelines Located in Jurisdiction	Number of Critical Facilities and Lifeline Facilities Exposed to 0.2 Percent Annual Chance Flood Hazard Event Area			
			Critical Facilities	Percent of Total Critical Facilities	Lifelines	Percent of Total Lifelines
West Hanover (T)	48	31	4	8.3%	3	9.7%
Wiconisco (T)	15	11	9	60.0%	7	63.6%
Williams (T)	16	12	1	6.3%	1	8.3%
Williamstown (B)	10	6	1	10.0%	1	16.7%
Dauphin County (Total)	**1,729**	**1,149**	**355**	**20.5%**	**309**	**26.9%**

Source: Dauphin County GIS 2020, FEMA 2012
Note: B – Borough; C – City; T – Township; % - Percent

Impact on the Economy

Flood events can significantly impact the local and regional economy. This includes but is not limited to general building stock damage and associated tax loss, impacts to utilities and infrastructure, business interruption, and impacts on the tax base to Dauphin County. Damage to general building stock can be quantified by use of Hazus as discussed above. Other economic components such as loss of facility use, functional downtime, and social economic factors are less susceptible to measurement with a high degree of certainty. In areas that are directly flooded, renovations of commercial and industrial buildings may be necessary, disrupting associated services.

Debris management may also be a large expense after a flood event. Hazus estimates the amount of debris generated from a 1 percent annual chance flood event. The model breaks down debris into three categories: (1) finishes (dry wall, insulation, etc.); (2) structural (wood, brick, etc.) and (3) foundations (concrete slab and block, rebar, etc.). The distinction is made because of the different types of equipment needed to handle the debris. Table 4.3.6-20 summarizes the debris estimated by Hazus that would result from a 1 percent annual chance flood event—over 75,000 tons of debris will be generated in total.

Table 4.3.6-20. Estimated Debris Generated from the 1 Percent Annual Chance Flood Event

Jurisdiction	1 Percent Annual Chance Flood Event Area			
	Total (tons)	Finish (tons)	Structure (tons)	Foundation (tons)
Berrysburg (B)	0	0	0	0
Conewago (T)	9	9	0	0
Dauphin (B)	278	78	116	84
Derry (T)	1,977	391	897	690
East Hanover (T)	613	213	227	173
Elizabethville (B)	1	1	0	0
Gratz (B)	82	32	29	22
Halifax (B)	3	1	1	1
Halifax (T)	605	228	220	157
Harrisburg (C)	4,880	4,285	341	254
Highspire (B)	463	275	94	94
Hummelstown (B)	544	155	226	164
Jackson (T)	57	21	19	17
Jefferson (T)	110	31	42	37
Londonderry (T)	1,130	469	367	293
Lower Paxton (T)	5,952	1,695	2,401	1,856
Lower Swatara (T)	868	218	332	318
Lykens (B)	1,709	828	443	438
Lykens (T)	1,285	275	568	442
Middle Paxton (T)	3,217	1,245	1,122	850
Middletown (B)	682	384	149	150
Mifflin (T)	129	42	49	38
Millersburg (B)	741	190	312	240
Paxtang (B)	483	361	73	49
Penbrook (B)	0	0	0	0
Pillow (B)	112	35	39	38
Reed (T)	450	94	216	140
Royalton (B)	159	89	34	36
Rush (T)	17	9	5	3
South Hanover (T)	1,880	503	780	597
Steelton (B)	1,222	328	524	371
Susquehanna (T)	2,651	988	1,036	627
Swatara (T)	1,788	897	521	370
Upper Paxton (T)	2,015	532	821	662

Jurisdiction	1 Percent Annual Chance Flood Event Area			
	Total (tons)	Finish (tons)	Structure (tons)	Foundation (tons)
Washington (T)	581	138	249	194
Wayne (T)	74	22	29	23
West Hanover (T)	392	257	79	56
Wiconisco (T)	488	168	183	138
Williams (T)	437	120	178	138
Williamstown (B)	2	2	0	0
Dauphin County (Total)	**38,090**	**15,610**	**12,720**	**9,759**

Sources: HAZUSv4.2; FEMA 2012, Dauphin County GIS 2020
Note: B – Borough; C – City; T – Township

Impact on the Environment

As Dauphin County and its jurisdictions evolve with changes in population and density, flood events may increase in frequency and/or severity as land use changes, more structures are built, and impervious surfaces expand. Flood extents for the 1 percent 0.2 percent annual chance flood event will continue to evolve alongside natural occurrences, such as climate change and/or severe weather events. These flood events will inevitably impact Dauphin County's natural and local environment.

Furthermore, the environmental impacts of a dam failure event can include significant water-quality and debris-disposal issues. Flood waters can back up sanitary sewer systems and inundate wastewater treatment plants, causing raw sewage to contaminate residential and commercial buildings and the flooded waterway. The contents of unsecured containers of oil, fertilizers, pesticides, and other chemicals get added to flood waters. Hazardous materials may be released and distributed widely across the floodplain. Water supply and wastewater treatment facilities could be offline for weeks. After the flood waters subside, contaminated and flood-damaged building materials and contents must be properly disposed of. Contaminated sediment must be removed from buildings, yards, and properties. In addition, severe erosion is likely; such erosion can negatively impact local ecosystems.

The acreage of natural land makes up about 51.0 percent of the county's total land area (NLCD 2016). Natural land areas from the 2016 land use type dataset includes areas of forested land and wetlands. Overall, 5.8 percent and 7.0 percent of the natural land area in the county is exposed to the 1 percent and 0.2 percent annual chance flood event boundaries, respectively. Severe flooding will affect these natural areas and can ultimately be disruptive to species that reside in these natural habitats.

Cascading Impacts on Other Hazards

Flood events can exacerbate the impacts of disease outbreak and utility failure. After a flooding event, runoff can pick up and transport pollutants from wildlife and soils. Such organisms can then appear in water drinking facilities and transmit illnesses water-borne and vector diseases to the population (World Health Organization [WHO] 2020). Water containing debris can trigger utility failure by clogging treatment systems or inundating power sources. More information about these hazards of concern is provided in Section 4.3.16 (Utility Interruption) and Section 4.3.11 (Pandemic and Infectious Disease).

Future Changes that May Impact Vulnerability

Understanding future changes that affect vulnerability in the county can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. Dauphin County considered the following factors to examine potential conditions that may affect hazard vulnerability:

1. Potential or projected development

2. Projected changes in population
3. Other identified conditions as relevant and appropriate, including the impacts of climate change

Projected Development

As discussed and illustrated in Section 2 (County Profile), areas targeted for future growth and development have been identified across the county. Any areas of growth could be impacted by the flood hazard if within identified hazard areas. The tables and hazard maps included in the jurisdictional annexes contain additional information regarding the specific areas of development that would increase county vulnerability to dam inundation areas.

Projected Changes in Population

Estimated population projections provided by the Center of Rural Pennsylvania indicates that Dauphin County's population will continue to increase into 2040, increasing total population to approximately 296,766 persons (The Center of Rural Pennsylvania 2013). This is approximately a 10.6 percent increase from the county's 2010 population. As more people move into flood zones, an increased amount of the population will be vulnerable to flood hazards.

Effect of Climate Change on Vulnerability

Climate is defined not simply as average temperature and precipitation but also by type, frequency, and intensity of weather events. Both globally and at the local scale, climate change can alter prevalence and severity of extremes such as flood events. While predicting changes of flood events under a changing climate is difficult, understanding vulnerabilities to potential changes is a critical part of estimating future climate change impacts on human health, society, and the environment (U.S. Environmental Protection Agency [EPA] 2006).

PADEP was directed by the Climate Change Act (Act 70 of 2008) to initiate a study of potential impacts of global climate change on the Commonwealth. The June 2009 Pennsylvania Climate Impact Assessment's main findings indicated that Pennsylvania is very likely to undergo increased temperatures in the 21st century (PADEP 2009). An increase in variability of temperature and precipitation may lead to increased frequency and/or severity of storm events. Summer floods and general stream flow variability are projected to increase because of increased variability in precipitation. Even with the anticipated increase in winter precipitation as rain rather than snow, increased winter temperatures and a reduced snowpack may decrease rain-on-snow events and thus major flooding events in Pennsylvania. This conclusion, however, remains speculative until further studies can validate it. Future improvements in modeling smaller-scale climatic processes are expected and will lead to improved understanding of how the changing climate will alter temperature, precipitation, storms, and flood events in Pennsylvania (PADEP 2009).

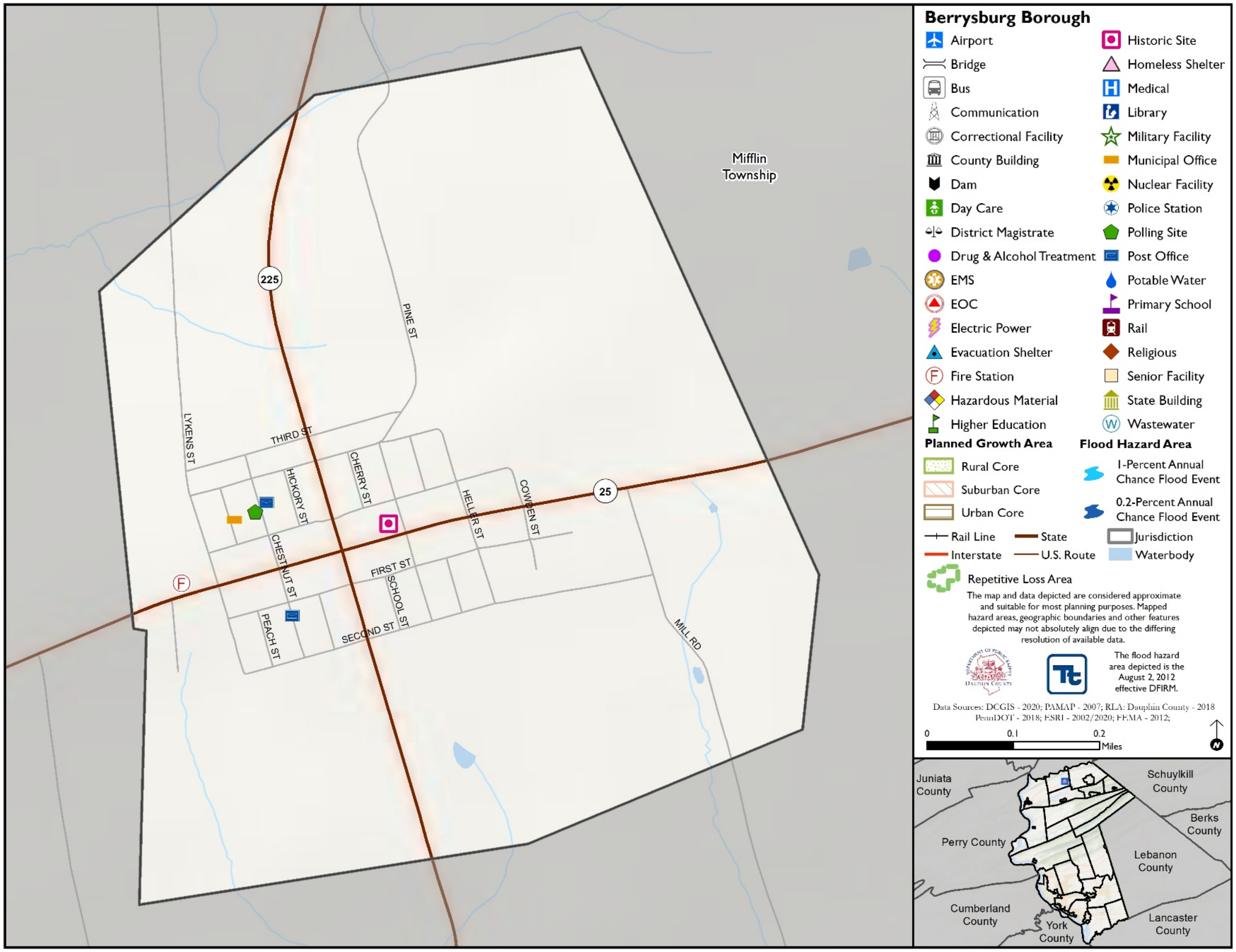
Change of Vulnerability Since the 2015 HMP

Since the 2015 analysis, population statistics have been updated using the 5-Year 2014-2018 American Community Survey Population Estimates. The general building stock was also established using RS Means 2020 building valuations that estimated replacement cost value for each building in the inventory. Additionally, a critical facility dataset was provided from the county. A Hazus riverine flood analysis of Dauphin County was based on the most current and best available data, including building and critical facility inventories, and 2012 FEMA effective DFIRM.

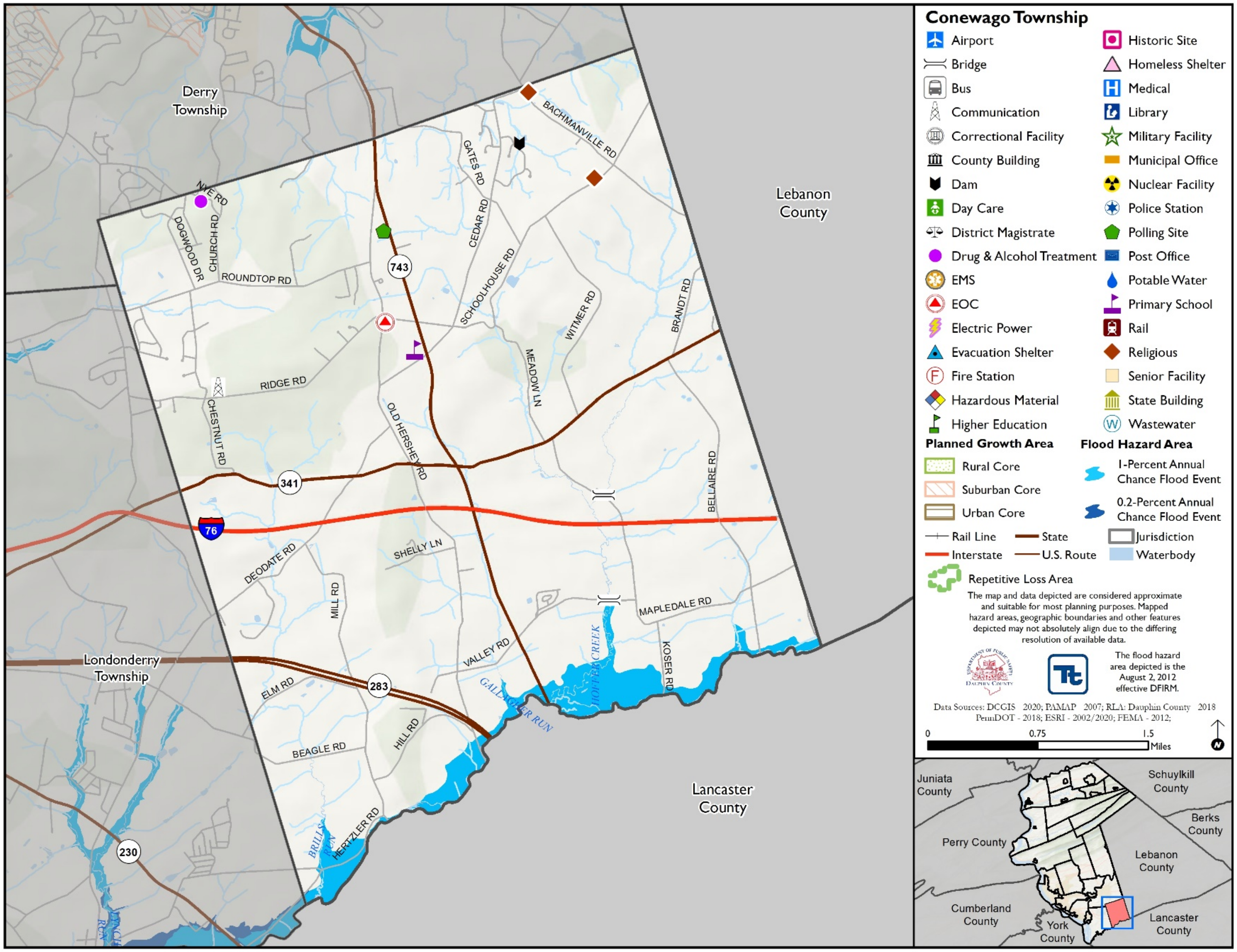
Section 6 (Mitigation Strategy) of this HMP includes discussions of specific mitigation actions addressing improved data collection, and further vulnerability analysis.

Flood Hazard Maps

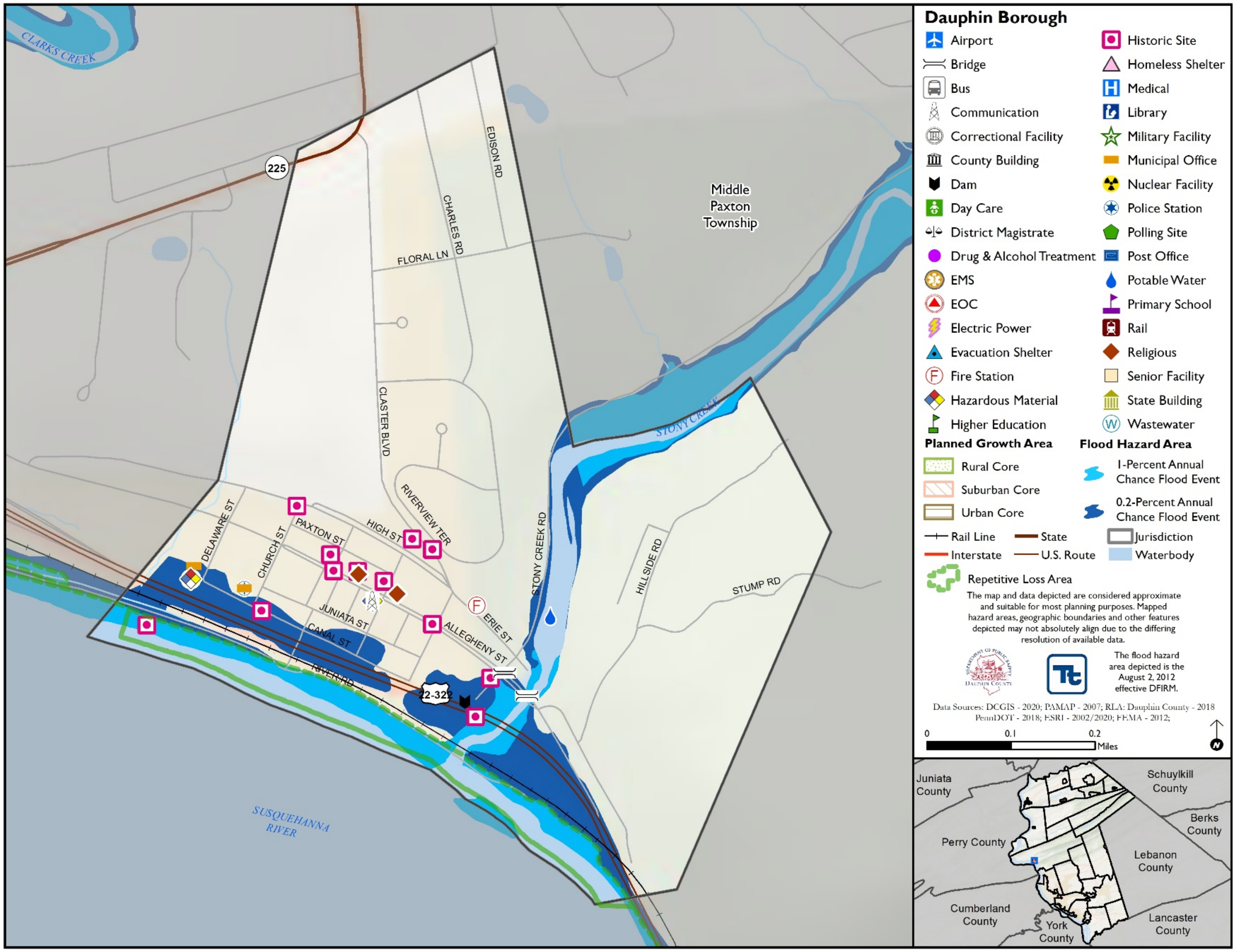
Berrysburg Borough



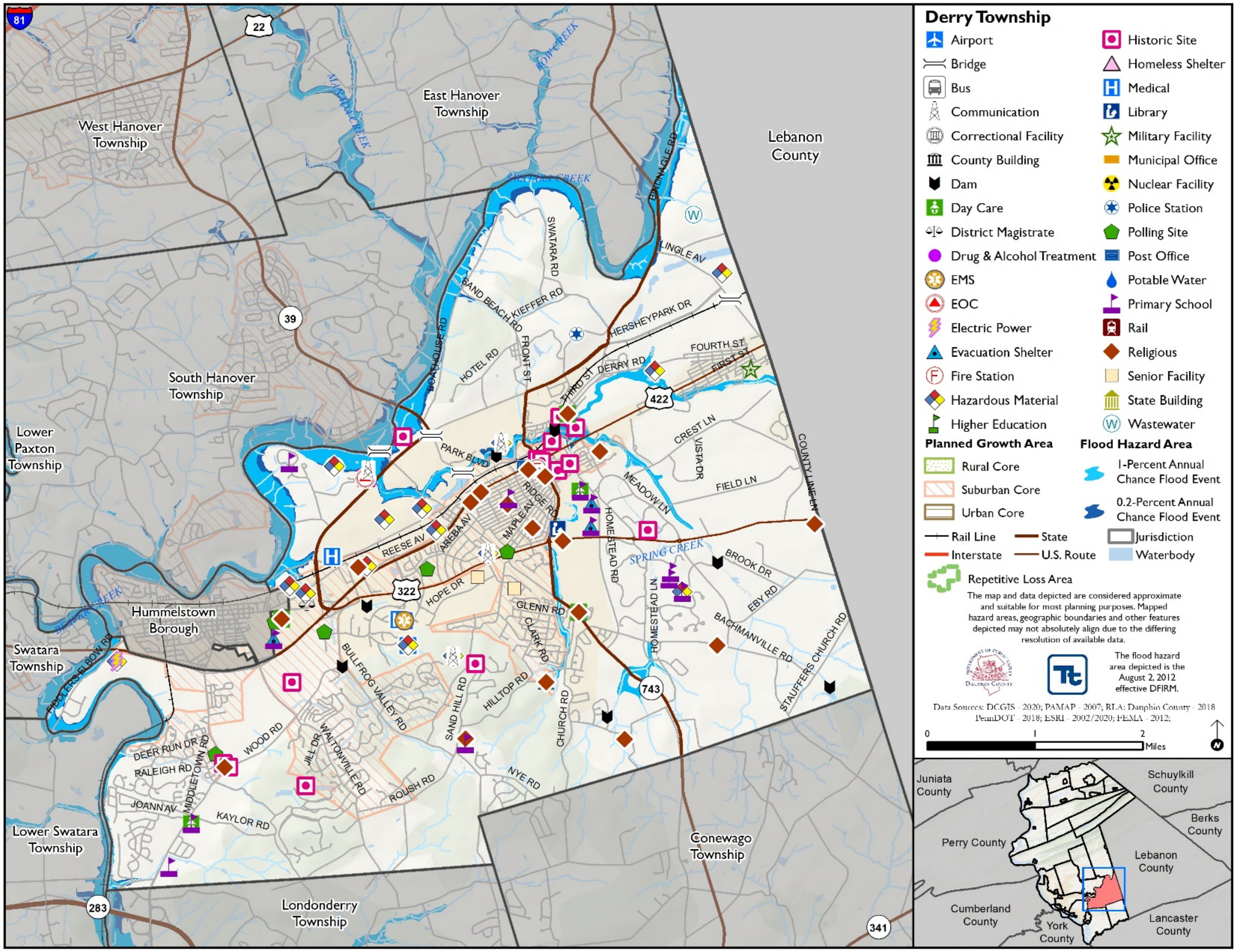
Conewago Township



Dauphin Borough



Derry Township



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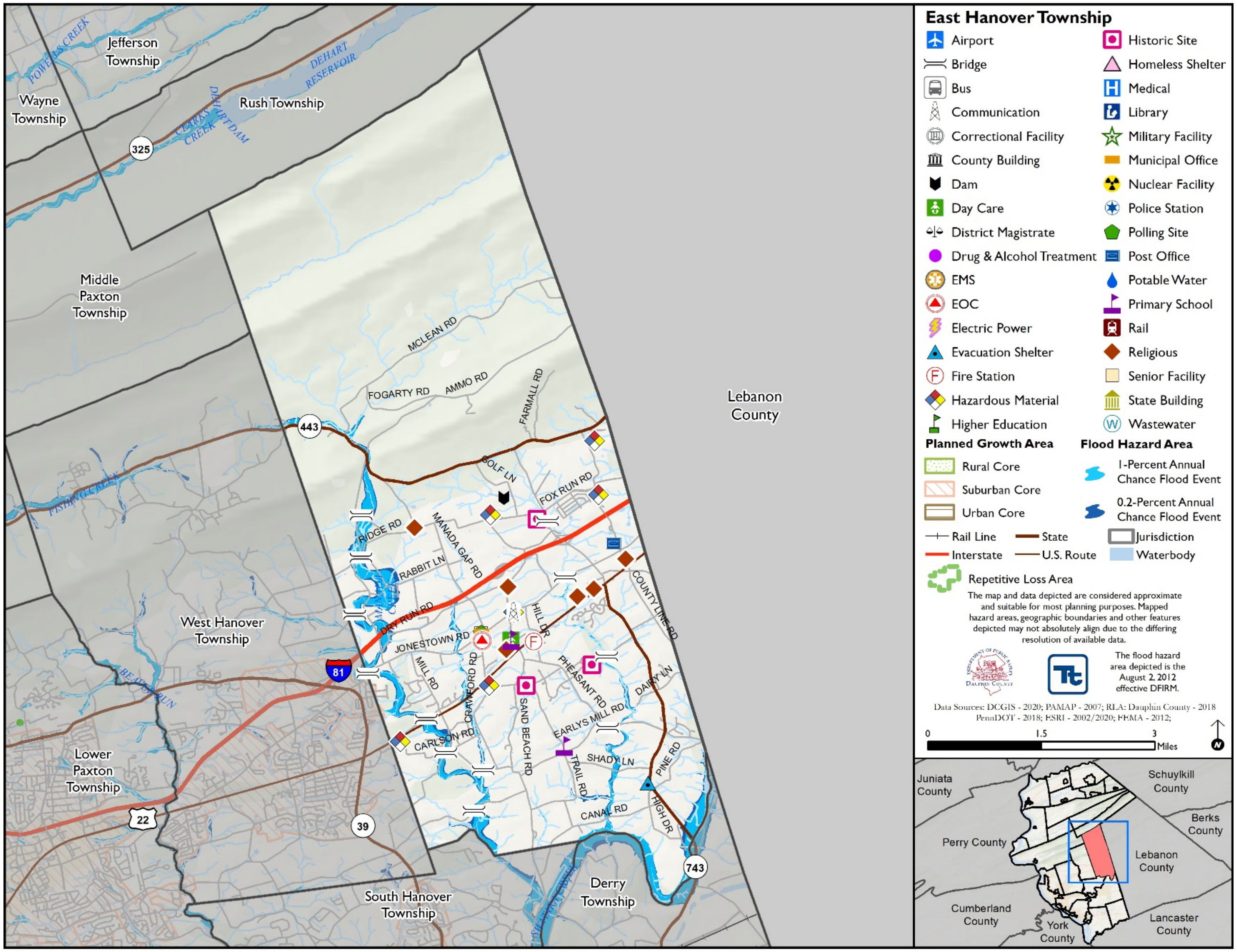
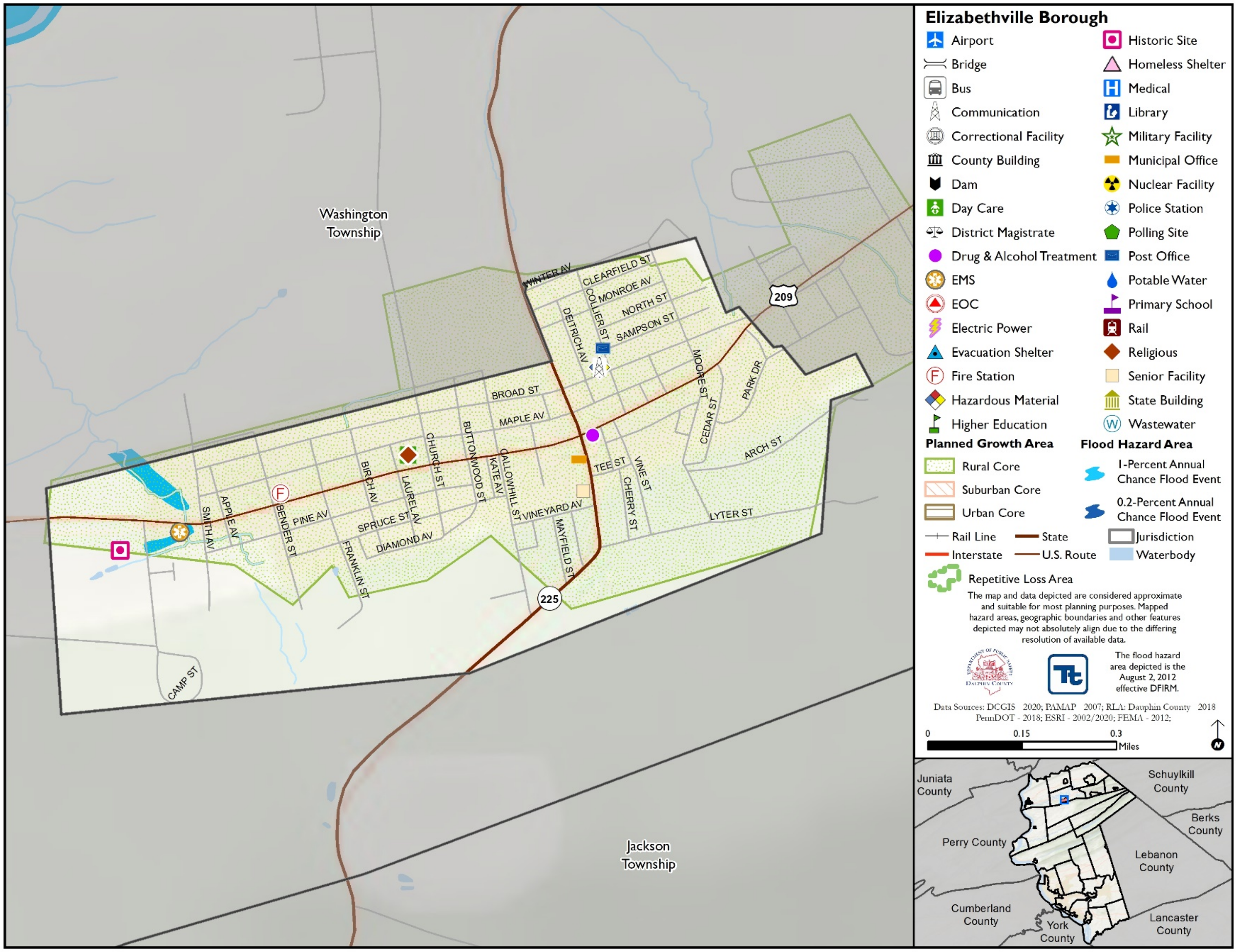
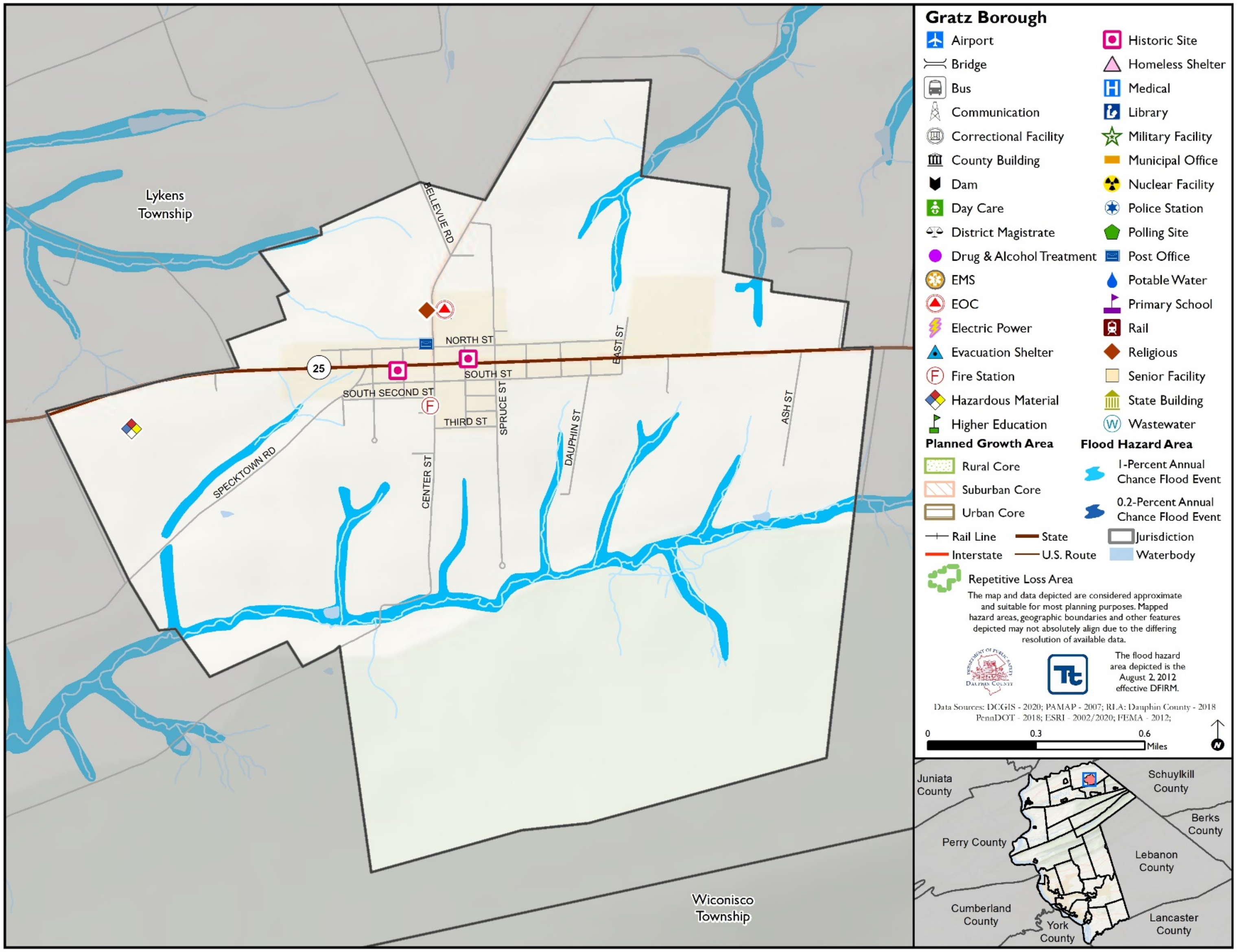


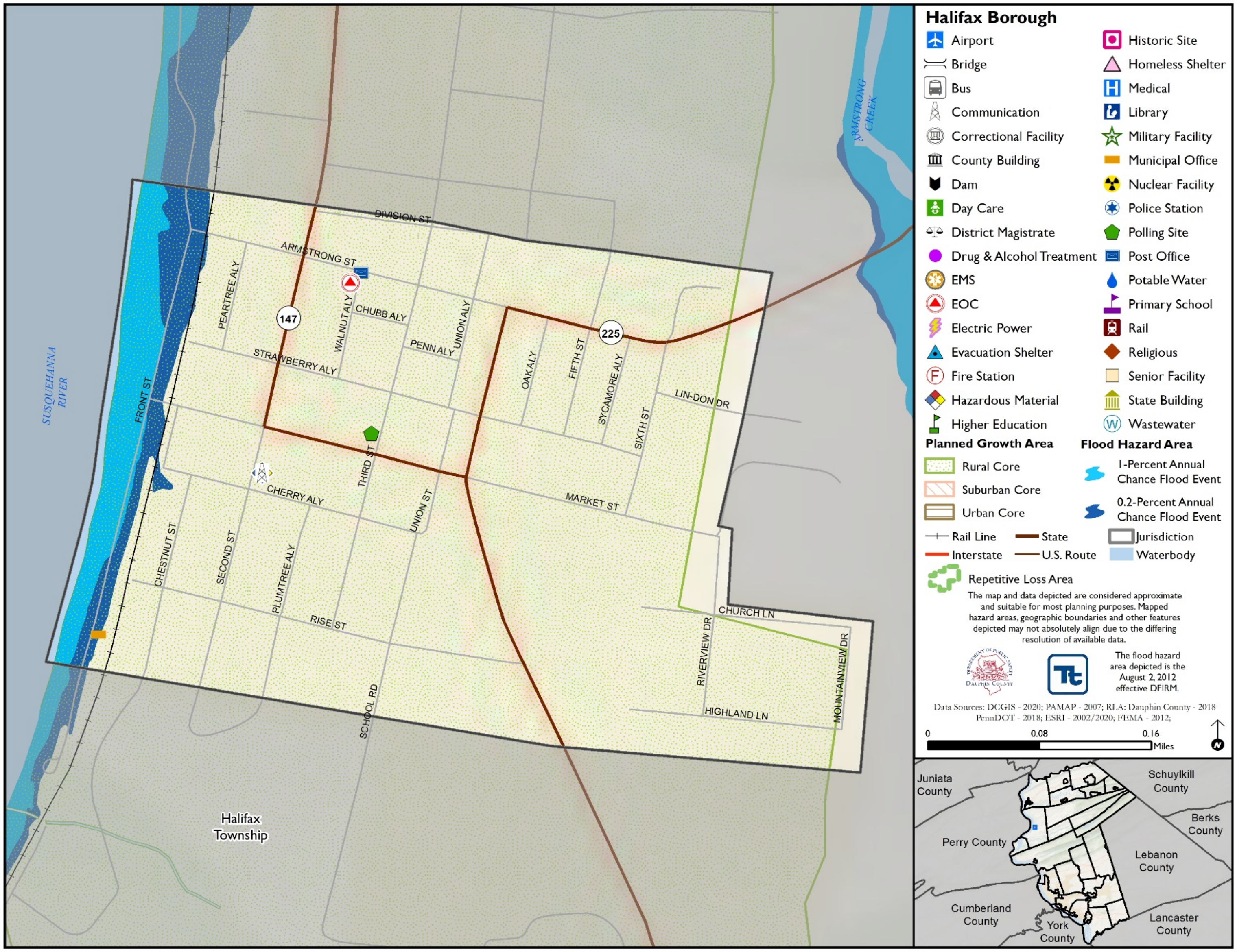
Elizabethville Borough



Gratz Borough



Halifax Borough



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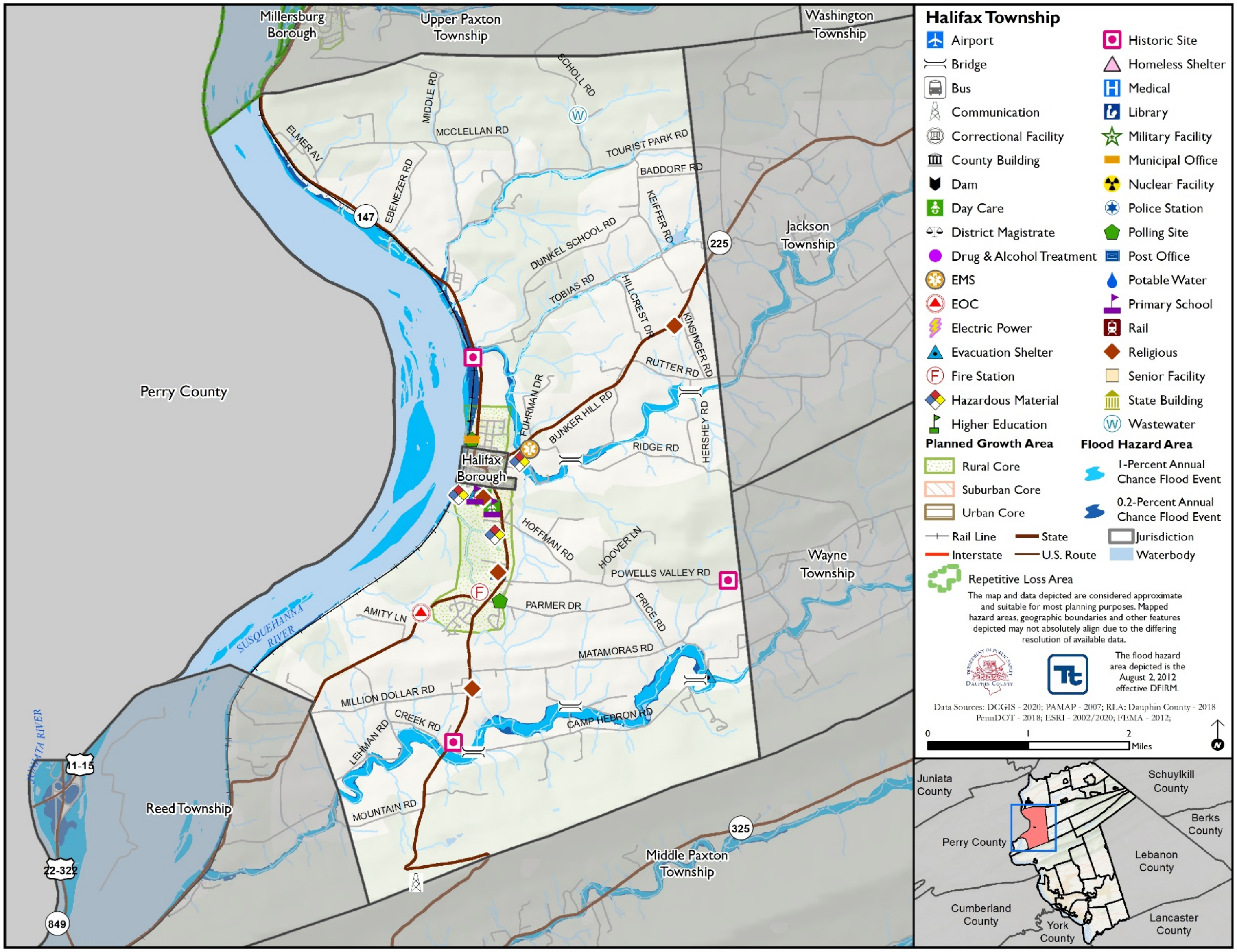
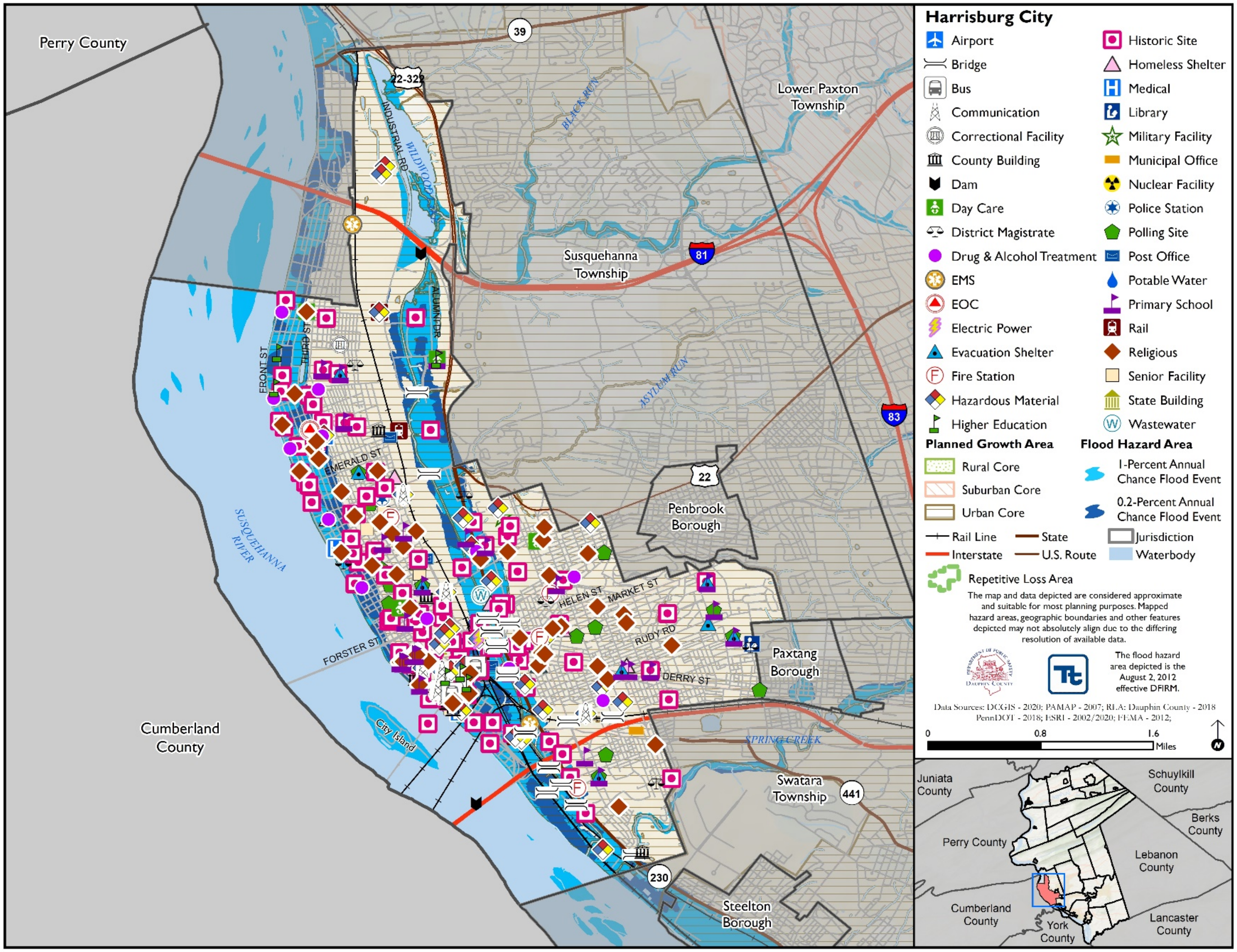
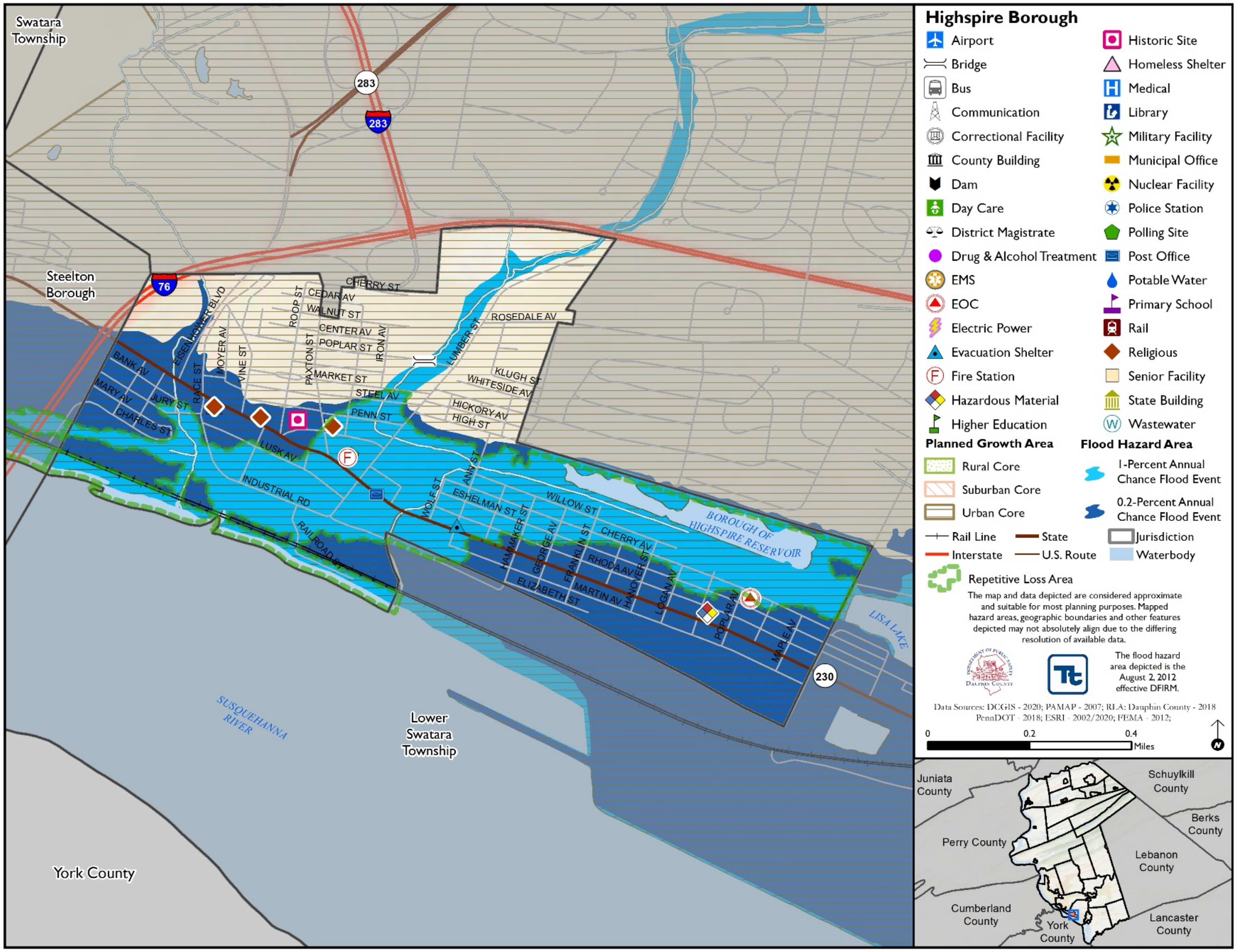


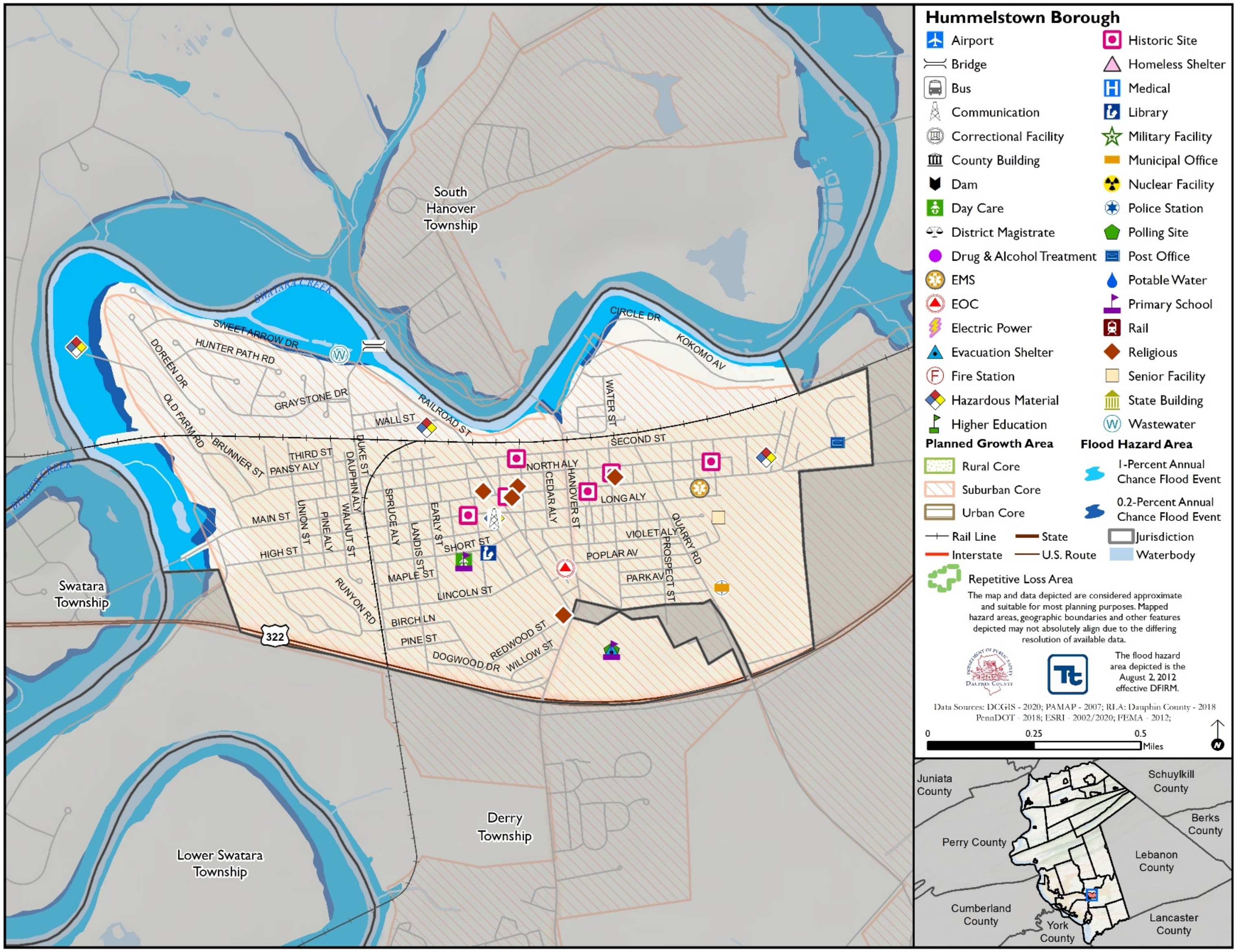
City of Harrisburg



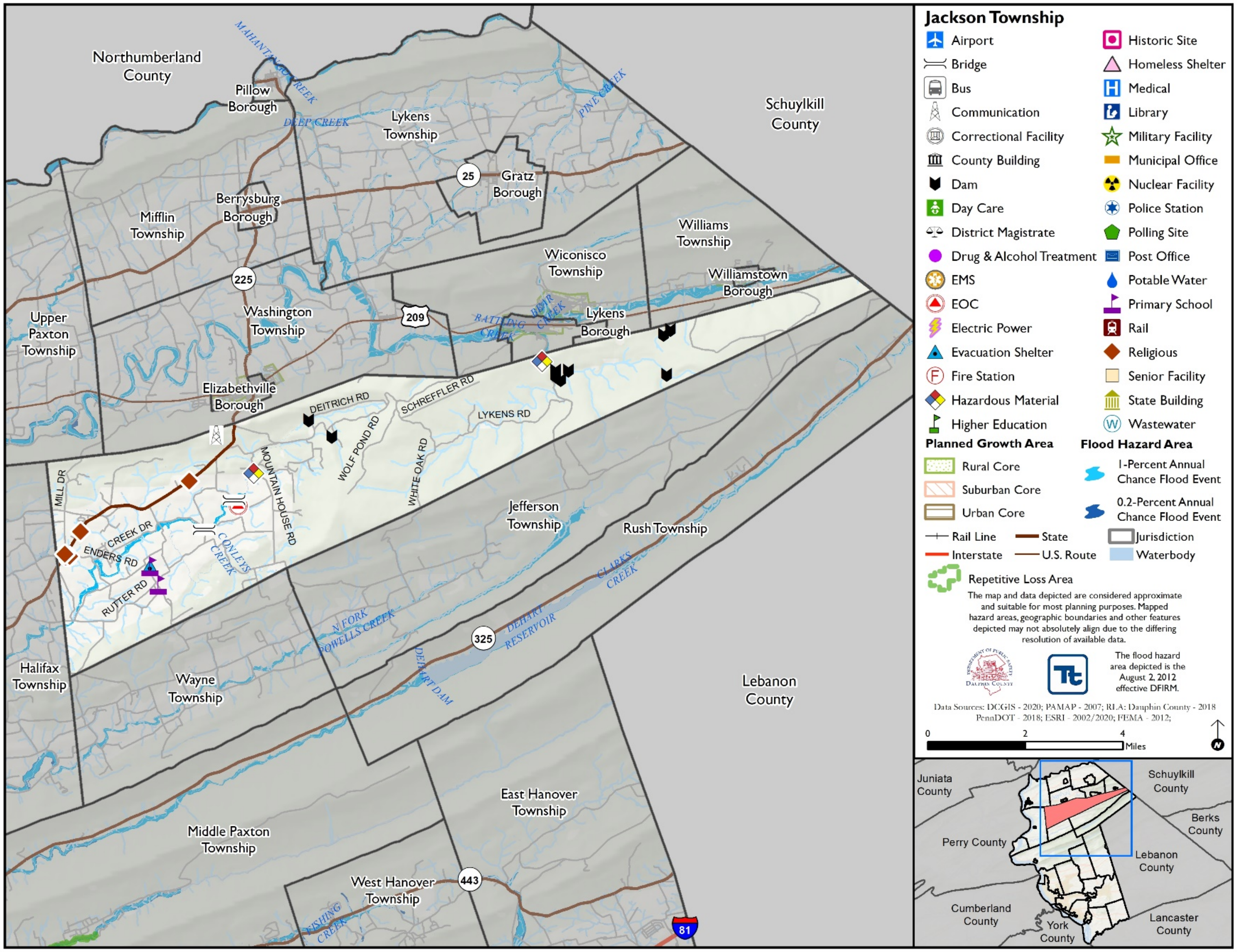
Highspire Borough



Hummelstown Borough



Jackson Township



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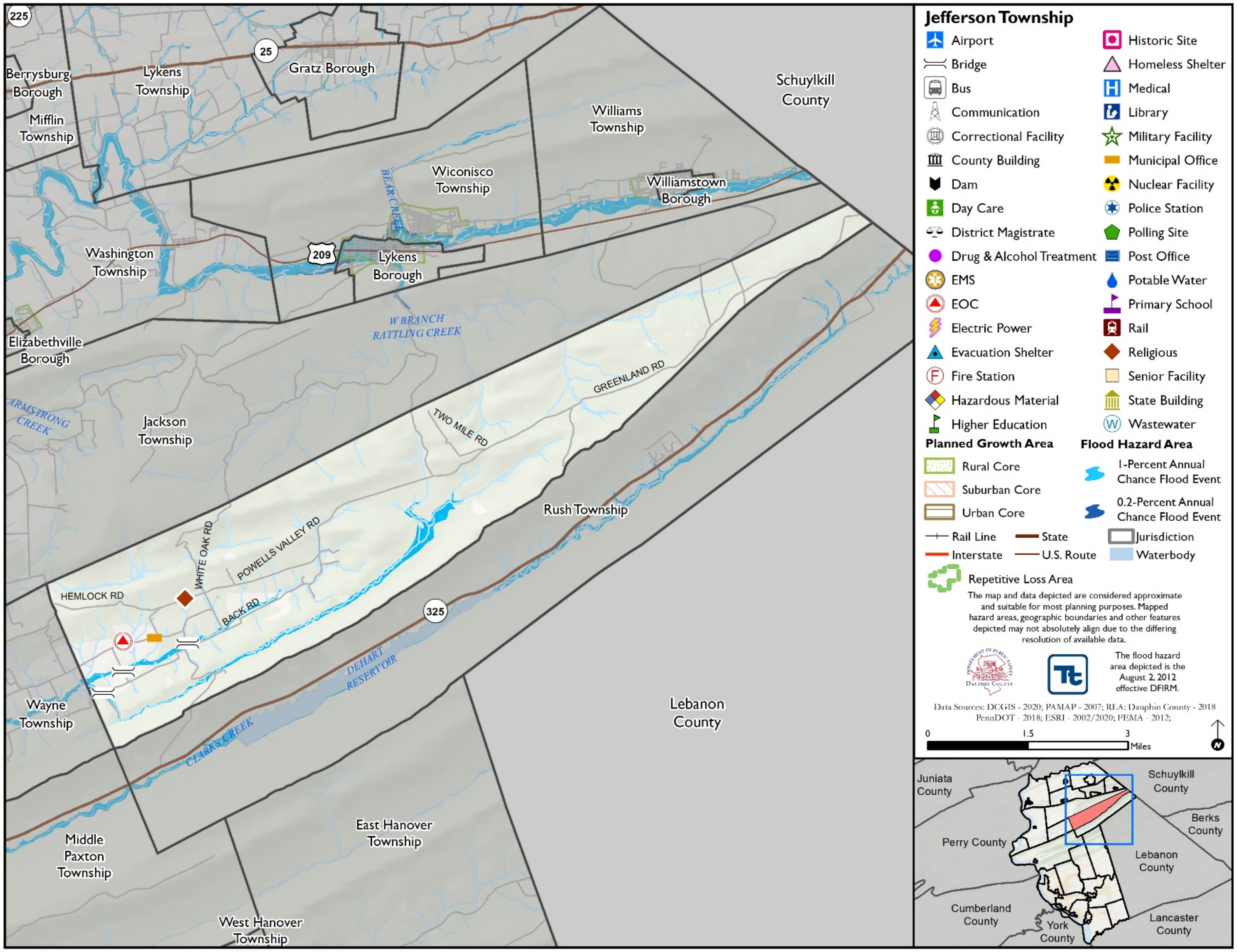
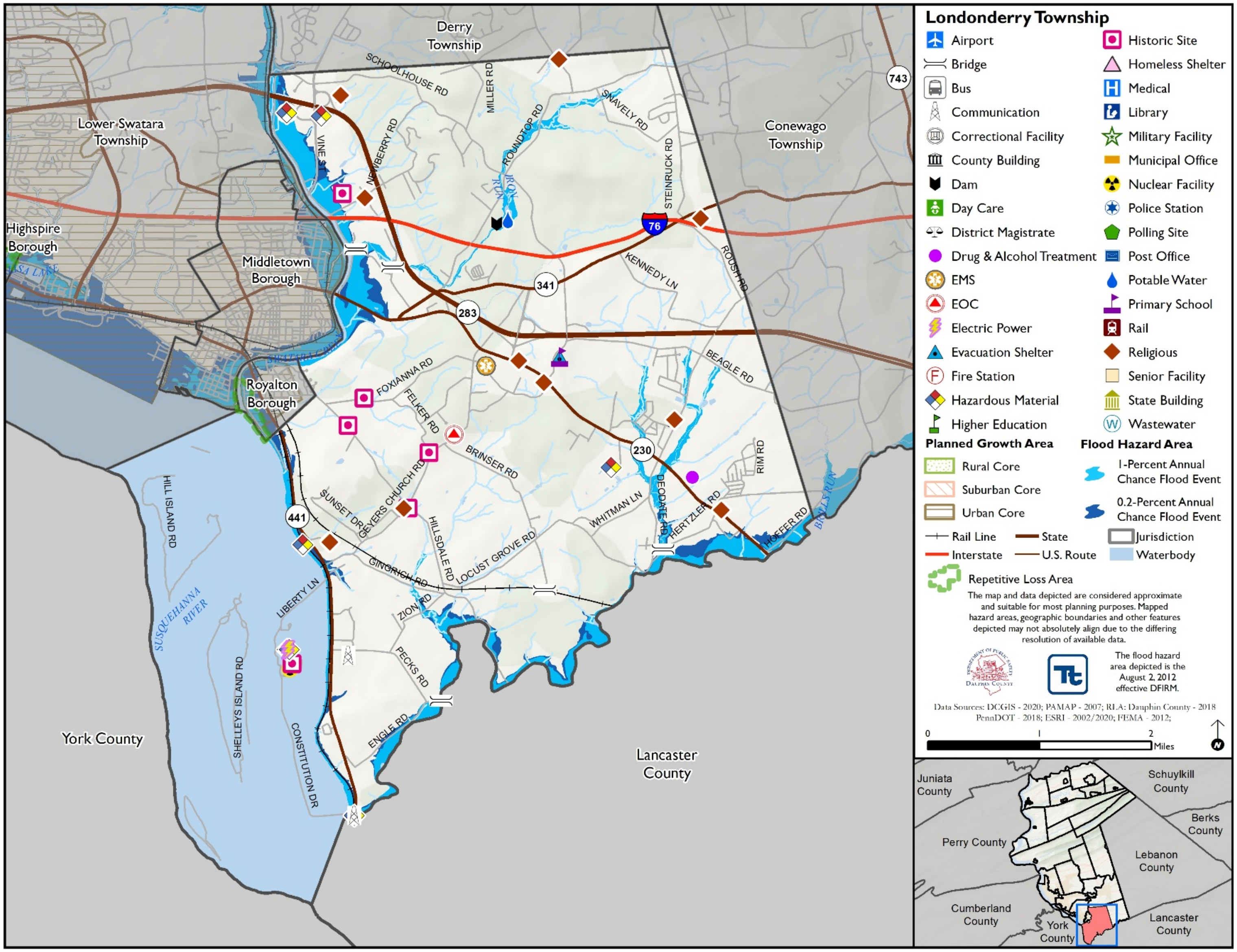
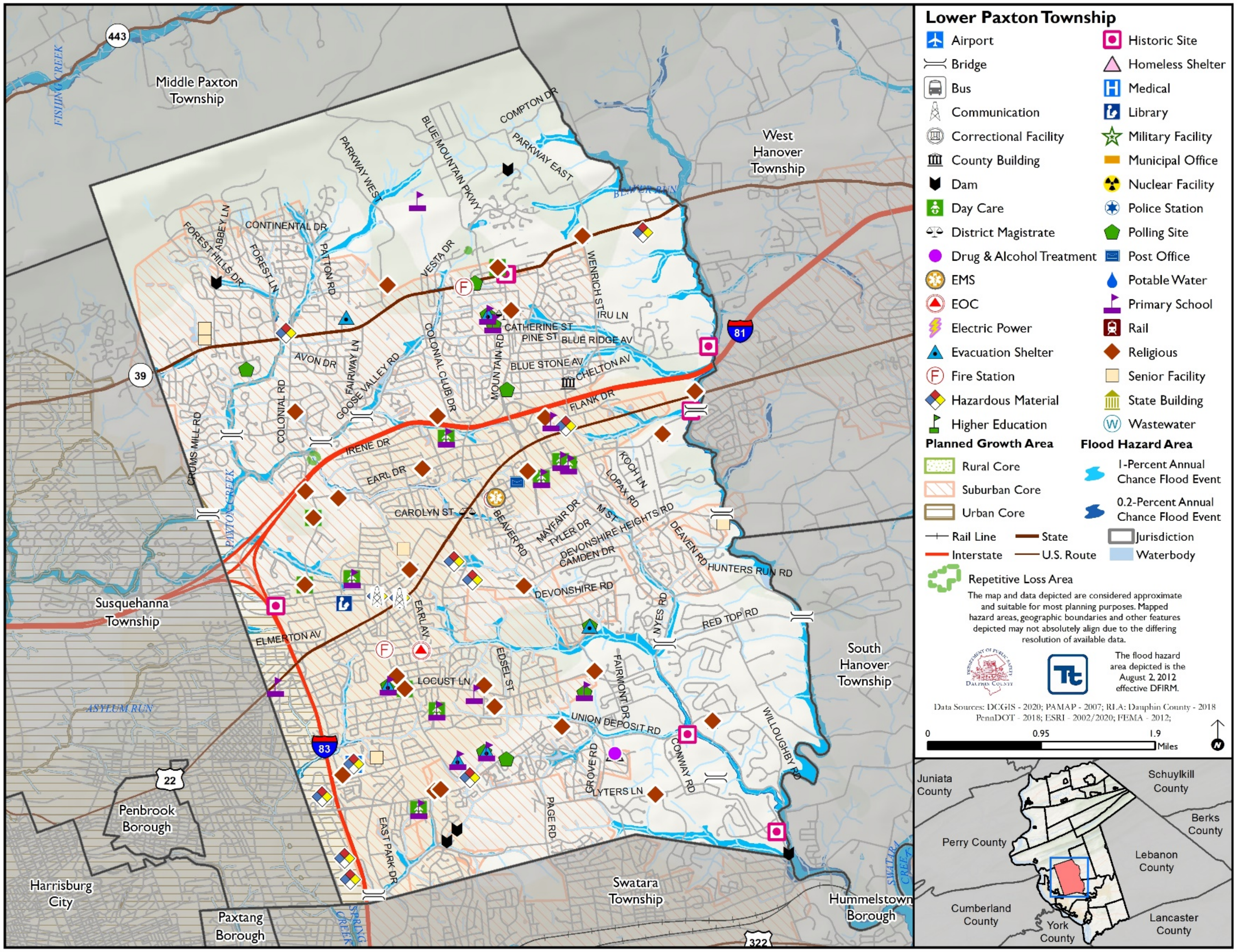


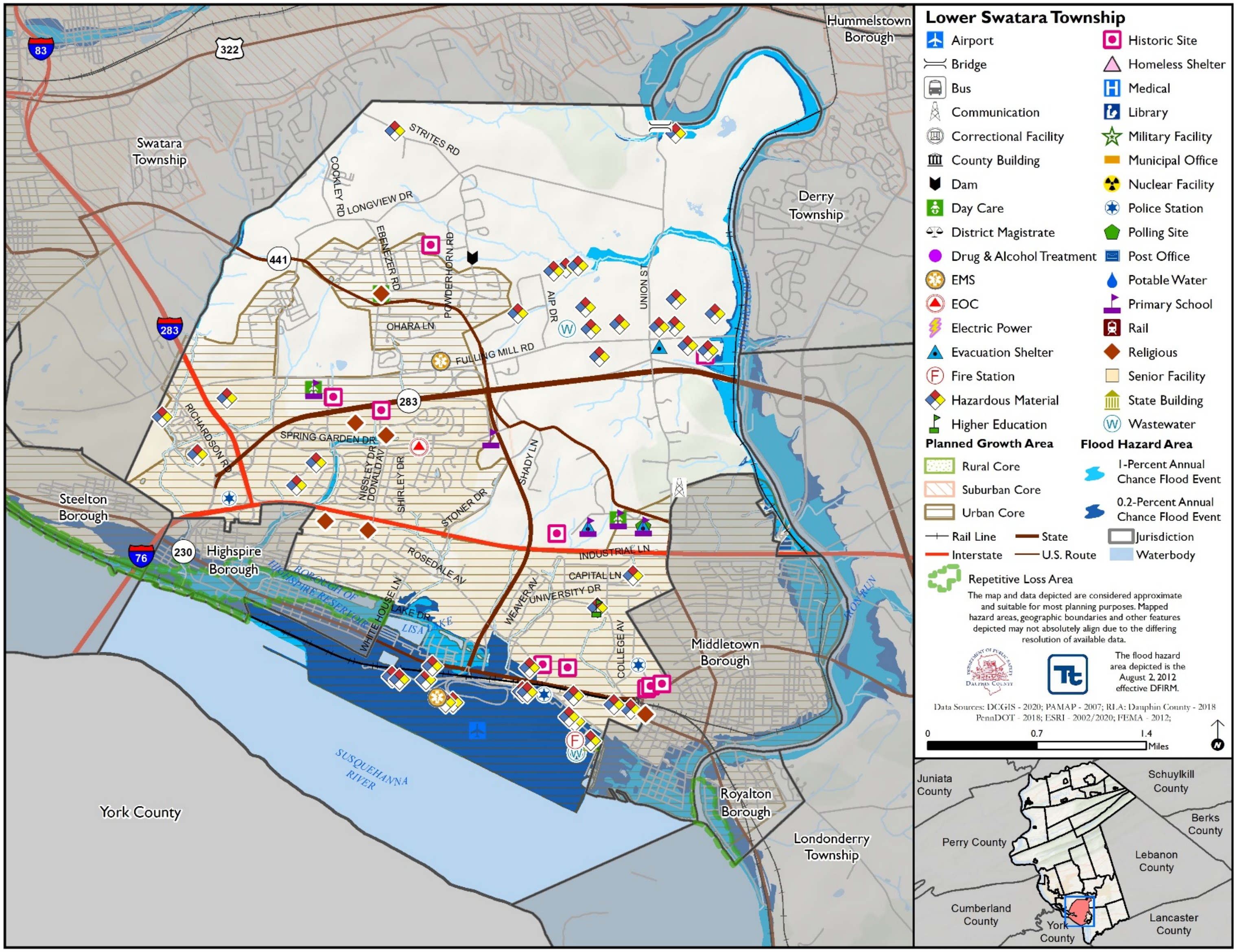
Londonderry Township



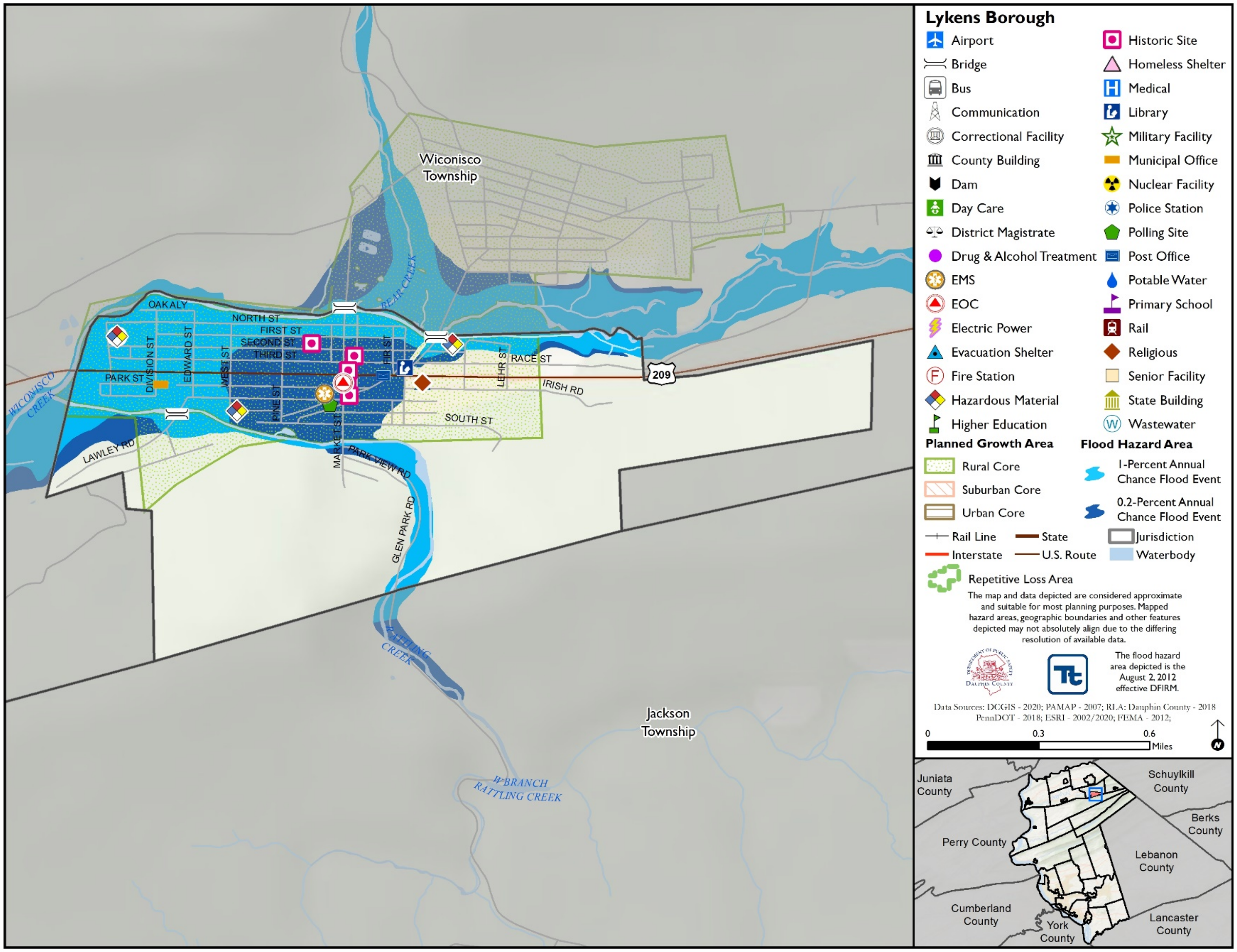
Lower Paxton Township



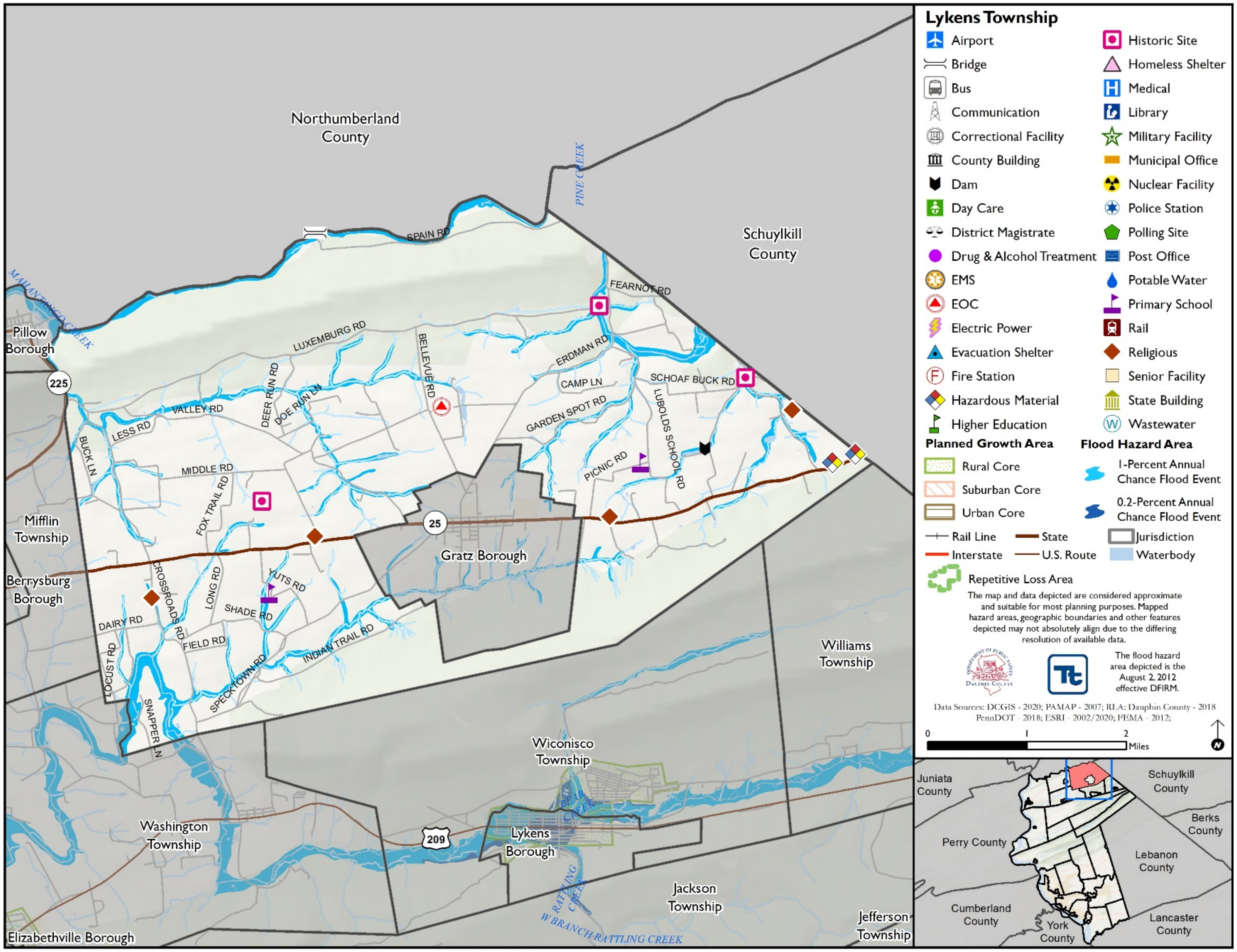
Lower Swatara Township



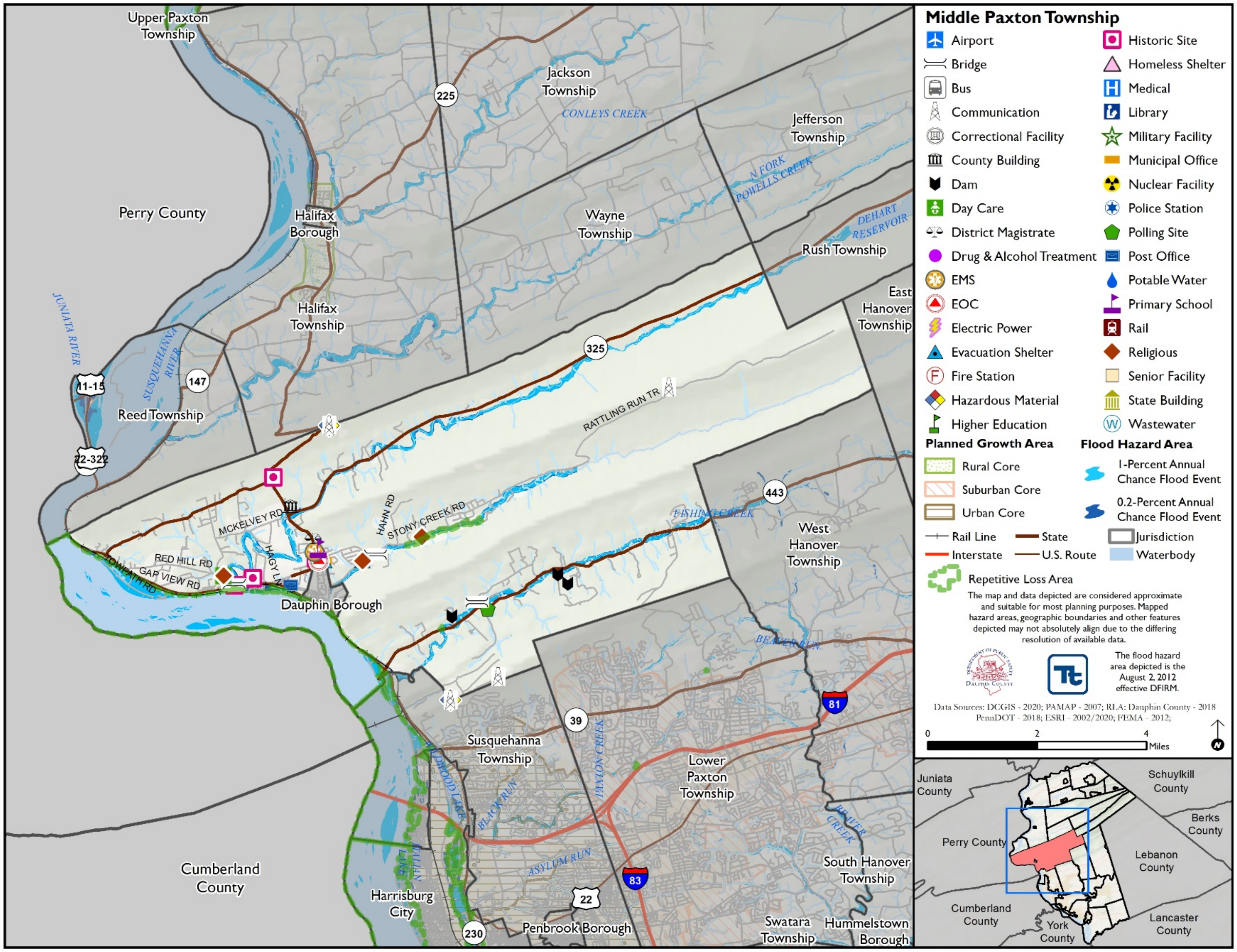
Lykens Borough



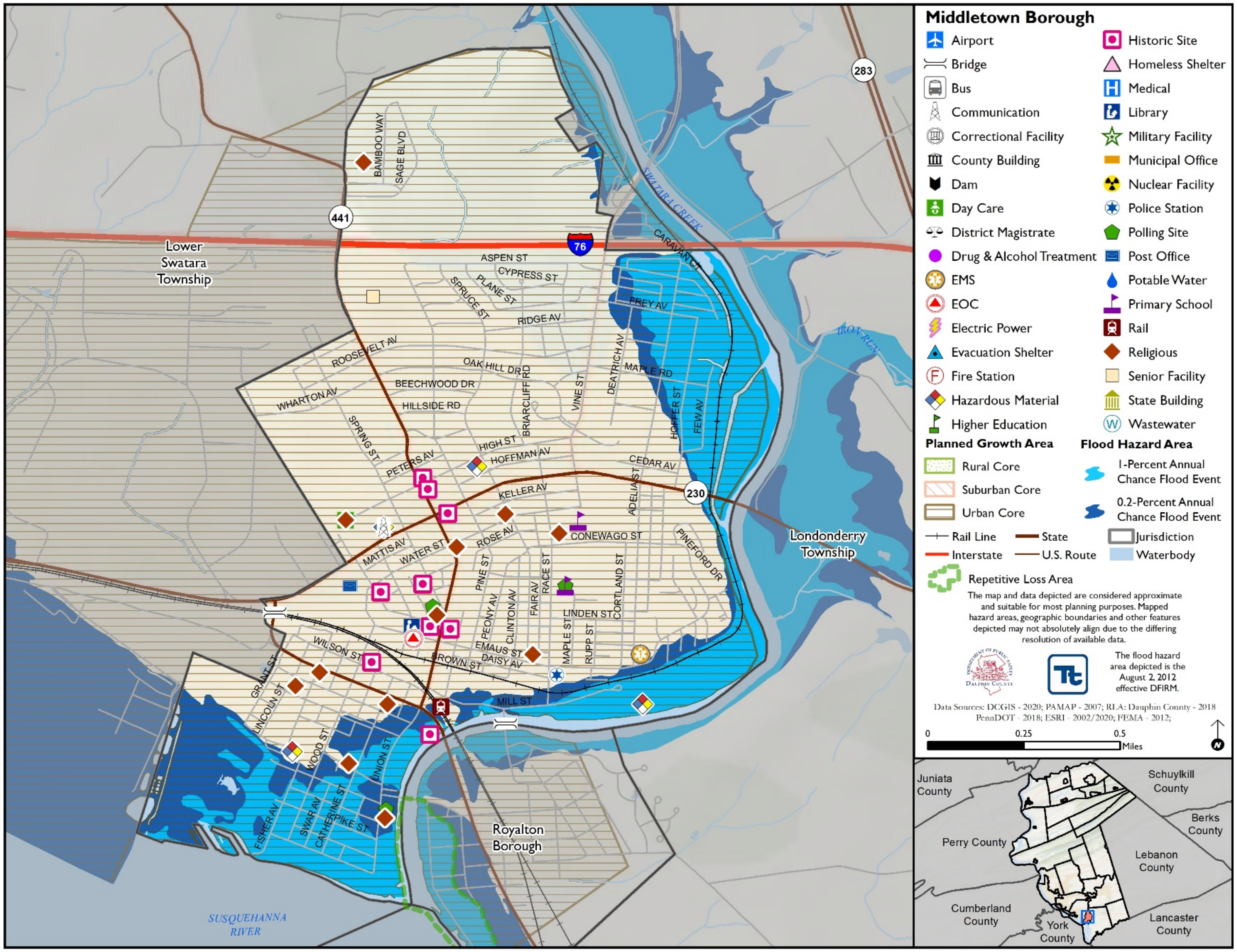
Lykens Township



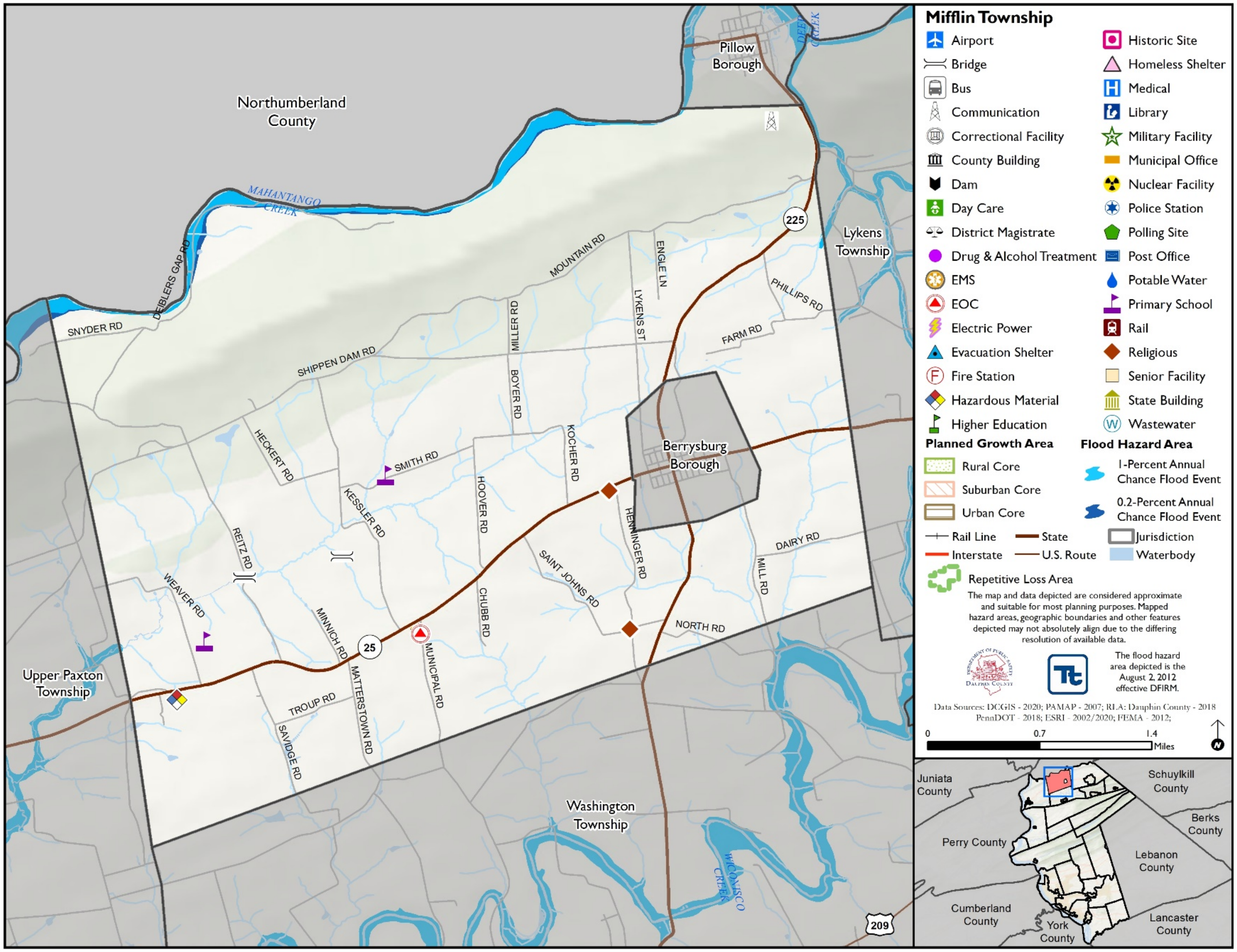
Middle Paxton Township



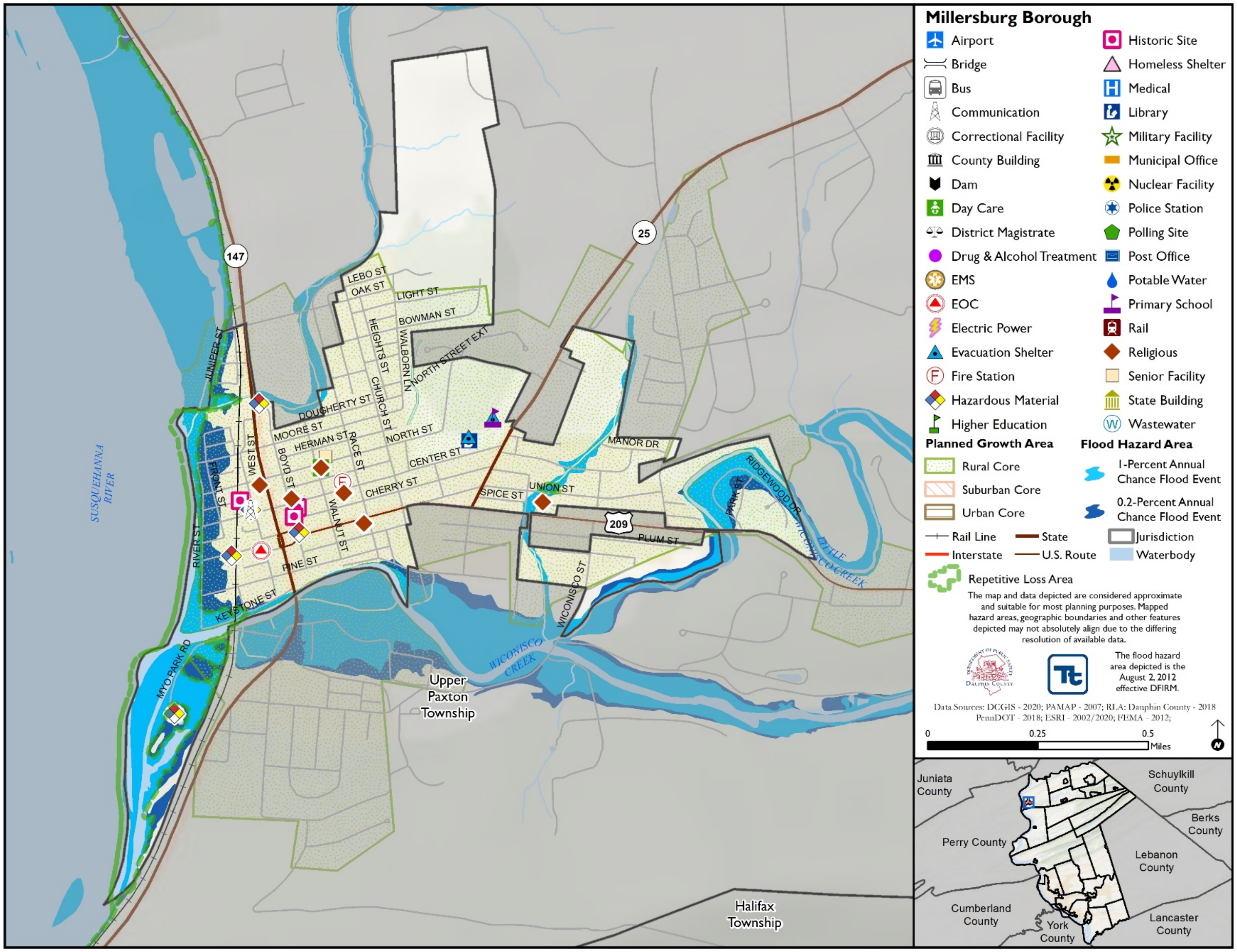
Middletown Borough



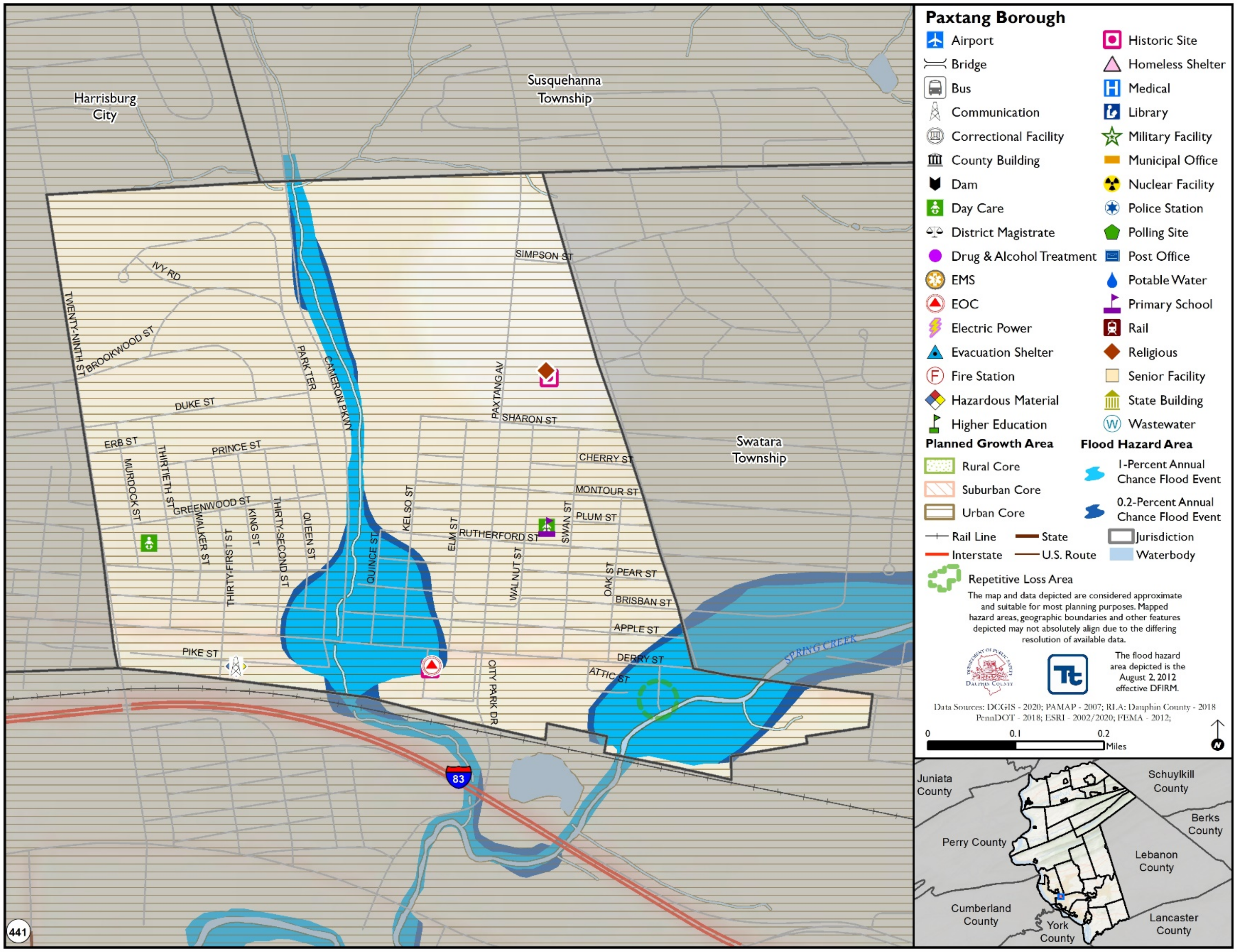
Mifflin Township



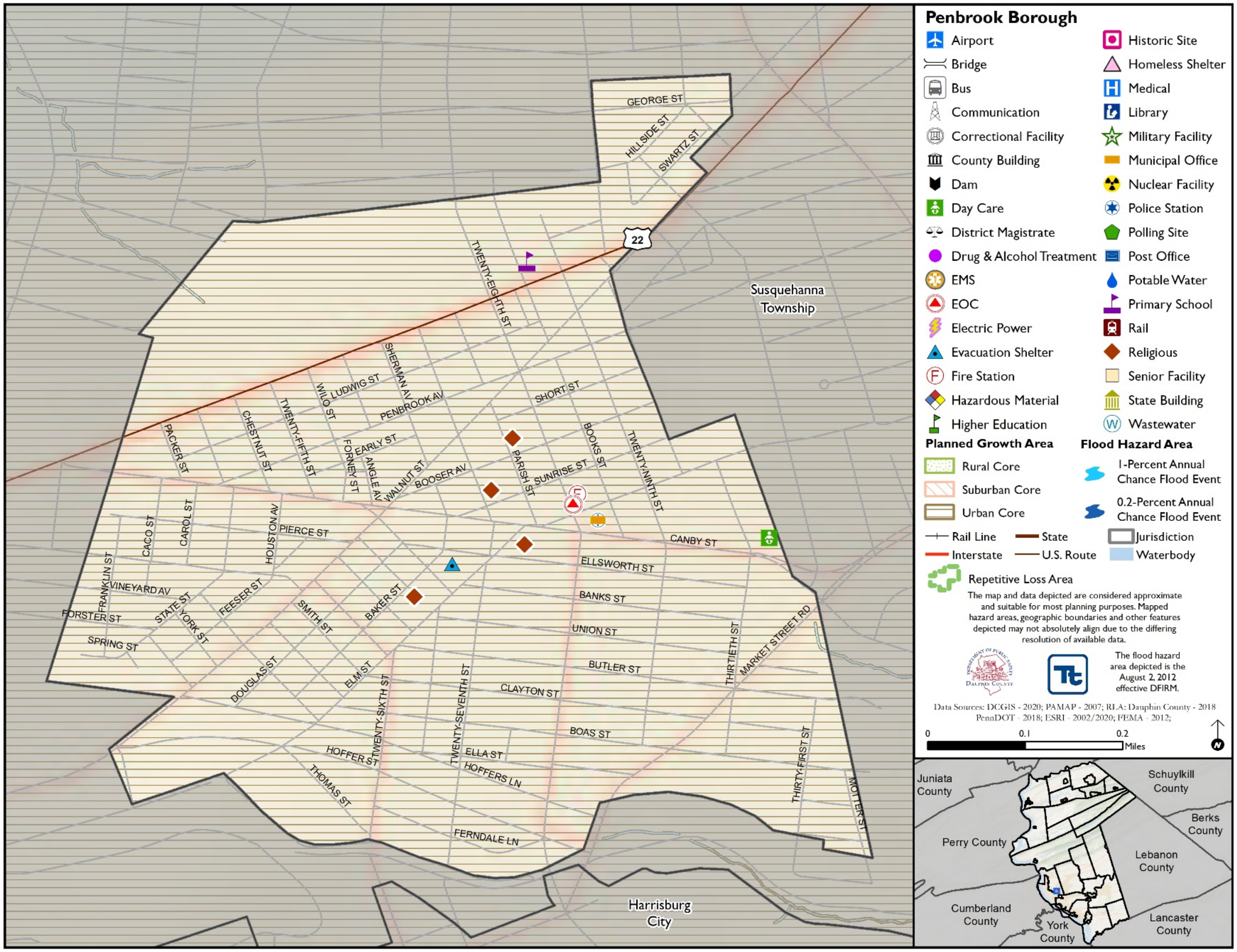
Millersburg Borough



Paxtang Borough

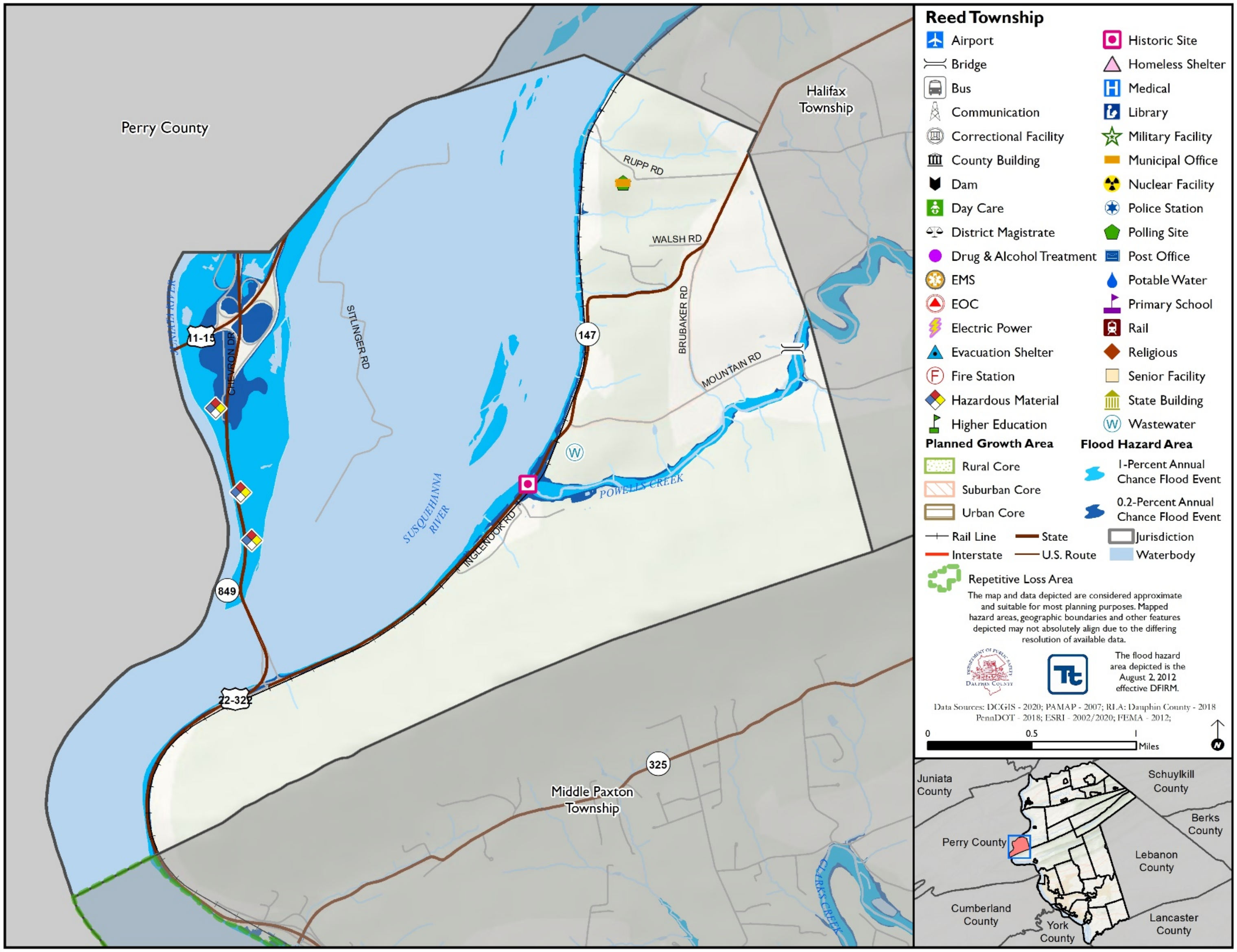


Penbrook Borough

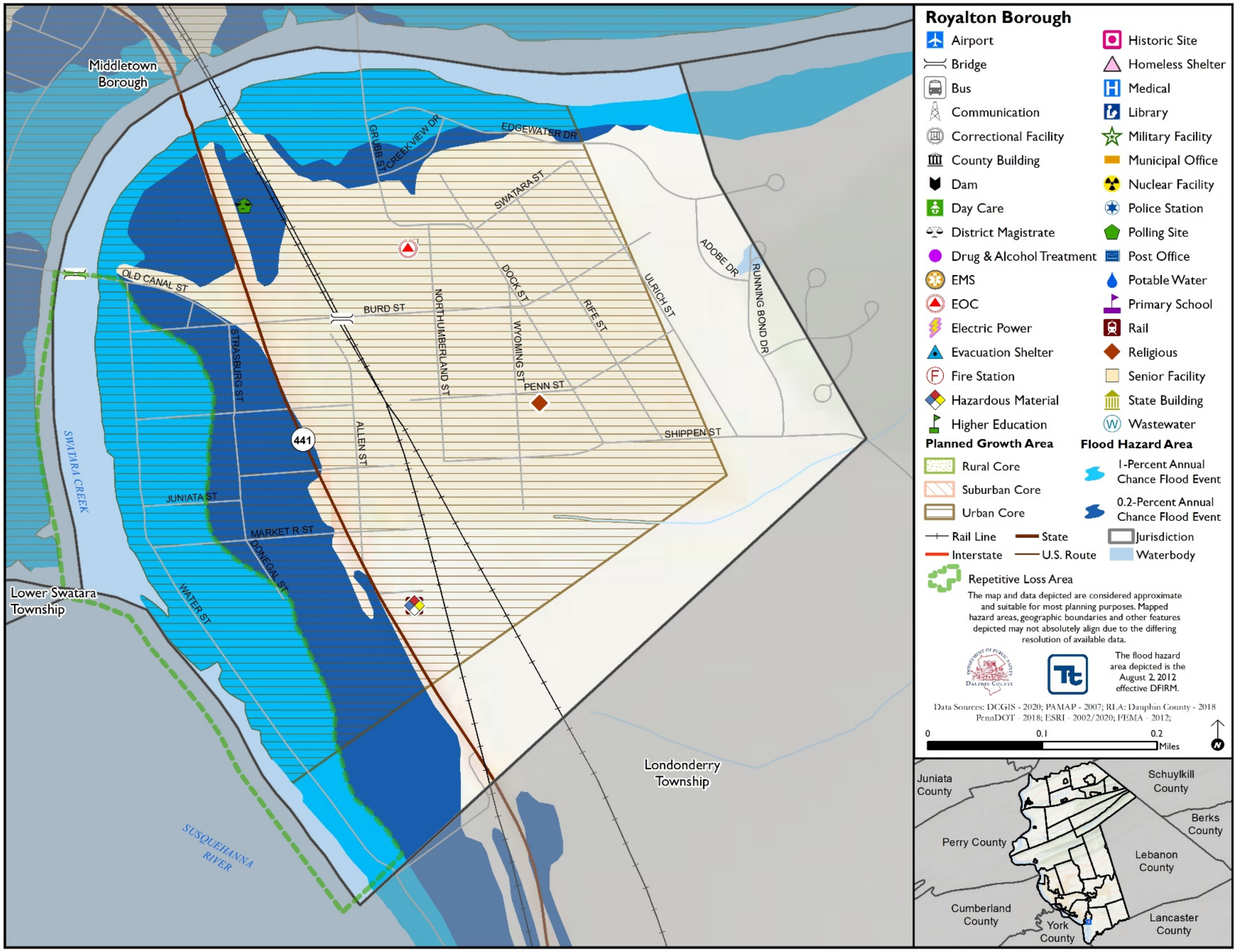


Pillow Borough

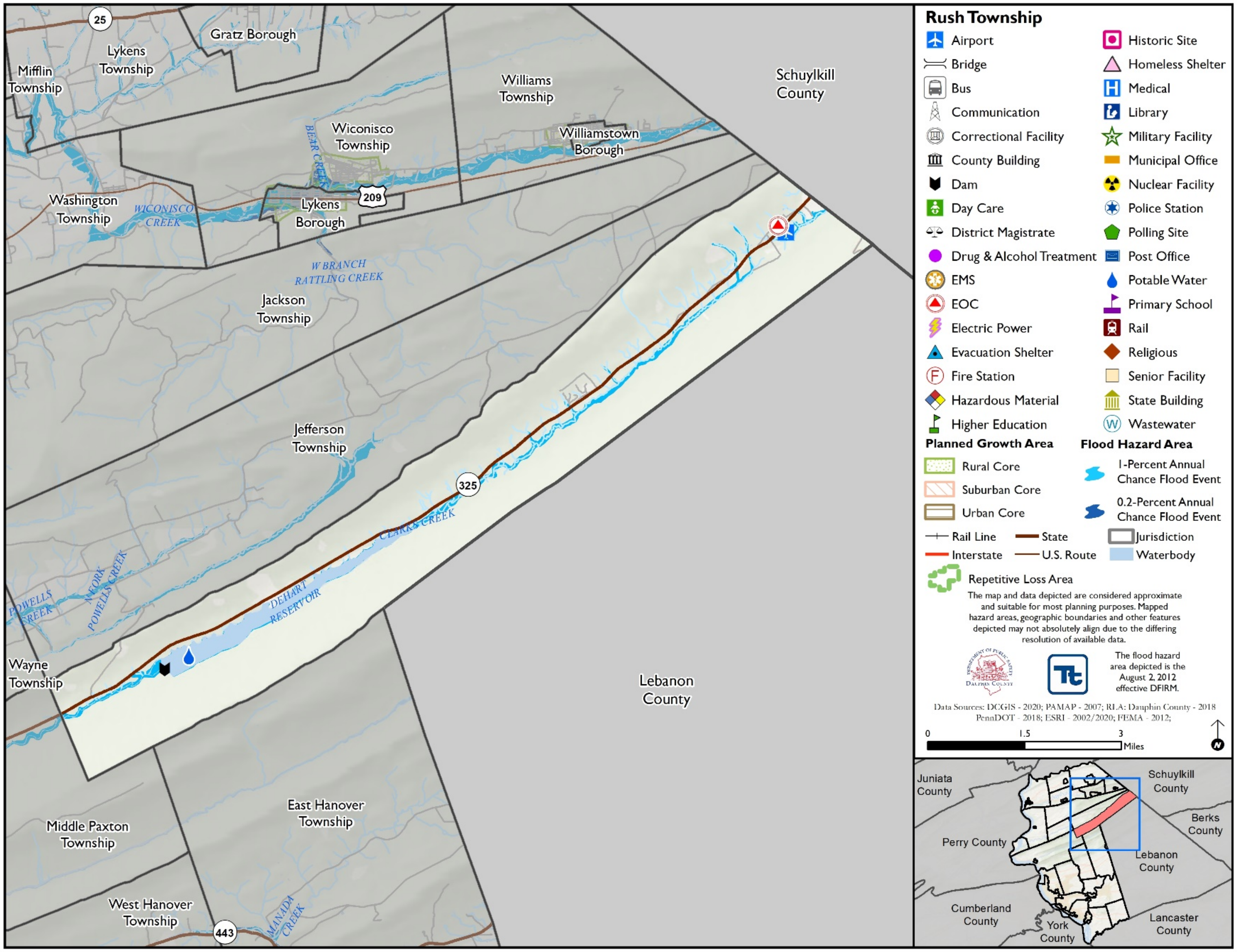
Reed Township



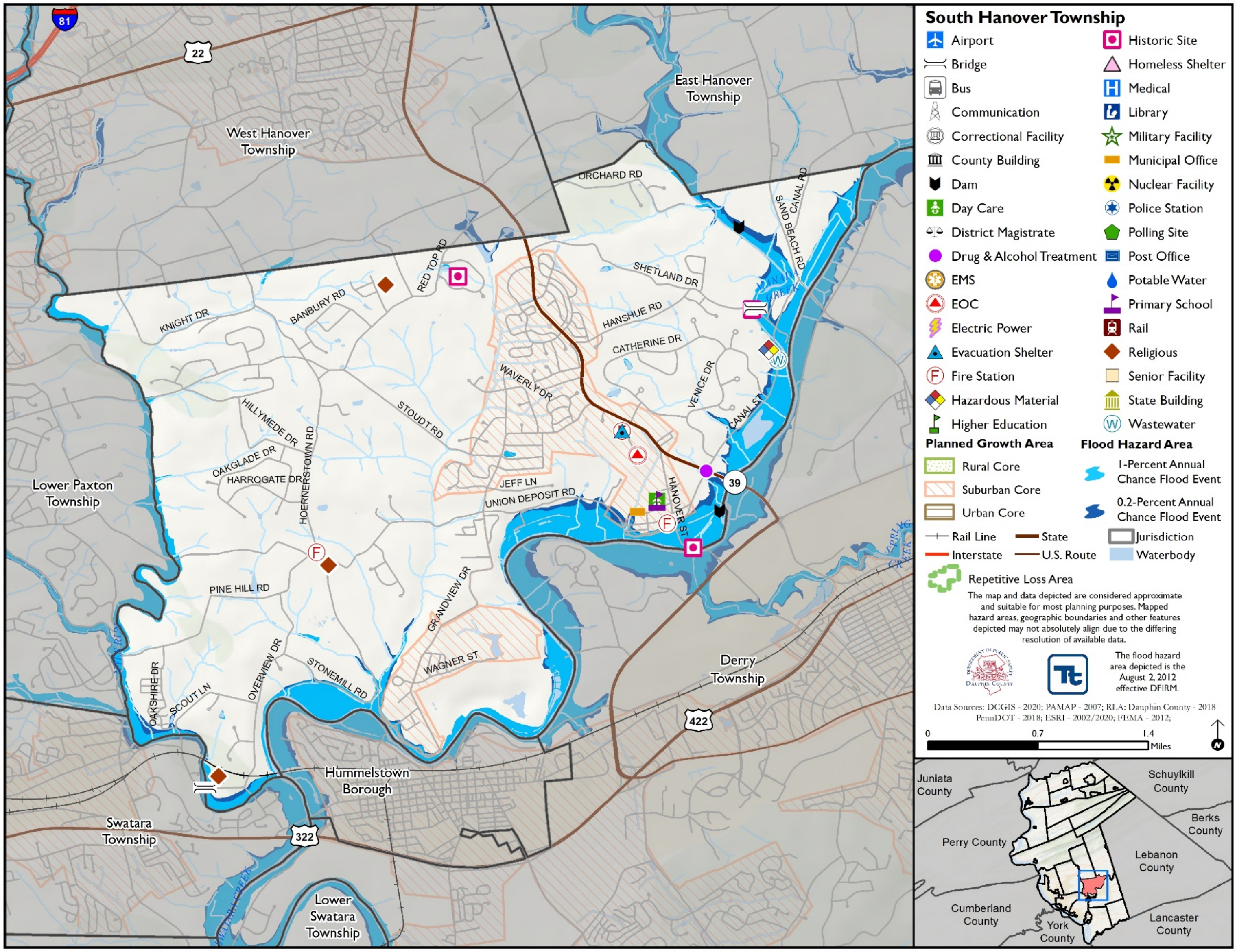
Royalton Borough



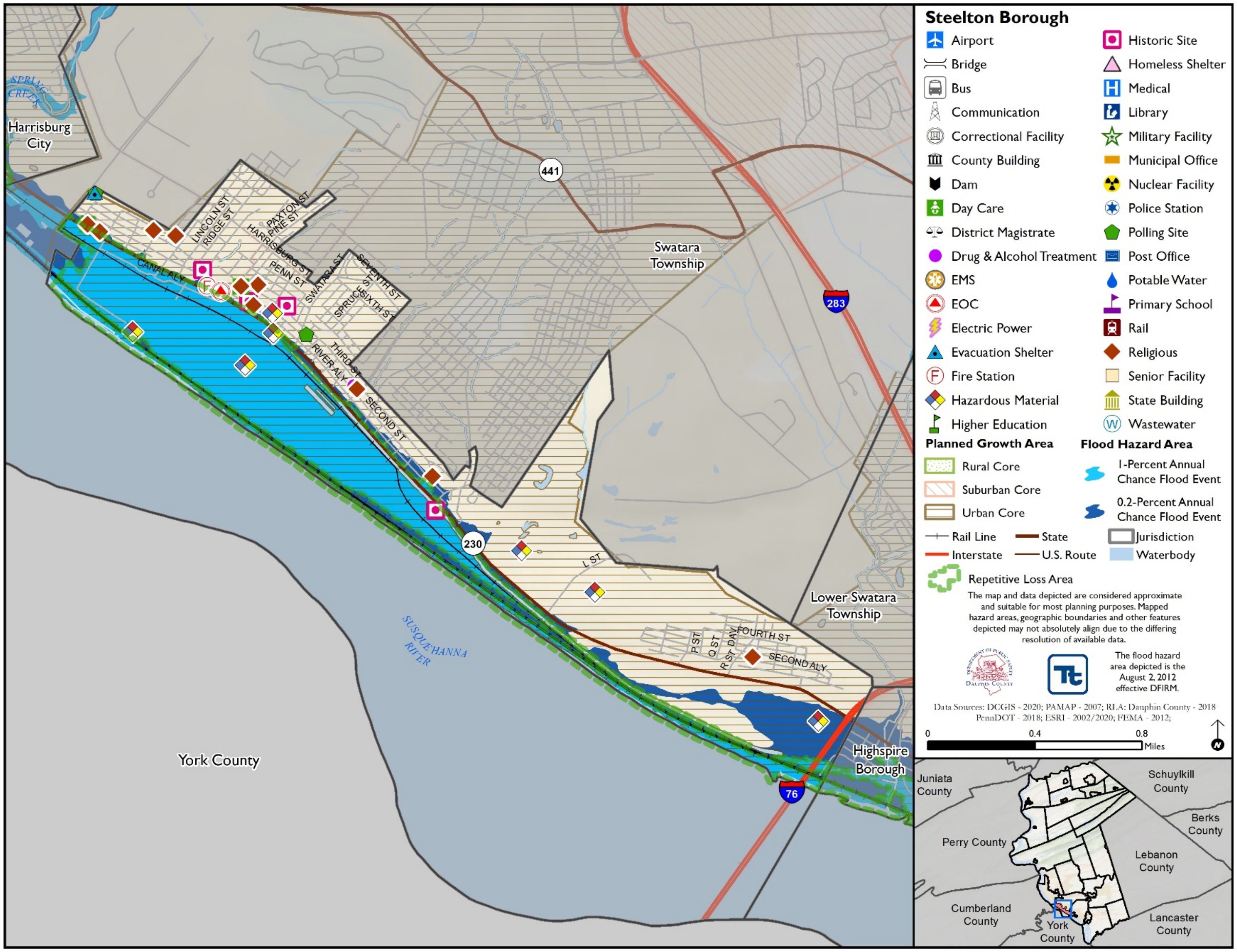
Rush Township



South Hanover Township



Steelton Borough



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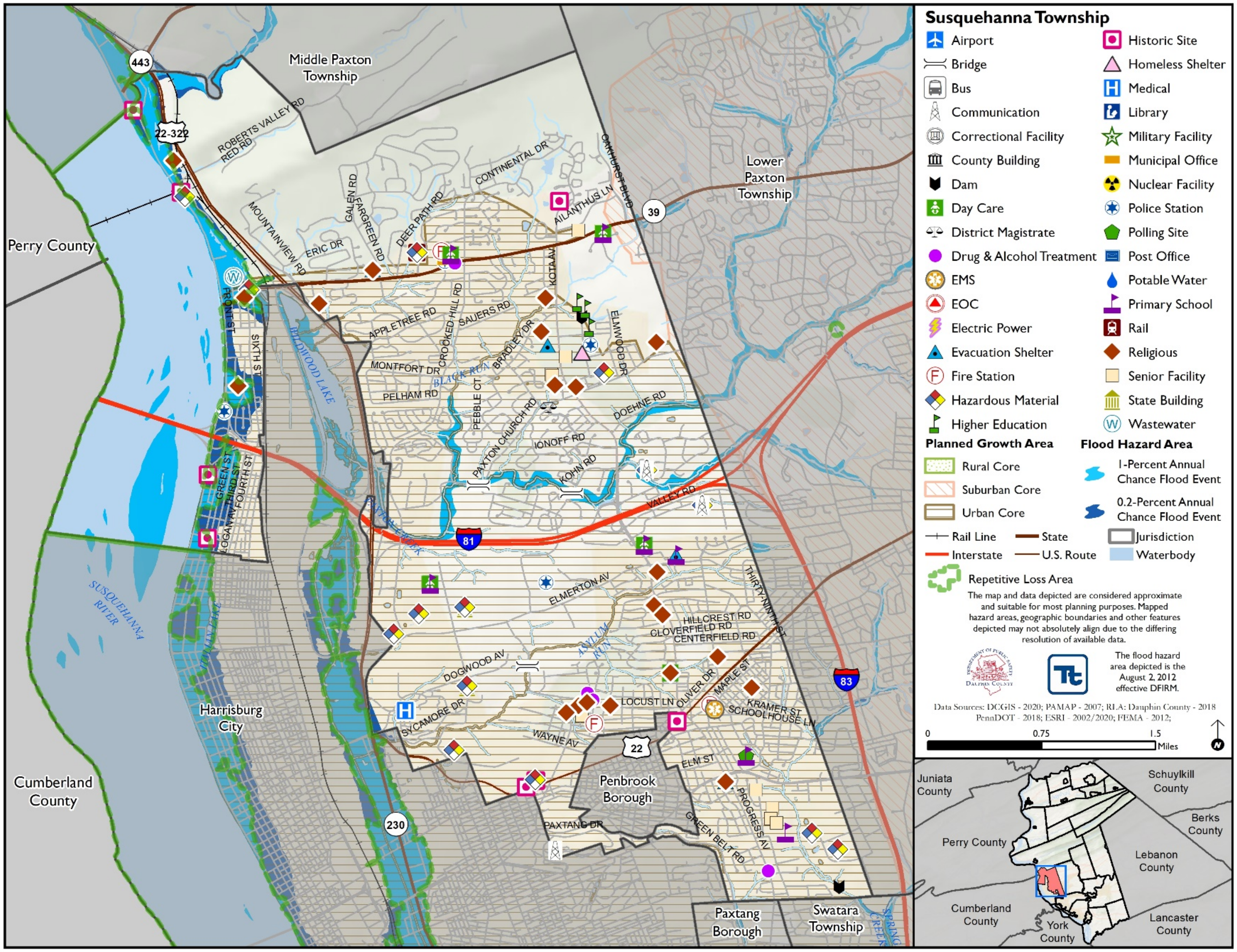
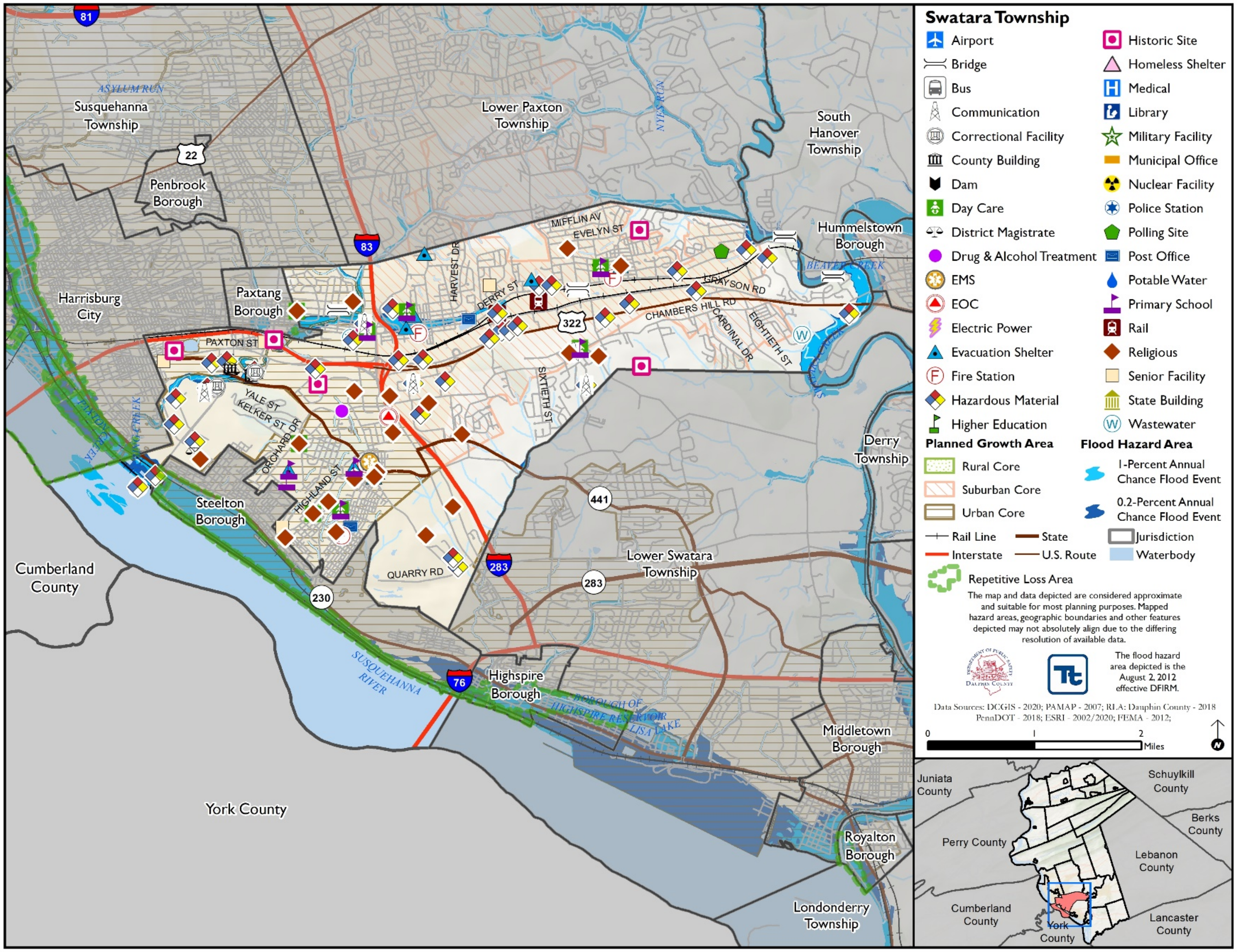
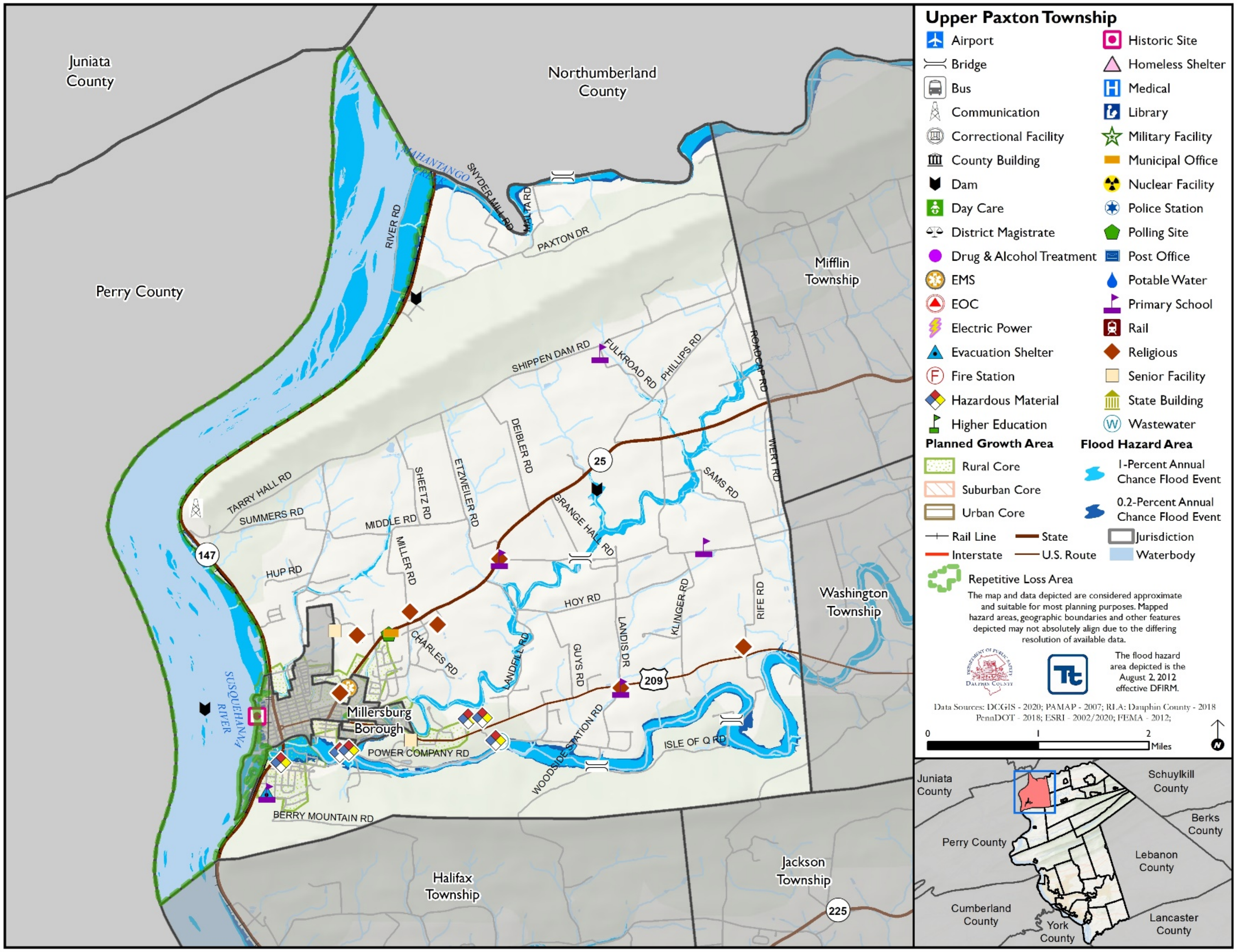


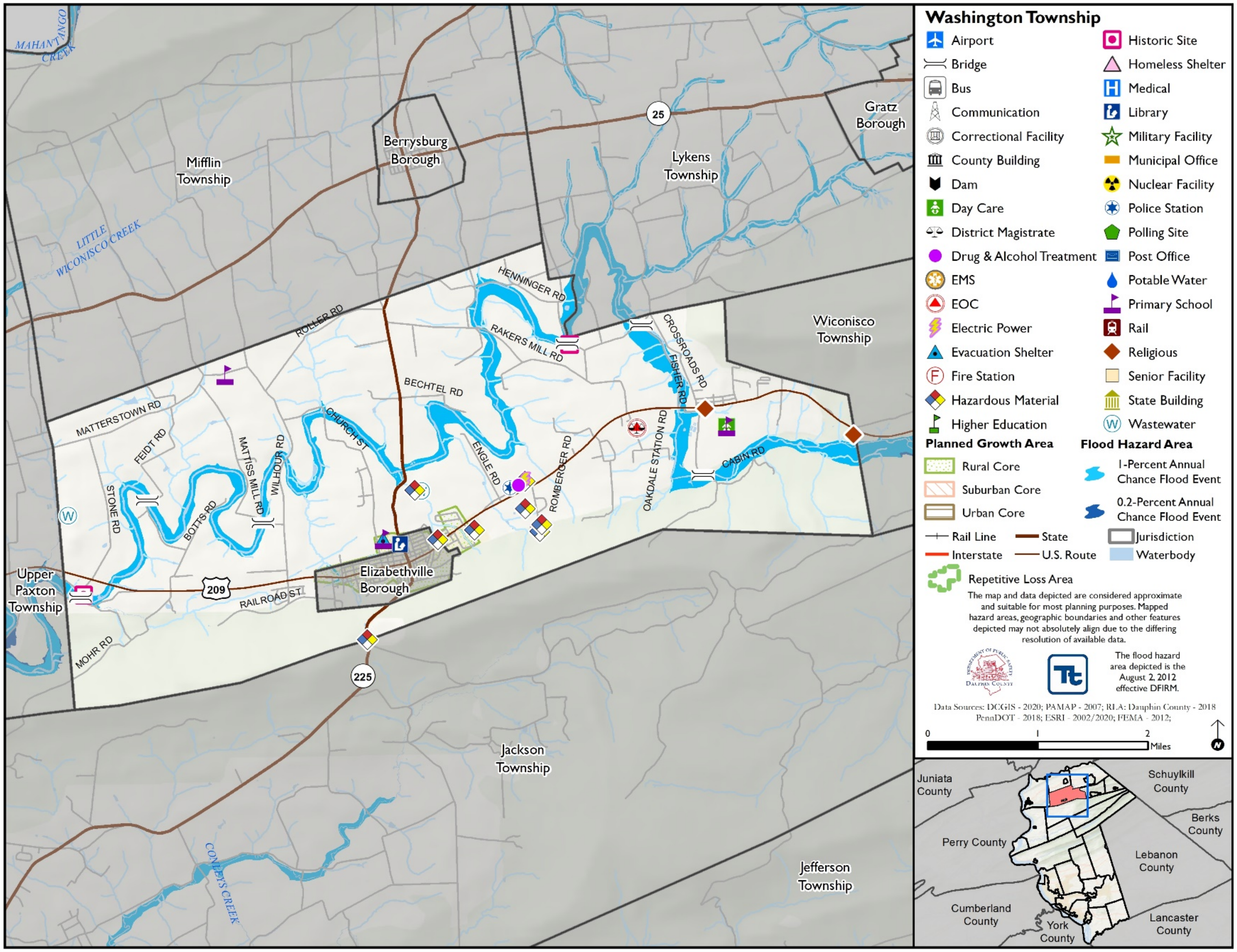
Swatara Township



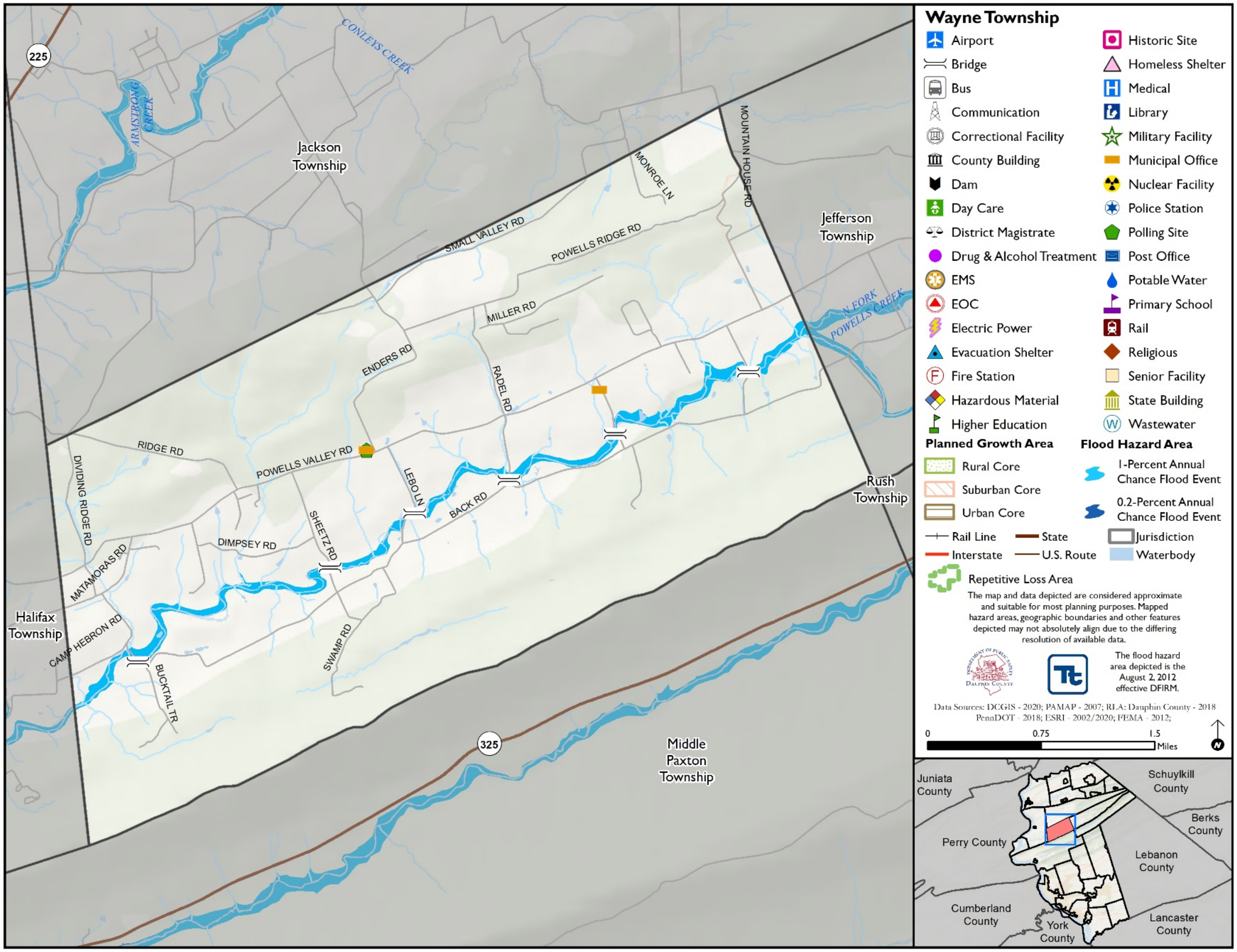
Upper Paxton Township



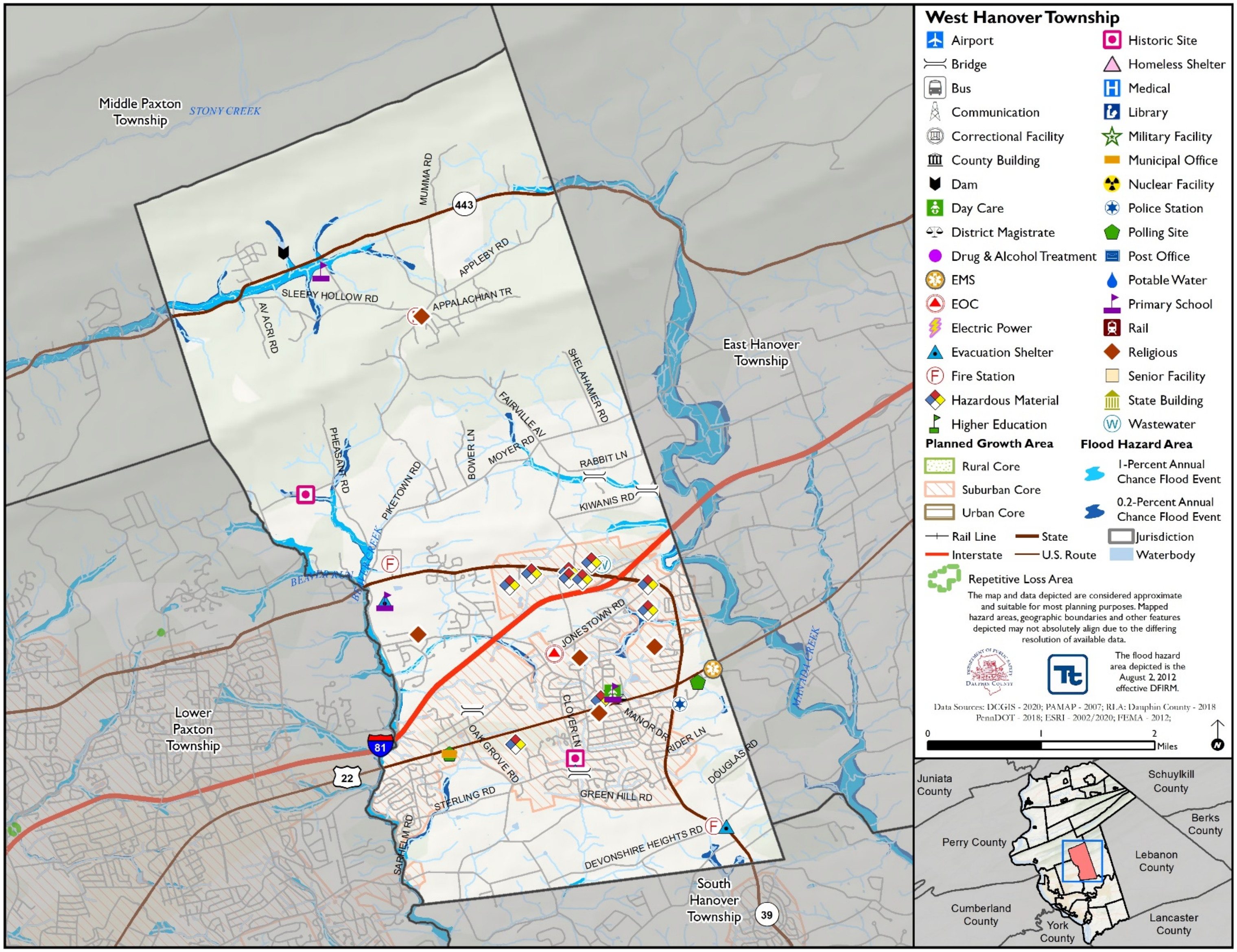
Washington Township



Wayne Township



West Hanover Township



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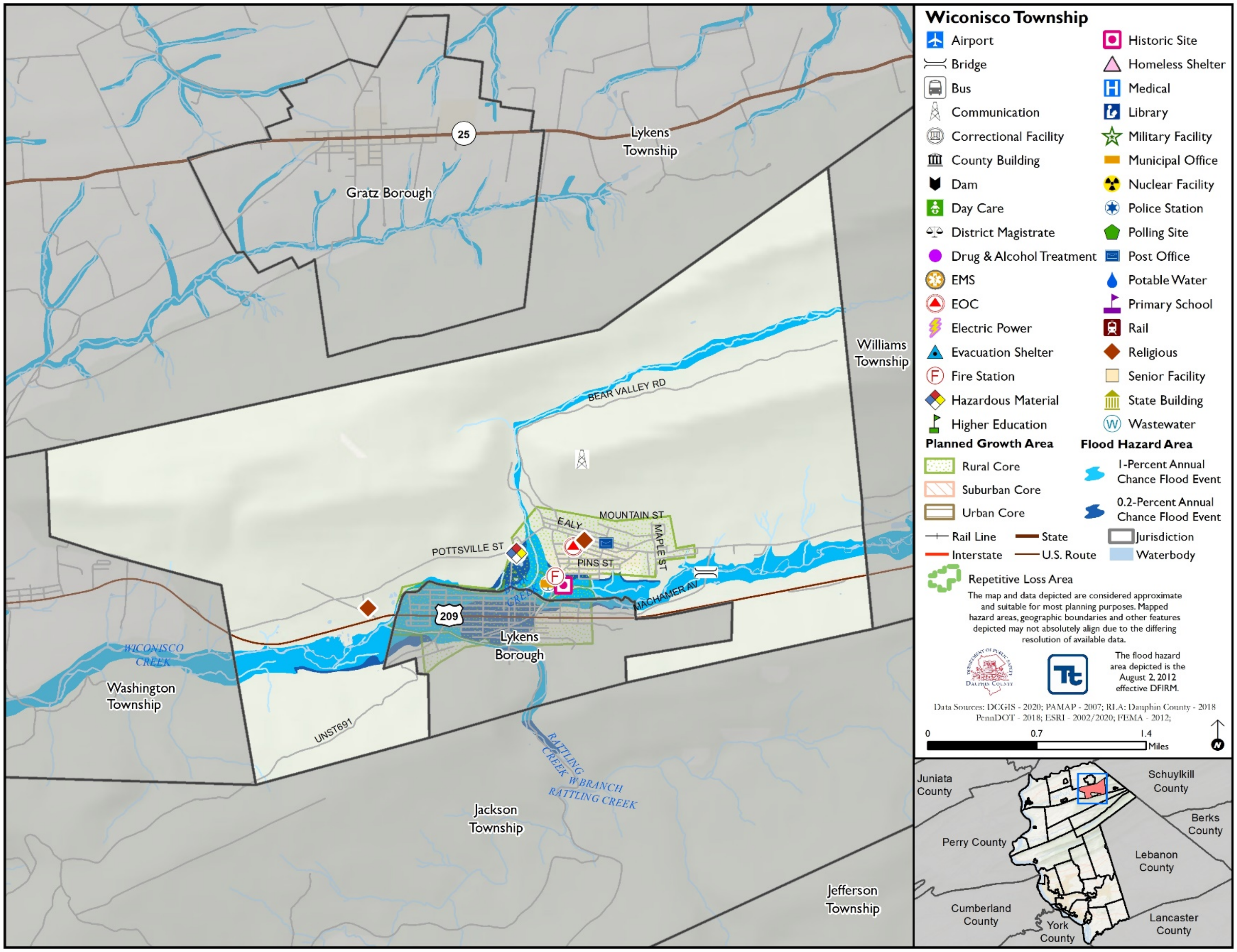
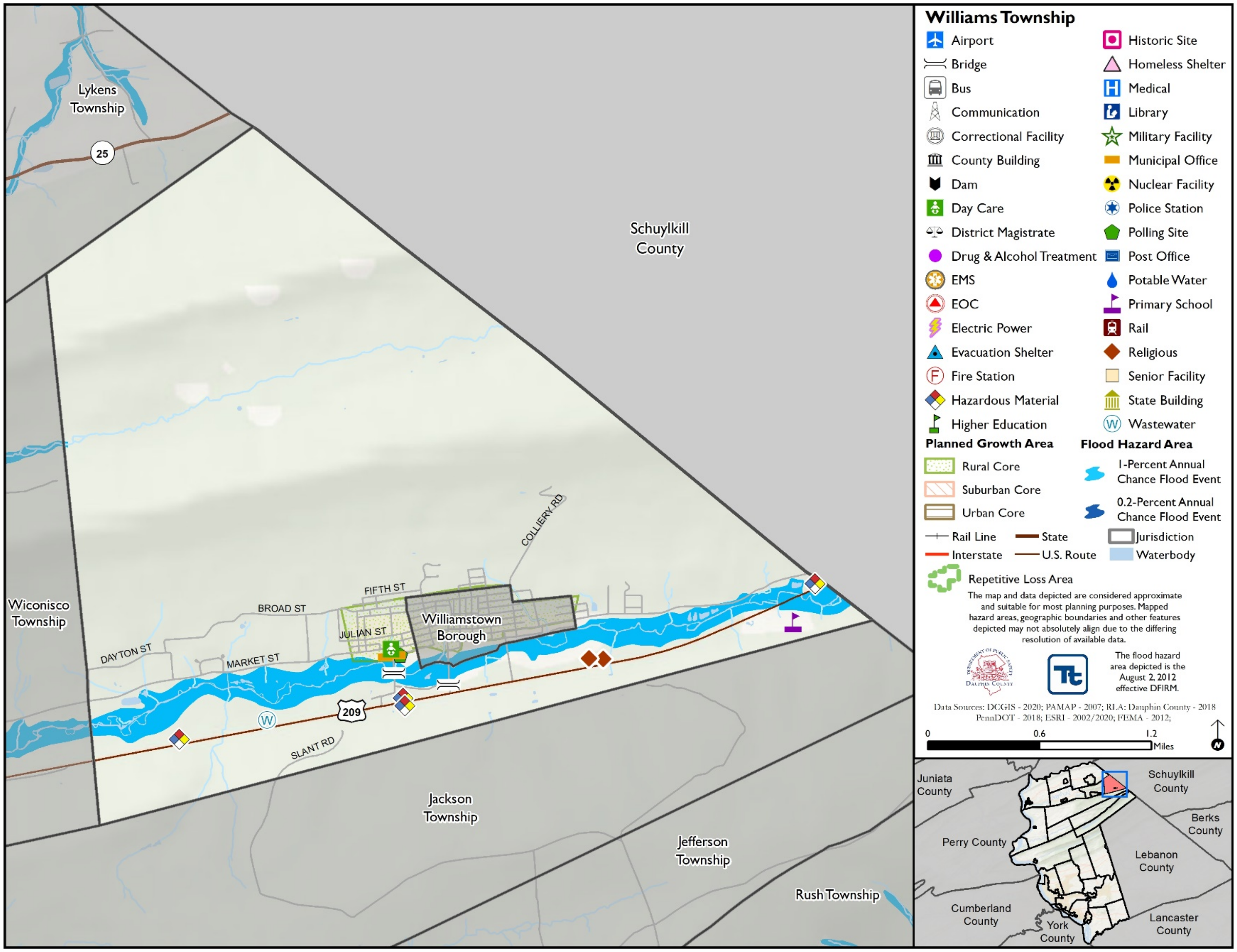
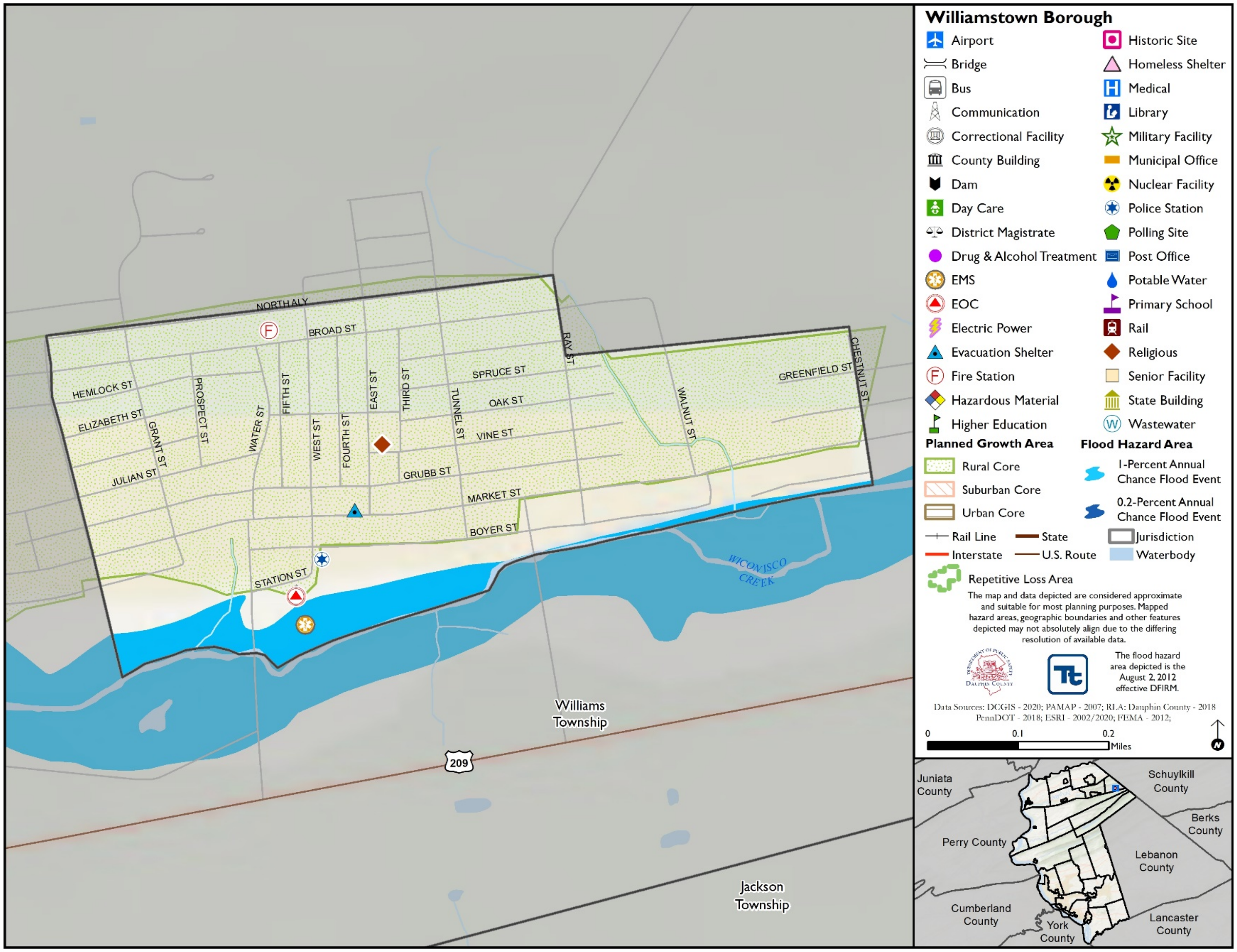


Williams Township



Williamstown Borough



4.3.7 Hurricane, Tropical Storm, Nor'easter

The following section provides the hazard profile (hazard description, location, extent, previous occurrences and losses, probability of future occurrences, and impact of climate change) and vulnerability assessment for the hurricane, tropical storm, and Nor'easter hazard in Dauphin County.

Hurricanes and Tropical Storm

Tropical cyclones are fueled by a different heat mechanism than other cyclonic windstorms, such as Nor'easters and polar lows. The characteristic that separates tropical storms from other cyclonic systems is that at any height in the atmosphere, the center of a tropical storm will be warmer than its surroundings, a phenomenon called *warm core* storm systems (NOAA 2013). Tropical cyclones strengthen when water evaporated from the ocean is released as the saturated air rises, resulting in condensation of water vapor contained in the moist air. Tropical cyclones begin as disturbed areas of weather, often referred to as tropical waves. As the storm organizes, it is designated as a tropical depression.

A tropical storm system is characterized by a low-pressure center and numerous thunderstorms that produce strong winds of 39–73 mph and heavy rain. A hurricane is a tropical storm that attains hurricane status when its wind speed reaches 74 mph or higher. Tropical systems can develop in the Atlantic between the Lesser Antilles and the African coast or in the warm tropical waters of the Caribbean Sea and Gulf of Mexico. These storms can move up the Atlantic Coast of the United States, impacting the eastern seaboard, or move into the United States through the states along the Gulf Coast, bringing wind and rain as far north as New England before moving eastward offshore.

Despite that Dauphin County is an inland county, the impacts of hurricanes and tropical storms can impact the County. Hurricanes and tropical storms are most likely to impact Dauphin County from June to November, the official Atlantic hurricane season (NHC 2019).

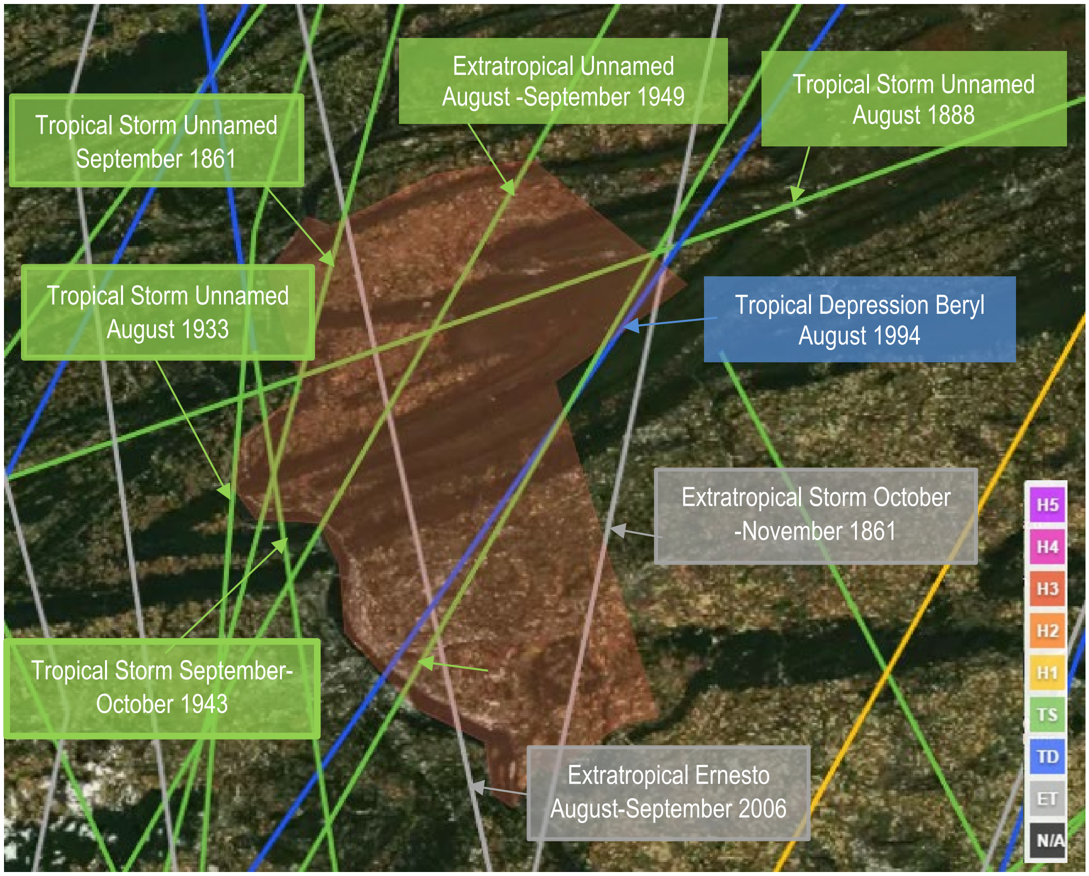
4.3.7.1 Location and Extent

Dauphin County is not located along the Atlantic Coast, but hurricanes and tropical storms can track inland, bringing heavy rainfall, strong winds, and flooding. These storms are regional events that can impact very large areas hundreds to thousands of miles across over the life the storm. Therefore, all communities within Dauphin County are equally subject to the impacts of hurricanes and tropical storms. Areas in Dauphin County that are subject to flooding and wind damage are particularly vulnerable.

Tropical Storm and Hurricane Tracks

NOAA's Historical Hurricane Tracks tool is a public interactive mapping application that displays Atlantic Basin and East-Central Pacific Basin tropical cyclone data. This interactive tool catalogs tropical cyclones that have occurred from 1842 to 2020 (latest date available from data source). Between 1842 and 2020, 41 events classified as either a hurricane, tropical storm, tropical depression, or extra tropical storm tracked within 65 nautical miles of Dauphin County. Figure 4.3.7-1 displays tropical cyclone tracks for Dauphin County that tracked with 65 nautical miles between 1842 and 2020. While some events are not shown on this figure, those events did not occur within 65 nautical miles of the County. However, these events could have severely impacted the County with strong winds, power outages, and other damage. The "Previous Events and Losses" section provides further information regarding hurricane and tropical storm events that impacted Dauphin County.

Figure 4.3.7-1. Historical Tropical Storm and Hurricane Tracks 1842 to 2020



Source: NOAA 2020
Note: Dauphin County is outlined in orange

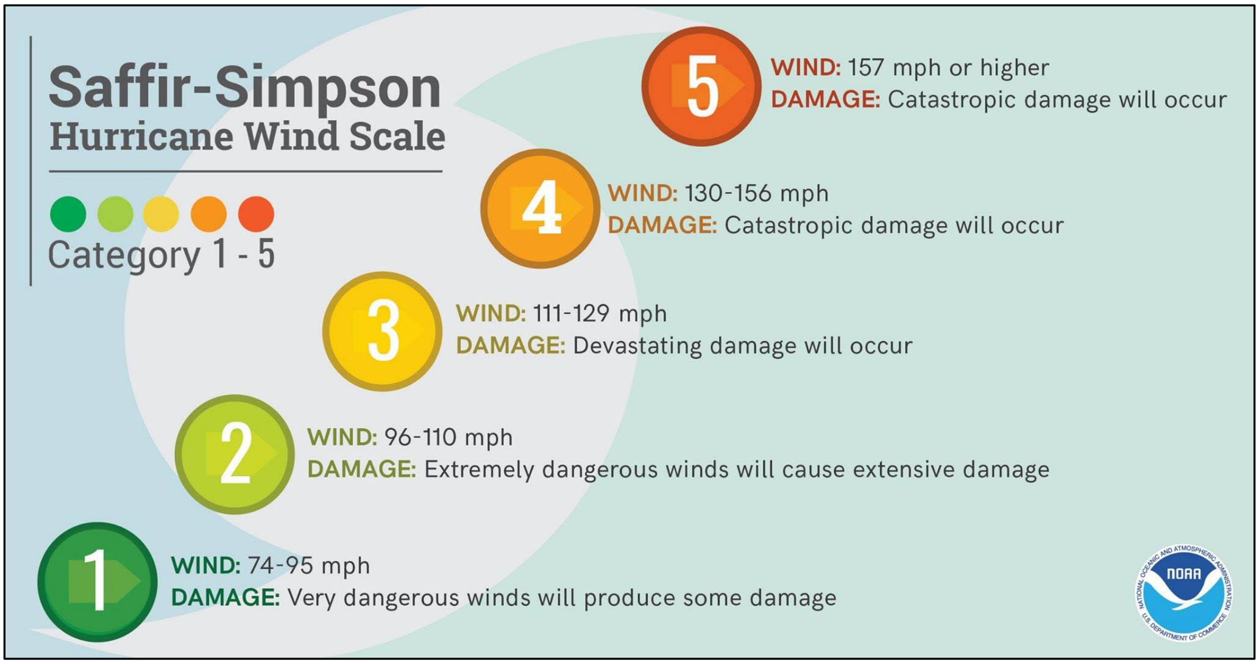
The National Weather Service (NWS) issues hurricane and tropical storm watches and warnings. These watches and warnings are issued or will remain in effect after a tropical cyclone becomes post-tropical when such a storm poses a significant threat to life and property. The NWS allows the NHC to issue advisories during the post-tropical stage. The following are the definitions of the watches and warnings:

- *Hurricane/Typhoon Warning* is issued when sustained winds of 74 mph or higher are expected somewhere within the specified area in association with a tropical, subtropical, or post-tropical cyclone. Because hurricane preparedness activities become difficult once winds reach tropical storm force, the warning is issued 36 hours in advance of the anticipated onset of tropical storm force winds. The warning can remain in effect when dangerously high water or combination of dangerously high water and waves continue, even though winds may be less than hurricane force.
- *Hurricane Watch* is issued when sustained winds of 74 mph or higher are possible within the specified area in association with a tropical, subtropical, or post-tropical cyclone. Because hurricane preparedness activities become difficult once winds reach tropical storm force, the hurricane watch is issued 48 hours prior to the anticipated onset of tropical storm force winds.
- *Tropical Storm Warning* is issued when sustained winds of 39–73 mph are expected somewhere within the specified area within 36 hours in association with a tropical, subtropical, or post-tropical storm.
- *Tropical Storm Watch* is issued when sustained winds of 39–73 mph are possible within the specified area within 48 hours in association with a tropical, subtropical, or post-tropical storm (NWS 2019).

4.3.7.2 Range of Magnitude

The extent of a hurricane or tropical storm is commonly categorized in accordance with the Saffir-Simpson Hurricane Wind Scale, which assigns a designation of tropical storm for storms with sustained wind speeds below 74 mph and a hurricane category rating of 1–5 based on a hurricane's increasing sustained wind speed. This scale estimates potential property damage. Hurricanes reaching Category 3 and higher are considered *major hurricanes* because of their potential for significant loss of life and damage. Tropical storms and Category 1 and 2 storms are still dangerous and require preventative measures (NOAA 2013). Figure 4.3.7-2 presents this scale, which is used to estimate the potential property damage and flooding expected when a hurricane makes landfall.

Figure 4.3.7-2. The Saffir-Simpson Scale

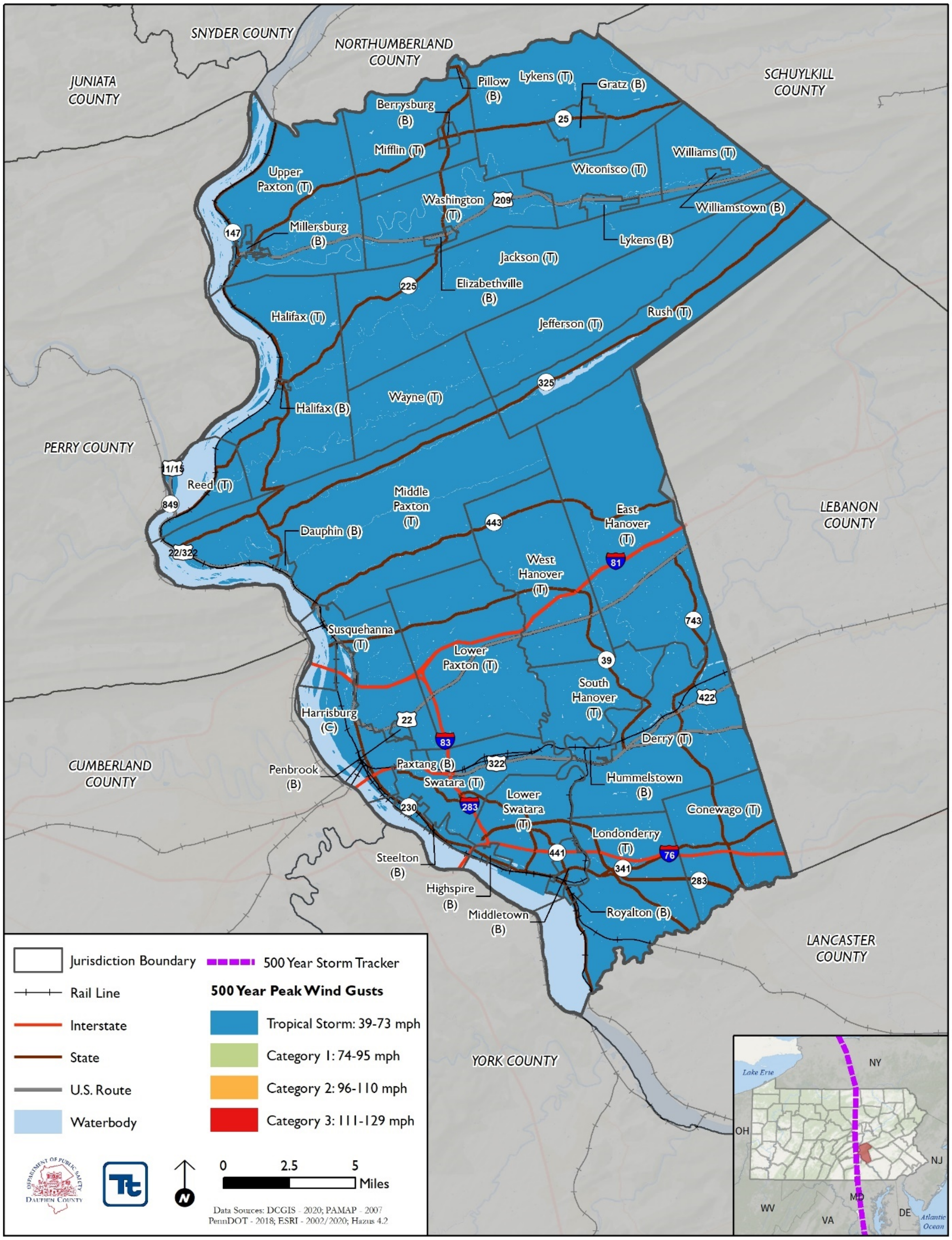


Source: Disaster Readiness Portal 2017

Mean Return Period

Peak wind speed projections were generated using Hazus estimated the maximum 3-second gust wind speeds for Dauphin County to range from 63–73 mph for the 500-year Mean Return Period (MRP) event (tropical storm). The associated impacts and losses from the 500-year MRP hurricane event model run is reported in the Vulnerability Assessment. Figure 4.3.7-3. shows the estimated maximum 3-second gust wind speeds that can be anticipated in the study area associated with the 500-year MRP events.

Figure 4.3.7-3. Wind Speeds for the 500-Year Mean Return Period Event



4.3.7.3 Past Occurrence

According to the NWS, remnants of 58 recorded storms have impacted eastern Pennsylvania, including Dauphin County from 1842 to 2020 (NWS 2018). Between 1954 and 2020, Pennsylvania was included in 14 Federal Emergency Management Agency (FEMA)-declared hurricane/tropical storm-related major disaster declaration (DR) or emergency (EM) classified as one or a combination of the following hazards: tropical storm, hurricane, tropical depression, flash flooding, severe storms, and flooding. Of those declarations, Dauphin County was included in eight of the declarations. It is to be noted that EM-3235 was not for direct impacts but to support evacuation from the Gulf Coast areas that were impacted directly (FEMA 2020).

Table 4.3.7-1. Hurricane/Tropical Storm-Related FEMA Declarations for Dauphin County, 1954 to 2020

FEMA Declaration Number	Date(s) of Event	Event Type	Details
DR-340	June 23, 1972	Tropical Storm	Pennsylvania Tropical Storm Agnes
DR-1298	September 6–7, 1999	Tropical Depression	Pennsylvania Tropical Depression Dennis and Flash Flooding
DR-1557	September 17–October 1, 2004	Tropical Depression	Pennsylvania Tropical Depression Ivan
EM-3235	August 29–October 1, 2005	Hurricane	Pennsylvania Hurricane Katrina Evacuation
EM-3340	September 2–October 15, 2011	Tropical Storm	Pennsylvania Remnants of Tropical Storm Lee
DR-4030	September 3–October 15, 2011	Tropical Storm	Pennsylvania Tropical Storm Lee
EM-3356	October 26–November 8, 2012	Hurricane	Pennsylvania Hurricane Sandy
DR-4099	October 26–November 8, 2012	Hurricane	Hurricane Sandy

Source: FEMA 2020

For this 2021 Hazard Mitigation Plan (HMP) update, hurricane and tropical storms events, including FEMA disaster declarations that impacted Dauphin County, are identified in Table 4.3.7-2. Because documentation for these types of events is so extensive, not all sources have been identified or researched. Therefore, Table 4.3.7-2 may not include all events that occurred throughout the County.

Table 4.3.7-2. Tropical Cyclone Events Impacting Dauphin County, PA 1860–2020

Date(s) of Event	Event Type	FEMA Declaration Number (if applicable)	County Designated?	Event Details
September 22–29, 1861	Hurricane	N/A	No	Losses and damages in Dauphin County were not identified for this event.
October 31–November 3, 1861	Tropical Storm	N/A	No	Losses and damages in Dauphin County were not identified for this event.
September 11–20, 1863	Tropical Storm	N/A	No	Losses and damages in Dauphin County were not identified for this event.
July 23–26, 1864	Tropical Storm	N/A	No	Losses and damages in Dauphin County were not identified for this event.
August 10–18, 1867	Tropical Storm	N/A	No	Losses and damages in Dauphin County were not identified for this event.
September 12–19, 1876	Hurricane	N/A	No	50 knots sustained winds were reported throughout the county.
October 18–25, 1878	Hurricane	N/A	No	In Pennsylvania, it was reported that at least 700 buildings were destroyed causing $2 million in damage, killed at least ten people, and injured more, produced 80 km/h sustained winds throughout the state.
September 4–13, 1883	Hurricane	N/A	No	Losses and damages in Dauphin County were not identified for this event.
October 10–14, 1885	Tropical Storm	N/A	No	70 km/h sustained winds were reported throughout the county.
August 14–24, 1888	Hurricane	N/A	No	75 km/h sustained winds were reported through the county.
August 15–September 2, 1893	Hurricane	N/A	No	100 km/h sustained winds were reported throughout the county.
September 25–October 15, 1893	Hurricane	N/A	No	65 km/h sustained winds were reported throughout the county.
October 20–23, 1893	Tropical Storm	N/A	No	Losses and damages in Dauphin County were not identified for this event.
October 26–November 4, 1899	Hurricane	N/A	No	95 km/h sustained winds were reported throughout the county.
September 12–17, 1903	Hurricane	N/A	No	Hurricane-force winds of 50-65 km/h were reported for the county.
July 13–August 5, 1915	Hurricane	N/A	No	45 km/h winds were reported throughout the county
September 6–21, 1928	Hurricane	N/A	No	Losses and damages in Dauphin County were not identified for this event.
September 19–October 5, 1929	Hurricane	N/A	No	Storm caused 55 km/h winds throughout the county.
August 13–28, 1933	Hurricane	N/A	No	Winds of 85 km/h were reported throughout the county.
June 4–21, 1934	Hurricane	N/A	No	Losses and damages in Dauphin County were not identified for this event.
September 1–4, 1934	Tropical Storm	N/A	No	Losses and damages in Dauphin County were not identified for this event.
August 7–19, 1939	Hurricane	N/A	No	Strong winds caused 45 km/h in the county.
September 28–October 2, 1943	Tropical Storm	N/A	No	Losses and damages in Dauphin County were not identified for this event.
September 12–20, 1945	Hurricane	N/A	No	Strong winds caused 45 km/h in the county.

Date(s) of Event	Event Type	FEMA Declaration Number (if applicable)	County Designated?	Event Details
August 23–September 20, 1949	Hurricane	N/A	No	Strong winds caused 65 km/h in the county.
August 18–September 3, 1952	Hurricane Able	N/A	No	Losses and damages in Dauphin County were not identified for this event.
October 5–18 1954	Hurricane Hazel	N/A	No	Hurricane-force winds and small portions with 6 inches or more of rain were reported.
August 3–15, 1955	Hurricane Connie	N/A	No	Losses and damages in Dauphin County were not identified for this event.
August 7–23, 1955	Hurricane Diane	N/A	No	More than 100 people died. Because damages from this event was primarily from flooding, refer to the Section 4.3.6.
September 20–October 2, 1959	Hurricane Gracie	N/A	No	Losses and damages in Dauphin County were not identified for this event.
June 1–4, 1963	Tropical Storm	N/A	No	Losses and damages in Dauphin County were not identified for this event.
June 23, 1972	Hurricane Agnes	DR-340	Yes	650 billion gallons of water gushed through Harrisburg causing more than $2 billion in damage in Pennsylvania including 68,000 homes and 3,000 businesses destroyed. 6 people were killed in Dauphin County due to the storm.
September 1975	Tropical Storm Eloise	N/A	No	Record rainfall, impassable roads and, some residents were evacuated from their homes. $150 million in damages were recorded for Pennsylvania.
August 25–September 8, 1979	Hurricane David	N/A	No	Tropical storm force winds were reported and at least 5 inches of rain.
August 21–30, 1988	Tropical Storm Chris	N/A	No	Losses and damages in Dauphin County were not identified for this event.
September 22–26, 1992	Tropical Storm Danielle	N/A	No	Some tropical storm force winds were reported.
August 14–19, 1994	Tropical Storm Beryl	N/A	No	Some tropical winds and rain were reported throughout the county.
August 24–September 8, 1999	Hurricane Dennis	N/A	No	High wind was reported but most damages from this event was primarily from flooding, refer to the Section 4.3.6.
September 16–29, 1999	Hurricane Floyd	DR-1294	No	Strong winds resulted in widespread downed trees, some of which landed on houses and vehicles. 6 deaths reported in Pennsylvania
September 15–23, 2003	Tropical Storm Henri and Isabel	DR-1497	No	$80 million in damages in Pennsylvania, 2 deaths reported
September 17–October 1, 2004	Tropical Depression Ivan	DR-1557	Yes	Because damages from this event was primarily from flooding, refer to the Section 4.3.6.
August 29–October 1, 2005	Hurricane Katrina	EM-3235	Yes	Downed trees and power outages were reported.
August 24–September 4, 2006	Hurricane Ernesto	N/A	No	Losses and damages in Dauphin County were not identified for this event.
August 26–August 30, 2011	Hurricane Irene	DR-4025 EM-3339	No	More than 73,000 PPL customers and several thousand more Met-Ed customers in Dauphin, Cumberland, Perry, Lebanon and York counties lost power as high winds toppled trees and downed power lines across the region. One death was

Date(s) of Event	Event Type	FEMA Declaration Number (if applicable)	County Designated?	Event Details
				recorded due to a falling tree in East Hanover Township. Many of the damages came from strong winds and Lower Paxton Township, Susquehanna Township, Harrisburg, Lower Swatara Township, Derry Township, and Hummelstown were hit the hardest.
September 3–October 15, 2011	Remnants of Tropical Storm Lee	DR-4030 EM-3340	No	Flooding of the Susquehanna River led to the evacuation of about 100,000 people. Nearly 5,000 homes were damaged or destroyed in Dauphin and Lebanon Counties. Numerous roads and 18 bridges damaged in PA. Reported damage from this storm was primarily caused by flooding and sinkhole formation. That damage is described in the Flood, Flash Flood, and Ice Jams (Section 4.3.6) and Subsidence, Sinkhole (Section 4.3.13) hazard profiles, respectively.
October 26–November 8, 2012	Hurricane Sandy	EM-3356	Yes	Strong winds caused downed trees and power lines causing 1.2 million customers without power and $20 million of damages in Pennsylvania
January 2013	Hurricane Sandy	DR-4099	Yes	1.2 million customers without power and $20 million in damages in Pennsylvania
August 30–September 18, 2018	Hurricane Florence	N/A	No	Because damages from this event was primarily from flooding, refer to the Section 4.3.6.
July 23–August 5, 2020	Hurricane Isaias	N/A	No	Because damages from this event was primarily from flooding, refer to the Section 4.3.6.

Sources: NOAA-NCEI 2020; PA HMP 2018; FEMA 2020

DR Federal Disaster Declaration
EM Emergency Management
EMA Emergency Management Agency
FEMA Federal Emergency Management Agency
NCEI National Centers for Environmental Information
NOAA National Oceanic Atmospheric Administration
N/A Not applicable/not available

4.3.7.4 Future Occurrence

For the 2021 HMP update, the most up-to-date data was collected to calculate the probability of future occurrence of hurricane and tropical storms events for Dauphin County. Information from NOAA-NCEI storm events database, FEMA, and a NOAA Historical Hurricane Tracks search were used to identify the number of events that occurred between 1950 and 2020. Using these sources ensures the most accurate probability estimates possible. A 65 nautical mile buffer was used to determine future occurrences. It is to be noted, that the storm was counted as its maximum category, not the category it was when it passed over the County. The table below shows these statistics as well as the annual average number of events and the estimated percent chance of an incident occurring in a given year.

Table 4.3.7-3. Probability of Future Hurricane and Tropical Storm Events

Hazard Type	Number of Occurrences Between 1950 and 2020	Recurrence Interval (in years) (# Years/Number of Events)	Percent Chance of Occurrence in Any Given Year
Extra-Tropical Storms	0	0.00	0.00
Tropical Depression	1	70.00	1.43
Tropical Storm	6	11.67	0.09
Hurricanes (all categories)	17	4.12	24.29

Source: NHC 2020

It is estimated that Dauphin County will continue to experience direct and indirect impacts of hurricanes and tropical storms annually that can induce secondary hazards, such as flooding, extreme wind, infrastructure deterioration or failure, utility failures, power outages, water quality and supply concerns, and transportation delays, accidents, and inconveniences. Therefore, the future occurrence of hurricanes and tropical storms in Dauphin County can be characterized as *possible*, as defined by the Risk Factor Methodology probability criteria, as provided in Table 4.4-1.

4.3.7.5 Vulnerability Assessment

To understand risk, a community must evaluate what assets are exposed and vulnerable in the identified hazard area. For severe storms, the entirety of Dauphin County has been identified as the hazard area. Therefore, all assets in the County (population, structures, critical facilities, and lifelines), as described in the County Profile, are vulnerable. Potential losses associated with high-wind events were calculated for the County using a probabilistic Level 2 Hazus hurricane wind model for the 500-year MRP hurricane event. The impacts on population, existing structures, critical facilities, and the economy are presented below.

Impact on Life, Health and Safety

For the purposes of this HMP, the entire population of Dauphin County (274,515 people) is exposed to hurricanes and tropical storm events (U.S. Census 2018). Residents might be displaced or require temporary to long-term sheltering. In addition, downed trees, damaged buildings, and debris carried by high winds can lead to injury or loss of life. Socially vulnerable populations are most susceptible, based on several factors, including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. Hazus estimates that there will be zero displaced households and no persons will require temporary shelter due to a 500-year wind event.

Economically disadvantaged populations are more vulnerable because they are likely to evaluate their risk and make decisions based on the major economic impact to their family and might lack funds to evacuate. The population over the age of 65 is also more vulnerable and might physically have more difficulty evacuating. The elderly is considered most vulnerable because they require extra time or outside assistance during evacuations and are more likely to seek or need medical attention that might not be available due to isolation during a storm event. Section 2 (County Profile) provides statistics of these populations.

Impact on General Building Stock

Building construction plays a major role in the extent of damage resulting from a severe storm event. Due to differences in construction, residential structures are generally more susceptible to wind damage than commercial and industrial structures. Wood and masonry buildings, in general, regardless of their occupancy class, tend to experience more damage than concrete or steel buildings. High-rise buildings are also very vulnerable structures. Mobile homes are the most vulnerable to damage, even if tied down, and offer little protection to people inside. As discussed in Section 4.3.15 (Tornado, Windstorm), there are over 4,000 manufactured homes located in Dauphin County.

To better understand these risks, Hazus was used to estimate the expected wind-related building damages. Specific types of wind damages are also summarized in Hazus at the following wind damage categories: no damage/very minor damage, minor damage, moderate damage, severe damage, and total destruction. Table 4.3.7-4 summarizes the definition of the damage categories.

Table 4.3.7-4. Description of Damage Categories

Qualitative Damage Description	Roof Cover Failure	Window Door Failures	Roof Deck	Missile Impacts on Walls	Roof Structure Failure	Wall Structure Failure
No Damage or Very Minor Damage Little or no visible damage from the outside. No broken windows or failed roof deck. Minimal loss of roof cover, with no or very limited water penetration.	≤2%	No	No	No	No	No
Minor Damage Maximum of one broken window, door or garage door. Moderate roof cover loss that can be covered to prevent additional water entering the building. Marks or dents on walls requiring painting or patching for repair.	>2% and ≤15%	One window, door, or garage door failure	No	<5 impacts	No	No
Moderate Damage Major roof cover damage, moderate window breakage. Minor roof sheathing failure. Some resulting damage to interior of building from water.	>15% and ≤50%	> one and ≤ the larger of 20% & 3	1 to 3 panels	Typically 5 to 10 impacts	No	No
Severe Damage Major window damage or roof sheathing loss. Major roof cover loss. Extensive damage to interior from water.	>50%	> the larger of 20% & 3 and ≤50%	>3 and ≤25%	Typically 10 to 20 impacts	No	No
Destruction Complete roof failure and/or failure of wall frame. Loss of more than 50% of roof sheathing.	Typically >50%	>50%	>25%	Typically >20 impacts	Yes	Yes

Source: Hazus Hurricane Technical Manual

Table 4.3.7-5 and Table 4.3.7-6 summarize the building value damage estimated for the 500-year MRP wind-only event by all occupancies and by residential and commercial general occupancies, respectively. Damage estimates are reported for the County's probabilistic Hazus model scenario. The data shown indicates total losses associated with wind damage to building structure and content. The damage counts include buildings damaged at all severity levels from minor damage to complete destruction. The total value of damage reflects the overall impact to buildings at an aggregate level.

The total damage to buildings for all occupancy types across Dauphin County is estimated to be approximately $29.9 million for the 500-year MRP wind-only event. Most of these losses are to the residential building category. Due to differences in building construction, residential structures are generally more susceptible to wind damage than commercial and industrial structures. Overall, structures in the Township of Lower Paxton would experience the greatest amount of damage caused by a 500-year MRP event, which is equal to approximately $5.6 million.

Table 4.3.7-5. Estimated Building Value Damaged by the 500-Year MRP Hurricane-Related Winds

Jurisdiction	Total Replacement Cost Value (All Occupancies)*	Estimated Total Damages	Percent of Total Building and Contents Replacement Cost Value
		500-Year	500-Year
Berrysburg (B)	$131,114,498	$48,736	<0.1%
Conewago (T)	$1,131,218,434	$536,254	<0.1%
Dauphin (B)	$160,174,274	$56,275	<0.1%
Derry (T)	$13,980,976,171	$4,061,922	<0.1%
East Hanover (T)	$2,617,412,647	$1,100,929	<0.1%
Elizabethville (B)	$396,035,763	$109,129	<0.1%
Gratz (B)	$432,294,298	$95,208	<0.1%
Halifax (B)	$181,049,719	$41,418	<0.1%
Halifax (T)	$1,457,192,513	$305,290	<0.1%
Harrisburg (C)	$15,182,832,338	$2,366,112	<0.1%
Highspire (B)	$550,466,766	$288,272	0.1%
Hummelstown (B)	$1,082,835,134	$643,344	0.1%
Jackson (T)	$776,111,853	$209,385	<0.1%
Jefferson (T)	$230,110,295	$58,815	<0.1%
Londonderry (T)	$2,360,384,847	$1,040,329	<0.1%
Lower Paxton (T)	$14,635,453,846	$5,564,092	<0.1%
Lower Swatara (T)	$5,522,875,069	$1,497,516	<0.1%
Lykens (B)	$517,534,065	$141,693	<0.1%
Lykens (T)	$941,126,374	$286,955	<0.1%
Middle Paxton (T)	$1,462,655,724	$505,118	<0.1%
Middletown (B)	$1,981,507,138	$1,031,248	<0.1%
Mifflin (T)	$603,453,937	$149,803	<0.1%
Millersburg (B)	$770,504,424	$109,088	<0.1%
Paxtang (B)	$403,915,987	$143,472	<0.1%
Penbrook (B)	$602,189,726	$226,792	<0.1%
Pillow (B)	$101,661,910	$40,081	<0.1%
Reed (T)	$117,139,877	$26,405	<0.1%
Royalton (B)	$196,935,626	$129,012	<0.1%
Rush (T)	$71,032,585	$42,330	0.1%
South Hanover (T)	$1,935,844,099	$1,266,324	0.1%
Steelton (B)	$2,111,932,612	$482,686	<0.1%
Susquehanna (T)	$8,633,889,539	$2,033,764	<0.1%
Swatara (T)	$8,581,237,561	$2,713,902	<0.1%
Upper Paxton (T)	$1,473,328,502	$269,925	<0.1%
Washington (T)	$1,106,223,564	$261,038	<0.1%

Jurisdiction	Total Replacement Cost Value (All Occupancies)*	Estimated Total Damages	Percent of Total Building and Contents Replacement Cost Value
		500-Year	500-Year
Wayne (T)	$398,741,088	$116,923	<0.1%
West Hanover (T)	$3,228,343,376	$1,627,600	0.1%
Wiconisco (T)	$297,597,257	$106,645	<0.1%
Williams (T)	$390,058,854	$89,435	<0.1%
Williamstown (B)	$345,185,743	$84,856	<0.1%
Dauphin County (Total)	**$97,100,578,032**	**$29,908,118**	**<0.1%**

Source: Hazus 4.2; Dauphin County GIS 2020
Notes: B – Borough; C – City; T – Township; % - Percent
**The Total Damages column represents the sum of damages for all occupancy classes (residential, commercial, industrial, agricultural, educational, religious, and government) based on improvement value.*

Table 4.3.7-6. Estimated Residential and Commercial Building Value Damaged by the 500-Year MRP Hurricane-Related Winds

Jurisdiction	Total Replacement Cost Value (All Occupancies)	Estimated Residential Damages	Percent of Total Building and Contents Replacement Cost Value	Estimated Commercial Damages	Percent of Total Building and Contents Replacement Cost Value
		500-Year	500-Year	500-Year	500-Year
Berrysburg (B)	$131,114,498	$47,342	<0.1%	$995	<0.1%
Conewago (T)	$1,131,218,434	$528,228	<0.1%	$5,503	<0.1%
Dauphin (B)	$160,174,274	$55,505	<0.1%	$460	<0.1%
Derry (T)	$13,980,976,171	$3,480,029	<0.1%	$460,503	<0.1%
East Hanover (T)	$2,617,412,647	$1,059,265	<0.1%	$33,213	<0.1%
Elizabethville (B)	$396,035,763	$101,172	<0.1%	$5,117	<0.1%
Gratz (B)	$432,294,298	$92,485	<0.1%	$1,945	<0.1%
Halifax (B)	$181,049,719	$39,563	<0.1%	$1,178	<0.1%
Halifax (T)	$1,457,192,513	$291,619	<0.1%	$8,683	<0.1%
Harrisburg (C)	$15,182,832,338	$1,880,732	<0.1%	$364,075	<0.1%
Highspire (B)	$550,466,766	$274,196	<0.1%	$8,674	<0.1%
Hummelstown (B)	$1,082,835,134	$620,407	0.1%	$15,477	<0.1%
Jackson (T)	$776,111,853	$200,008	<0.1%	$5,955	<0.1%
Jefferson (T)	$230,110,295	$56,181	<0.1%	$1,673	<0.1%
Londonderry (T)	$2,360,384,847	$956,134	<0.1%	$58,508	<0.1%
Lower Paxton (T)	$14,635,453,846	$5,284,075	<0.1%	$230,679	<0.1%
Lower Swatara (T)	$5,522,875,069	$1,217,189	<0.1%	$185,004	<0.1%
Lykens (B)	$517,534,065	$136,578	<0.1%	$3,394	<0.1%
Lykens (T)	$941,126,374	$278,747	<0.1%	$5,861	<0.1%
Middle Paxton (T)	$1,462,655,724	$498,207	<0.1%	$4,132	<0.1%
Middletown (B)	$1,981,507,138	$952,013	<0.1%	$57,503	<0.1%
Mifflin (T)	$603,453,937	$145,518	<0.1%	$3,060	<0.1%
Millersburg (B)	$770,504,424	$95,737	<0.1%	$5,710	<0.1%
Paxtang (B)	$403,915,987	$135,393	<0.1%	$5,995	<0.1%
Penbrook (B)	$602,189,726	$216,845	<0.1%	$6,915	<0.1%
Pillow (B)	$101,661,910	$38,934	<0.1%	$819	<0.1%
Reed (T)	$117,139,877	$25,222	<0.1%	$751	<0.1%
Royalton (B)	$196,935,626	$118,564	0.1%	$7,261	<0.1%

Jurisdiction	Total Replacement Cost Value (All Occupancies)	Estimated Residential Damages	Percent of Total Building and Contents Replacement Cost Value	Estimated Commercial Damages	Percent of Total Building and Contents Replacement Cost Value
		500-Year	500-Year	500-Year	500-Year
Rush (T)	$71,032,585	$41,751	0.1%	$346	<0.1%
South Hanover (T)	$1,935,844,099	$1,224,760	0.1%	$12,466	<0.1%
Steelton (B)	$2,111,932,612	$417,787	<0.1%	$37,317	<0.1%
Susquehanna (T)	$8,633,889,539	$1,835,040	<0.1%	$132,337	<0.1%
Swatara (T)	$8,581,237,561	$2,460,869	<0.1%	$199,996	<0.1%
Upper Paxton (T)	$1,473,328,502	$261,546	<0.1%	$6,985	<0.1%
Washington (T)	$1,106,223,564	$242,018	<0.1%	$12,231	<0.1%
Wayne (T)	$398,741,088	$111,687	<0.1%	$3,325	<0.1%
West Hanover (T)	$3,228,343,376	$1,580,188	<0.1%	$39,452	<0.1%
Wiconisco (T)	$297,597,257	$102,795	<0.1%	$2,554	<0.1%
Williams (T)	$390,058,854	$83,409	<0.1%	$2,240	<0.1%
Williamstown (B)	$345,185,743	$79,138	<0.1%	$2,125	<0.1%
Dauphin County (Total)	**$97,100,578,032**	**$27,266,873**	**<0.1%**	**$1,940,418**	**<0.1%**

Source: Hazus 4.2; Dauphin County GIS 2020
Notes: B – Borough; C – City; T – Township; % - Percent

Impact on Critical Facilities

Utility infrastructure could suffer damage from high winds associated with falling tree limbs or other debris, resulting in the loss of power. Loss of service can impact residents and business operations alike. Interruptions in heating or cooling utilities can affect populations such as the young and elderly, who are particularly vulnerable to temperature-related health impacts. Loss of power can impact other public utilities, including potable water, wastewater treatment, and communications. In addition to public water services, property owners with private wells might not have access to potable water due to pump failure until power is restored. Lack of power to emergency facilities, such as police stations, fire stations, emergency medical services, and hospitals, will inhibit a community's ability to effectively respond to an event and maintain the safety of its citizens.

Overall, all critical facilities are exposed to the wind hazard. Hazus estimates the probability that critical facilities (i.e., medical facilities, fire/EMS, police, EOC, schools, and user-defined facilities such as shelters and municipal buildings) could sustain damage as a result of the 500-year MRP wind event. Additionally, Hazus estimates the loss of use for each facility in number of days. Due to the sensitive nature of the critical facility dataset, individual facility estimated loss is not provided.

Table 4.3.7-7 summarizes the percent probability that each facility type may experience damage as a result of the 500-year MRP event.

Table 4.3.7-7. Estimated Impacts to Critical Facilities for the 500-Year Mean Return Period Hurricane-Related Winds

Facility Type	500-Year Event				
	Loss of Days	Percent Probability of Sustaining Damage			
		Minor	Moderate	Severe	Complete
EOC	0	0.4%–0.9%	0.0%	0.0%	0.0%
Medical	0	0.2%–0.3%	0.0%	0.0%	0.0%
Police	0	0.4%–0.9%	0.0%	0.0%	0.0%
Fire	0	0.2%–0.5%	<0.1%	0.0%	0.0%
Schools	0	0.2%–0.7%	<0.1%	0.0%	0.0%

Source: Hazus 4.2; Dauphin County GIS 2020

Impact on Economy

Hurricanes and tropical storms also impact the economy, including loss of business function (e.g., tourism, recreation), damage to inventory, relocation costs, wage loss and rental loss due to the repair/replacement of buildings. Hazus estimates the total economic loss associated with each storm scenario (direct building losses and business interruption losses). Direct building losses are the estimated costs to repair or replace the damage caused to the building. This is reported in the "Impact on General Building Stock" subsection discussed earlier. Business interruption losses are the losses associated with the inability to operate a business because of the wind damage sustained during the storm or the temporary living expenses for those displaced from their home because of the event. Refer to Table 4.3.7-8 for a summary of Hazus estimated economic losses for Dauphin County caused by the 500-year MRP hurricane wind event.

Table 4.3.7-8 Estimated Economic Losses for the 500-Year Mean Return Period Hurricane Wind Event

Mean Return Period (MRP)	Inventory Loss	Relocation Loss	Building and Content Losses	Wages Losses	Rental Losses	Income Losses
500-year MRP	$0	$64,910	$29,835,760	$0	$7,440	$0

Source: Hazus 4.2; Dauphin County GIS 2020

Impacts to transportation lifelines affect both short-term (e.g., evacuation activities) and long-term (e.g., day-to-day commuting and goods transport) transportation needs. Utility infrastructure (power lines, gas lines, electrical systems) could suffer damage and impacts can result in the loss of power, which can impact business operations and heating or cooling provisions to the population.

Debris management can be costly and impact the local economy. Hazus estimates the amount of debris that might be produced as result of the 500-year MRP wind event. Table 4.3.7-9 summarizes the estimated debris by municipality, which should be considered a lower-bound analysis. Because the estimated debris production does not include debris generated by flooding, this is likely a conservative estimate and could be higher if multiple impacts occur.

Table 4.3.7-9. Debris Production for 500-Year Mean Return Period Hurricane-Related Winds

Jurisdiction	Brick and Wood (Tons)	Concrete/Steel (Tons)	Tree (Tons)	Eligible Tree Volume (Cubic Yards)
	500-Year	500-Year	500-Year	500-Year
Berrysburg (B)	4	0	115	1,154
Conewago (T)	35	0	533	5,335
Dauphin (B)	1	0	0	0
Derry (T)	352	0	1,610	16,097
East Hanover (T)	76	0	0	0
Elizabethville (B)	11	0	0	0
Gratz (B)	8	0	225	2,254
Halifax (B)	4	0	0	0
Halifax (T)	31	0	0	0
Harrisburg (C)	248	0	474	4,739
Highspire (B)	26	0	71	707
Hummelstown (B)	48	0	120	1,195
Jackson (T)	21	0	0	0

Jurisdiction	Brick and Wood (Tons)	Concrete/Steel (Tons)	Tree (Tons)	Eligible Tree Volume (Cubic Yards)
	500-Year	500-Year	500-Year	500-Year
Jefferson (T)	6	0	0	0
Londonderry (T)	93	0	1,552	15,522
Lower Paxton (T)	412	0	1,137	11,353
Lower Swatara (T)	146	0	1,419	14,190
Lykens (B)	5	0	0	0
Lykens (T)	24	0	679	6,793
Middle Paxton (T)	12	0	0	0
Middletown (B)	83	0	179	1,801
Mifflin (T)	13	0	355	3,546
Millersburg (B)	5	0	24	240
Paxtang (B)	11	0	26	259
Penbrook (B)	17	0	29	282
Pillow (B)	3	0	95	949
Reed (T)	3	0	0	0
Royalton (B)	11	0	193	1,925
Rush (T)	1	0	0	0
South Hanover (T)	99	0	728	7,281
Steelton (B)	55	0	123	1,232
Susquehanna (T)	167	0	375	3,759
Swatara (T)	230	0	1,078	10,783
Upper Paxton (T)	8	0	3	28
Washington (T)	25	0	0	3
Wayne (T)	12	0	0	0
West Hanover (T)	98	0	1	13
Wiconisco (T)	3	0	0	0
Williams (T)	4	0	0	0
Williamstown (B)	3	0	0	0
Dauphin County (Total)	**2,412**	**0**	**11,143**	**111,438**

Source: Hazus 4.2; Dauphin County GIS 2020
Notes: B – Borough; C – City; T – Township; % - Percent

Impact on the Environment

The impacts of hurricane-related windstorms on the environment typically take place over a larger area. Where these events occur, widespread, severe damage to plant species is likely. This includes uprooting or total destruction of trees and an increased threat of wildfire in areas where dead trees are not removed (PEMA 2018). Section 4.3.15 (Tornado, Windstorm) provides additional environmental impacts due to wind, and Section 4.3.6 (Flood, Flash Flood, and Ice Jam) provides additional environmental impacts due to flooding from heavy rainfalls.

Cascading Impacts to Other Hazards

Severe wind from a tropical storm can escalate the impacts of flooding and severe winter weather. A severe storm may carry extreme rainfall that could exacerbate flooding and could increase the intensity of snow and blizzard events. More information about flooding and severe winter storm can be found in Section 4.3.6 and Section 4.3.18, respectively.

Future Changes that May Impact Vulnerability

Understanding future changes that effect vulnerability in the County can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The County considered the following factors to examine potential conditions that may affect hazard vulnerability:

- Potential or projected development
- Projected changes in population
- Other identified conditions as relevant and appropriate, including the impacts of climate change

New development might be less vulnerable to wind-related hazards compared to the aging building stock.

Projected Development

Understanding future changes that impact vulnerability in Dauphin County can assist in planning for future development and ensuring that appropriate mitigation, planning, and preparedness measures are in place. It is anticipated that any new development and new residents will be exposed to the hurricane and tropical storm hazard. However, due to increased standards and codes, new development might be less vulnerable to wind-related hazards compared to the aging building stock. The tables and hazard maps included in the jurisdictional annexes contain additional information regarding the specific areas of development that would increase County vulnerability to a wind event.

Projected Changes in Population

Estimated population projections provided by the Center of Rural Pennsylvania indicates that Dauphin's population will continue to increase into 2040, increasing total population to approximately 296,766 persons (The Center of Rural Pennsylvania 2013). This is approximately a 10.6-percent increase from the County's 2010 population. With the rise in population, additional persons will be exposed to a hurricane or other wind event.

Effect of Climate Change on Vulnerability

Since the 1970s, there has been a global increase in "tropical cyclone destructiveness" as measured by the Power Dissipation Index. This increased tropical cyclone intensity and duration correlates with increased sea surface temperature. This suggests that future increases of tropical sea surface temperature might lead to future increases in tropical cyclone intensity and duration. However, there is a high level of uncertainty regarding the relationship between climate change and storm events. Future improvements in modeling smaller scale climatic processes can be expected and will lead to improved understanding of how the changing climate will alter temperature, precipitation, and storm events in Pennsylvania (Shortle et. al 2009).

The northeast region of the United States has experienced a greater increase in extreme precipitation than any other region in the U.S. between 1958 and 2010, the northeast experienced more than 70 percent increase in the amount of precipitation falling in rain events (NCA 2014). Refer to Section 4.3.6 (Flood) for a discussion related to the impact of climate change due to increases in rainfall. An increase in storms will produce more wind events and may increase tornado activity. Additionally, thunderstorms and increase in temperature can relate to the strength of a storm resulting in tornadoes (NOAA 2020). With an increased likelihood of strong winds and tornado events, all the County's assets will experience additional risk for losses as a result of extreme wind events.

Change of Vulnerability Since the 2015 HMP

Since the 2015 analysis, population statistics have been updated using the 5-Year 2014–2018 American Community Survey Population Estimates. The general building stock was also updated using RS Means 2020 building valuations that estimated replacement cost value for each building in the inventory, updated building footprints and critical facilities were provided and reviewed by Dauphin County. The updated building stock inventory was imported into Hazus version 4.2 to complete a hurricane wind analysis for the 500-year MRP hurricane wind event. Over time, Dauphin County may obtain additional data to support the analysis of this hazard. Data that will support the analysis include additional detail on past hazard events and impacts, building footprints, and specific building information, such as details on protective features (e.g., hurricane straps).

4.3.8 Invasive Species

This section provides a profile and vulnerability assessment for the invasive species hazard. An invasive species is a species that is not indigenous to a given ecosystem and that, when introduced to a non-native environment, is likely to cause economic or environmental harm or pose a hazard to human health. To further assist and identify invasive species in Pennsylvania, the U.S. Department of Agriculture (USDA) has provided a suite of Invasive Species Resources located online at the USDA National Invasive Species Information Center. The following link provides access to the Pennsylvania's Resource List: https://www.invasivespeciesinfo.gov/us/pennsylvania.

4.3.8.1 Location and Extent

The Commonwealth of Pennsylvania plays host to a number of invasive pathogens, insects, plants, invertebrates, fish, and higher mammals. These species have largely been introduced by the actions of humans. Common pathways for invasive species include unintentional release, the movement of goods and equipment that may unknowingly harbor species, smuggling, emptying ship ballast water, hull fouling, and escape from cultivation (Pennsylvania Invasive Species Council [PISC] 2010). Invasive species threats are generally divided into two main subsets, as described below.

- Aquatic invasive species are non-native viruses, invertebrates, fish, and aquatic plants that threaten the diversity or abundance of native species; the ecological stability of the infested waters; human health and safety; or commercial, agriculture, aquaculture, or recreational activities dependent on such waters.

- Terrestrial invasive species are non-native arthropods, vascular plants, higher vertebrates, or pathogens that complete their life cycle on land instead of water and whose introduction causes or is likely to cause economic or environmental harm or harm to human health.

The PISC, the lead organization for invasive species threats, has identified over 100 species threats that are or could potentially become significant in Pennsylvania. Of these threats, Dauphin County officials and municipal leaders have identified plants, insects, and diseases that have caused, or have potential to cause, significant damage to the County's natural landscape and agricultural economy through defoliation and mortality, or out-competition for vital resources. Dauphin County recognizes the importance of preserving natural resources, promoting native species, and maintaining agricultural productivity for the county's cultural heritage and economic stability. The potential financial impact of invasive species on agriculture in Dauphin County was identified as having 1.66 percent of state total sales (PEMA 2018).

In Pennsylvania, the insects and diseases that have caused the most damage in terms of defoliation and mortality during recent years include the emerald ash borer, gypsy moth, hemlock woolly adelgid, beech bark disease, and oak wilt. These species also pose a threat to Dauphin County. Additionally, Dauphin County officials and municipal leaders identified a number of invasive insects, diseases, and plants of particular concern and these are discussed below.

Invasive insects of concern in Dauphin County include the spotted lanternfly, walnut twig beetles, emerald ash borer, and the Asian longhorned beetle (Martin 2017). The spotted lanternfly was first observed in Berks County in 2014. Since then, the pests have been found in 26 southeastern Pennsylvania counties, including Dauphin County (Pennsylvania Department of Environmental Protection [PA DEP] 2020). As a result, the movement of firewood in Dauphin County and the other impacted counties is restricted. Spotted lanternflies primarily feed on the invasive Tree of Heaven and they threaten agricultural crops, including apples, grapes, and hardwoods (Pennsylvania Department of Agriculture 2017a). To feed, the spotted lanternfly (adult and juvenile) will suck the sap from stem and branches from under the bark. When the spotted lanternfly is done feeding, sap will continue to ooze from the tree and attract other insects. If the sap continues to flow, this liquid then promotes mold. All these factors will damage a tree (USDA 2020). A recent economic impact study estimates Pennsylvania could lose more than $324 million annually and 2,800 jobs (Pennsylvania Department of Agriculture 2020). Because of the detrimental effects this insect has on Pennsylvania's ecosystem and economy, the Department of Agriculture has set up a hotline to report spotted lanternfly sightings: 1-888-4BAD-FLY (1-88-422-3359).

Despite thousand cankers disease currently being absent from Dauphin County, the potential for introduction is high. Thousand cankers disease was first identified in Bucks County in August 2011 and spread to Chester County in 2014 by the walnut twig beetle. A quarantine order was imposed on July 22, 2014 restrict the movement of walnut material from Bucks, Chester, Delaware, Montgomery, and Philadelphia counties. This disease is transmitted to black walnut trees when walnut twig beetles carrying the fungus *Geosmithia morbida* tunnel beneath the bark, causing cankers to form. After repeated attacks, the cankers impede water and nutrient movement through the tree, resulting in tree death. Although thousand cankers disease has not been confirmed in Dauphin County, the disease still poses a threat to the walnut tree population and industry. Black walnut lumber is highly valued for woodworking and furniture-making, and the tree nuts are consumed by humans (PADA 2017b). The Asian longhorned beetle species have not been confirmed within Pennsylvania but pose a threat to softer hardwood trees, including maples, birch, elm, willow, ash, and poplar trees. The Asian longhorned beetle will chew out a small area about an inch in size and lay eggs into the bark of a tree. When hatched, these larvae then bore into the tree and will continue to eat the wood for nearly a year creating tunnels up to a half inch in size. After that year, the beetle will create a cocoon and merge as an adult Asian longhorned beetle. During the larval period, the beetle puts great strain on the feeding tree and eventually kills the tree (PennState Extension 2020).

A number of invasive plants also pose a significant threat to ecosystem biodiversity and agricultural productivity because of their ability to out-compete native species. Pennsylvania has identified 10 Class A noxious weeds as part of the Controlled Plant and Noxious Weed Act. These plants include Palmer amaranth, waterhemp, animated oat, dodder, goatsrue, giant hogweed, hydrilla, wavyleaf basketgrass, broomrape, and kudzu (PA Agricultural Code Title 7). Some species (e.g., Palmer amaranth and waterhemp) are prolific seed producers and have developed a potential resistance to traditional herbicides, making them challenging and expensive to manage. Others, such as kudzu, grow rapidly and prevent slower growing native plants from establishing.

The location and extent of these invasive threats depend on the preferred habitat of the species as well as the species' ease of movement and establishment.

4.3.8.2 Range of Magnitude

The magnitude of invasive species threats ranges from nuisance to widespread killer. Some invasive species are not considered agricultural pests and do not harm humans. Other invasive species can cause significant changes in the composition of Pennsylvania's ecosystems. Forest or crop-impacting invasive species could have a significant economic impact in Dauphin County because the County hosts both forest-based recreational land and agricultural land. Other invasive species can cause widespread illness or death in humans.

Invasive species contribute to a broad range of environmental impacts. The aggressive nature of many invasive species can cause significant reductions in biodiversity by crowding out native species. This can affect the health of individual host organisms as well as the overall well-being of the affected ecosystem.

Beyond causing human, animal, and plant harm, there are secondary impacts of invasive species in that they also cause harm to host species and ecosystems, particularly in the case of invasive species that attack forests or agricultural crops. Forests prevent soil degradation and erosion, protect watersheds, stabilize slopes, and absorb carbon dioxide emissions. The key role of forests in the hydrologic system means that if forest land is wiped out, the effects of erosion and flooding will be amplified. Invasive species would also negatively impact the county's agricultural economy by increasing the cost of pest control measures and decreasing harvest yields. Overall, invasive species reduce the productivity and profitability of agricultural land. Invasive species that affect the health of hardwood trees can have particularly damaging secondary impacts in urban and suburban areas. As the damage progresses, branches become less stable and are more susceptible to winds. Significant building and auto damage can result from falling trees.

The magnitude of an invasive species threat is generally amplified when the ecosystem or host species is already stressed, such as in times of drought. The already-weakened state of the native ecosystem causes it to more easily succumb to an infestation. An example of a possible worst-case invasive species scenario would be if the spotted lanternfly would continue to spread across Dauphin County and significantly destroy the county's crops. With the high mortality rate associated with the spotted lanternfly, crops, including grapes and apples, would be devastated. Farms, orchards, wineries, and lumber companies could experience a $324 billion loss in Pennsylvania (Penn State Extension 2020). Such significant crop loss could cause farms to fail, resulting in the loss of jobs and valuable income to the county. If the land is no longer agriculturally profitable, arable land may have to be developed for residential or business use.

4.3.8.3 Past Occurrence

Invasive species have been entering Pennsylvania since the arrival of early European settlers. The presence of the emerald ash borer in Dauphin County was first confirmed in 2013. Pennsylvania has been entirely within the emerald ash borer infestation zone since 2017 (USDA 2020). Additionally, the hemlock woolly adelgid has been present in Pennsylvania since 1973 and was first detected in Dauphin County between 1973 and 2010. The Pennsylvania Department of Conservation and Natural Resources (DCNR) continues to monitor the westerly progression of the invasive species, and since 2010, has detected a general movement west. There are currently 34 counties, including Dauphin County, that have detected the woolly adelgid. Within the past 2 years, cankerworms and spotted lanternflies have been observed in Dauphin County with the potential to cause significant crop and forest damage. Dauphin County is also part of the quarantine zone for the emerald ash borer and spotted lanternfly (USDA 2017c). This means it is legal to move firewood, ash, and the insect between counties, but it is not legal to move non-compliant items out of the state, nor is it legal to move non-compliant firewood into the state.

4.3.8.4 Future Occurrence

According to the PISC, the probability of future occurrence for invasive species threats is on the rise because of the growing volume of transported goods; increasing technology, efficiency, and speed of transportation; and expanding international trade agreements. Expanded global trade has created opportunities for many organisms to be transported to and establish themselves in new countries and regions. Furthermore, climate change is contributing to the introduction of new invasive species. As maximum and minimum seasonal temperatures change, pests are able to establish themselves in previously inhospitable climates. This also gives introduced species an earlier start and increases the magnitude of their growth, which may shift the dominance of ecosystems in the favor of non-native species.

To combat the increase in future occurrences, the PISC, which is a collaboration of state agencies, public organizations, and federal agencies, released the Invasive Species Management Plan in May 2009 and revised in 2016. This plan outlines the Commonwealth's goals for the management of the spread of non-native invasive species and creates a framework for responding to threats through research, action, and public outreach and communication. More information on the Species Management Plan can be found online at https://www.agriculture.pa.gov/Plants_Land_Water/PlantIndustry/GISC/Pages/default.aspx#:~:text=The%20Governor%27s%20Invasive%20Species%20Council,the%20Commonwealth%27s%20natural%20and%20agricultural. It is reasonable to assume that current threats, including the emerald ash borer, hemlock woolly adelgid, Asian longhorned beetle, spotted lanternfly, cankerworms, and walnut twig beetles causing thousand cankers disease, will continue to directly impact or threaten Dauphin County. Plants currently identified as part of the Noxious Weed Act, including Palmer amaranth, waterhemp, animated oat, dodder, goatsrue, giant hogweed, hydrilla, wavyleaf basketgrass, broomrape, and kudzu are also likely to threaten Dauphin County.

The future occurrence of invasive species is considered *highly likely,* as defined by the Risk Factor Methodology probability criteria (further discussed in Section 4.4).

4.3.8.5 Vulnerability Assessment

To understand risk, a community must evaluate what assets are exposed or vulnerable in the area identified. The following sections discuss the potential impact of the invasive species hazard on Dauphin County, including:

- Overview of vulnerability
- Data and methodology used for the evaluation
- Impact on (1) life, (2) health and safety, (3) general building stock and critical facilities, (4) economy, and (5) future growth and development
- Effect of climate change on vulnerability
- Additional data and next steps

Overview of Vulnerability

Dauphin County's exact vulnerability will depend on the invasive species in question. In general, though, the University of Arizona and the National Invasive Species Information Center have identified the following characteristics of areas that are more likely to be invaded by invasive species:

- Lack of natural predators or diseases that kept the species under control in its native environment
- Present vacant ecological niches that can be exploited by non-native species
- Lack of species diversity
- Lack of a multi-tiered canopy (in the case of invasive plants)
- Disturbed by fire, construction, or agriculture prior to invasion (University of Arizona 2006)

Estimated losses are difficult to quantify; however, infestation can impact Dauphin County's population and economy. Direct effects of infestation lead to cascading indirect impacts. As vegetation dies or becomes stressed and weakened by pests, such as the emerald ash borer, available fuel and high-intensity wildfires increase. As species compositions change from infestation outbreaks, whole fire regimes can shift. Physical stresses on trees may also affect how trees respond to other natural hazards, such as hurricanes, drought, and ice storms (Kurtz 2007).

Because invasive species is currently present in Dauphin County, it is clear that the county is vulnerable to invasive species. Despite quarantine and control efforts, invasive species movement occurs across county lines through anthropogenic and natural modes, including freight shipping, transplantation, and animal movement. Considering the extent of the current infestations and neighboring county infestations, it is reasonable to project that the county's vulnerability will increase.

Data and Methodology

Because of lack of quantifiable loss information, a qualitative assessment has been used to evaluate assets exposed to this hazard and potential impacts associated with this hazard.

Impact on Life, Health, and Safety

The entire population of Dauphin County is vulnerable to invasive species to some extent, but direct impacts to life, health, and safety are minor.

Impact on General Building Stock and Critical Facilities

No structures are anticipated to be affected directly by infestation or invasive species; however, the emerald ash borer may cause a catastrophic loss of the ash tree throughout state forests, which could result in stream bank instability, erosion, and increased sedimentation. In addition, a preponderance of dead tree limbs could increase the occurrence of downed trees on roadways and utility lines during storms with heavy winds.

Impact on Economy

Impacts of infestation and invasive species on the economy and estimated dollar losses are difficult to measure and quantify. Costs associated with activities and programs implemented to conduct surveillance and address a variety of infestations within Dauphin County have not been quantified in available documentation.

Although the economic impact has not been quantified for Dauphin County, state-wide agricultural losses because of invasive species were estimated at $7,405,754,000 (PEMA 2018). The potential financial impact of invasive species on agriculture in Dauphin County was identified as having 1.66 percent of state total sales (PEMA 2018). As stated in Section 4.3.4 (Drought and Water Supply Deficiencies), Dauphin County's agricultural products total over $93 million; any portion of that value is vulnerable to the effects of invasive species.

Impact of Future Growth and Development

As discussed in Section 2, areas targeted for future growth and development have been identified across Dauphin County. Any areas of growth could be impacted by the infestation hazard because the entire planning area is exposed and vulnerable.

Change of Vulnerability

Invasive species were not profiled in the 2015 HMP, so the change in vulnerability to this hazard cannot be determined.

Additional Data and Next Steps

Any additional information regarding localized concerns and past impacts will be collected and analyzed. These data will be developed to support future revisions to the plan. Future mitigation efforts could include partnering and collaborating with existing Commonwealth of Pennsylvania organizations and through local efforts.

4.3.9 Landslide

This section provides a profile and vulnerability assessment of the landslide hazard in Dauphin County. According to the U.S. Geological Survey (USGS), the term landslide includes a wide range of ground movement, such as rock falls, deep failure of slopes, and shallow debris flows (USGS 2016). Landslides are classified by type of material involved and the type of movement. In addition, they are classified at the rate of movement and the water content of the material. Movement rates range from inches over many years to many feet per second (Pennsylvania Department of Conservation and Natural Resources [DCNR] 2001).

Landslides may be triggered by both natural and human-caused changes in the environment, including heavy rain, rapid snow melt, steepening of slopes through construction or erosion, earthquakes, and changes in groundwater levels. Areas that are generally prone to landslide hazards include previous landslide areas, the bases of steep slopes, the bases of drainage channels, developed hillsides, and areas recently burned by forest and brush fires (Delano and Wilshusen 2001). Human activities that contribute to slope failure include altering the natural slope gradient, increasing soil water content, and removing vegetation cover.

4.3.9.1 Location and Extent

The entire country experiences landslides, with 36 states having moderate to highly severe landslide hazards. Expansion of urban and recreational developments into hillside areas exposes more people to the threat of landslides each year. According to the Pennsylvania Emergency Management Agency (PEMA), Dauphin County has high landslide potential.

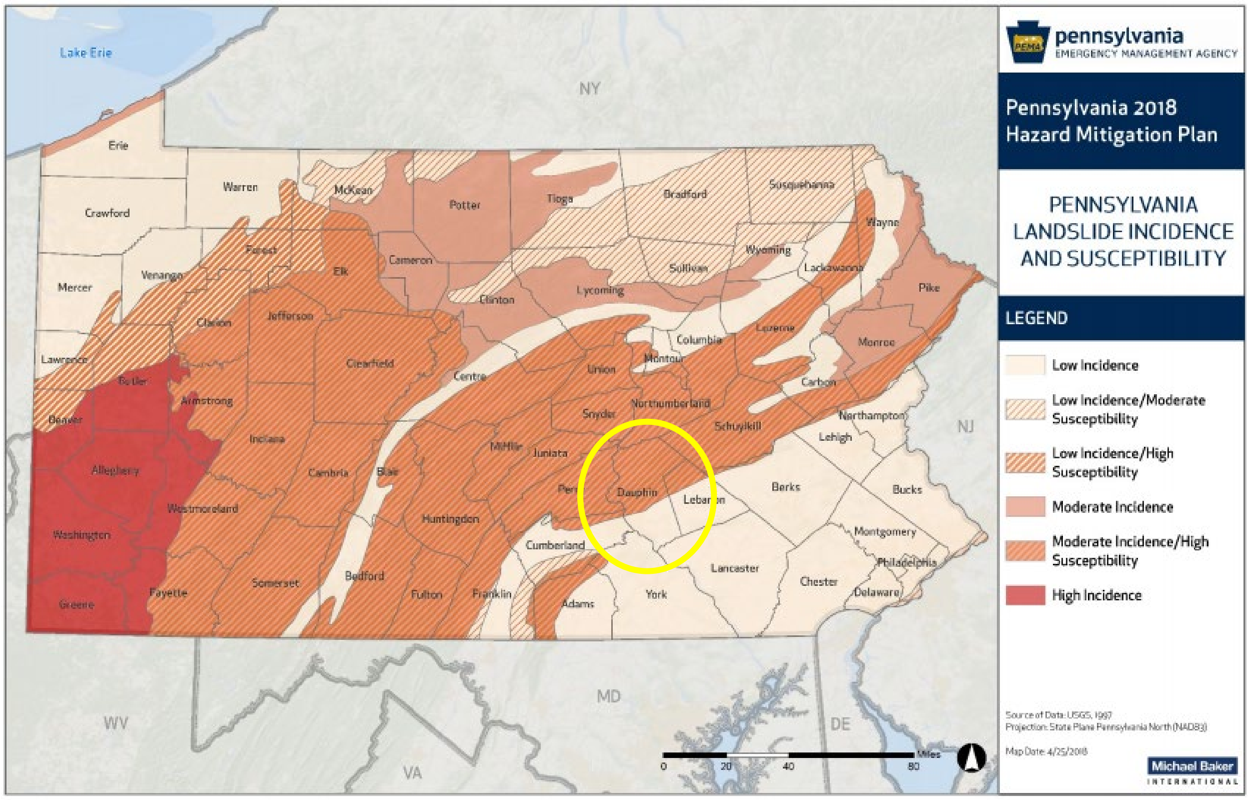
Rock falls and other slope failures occur in areas of Pennsylvania with moderate to steep slopes; however, most of Pennsylvania has areas susceptible to landslides. The southwestern area of Pennsylvania has the highest concentration of landslides (PEMA 2018; DCNR 2001). According to DCNR, most major and minor highways have sections cut in rock or soil that can lead to slope failure. Steep mountain slopes across Pennsylvania have experienced debris avalanches associated with extreme rainfall or rain-on-snow events. Additionally, urban and rural land development is increasing the number of landslide occurrences. Major highway construction with large excavations and fills creates potential for landslides (DCNR 2001).

To determine the extent of a landslide hazard, the affected areas need to be identified, and the probability of the landslide occurring within some time period needs to be assessed. Natural variables that contribute to the overall extent of potential landslide activity in any particular area include soil properties, topographic position and slope, and historical incidence. Predicting a landslide is difficult, even under ideal conditions and with reliable information. As a result, the landslide hazard is often represented by landslide incidence and/or susceptibility, as defined below:

- Landslide incidence is the number of landslides that have occurred in a given geographic area. High incidence means greater than 15 percent of a given area has been involved in landsliding; medium incidence means that 1.5 to 15 percent of an area has been involved; and low incidence means that less than 1.5 percent of an area has been involved (Radbruch-Hall 1982).
- Landslide susceptibility is defined as the probable degree of response of geologic formations to natural or artificial cutting, to loading of slopes, or to unusually high precipitation. It can be assumed that unusually high precipitation or changes in existing conditions can initiate landslide movement in areas where rocks and soils have experienced numerous landslides in the past. Landslide susceptibility depends on slope angle and the geologic material underlying the slope. Landslide susceptibility only identifies areas potentially affected and does not imply a time frame when a landslide might occur. High, medium, and low susceptibility are delimited by the same percentages used for classifying the incidence of landsliding (Radbruch-Hall 1982).

Figure 4.3.9-1 shows the landslide susceptible areas across the Commonwealth. The northern portion of Dauphin County is noted as having low incidence and high susceptibility to landslides.

Figure 4.3.9-1. Areas of Pennsylvania Susceptible to Landslides

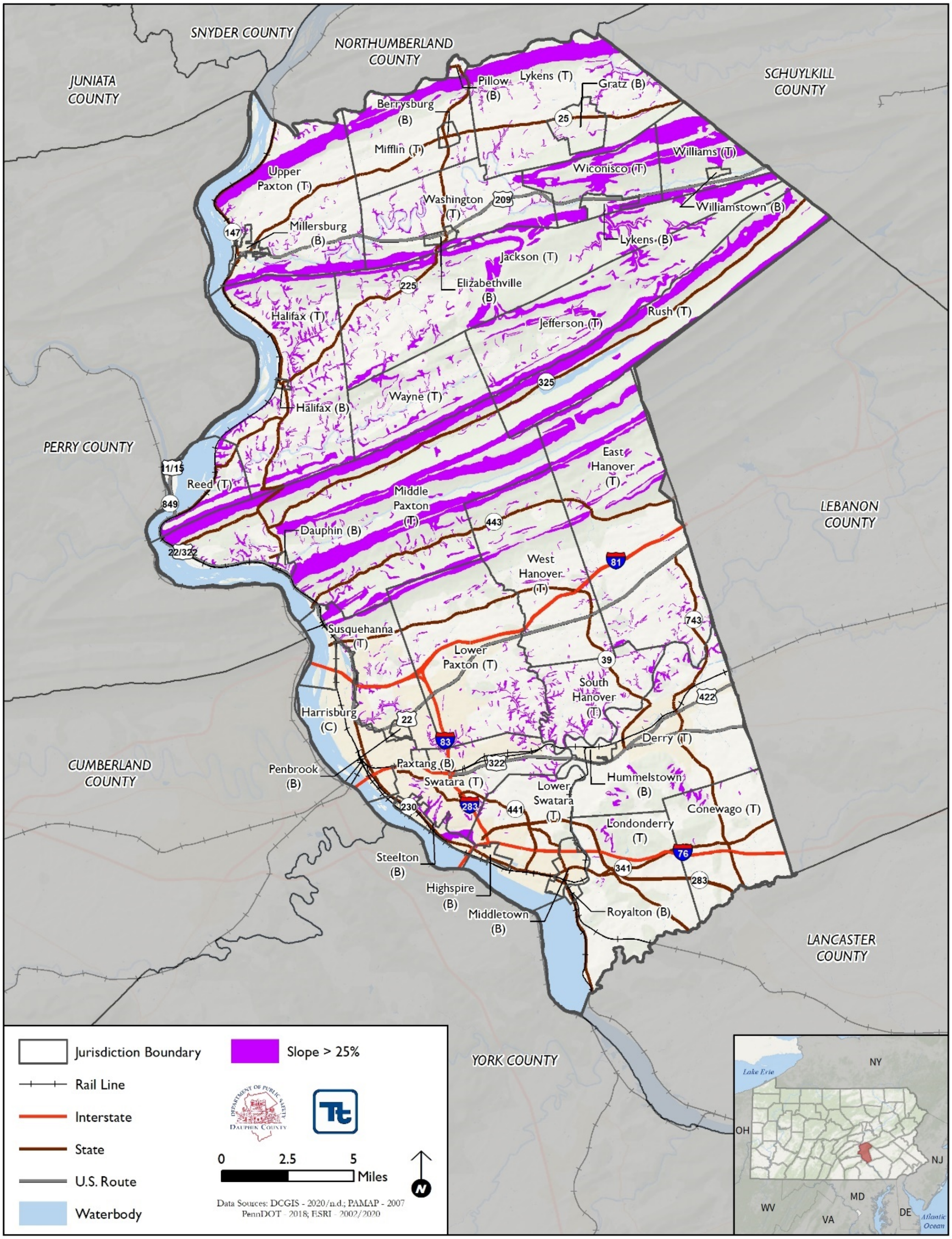


Source: *PEMA, 2018*

Note: *The yellow circle indicates the approximate location of Dauphin County. The northern portion of Dauphin County is shown as having a low incidence and high susceptibility to landslide.*

For the purposes of this planning effort, any area with a slope greater than 25 percent is considered the hazard area. According to the Steep Slopes GIS layer derived from the Dauphin County Department of Emergency Management (DEM), Dauphin County has a considerable amount of steep slope area. Figure 4.3.9-2 shows that steep slope occurs primarily in the central and northern parts of the county.

Figure 4.3.9-2. Landslide Hazard Area in Dauphin County



4.3.9.2 Range of Magnitude

Landslides have the potential to damage transportation routes, utilities, and buildings. They can also create travel delays and other side effects. Fortunately, deaths and injuries caused by landslides are rare in Pennsylvania, and most landslides in the Commonwealth are moderate to slow moving, damaging objects rather than people. Almost all of the known deaths caused by landslides have occurred when rock falls or other slides along highways have involved vehicles. Storm-induced debris flows are another type of landslide likely to cause death and injuries. As residential and recreational development increases on and near steep mountain slopes, the hazards from these events will also increase (PEMA 2018).

According to DCNR, the Pennsylvania Department of Transportation (PennDOT) and large municipalities incur substantial costs because of landslide damage and from extra construction costs for new roads in known landslide-prone areas. One PennDOT estimate in 1991 showed an average of $10 million per year in landslide repair contracts across the Commonwealth and a similar amount in mitigation costs for grading projects (DCNR 2001).

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 (PEMA 2018).

4.3.9.3 Past Occurrence

Outside of impacts to important transportation routes, landslide history is not documented as completely (if at all) as other hazards, primarily because landslides are not always seen, and therefore historical landslide occurrences in Dauphin County are not well known.

Neither FEMA, the National Centers for Environmental Information (NCEI), nor the county have any records of landslides in the county. Between 1954 and 2021, FEMA issued a disaster (DR) or emergency (EM) declaration for Pennsylvania for one geological hazard-related event, classified as severe storms, flooding, and mudslide. This declaration (DR-1649-PA) included Dauphin County for individual assistance, but Dauphin County was identified as having flood impact only from the event (FEMA 2021).

4.3.9.4 Future Occurrence

Based upon risk factors but lack of occurrences, it is unlikely landslides will occur in Dauphin County in the future. However, severity of the landslides can vary depending on type and location of event. Landslide probabilities are largely a function of surface geology but are also influenced by both weather and human activities. Mismanaged, intense development in steeply sloped areas could increase the frequency of a landslide occurrence. Periods of intense rain or snowmelt can also increase the risk of landslides.

Mismanaged, intense development in steeply sloped areas could increase the frequency of landslides in Dauphin County. Building and road construction are contributing development factors to landslides, as they can often undermine or steepen otherwise stable soil. Increased deforestation and soil disturbances caused by development on sloped areas further increases these risks. As timbering and development of sloped land continue, the risk of significant landslides increases. The probability of future occurrence of landslides in Dauphin County, according to FEMA's National Risk Index, has an annualized frequency of 0.02 (FEMA 2021).

Based on available historical data, the future occurrence of landslides can be considered *unlikely* as defined by the Risk Factor Methodology probability criteria (refer to Section 4.4).

4.3.9.5 Vulnerability Assessment

To understand risk, a community must evaluate what assets are exposed and/or vulnerable to the identified hazard. Because of the lack of spatially delineated landslide hazard areas in the county, a spatial analysis referenced areas with slopes greater than 25 percent to delineate the landslide hazard area. Slope degrees greater than 25 percent are categorized as the most at-risk slopes in the study.

Impact on Life, Health, and Safety

Generally, a landslide event would be an isolated incidence and impact the populations within the immediate area of the incident. Specifically, the populations located downslope of the landslide hazard areas are particularly vulnerable to this hazard. In addition to causing damage to residential buildings and displacing residents, landslide events can block off or damage major roadways and inhibit travel for emergency responders or populations trying to evacuate the area.

Table 4.3.9-1 summarizes the population located in the landslide-susceptible hazard area, or areas where slopes have degree angles greater than 25 percent. Swatara Township has the greatest number of persons located in the landslide-susceptible hazard area with 714 people, or 2.9 percent of its total population. The Borough of Dauphin has the greatest percentage of its population located in the landslide-susceptible hazard area (15.1-percent of its total population).

Table 4.3.9-1. Estimated Dauphin County Population Vulnerable to the Landslide Hazard Area

Jurisdiction	American Community Survey (2014-2018) Population	Estimated Population Exposed to Steep Slopes - Over 25-Percent	
		Number of People	Percent of Total
Berrysburg (B)	323	0	0.0%
Conewago (T)	3,069	13	0.4%
Dauphin (B)	855	129	15.1%
Derry (T)	25,036	173	0.7%
East Hanover (T)	5,919	50	0.8%
Elizabethville (B)	1,609	0	0.0%
Gratz (B)	805	0	0.0%
Halifax (B)	954	11	1.2%
Halifax (T)	3,561	113	3.2%
Harrisburg (C)	49,230	70	0.1%
Highspire (B)	2,667	0	0.0%
Hummelstown (B)	4,650	65	1.4%
Jackson (T)	1,727	53	3.0%
Jefferson (T)	302	28	9.3%
Londonderry (T)	5,211	24	0.5%
Lower Paxton (T)	48,739	526	1.1%
Lower Swatara (T)	8,788	13	0.1%
Lykens (B)	1,673	0	0.0%

Jurisdiction	American Community Survey (2014-2018) Population	Estimated Population Exposed to Steep Slopes - Over 25-Percent	
		Number of People	Percent of Total
Lykens (T)	1,631	49	3.0%
Middle Paxton (T)	5,067	202	4.0%
Middletown (B)	9,176	0	0.0%
Mifflin (T)	727	14	1.9%
Millersburg (B)	2,546	0	0.0%
Paxtang (B)	1,650	0	0.0%
Penbrook (B)	2,981	0	0.0%
Pillow (B)	256	1	0.4%
Reed (T)	209	13	6.2%
Royalton (B)	1,259	0	0.0%
Rush (T)	305	2	0.7%
South Hanover (T)	6,766	322	4.8%
Steelton (B)	5,954	537	9.0%
Susquehanna (T)	24,857	314	1.3%
Swatara (T)	24,685	714	2.9%
Upper Paxton (T)	4,219	75	1.8%
Washington (T)	2,166	23	1.1%
Wayne (T)	1,365	20	1.5%
West Hanover (T)	10,165	109	1.1%
Wiconisco (T)	1,122	18	1.6%
Williams (T)	1,104	40	3.6%
Williamstown (B)	1,187	0	0.0%
Dauphin County (Total)	**274,515**	**3,722**	**1.4%**

Sources: American Community Survey 2018 5-year estimates; Dauphin County – n.d.
Note: B – Borough; T - Township; C – City

Socially vulnerable populations (e.g., the elderly and low-income populations) are particularly vulnerable to a landslide event. There are approximately 44,262 persons over 65 and 34,158 persons living below the poverty level in Dauphin County (American Community Survey 2018). Lower Paxton Township has the greatest elderly population (8,600 people) and the City of Harrisburg has the greatest low-income population (13,492 people). The jurisdiction with greatest number of exposed persons, Swatara Township, has 4,106 elderly persons and 1,774 low-income persons. The jurisdiction with the greatest percentage of its population located in the landslide-susceptible hazard area, the Borough of Dauphin, has 113 elderly persons and 23 low-income persons. Economically disadvantaged populations are more vulnerable because they are likely to evaluate their risk and make decisions to evacuate based on the net economic impact to their family. The population over the age of 65 is more vulnerable because they are more likely to seek or need medical attention, which may not be available because of isolation during a flood event; they may also have more difficulty evacuating. Special consideration should be taken when planning for disaster preparation, response, and recovery for these vulnerable groups.

Impact on General Building Stock

In general, the built environment located in the landslide-susceptibility area and the population, structures and infrastructure located downslope are vulnerable to this hazard. Landslides also have the potential of destabilizing the foundation of structures, which may result in monetary losses to businesses and residents. There are 2,224 buildings with a replacement cost value of $998.2-million located in the landslide hazard area countywide. Swatara Townshipo has the greatest number of buildings and estimated replacement cost value located in landslide-susceptible hazard area, with 329 buildings totaling in a $221.2-million. Table 4.3.9-2 summarizes the exposed building stock located in the landslide-susceptibility area throughout the county by jurisdiction.

Table 4.3.9-2. Estimated General Building Stock Exposure to the Landslide Hazard Area

Jurisdiction	Number of Buildings	Total Replacement Cost Value	Estimated Building Stock Exposed Steep Slopes - Over 25-Percent			
			Number of Buildings	Percent of Total	Replacement Cost Value (RCV)	Percent of Total
Berrysburg (B)	366	$131,114,498	0	0.0%	$0	0.0%
Conewago (T)	2,495	$1,131,218,434	13	0.5%	$3,423,463	0.3%
Dauphin (B)	456	$160,174,274	70	15.4%	$21,501,415	13.4%
Derry (T)	11,617	$13,980,976,171	80	0.7%	$49,790,626	0.4%
East Hanover (T)	5,054	$2,617,412,647	35	0.7%	$8,953,026	0.3%
Elizabethville (B)	949	$396,035,763	0	0.0%	$0	0.0%
Gratz (B)	715	$432,294,298	2	0.3%	$486,727	0.1%
Halifax (B)	469	$181,049,719	9	1.9%	$4,832,966	2.7%
Halifax (T)	3,457	$1,457,192,513	119	3.4%	$29,740,941	2.0%
Harrisburg (C)	18,718	$15,182,832,338	29	0.2%	$16,260,458	0.1%
Highspire (B)	1,374	$550,466,766	0	0.0%	$0	0.0%
Hummelstown (B)	2,337	$1,082,835,134	30	1.3%	$12,741,397	1.2%
Jackson (T)	2,371	$776,111,853	77	3.2%	$21,615,961	2.8%
Jefferson (T)	666	$230,110,295	42	6.3%	$7,205,543	3.1%
Londonderry (T)	5,080	$2,360,384,847	18	0.4%	$6,916,020	0.3%
Lower Paxton (T)	20,948	$14,635,453,846	226	1.1%	$142,481,369	1.0%
Lower Swatara (T)	4,771	$5,522,875,069	14	0.3%	$6,993,932	0.1%
Lykens (B)	1,322	$517,534,065	1	0.1%	$478,421	0.1%
Lykens (T)	2,155	$941,126,374	60	2.8%	$18,256,032	1.9%
Middle Paxton (T)	4,093	$1,462,655,724	166	4.1%	$51,177,389	3.5%
Middletown (B)	3,582	$1,981,507,138	0	0.0%	$0	0.0%
Mifflin (T)	1,125	$603,453,937	18	1.6%	$3,890,023	0.6%
Millersburg (B)	1,439	$770,504,424	0	0.0%	$0	0.0%
Paxtang (B)	869	$403,915,987	0	0.0%	$0	0.0%
Penbrook (B)	1,525	$602,189,726	0	0.0%	$0	0.0%
Pillow (B)	301	$101,661,910	7	2.3%	$2,646,621	2.6%
Reed (T)	299	$117,139,877	17	5.7%	$3,853,108	3.3%
Royalton (B)	630	$196,935,626	0	0.0%	$0	0.0%
Rush (T)	343	$71,032,585	2	0.6%	$573,602	0.8%
South Hanover (T)	3,972	$1,935,844,099	180	4.5%	$56,647,875	2.9%
Steelton (B)	2,721	$2,111,932,612	232	8.5%	$81,470,051	3.9%
Susquehanna (T)	11,785	$8,633,889,539	154	1.3%	$112,456,086	1.3%
Swatara (T)	11,354	$8,581,237,561	329	2.9%	$221,169,758	2.6%
Upper Paxton (T)	3,560	$1,473,328,502	67	1.9%	$21,384,121	1.5%
Washington (T)	2,270	$1,106,223,564	42	1.9%	$25,169,274	2.3%
Wayne (T)	1,324	$398,741,088	23	1.7%	$5,871,112	1.5%
West Hanover (T)	6,505	$3,228,343,376	69	1.1%	$18,736,910	0.6%
Wiconisco (T)	995	$297,597,257	49	4.9%	$30,665,292	10.3%
Williams (T)	957	$390,058,854	44	4.6%	$10,824,406	2.8%
Williamstown (B)	908	$345,185,743	0	0.0%	$0	0.0%
Dauphin County (Total)	**145,877**	**$97,100,578,032**	**2,224**	**1.5%**	**$998,213,924**	**1.0%**

Sources: RS Means – 2020; Dauphin County – n.d.
Note: B – Borough; T - Township; C – City

Critical Facilities and the Economy

Landslides can also impact the critical facilities in Dauphin County. There are 42 critical facilities located in the identified landslide-susceptibility hazard area (Table 4.3.9-3). Bridges, hazardous material facilities, and historic sites are the types of critical facilities primarily in the landslide hazard area. Furthermore, Table 4.3.9-4 shows the number of lifelines exposed to the landslide-susceptible hazard area in the county. Overall, 34 of the critical facilities exposed to the landslide hazard area are considered lifelines for the county. Section 4, County Profile, provides more information about these critical facilities and lifelines.

Table 4.3.9-3. Distribution of Critical Facilities in the Landslide-Susceptible Hazard Area (Slope Degrees >25 Percent) by Type and Jurisdiction

Jurisdiction	Critical Facilities Exposed to Steep Slopes - Over 25-Percent													
	Bridge	Communication Infrastructure	Dam	Day Care Facility	Fire Station	Hazardous Material Facility	Historic Sites	Municipal Office	Polling Site	Post Office	Potable Water Facility	Religious	Senior	Wastewater Plant
Berrysburg (B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Conewago (T)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dauphin (B)	0	0	0	0	1	0	3	0	0	0	0	0	0	0
Derry (T)	0	0	0	0	0	0	1	0	0	0	0	0	0	1
East Hanover (T)	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Elizabethville (B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gratz (B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Halifax (B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Halifax (T)	1	1	0	0	0	1	0	0	0	0	1	0	0	0
Harrisburg (C)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Highspire (B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hummelstown (B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jackson (T)	0	0	4	0	0	0	0	0	0	0	0	0	0	0
Jefferson (T)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Londonderry (T)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lower Paxton (T)	2	0	2	0	0	0	1	0	0	0	0	0	0	0
Lower Swatara (T)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lykens (B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lykens (T)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Middle Paxton (T)	0	1	0	0	0	1	0	0	0	1	0	1	0	0
Middletown (B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mifflin (T)	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Millersburg (B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paxtang (B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Penbrook (B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pillow (B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Jurisdiction	Critical Facilities Exposed to Steep Slopes - Over 25-Percent													
	Bridge	Communication Infrastructure	Dam	Day Care Facility	Fire Station	Hazardous Material Facility	Historic Sites	Municipal Office	Polling Site	Post Office	Potable Water Facility	Religious	Senior	Wastewater Plant
Reed (T)	0	0	0	0	0	0	0	1	1	0	0	0	0	0
Royalton (B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rush (T)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
South Hanover (T)	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Steelton (B)	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Susquehanna (T)	1	0	0	1	0	0	0	0	0	0	0	1	0	0
Swatara (T)	1	0	0	0	0	1	0	0	0	0	0	1	1	0
Upper Paxton (T)	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Washington (T)	0	0	0	0	0	1	0	0	0	0	0	0	0	1
Wayne (T)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
West Hanover (T)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wiconisco (T)	0	1	0	0	0	1	0	0	0	0	0	0	0	1
Williams (T)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Williamstown (B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dauphin County (Total)	**6**	**5**	**6**	**1**	**1**	**6**	**6**	**1**	**1**	**1**	**1**	**3**	**1**	**3**

Sources: Dauphin County – n.d./2020
Note: B – Borough; T - Township; C – City

Table 4.3.9-4. Critical Facilities Located in the Landslide-Susceptible Hazard Areas (Slope Degrees >25%)

Jurisdiction	Total Critical Facilities Located in Jurisdiction	Total Lifelines Located in Jurisdiction	Number of Critical Facilities and Lifeline Facilities Exposed to a Landslide			
			Critical Facilities	Percent of Total Critical Facilities	Lifelines	Percent of Total Lifelines
Berrysburg (B)	6	5	0	0.0%	0	0.0%
Conewago (T)	12	7	0	0.0%	0	0.0%
Dauphin (B)	27	23	4	14.8%	4	17.4%
Derry (T)	122	74	2	1.6%	2	2.7%
East Hanover (T)	41	29	1	2.4%	1	3.4%
Elizabethville (B)	12	9	0	0.0%	0	0.0%
Gratz (B)	9	7	0	0.0%	0	0.0%
Halifax (B)	8	7	0	0.0%	0	0.0%
Halifax (T)	37	24	4	10.8%	4	16.7%
Harrisburg (C)	371	271	0	0.0%	0	0.0%
Highspire (B)	15	9	0	0.0%	0	0.0%
Hummelstown (B)	33	23	0	0.0%	0	0.0%
Jackson (T)	26	15	4	15.4%	2	13.3%
Jefferson (T)	8	6	0	0.0%	0	0.0%

Jurisdiction	Total Critical Facilities Located in Jurisdiction	Total Lifelines Located in Jurisdiction	Number of Critical Facilities and Lifeline Facilities Exposed to a Landslide			
			Critical Facilities	Percent of Total Critical Facilities	Lifelines	Percent of Total Lifelines
Londonderry (T)	47	31	0	0.0%	0	0.0%
Lower Paxton (T)	149	73	5	3.4%	4	5.5%
Lower Swatara (T)	94	75	0	0.0%	0	0.0%
Lykens (B)	22	17	0	0.0%	0	0.0%
Lykens (T)	16	10	0	0.0%	0	0.0%
Middle Paxton (T)	38	23	4	10.5%	3	13.0%
Middletown (B)	48	27	0	0.0%	0	0.0%
Mifflin (T)	11	8	1	9.1%	1	12.5%
Millersburg (B)	28	16	0	0.0%	0	0.0%
Paxtang (B)	14	9	0	0.0%	0	0.0%
Penbrook (B)	16	5	0	0.0%	0	0.0%
Pillow (B)	7	4	0	0.0%	0	0.0%
Reed (T)	8	7	2	25.0%	1	14.3%
Royalton (B)	12	9	0	0.0%	0	0.0%
Rush (T)	6	5	0	0.0%	0	0.0%
South Hanover (T)	25	17	1	4.0%	1	5.9%
Steelton (B)	34	17	1	2.9%	1	5.9%
Susquehanna (T)	112	72	3	2.7%	1	1.4%
Swatara (T)	146	95	4	2.7%	3	3.2%
Upper Paxton (T)	37	25	1	2.7%	1	4.0%
Washington (T)	34	27	2	5.9%	2	7.4%
Wayne (T)	9	8	0	0.0%	0	0.0%
West Hanover (T)	48	31	0	0.0%	0	0.0%
Wiconisco (T)	15	11	3	20.0%	3	27.3%
Williams (T)	16	12	0	0.0%	0	0.0%
Williamstown (B)	10	6	0	0.0%	0	0.0%
Dauphin County (Total)	**1,729**	**1,149**	**42**	**2.4%**	**34**	**3.0%**

Sources: Dauphin County – n.d./2020
Note: B – Borough; T - Township; C – City

In addition to critical facilities, a significant amount of infrastructure can be exposed to mass movements of geological material:

- *Roads* – Access to major roads is crucial to life-safety after a disaster event and to response and recovery operations. Landslides can block egress and ingress on roads, isolating neighborhoods, posing traffic problems, and causing delays of public and private transportation. This can result in economic losses for businesses.
- *Bridges* – Landslides can significantly impact road bridges. Mass movements can knock out bridge abutments or significantly weaken the soil supporting them, rendering them hazardous for use.
- *Power Lines* – Power lines are generally elevated above steep slopes but the towers supporting them can be subject to landslides. A landslide could trigger failure of the soil underneath a tower, causing it to collapse and ripping down the lines. Power and communication failures from landslides can create problems for vulnerable populations and businesses.

- *Rail Lines* – Similar to roads, rail lines are important for response and recovery operations after a disaster. Landslides can block travel along the rail lines, which would become especially troublesome, because it would not be as easy to detour a rail line as it would be to re-route a local road or highway.

Impact on the Economy

Geologic hazards can impose direct and indirect impacts on society. Direct costs include actual damage sustained by buildings, property, and infrastructure. Indirect costs, such as cleanup costs, business interruption, loss of tax revenues, reduced property values, and loss of productivity, are difficult to measure. Additionally, ground failure threatens transportation corridors, fuel and energy conduits, and communication lines (Spiker and Gori 2000).

Impact on the Environment

A landslide event alters the landscape. In addition to changes in topography, vegetation and wildlife habitats may be damaged or destroyed. Soil and sediment runoff will accumulate downslope, potentially blocking waterways and roadways and impacting quality of streams and other water bodies. Additional environmental impacts include loss of forest productivity.

Mudslides are a type of landslide that involve quick-moving debris rivers. These types of landslides can destroy natural and man-made objects, ultimately settling in a level location and gathering into thick deposits (PEMA 2018).

Cascading Impacts on Other Hazards

Landslide events can have cascading impacts on transportation accidents and utility interruption. As discussed in earlier sections, landslides may disturb roadways, railways, or other methods of transportation. Debris can intersect these lines, causing accidents and other disruptions to occur.

Landslides can also disrupt the functionality of utilities if the debris falls, topples, or spreads over the utilities providing services to the county. For example, electric utilities may become disconnected if power lines are broken from displaced geologic material. Water utilities may become breached with excess debris and/or contaminants carried by landslide events. More information about traffic accidents and utility interruptions is provided in Sections 4.3.15 and 4.3.16.

4.3.9.6 Future Changes that May Impact Vulnerability

Understanding future changes that impact vulnerability in the county can assist in planning for future development and ensuring that appropriate mitigation and preparedness measures are in place. The county considered the following factors to examine potential conditions that may affect landslide hazard vulnerability:

- Potential or projected development
- Projected changes in population
- Other identified conditions as relevant and appropriate, including the impacts of climate change

Projected Development

Any sections of growth located in the landslide-susceptible hazard areas could be potentially impacted by the geologic ground movement caused by landslides. It is recommended that the county and jurisdictional partners implement design strategies that mitigate against the risk of landslides. The maps in Section 4.4 show growth area locations throughout the county and their proximity to the landslide-susceptible hazard areas (i.e., where slope degrees are greater than 25 percent).

Projected Changes in Population

Estimated population projections provided by the Center of Rural Pennsylvania indicate that Dauphin County's population will continue to increase into 2040, increasing total population to approximately 296,766 persons (The Center of Rural Pennsylvania 2013). This is approximately a 10.6 percent increase from the county's 2010 population. Persons that move into areas with steep slope are at greater risk to be impacted if a landslide were to occur.

Climate Change

A direct impact of climate change on landslides is difficult to determine. However, multiple secondary effects of climate change have the potential to increase the likelihood of landslides. Warming temperatures resulting in wildfires would reduce vegetative cover along steep slopes and destabilize the soils because of destruction of the root system. Additionally, increased intensity of rainfall events would increase saturation of soils on steep slopes. Under these future conditions, the county's assets located on or at the base of these steep slopes will have an increased risk to landslides.

4.3.9.7 Change of Vulnerability Since 2015 HMP

Since the 2015 HMP analysis, population statistics have been updated using the 5-Year 2014-2018 American Community Survey Population Estimates. The general building stock was updated using RSMeans 2020 building valuations that estimated replacement cost value for each building in the inventory. Landslide susceptibility was considered to be a slope of 25 percent or greater. Overall, this vulnerability assessment provides more accurate exposure and potential loss estimates for Dauphin County.

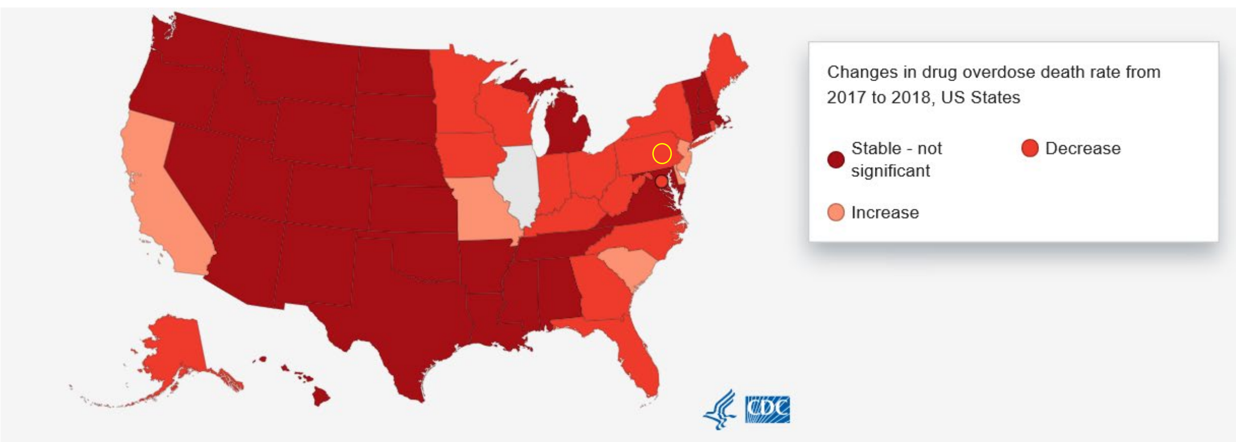
4.3.10 Opioid Addiction Response

The following section provides the hazard profile (hazard description, location, extent, previous occurrences and losses, probability of future occurrences, and impact of climate change) and vulnerability assessment for the Opioid Addiction Response hazard in Dauphin County.

Pennsylvania is experiencing an unprecedented epidemic of drug abuse and drug-related deaths, affecting residents throughout the state. In 2019, 4,458 drug overdose deaths were identified statewide. Of those deaths, 83.9 percent (3,742) have been confirmed to be opioid-related, a 0.1 percent increase compared to the 3,737 in 2018 (PA Department of Health 2020). In 2018, Pennsylvania had the fourth highest rate of drug overdose deaths in the country. In 2019, there were 101 drug overdose-related deaths within Dauphin County (Overdose Free PA n.d.)

Death rates have been stable in the majority of the United States, with some states reporting a decrease, including Pennsylvania. (highlighted on Figure 4.3.10-1) (Centers for Disease Control and Prevention [CDC] 2019). The Dauphin County drug overdose death rate per 100,000 people was 44 in 2018 (Overdose Free PA n.d.).

Figure 4.3.10-1. Statistically Significant Drug Overdose Death Rate Increase and Decrease from 2017 to 2018



Source: Centers for Disease Control and Prevention (CDC) 2019
Note: Yellow circle over Dauphin County

In 2017, the U.S. Drug Enforcement Administration (DEA) Philadelphia Division and the University of Pittsburgh prepared a document titled, "Analysis of Overdose Deaths in Pennsylvania, 2016" to assist law enforcement's efforts to identify and combat drug suppliers, and ultimately drug abuse and related overdoses (DEA Philadelphia Division 2017). The drugs included in the analysis (listed in Table 4.3.10-1) were selected based on (1) law enforcement intelligence regarding frequency of abuse and diversion, and (2) the most common drugs present in drug-related overdose deaths according to national public safety and public health sources.

For the purpose of this Hazard Mitigation Plan (HMP) update and as identified by the Steering Committee, the drugs included in Table 4.3.10-1 below will be discussed in further detail in this section. This section also describes the location and extent, range of magnitude, past occurrence, future occurrence, and vulnerability assessment for the opioid addiction response hazard for the Dauphin County HMP.

Table 4.3.10-1. Drugs Included in Analysis of Drug-Related Overdose Deaths, Pennsylvania, 2017

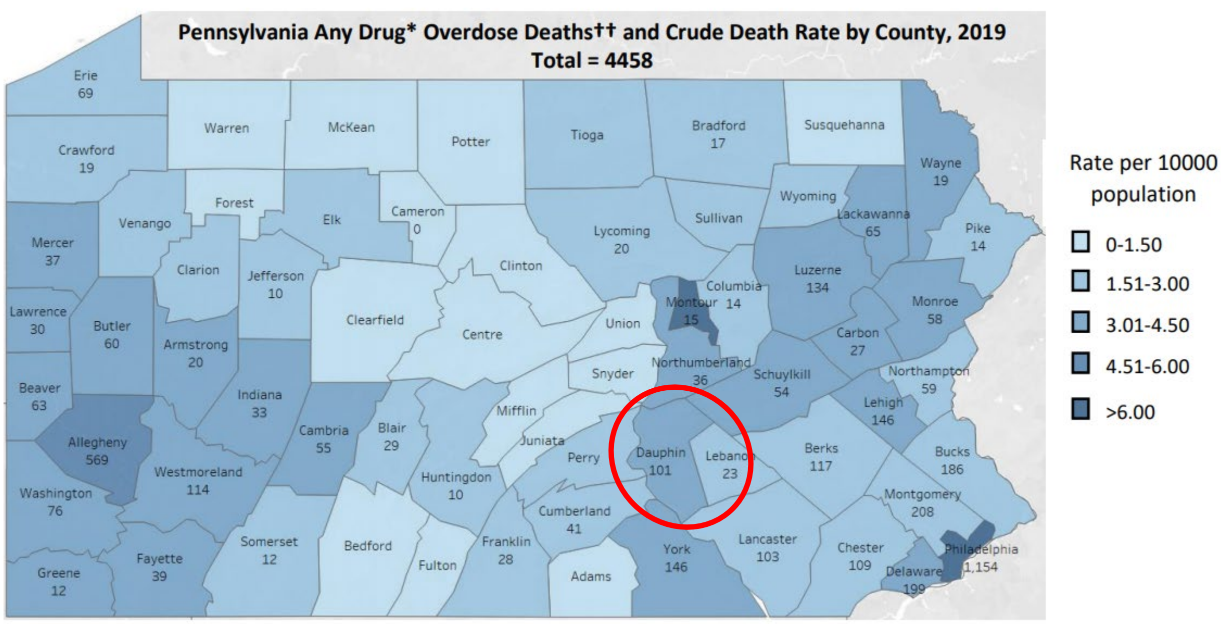
Drug Category	Substances Included in Analysis		
Benzodiazepines	Alprazolam Chlordiazepoxide Clonazepam Delorazepam	Diazepam Estazolam Flurazepam Lorazepam	Midazolam® Oxazepam Temazepam
Cocaine			
Fentanyl/Fentanyl-Related Substances (FRS)/Non-Prescription Synthetic Opioids (NPSO)	3-Methylfentanyl 4-Methoxy-Butyryl Fentanyl Acetyl Fentanyl Acryl Fentanyl	Carfentanil Fentanyl Fluorobutyrfentanyl Fluorofentanyl	Furanyl Fentanyl Para-Fluoro-Isobutyryl Fentanyl/FIBF Sufentanil U-47700
Heroin			
Other Illicit Drugs	Lysergic Acid Diethylamid (LSD) Methylenedioxy-amphetamine (MDA) 3,4-Methylenedioxymethamphetamine (MDMA)		Methamphetamine Phencyclidine (PCP)
Prescription Opioids	Hydrocodone Hydromorphone Meperidine	Morphine Oxycodone Oxymorphone	Tapentadol Tramadol

Source: DEA Philadelphia Field Division 2017

4.3.10.1 Location and Extent

The number of overdoses within Dauphin County has increased from 2015 to 2019. The number of opioid overdoses peaked in 2018 with 120 overdoses. The number of reported opioid overdoses decreased from 2018 to 2019 from 120 to 101 overdoses. (Pennsylvnaia Department of Health 2019.). As shown in Figure 4.3.10-2, in 2019, Dauphin County had a rate of 3.01-4.50 drug-related overdose deaths per 10,000 people.

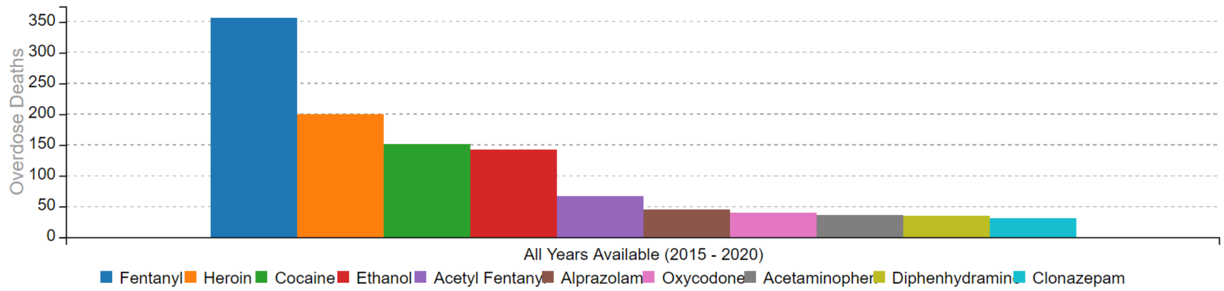
Figure 4.3.10-2. Pennsylvania Overdose Deaths and Crude Rate by County, 2019



Source: Pennsylvania Department of Health 2019
Note: The red oval indicates the location of Dauphin County.

The figure shows that fentanyl was the most frequently reported drug category associated with overdose deaths in the county, followed by heroin.

Figure 4.3.10-3. Top 10 Drugs Present in 2015–2020 Drug-Related Overdose Deaths, Dauphin County



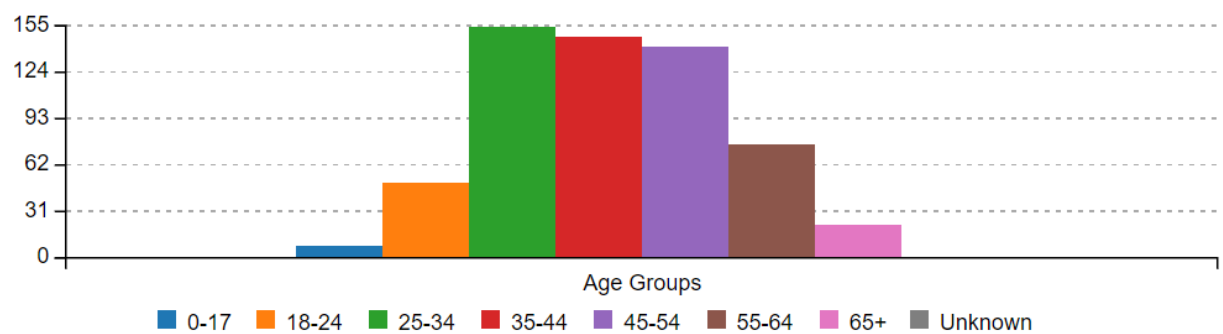
Source: Overdose Free PA 2020

4.3.10.2 Range of Magnitude

Age

Overdose Free PA indicated 541 overdose deaths between 2015 and 2020 in Dauphin County. The age groups with the highest number of overdoses were (in descending order) 25–34, 35–44, 45–54, with these three age groups composing 74 percent of overdose deaths in the county (Overdose Free PA n.d.).

Figure 4.3.10-4. Age Distribution of Drug-Related Overdose Decedents, Dauphin County, 2015–2020



Source: Overdose Free PA 2020

Gender

In 2016, 2017, and 2018, Fentanyl was the drug category most frequently associated with overdose deaths among males and females in the county. In 2018, toxicology reports identified the three most prevalent drug categories associated with overdose deaths among males in Dauphin County as fentanyl (82 percent), heroin (42 percent), and FRSs and NPSOs (29 percent). The three most prevalent drug categories associated with overdose deaths among females were fentanyl (74 percent), cocaine (47 percent), and benzodiazepines (39 percent), as shown in Figure 4.3.10-5.

Figure 4.3.10-5. Drug Presence among Drug-Related Overdose Decedents by Gender 2016–2018 in Dauphin County, Pennsylvania

Drug Category	2016 Female	2016 Male	2017 Female	2017 Male	2018 Female	2018 Male
Fentanyl	45%	60%	74%	76%	74%	82%
Heroin	42%	40%	37%	56%	26%	42%
Cocaine	19%	19%	7%	20%	47%	27%
Benzodiazepines	32%	25%	19%	16%	39%	21%
Rx Opioids	10%	19%	11%	26%	13%	14%
Ethanol	23%	38%	22%	26%	18%	25%
FRSs & NPSOs	6%	8%	11%	29%	24%	29%
Other Illicit Drugs	16%	6%	4%	6%	16%	11%

Source: Overdose Free PA 2018

Race and Ethnicity

Figure 4.3.10-6 shows the breakdown of overdose deaths by race and ethnicity in Dauphin County from 2016–2018. Fentanyl, heroin, and ethanol were most prevalent in the White and Black populations; fentanyl, heroin, cocaine, and FRSs and NPSOs were most prevalent in the Hispanic population; and fentanyl, heroin, and benzodiazepines were most prevalent in the Other population.

Figure 4.3.10-6. Drug Presence by Race and Ethnicity Among Drug-Related Overdose Decedents, Dauphin County, Pennsylvania, 2016–2018

Drug Category	White	Black	Hispanic	Other
Fentanyl	70%	63%	96%	75%
Heroin	41%	37%	50%	75%
Cocaine	22%	29%	33%	25%
Benzodiazepines	24%	21%	17%	50%
Rx Opioids	20%	11%	4%	13%
Ethanol	25%	34%	29%	
FRSs & NPSOs	20%	21%	33%	13%
Other Illicit Drugs	10%	11%		25%

Source: Overdose Free PA 2020

4.3.10.3 Past Occurrence

Deaths from drug overdose are an increasing public health burden in the United States. A total of 67,367 drug overdose-related deaths were reported in 2018 (National Institute on Drug Abuse n.d.). Table 4.3.10-2 shows the annual accidental drug-related deaths in Dauphin County from 2015 to 2020. Drug-related deaths in Dauphin County increased from 2015 to 2018, but in 2019, the number of drug-related deaths decreased.

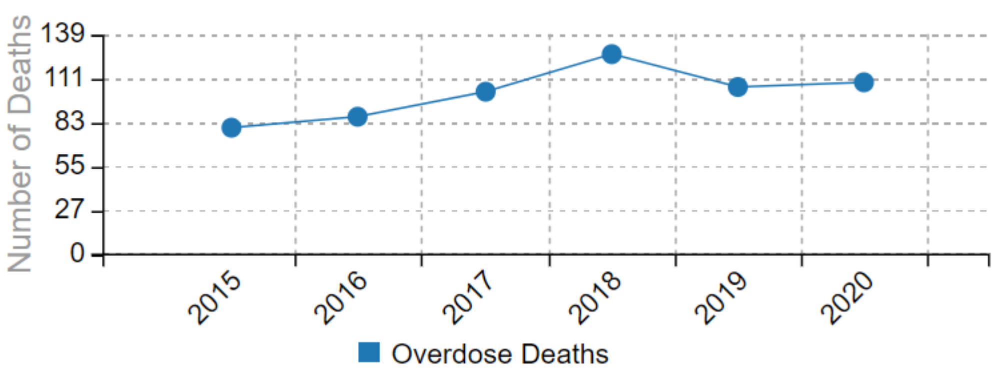
Table 4.3.10-2. Accidental Drug-Related Deaths, Dauphin County, Pennsylvania 2015–2020

Year	Drug-Related Deaths	Population
2015	81	272,983
2016	88	273,707
2017	104	275,710
2018	128	277,097
2019	107	278,299
2020*	91	N/A

Source: Overdose Free PA, U.S. Census 2015-2019
*Note: *Data available as of December 17, 2020*

Figure 4.3.10-7 shows the changes in overdose death rates from 2015 to 2020 for Dauphin County, Pennsylvania.

Figure 4.3.10-7. Annual Drug-Related Deaths, Dauphin County, 2015–2020



Source: Overdose Free PA 2020

Pennsylvania Governor Wolf declared the heroin and opioid epidemic a statewide disaster emergency on January 10, 2018. He has signed six renewals of the proclamation since then. This first-ever public health disaster declaration is meant to enhance state response, increase access to treatment, and save lives. A command center at the Pennsylvania Emergency Management Agency (PEMA) tracks progress and enhances coordination of health and public safety agencies. The declaration specifies 13 key initiatives organized by three areas of focus. The three areas of focus are listed below, with the associated key initiatives described beneath each area:

1. Enhancing Coordination and Data Collection to Bolster State and Local Response

   - Establishes an Opioid Command Center located at PEMA**,** which will house the Unified Opioid Coordination Group that will meet weekly during the period of the disaster declaration to monitor implementation and progress of the initiatives in the declaration.

- Expands Access to Prescription Drug Monitoring Program (PDMP) to Other Commonwealth Entities for Clinical Decision-Making Purposes to improve treatment outcomes and better monitor compliance among prescribers. Since 2016, 90,000 physicians have conducted more than 1 million searches on the PDMP.

- Adds Overdoses and Neonatal Abstinence Syndrome (NAS) as Reportable Conditions in Title 28, Chapter 27 to the Pennsylvania Department of Health (DOH) to increase data collection and improve outcomes in both areas.

- Authorizes Emergency Purchase Under Procurement Code for Hotline Contract with Current Vendor, giving the Pennsylvania Department of Drug and Alcohol Program (DDAP) further emergency purchase authorization to allow the department to enter into a contract with the current drug and alcohol hotline vendor for uninterrupted services. To date, the 24/7 helpline, 1-800-662-HELP, has received more than 18,000 calls to connect those suffering from substance use disorder with treatment.

2. Improving Tools for Families, First Responders, and Others to Save Lives

- Enables emergency medical services providers to leave behind naloxone by amending the current standing order to include dispensing by first responders, including emergency medical technicians (EMT). The existing naloxone standing order and funding for naloxone to first responders has allowed for more than 5,000 lives to be saved, helping connect sufferers to treatment for substance use disorder.

- Allows pharmacists to partner with other organizations to increase access to naloxone by waiving regulations to allow pharmacists to partner with other organizations, including prisons and treatment programs, to make naloxone available to at-risk individuals upon discharge from these facilities.

- Allows for the immediate temporary rescheduling of all fentanyl derivatives to align with the federal DEA schedule while working toward permanent rescheduling.

- Authorizes emergency purchasing under Section 516 of the Procurement Code to allow for an emergency contract to expand the advanced body scanner pilot program currently in place at Wernersville State Hospital that is used on re-entrants returning to the facility. This would prevent the program from lapsing.

3. Speeding Up and Expanding Access to Treatment

- Waive the face-to-face physician requirement for Narcotic Treatment Program (NTP) admissions to allow initial intake review by a certified registered nurse practitioner (CRNP) or physician assistant (PA) to expedite initial intakes and streamline coordination of care when an individual is most in need of immediate attention.

- Expand access to medication-assisted treatment (MAT) by waiving the regulatory provision to permit dosing at satellite facilities even while counseling remains at the base of the NTP. This allows more people to receive necessary treatments at the same location, increasing their access to care and chances for recovery.

- Waive annual licensing requirements for high-performing drug and alcohol treatment facilities to allow for bi-annual licensure process, which streamlines licensing functions and better allocates staff time. DDAP will request that facilities seek a waiver by filing exception requests to the annual licensing requirement.

- Waive the fee provided for in-statute for birth certificates for individuals who request a good-cause waiver by attesting that they are affected by opioid use disorder (OUD). This is of particular importance to individuals experiencing homelessness and other vulnerable populations who often cannot obtain copies of their birth certificates to access treatment and other benefits due to the financial requirements.

- Waive separate licensing requirements for hospitals and emergency departments to expand access to drug and alcohol treatment to allow physicians to administer short-term MAT consistent with DEA regulations without requiring separate notice to DDAP.

4.3.10.4 Future Occurrence

One of the most important components in reducing drug-related deaths is to prevent initial drug use; as such, the impact of education and prevention strategies in use today are geared to reduce the number of overdose deaths that will be shown in future years. The DEA Philadelphia Field Division will continue efforts, in conjunction with law enforcement and public health partners, to define and address the factors impacting availability and abuse of illicit drugs and diverted pharmaceuticals in Pennsylvania, which will ultimately impact the number of overdose deaths.

As evidenced by the upward trajectory of drug-related overdose deaths over the past several years throughout Dauphin County, Pennsylvania, and United States, the drug overdose hazard is likely to continue if something is not done. A crisis exists among law enforcement, public health entities, and educators to address drug availability, drug treatment, and drug education.

The identified hazards of concern for Dauphin County were ranked for relative risk in Section 4.4 of this plan. The probability of occurrence, or likelihood of the event, is one parameter used for ranking hazards. Based on historical records, the probability of occurrence for drug overdose events in Dauphin County is considered *highly likely*. Section 4.4 provides further information on PEMA’s risk factor methodology and the risk factors used to determine each hazard’s risk rank.

4.3.10.5 Vulnerability Assessment

To understand risk, a community must evaluate the assets that are exposed and potentially vulnerable to the identified hazard. The following sections evaluate and estimate the potential impact of drug overdose deaths on Dauphin County, including:

- Overview of vulnerability
- Impact on (1) life, health, and safety; (2) general building stock and critical facilities; (3) economy; (4) the environment; and (6) future growth and development
- Effects of climate change on vulnerability
- Further data collections that will assist with understanding of this hazard over time

Overview of Vulnerability

This section is being added as an introductory representation, with hopes that future HMP updates will include more enhanced data for Dauphin County as well as successful mitigation actions. At this time, available data support the need to create awareness and provide education to Dauphin County residents regarding this hazard of concern.

Impact on Life, Health, and Safety

The population that uses opioids their family and friends, as well as first responders, are vulnerable to opioid addiction and overdose deaths. According to the 2014–2018 American Community Survey 5-Year Estimates, Dauphin County's population was 277,097. The rates of drug overdose deaths are continuing to increase. According to CDC, in 2018, Pennsylvania had one of the top four highest observed drug overdose death rates in the country (CDC 2020). As discussed above, Dauphin County drug overdose death rate per 10,000 people was 3.01-4.50 in 2018 (Overdose Free PA n.d.).

Impact on General Building Stock and Critical Facilities

No structures are anticipated to be affected directly by drug-related overdose deaths.

Impact on the Economy

The impact the drug overdose hazard has on the economy and estimated dollar losses are difficult to measure and quantify.

Impact on the Environment

As discussed in the 2018 Pennsylvania State HMP, fentanyl and fentanyl-related substances are hazardous materials and should be treated as such. Depending on the potency of the drug, it can take as little as the equivalent of a few micrograms to cause health complications (DEA 2019).

According to a recent study, environmental scientists at the Cary Institute of New York found traces of opioids and other drugs in streams, rivers, and lakes. These traces came from human urine and feces, and medications that have been flushed down the toilet. However, the ecological and environmental impacts are unknown. The U.S. Environmental Protection Agency (EPA) suggests that while the risks of pharmaceuticals found in wastewater, ambient water, and drinking water is low, further research is needed (EPA n.d.).

Future Growth and Development

Areas targeted for potential future growth and development in the next 5 to 10 years have been identified across Dauphin County (further discussed in Section 2.4 of this HMP). Any areas of growth could be potentially impacted by the drug overdose hazard because the entire county is exposed and potentially vulnerable.

Effect of Climate Change on Vulnerability

Climate change is not anticipated to affect vulnerability associated with drug overdose deaths.

Additional Data and Next Steps

For the HMP update, any additional information regarding localized concerns and past impacts will be collected and analyzed. These data will be developed to support future revisions to the plan. Future mitigation efforts could include building on existing state, county, and local efforts.

4.3.11 Pandemic and Infectious Disease

Pandemics are large-scale disease outbreaks, defined by the way in which a disease spreads rather than the number of fatalities associated with it. A pandemic outbreak has several recognizable characteristics, including rapid, large-scale (potentially global) spread causing (1) overloaded healthcare systems; (2) inadequate medical supplies; (3) medical supply shortages; and (4) a disrupted economy and society (CDC 2015). Pandemics typically result from infectious diseases. An infectious disease, as defined by the World Health Organization (WHO), is caused by pathogenic organisms (e.g., bacteria, viruses, fungus, or parasites) that spread from one person to another, whether through direct or indirect contact. Zoonotic disease is a type of infectious disease that occurs when animals transmit a disease to humans (WHO 2015). Although any infectious disease can reach pandemic levels, the 2019 Coronavirus (COVID-19), is the current pandemic affecting most countries.

This section describes the location and extent, range of magnitude, past occurrence, future occurrence, and vulnerability assessment for the pandemic and infectious disease hazard for the Dauphin County Hazard Mitigation Plan (HMP).

4.3.11.1 Location and Extent

Pandemic events cover a wide geographic area and can affect large populations, which can include multiple countries or continents. Size and extent of an infected population depends on how easily the illness is spread, mode of transmission, and amount of contact between infected and uninfected individuals. Locations with higher-density populations are more susceptible to pandemic outbreaks, as the disease can be transmitted more easily. Additionally, vulnerable populations—especially the young and the elderly (who have weaker immune systems)—are at greater risk for both contracting a disease and suffering fatal or severe consequences. Flu most frequently spreads through the air or by touch; when an infected person coughs, infected droplets are expelled into the air or onto their hands, facilitating transmission of the disease to other people (WHO 2015).

When a pandemic or disease outbreak occurs, WHO and other public health institutions begin tracking the disease outbreak, treatment, and more. COVID-19 is a global health threat and, as of the date of publication of this HMP update, continues to be a significant pandemic concern for American public health officials in the United States as well as the rest of the world. The Centers for Disease Control and Prevention (CDC) and the National Institutes of Health (NIH) is actively involved in managing the outbreak and treatment of the disease.

The first human cases of COVID-19 were first reported by officials in Wuhan City, China, in December 2019. In the United States, community transmission of COVID-19 was first detected in February 2020. By mid-March, all 50 states and four U.S. territories had reported cases of COVID-19. As of December 4, 2020, a total of 13,822,249 cases and 272,525 deaths related to COVID-19 have been reported in the United States (CDC 2020). Dauphin County has had a total of 8,618 cases of COVID-19 and 224 deaths as of December 4, 2020 (CDC 2020).

In addition to COVID-19, the possibility of a pandemic flu outbreak is also of concern. Influenza viruses with the potential to reach pandemic levels include the avian influenza A (H5N1) and avian influenza H7N9 (CDC 2015). Several years ago, the swine influenza (H1N1) was of particular concern. Human cases of H1N1 were first detected in the United States in April 2009. On June 11, 2009, WHO signaled that a pandemic of 2009 H1N1 flu was underway. On August 10, 2010, the H1N1 influenza virus moved into the post-pandemic period(CDC 2009).

4.3.11.2 Range of Magnitude

Severity of a pandemic disease depends on a number of factors, including the aggressiveness of the disease, ease of transmission, and factors associated with the impacted community (e.g., access to medical care, demographic data, and population density). Advancements in medical technologies have greatly reduced the number of deaths caused by influenza, which was considered a disease most likely to reach pandemic scale in Pennsylvania. Consequently, global effects of various influenza outbreaks have declined over the past century. High-risk populations considered more vulnerable to various pandemic diseases are described in the vulnerability assessment presented in Section 4.3.11.5.

COVID-19 is currently the biggest pandemic threat to the county because (1)it is easily spreadable, (2) infected people can be asymptomatic, and (3) the virus is new and is not yet fully understood.

Pandemic flu should not be confused with seasonal flu. Seasonal flu is a less severe concern because of its regularity of occurrence and predictability. Table 4.3.11-1 lists key differences between pandemic and seasonal flu.

Table 4.3.11-1. Seasonal Flu vs. Pandemic Flu

Pandemic Flu	Seasonal Flu
Rarely happens (three times in 20th century).	Happens annually and usually peaks in January or February.
People have little or no immunity because they have no previous exposure to the virus.	Sufferers usually have some immunity built up from previous exposure.
Healthy people may be at increased risk for serious complications.	Usually only people in vulnerable populations, not healthy adults, are at risk of serious complications.
Healthcare providers and hospitals may be overwhelmed.	Healthcare providers and hospitals can usually meet public and patient needs.
Vaccine probably would not be available in the early stages of a pandemic.	Vaccine is available for annual flu season.
Effective antivirals may be in limited supply.	Adequate supplies of antivirals are usually available.
Number of deaths could be high (U.S. death toll during the 1918 pandemic was approximately 675,000).	Seasonal flu-associated deaths in the United States over 30 years ending in 2007 have ranged from about 3,000 per season to about 49,000 per season.
Symptoms may be more severe.	Symptoms include fever, cough, runny nose, and muscle pain.
May cause major impact on the general public, such as widespread travel restrictions and school or business closings.	Usually causes minor impact on the general public; some schools may close, and sick people are encouraged to stay home.
Potential for severe impact on domestic and world economy.	Manageable impact on domestic and world economy.

Source: CDC 2015

Approximately 12,470 Americans died from H1N1 within a roughly 1-year period from April 2009 to April 2010 (CDC 2010). Between October 2014 and late May 2015, 6.4 percent of deaths were attributable to pneumonia and influenza—below the epidemic threshold of 6.6 percent (an epidemic occurs when the incidence rate exceeds the expected rate but is not at the magnitude of a pandemic) (CDC 2016).

In 2014, the CDC updated the Pandemic Intervals Framework (PIF), which describes the progression of an influenza pandemic using six intervals. The framework is used to guide planning for an influenza pandemic and provides recommendations for risk assessment, decision-making, and action in the United States. Descriptions of CDC pandemic intervals are presented in Table 4.3.11-2.

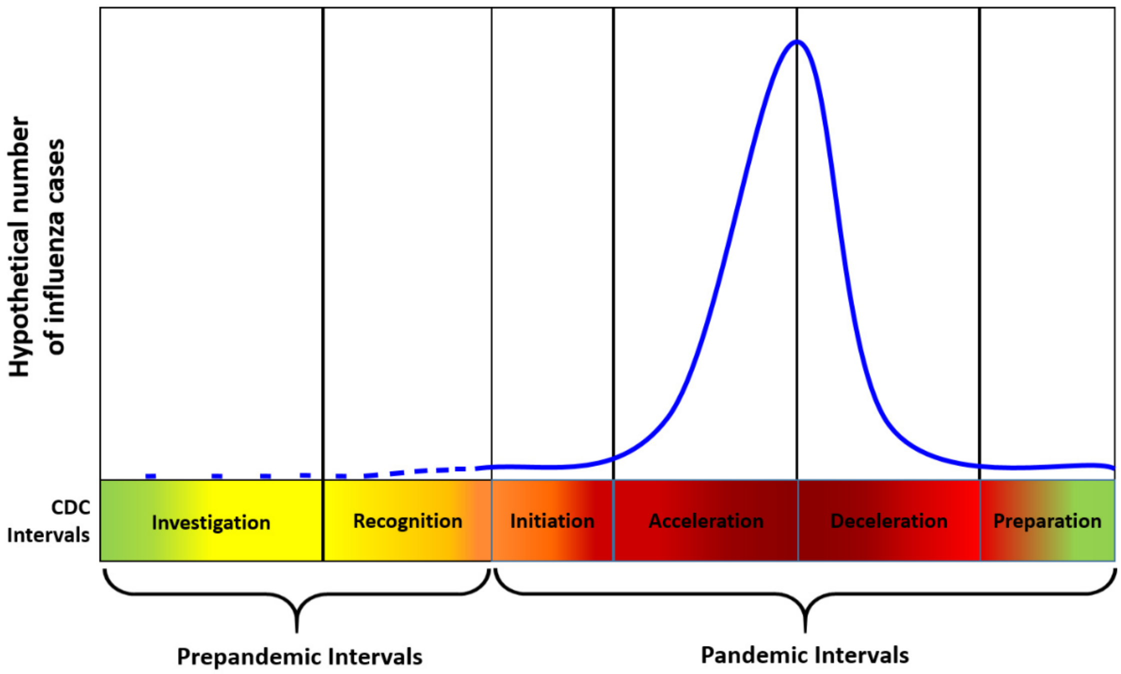
Table 4.3.11-2. CDC Pandemic Intervals Framework

Interval	Description
Interval 1: Investigation of cases of novel Influenza A virus infection in humans	When novel Influenza A viruses are identified in people, public health actions focus on targeted monitoring and investigation. This can trigger a risk assessment of that virus with the Influenza Risk Assessment Tool (IRAT), which is used to evaluate if the virus has the potential to cause a pandemic.
Interval 2: Recognition of increased potential for ongoing transmission of a novel Influenza A virus	When increasing numbers of human cases of novel Influenza A illness are identified and the virus has the potential to spread from person to person, public health actions focus on control of the outbreak, including treatment of sick persons.
Interval 3: Initiation of a pandemic wave	A pandemic occurs when people are easily infected with a novel Influenza A virus that has the ability to spread in a sustained manner from person to person.
Interval 4: Acceleration of a pandemic wave	The acceleration (or "speeding up") is the upward epidemiological curve as the new virus infects susceptible people. Public health actions at this time may focus on the use of appropriate non-pharmaceutical interventions in the community (e.g. school and child-care facility closures, social distancing), as well the use of medications (e.g. antivirals) and vaccines, if available. These actions combined can reduce the spread of the disease and prevent illness or death.
Interval 5: Deceleration of a pandemic wave	The deceleration (or "slowing down") happens when pandemic influenza cases consistently decrease in the United States. Public health actions include continued vaccination, monitoring of pandemic Influenza A virus circulation and illness, and reducing the use of non-pharmaceutical interventions in the community (e.g. school closures).
Interval 6: Preparation for future pandemic waves	When pandemic influenza has subsided, public health actions include continued monitoring of pandemic Influenza A virus activity and preparing for potential additional waves of infection. It is possible that a second pandemic wave could have higher severity than the initial wave. An influenza pandemic is declared ended when enough data shows that the influenza virus, worldwide, is similar to a seasonal influenza virus in how it spreads and the severity of the illness it can cause.

Source: CDC 2014

Conclusion of Interval 6 leads to the post-peak period, where the pandemic is declared ended when enough data shows that the influenza virus, worldwide, is similar to a seasonal influenza virus. Despite a decrease in activity, countries still must be prepared for additional waves of the pandemic. Pandemic waves can be separated by a period of months, leading to a long recovery time to guarantee entry of the pandemic into the post-pandemic interval (CDC 2014). Figure 4.3.11-1 shows the six intervals of pandemic influenza described by the CDC.

Figure 4.3.11-1. Preparedness and Response Framework for Novel Influenza A Virus Pandemics



Source: CDC 2014

COVID-19 Symptoms and Prevention Measures

Symptoms may appear 2 to 14 days after exposure to the virus. Symptoms of COVID-19 include fever or chills, cough, shortness of breath or difficulty breathing, fatigue, muscle or body aches, headache, new loss of taste or smell, sore throat, congestion or runny nose, nausea or vomiting, and diarrhea. Anyone can have mild to severe symptoms but older adults and people who have severe underlying medical conditions seem to be at higher risk for developing more serious complications. Ways to prevent the spread of COVID-19 include social distancing, staying home whenever possible and avoiding crowds, taking care of personal health (by resting and staying hydrated), staying in touch with family doctor or healthcare professional, and avoiding public transportation. COVID-19 has caused a major impact on the general public, such as widespread travel restrictions and school and business closings. COVID-19 has the potential for severe impact on domestic and world economy (CDC 2020). On December 11, 2020, the U.S. Food and Drug Administration issued the first emergency use authorization for a vaccine for the prevention of COVID-19 in individuals 16 years of age and older. The emergency authorization allows the Pfizer-BioNech COVID-19 vaccine to be distributed in the United States (U.S. Food and Drug Administration 2020).

4.3.11.3 Past Occurrence

Several pandemic influenza outbreaks have occurred worldwide over the past 100 years, as listed in Table 4.3.11-3. Deaths occurred in the United States as a result of Spanish Flu, Asian Flu, and Hong Kong Flu outbreaks. In the United States, about 675,000 people died while 22 million caught the Spanish Flu (1918-1920). Pennsylvania, one of the states that was hit the hardest, faced over 60,000 deaths (Shetty 2018). Most deaths resulting from Asian Flu occurred between September 1957 and March 1958; within the United States, approximately 70,000 people died, and approximately 15 percent of the population of Pennsylvania was affected. The first cases of Hong Kong Flu in the United States were detected in September 1968, with deaths peaking between December 1968 and January 1969 (Global Security 2009). As of August 2010, H1N1 was in a post-pandemic period. The COVID-19 virus has no conclusion data, as it was first reported in 2019.

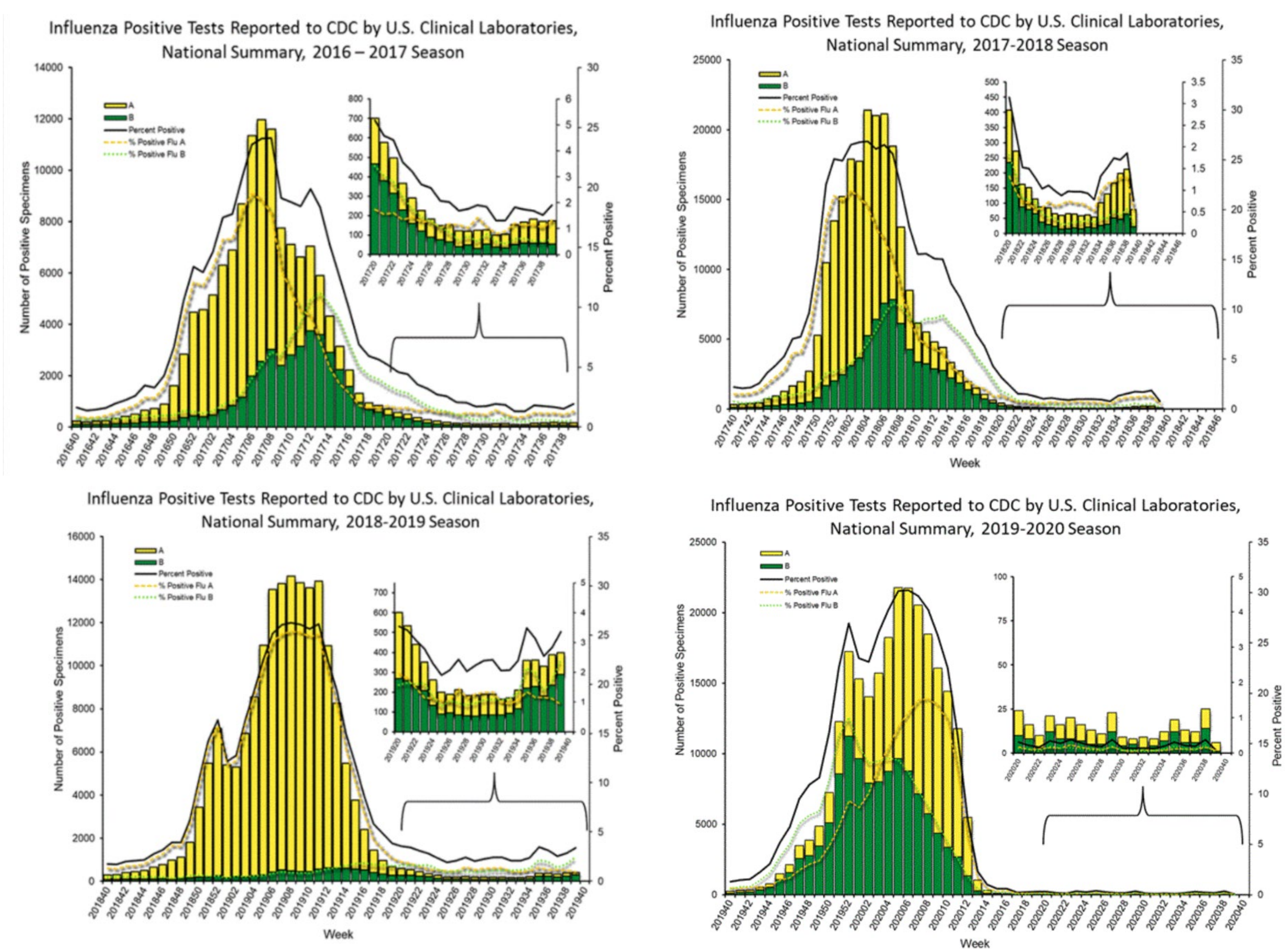
Table 4.3.11-3. Previous Pandemic Outbreaks

Date	Pandemic/Subtype	Worldwide Deaths (Approx.)
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/H1N1	> 18,000
2019- ongoing	COVID-19	1.5 Million of 12/10/2020

Source: CDC 2010, WHO 2020

Epidemiologists and public health officials consistently track the rate of influenza or influenza-like illnesses (ILI) to monitor potential pandemic threats. This also allows them to provide annual data on ILI seasonal outbreaks. Figure 4.3.11-2Figure 4.3.11-1 below shows the national number of cases of ILI during 2016-2017, 2017-2018, 2018-2019, and 2019-2020 season, distinguishing each type of ILI (Influenza A and Influenza B) with a unique color. As shown below, Influenza A is more prevalent each season, with the most positive cases in the 2019-2020 season.

Figure 4.3.11-2. ILI Cases in the United States, 2016-2020 Seasons



Source: CDC Weekly Flu 2017, 2018, 2019,and 2020

4.3.11.4 Future Occurrence

Based on historical data, Dauphin County is expected to undergo pandemic influenza outbreaks every 11 to 41 years. Because COVID-19 is so new, the likelihood of future occurrence is unknown. Exact timing of pandemic influenza outbreaks is unpredictable and complete avoidance is impossible. Future occurrence is considered *possible*, as defined by the Risk Factor Methodology probability criteria (shown in Table 4.4-1 in Section 4.4 of this HMP).

4.3.11.5 Vulnerability Assessment

Depending on the characteristics of the disease or virus, certain population groups can be at higher risk of infection than others. About 60 percent of hospitalizations related to seasonal flu and 90 percent of flu-related deaths occur among people 65 and older. However, during the H1N1 pandemic, 90 percent of hospitalizations and 87 percent of H1N1-related deaths occurred in people younger than 65. As with seasonal flu, people with underlying health conditions face a much higher probability of contracting H1N1. Schools, convalescent centers, and other institutions are highly conducive to faster transmission of pandemic diseases (CDC 2010).

Table 4.3.11-4 shows the demographic change in children and the elderly from 2000 through 2018 in Dauphin County. Dauphin County has seen population increases in both individuals under 18 years of age as well as individuals over 65 years of age. Therefore, Dauphin County is more vulnerable to both seasonal influenza and pandemic influenza, such as the H1N1 pandemic.

Table 4.3.11-4. Demographic Trends for Vulnerable Populations

Vulnerable Population	2000 Census	2010 Census	2018 Census Estimate	2000 to 2018 Change
Under 18 years	61,113	62,228	62,354	1,241
Under 65 years	215,954	231,206	230,253	14,299
65 years and over	35,844	35,844	46,818	10,974

Source: U.S. Census Bureau 2020

4.3.12 Radon Exposure

Radon is a natural gas that cannot be seen, smelled, or tasted. It is a noble gas that originates from natural radioactive decay of uranium and thorium. Radon is a large component of the natural radiation to which humans are exposed and can pose a serious threat to public health when it accumulates in poorly ventilated residential and occupation settings. According to the U.S. Environmental Protection Agency (EPA), radon causes more than 20,000 lung cancer deaths per year, second only to smoking as the leading cause of lung cancer (EPA 2013). An estimated 40 percent of the homes in Pennsylvania are believed to have elevated radon levels (Pennsylvania Department of Environmental Protection [PADEP] 2019).

This section describes the location and extent, range of magnitude, past occurrence, future occurrence, and vulnerability assessment for the radon exposure hazard for the Dauphin County Hazard Mitigation Plan (HMP).

4.3.12.1 Location and Extent

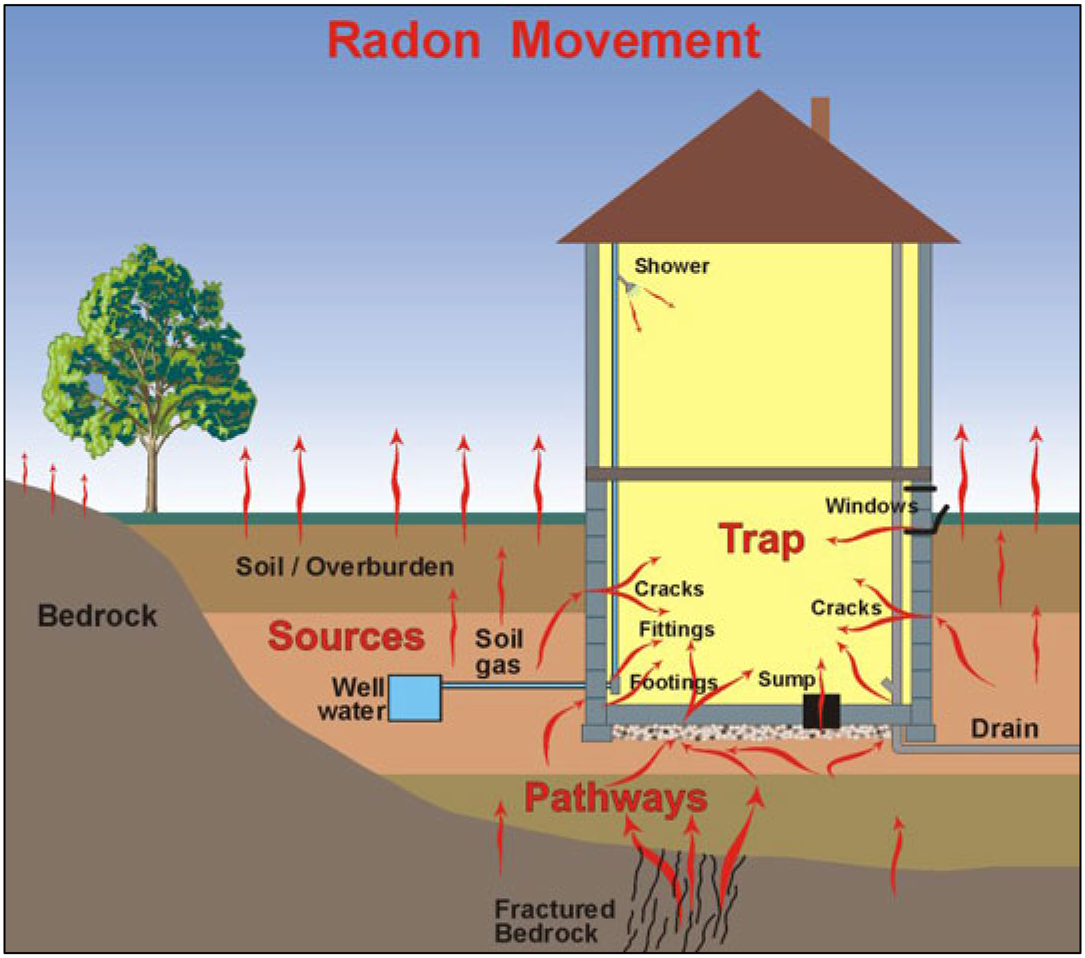
Radioactivity caused by airborne radon has been recognized for many years as an important component in the natural background radioactivity exposure of humans. However, it was not until the 1980s that the wide geographic distribution of elevated radon levels in houses was identified, and the possibility of extremely high radon concentrations in houses was recognized. In 1984, routine monitoring of employees leaving the Limerick nuclear power plant near Reading, Pennsylvania, showed that readings from one employee 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 picoCuries per liter (pCi/L), much higher than the 4 pCi/L guideline set by EPA or even the 67 pCi/L limit for uranium miners. As a result of this event, the Reading Prong section of Pennsylvania (where the employee lived) became the focus of the first large-scale radon scare in the world.

Radon (Rn-222), which has a half-life of 3.8 days, is a widespread hazard. The distribution of radon correlates with the distribution of radium (Ra-226), its immediate radioactive parent, and with uranium, its original ancestor. Because of the short half-life of radon, the distance radon atoms travel from their parent before they decay is generally limited to feet or tens of feet. Three sources of radon in houses are now recognized:

- Radon in soil air flows into the house.
- Radon dissolved in water from private wells and exsolved during water usage; this source is rarely a problem in Pennsylvania.
- Radon emanating from uranium-rich building materials (such as concrete blocks or gypsum wallboard); this source also is not known to be a problem in Pennsylvania (PEMA 2013).

Figure 4.3.12-1 illustrates radon entry points into a home.

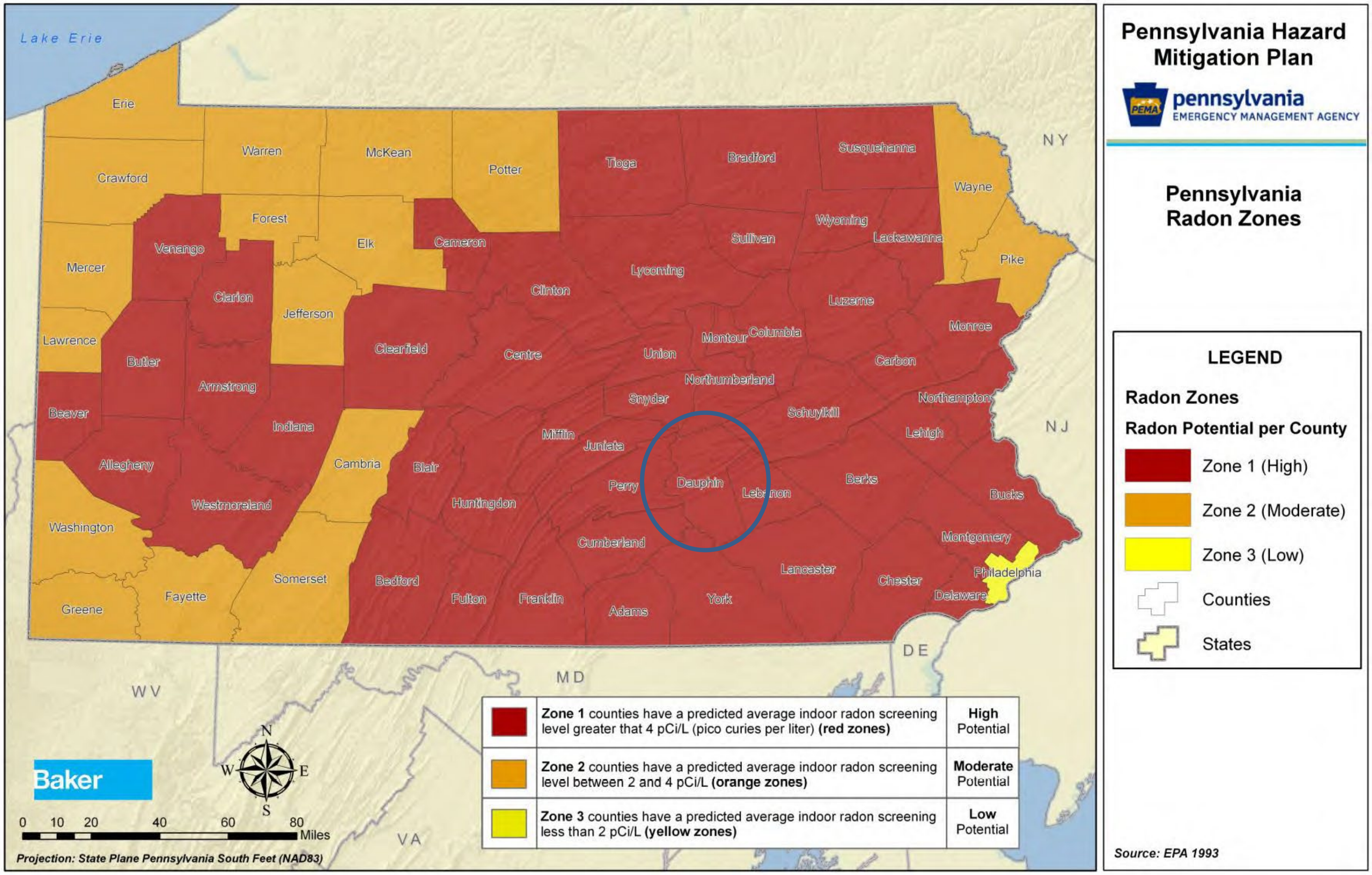
Figure 4.3.12-1. Sketch of Radon Entry Points into a House



Sources: PEMA 2013

Each county in Pennsylvania is classified as having a low, moderate, or high radon hazard potential. A majority of counties across the Commonwealth, particularly counties in eastern Pennsylvania, have a high hazard potential. Western Pennsylvania counties, however, are not completely immune from the threat of radon, as high potential for radon exposure exists within nine western counties. The average indoor radon screening level within high-exposure counties exceeds 4 pCi/L. Dauphin County is in Zone 1 – High Radon Potential, as noted on Figure 4.3.12-2 below.

Figure 4.3.12-2. Radon Hazard Zones in Pennsylvania



	Zone 1 counties have a predicted average indoor radon screening level greater that 4 pCi/L (pico curies per liter) **(red zones)**	**High** Potential
	Zone 2 counties have a predicted average indoor radon screening level between 2 and 4 pCi/L **(orange zones)**	**Moderate** Potential
	Zone 3 counties have a predicted average indoor radon screening less than 2 pCi/L **(yellow zones)**	**Low** Potential

Sources: PEMA 2013
Note: Dauphin County is identified by the blue oval

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

Radon concentration in soil gas depends on a number of soil properties, the importance of which are still being evaluated. In general, 10 to 50 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 airflow, including cracks and channels, are important factors in 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 with radon concentrations similar to those in deep soil.

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

- <u>Areas of very elevated uranium content (above 50 parts per million [ppm]) around uranium deposits and prospects</u>: Although very high levels of radon can occur in these areas, the hazard normally is restricted to within a few hundred feet of the deposit. In Pennsylvania, these localities occupy an insignificant area.
- <u>Areas of common rocks having higher than average uranium content (5 to 50 ppm)</u>: In Pennsylvania, these rock types include granitic and felsic alkali igneous rocks and black shales. High uranium values in rock or soil and high radon levels in houses in the Reading Prong are associated with Precambrian granitic gneisses commonly containing 10 to 20 ppm uranium, but locally containing more than 500 ppm uranium. Elevated uranium occurs in black shales of the Devonian Marcellus Formation and possibly the Ordovician Martinsburg Formation in Pennsylvania. High radon values are locally present in areas underlain by these formations.
- <u>Areas of soil or bedrock with normal uranium content but containing properties that promote high radon levels in houses</u>: This group is incompletely understood at present. Relatively high soil permeability can lead to high radon concentrations, 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, where radium is concentrated by weathering on iron oxide or clay surfaces, coupled with moderate porosity and permeability. The importance of carbonate soils is indicated by exceedance of 4 pCi/L in 93 percent of a sample of houses built on limestone-dolomite soils near State College, Centre County, and exceedance of 20 pCi/L in 21 percent of that sample of houses, even though uranium levels in the underlying bedrock are all within the normal range of 0.5 to 5 ppm (PEMA 2013).

According to the Pennsylvania HMP, radon tends to exist as a gas or as a dissolved atomic component in groundwater. The most problematic source of radon in houses in Pennsylvania is radon in soil gas that flows into the house. Even a small rate of soil gas inflow can lead to elevated radon concentrations in a house. The HMP indicates that current data on abundance and distribution of radon in Pennsylvania homes are incomplete and biased, but the plan identifies general patterns (PEMA 2013).

4.3.12.2 Range of Magnitude

Exposure to radon is the second-leading cause of lung cancer after smoking, and the leading cause of lung cancer among non-smokers. As stated earlier, radon is responsible for more than 20,000 lung cancer deaths every year. Lung cancer is the only known effect on human health from exposure to radon in air and, thus far, no evidence indicates that children are at greater risk of lung cancer than adults (EPA 2013). The main hazard is actually from the radon daughter products (polonium-218, lead-214, and bismuth-214), which may become attached to lung tissue and induce lung cancer by their radioactive decay. Table 4.3.12-1 lists (1) cancer risks from exposure to radon at various levels for smokers and non-smokers, (2) lung cancer risks from radon exposure compared to risks of dying from other hazards for smokers and non-smokers, and (3) action thresholds.

Table 4.3.12-1. Radon Risk for Smokers and Non-Smokers

Radon Level (picoCuries per liter [pCi/L])	Cancer Rate per 1,000 People with Lifetime Exposure	Comparative Cancer Risk of Radon Exposure	ACTION THRESHOLD
SMOKERS			
20	About 260 people could get lung cancer	250 times the risk of drowning	Fix structure
10	About 150 people could get lung cancer	200 times the risk of dying in a home fire	
8	About 120 people could get lung cancer	30 times the risk of dying in a fall	
4	About 62 people could get lung cancer	5 times the risk of dying in a car crash	
2	About 32 people could get lung cancer	6 times the risk of dying from poison	Consider fixing structure between 2 and 4 pCi/L
1.3	About 20 people could get lung cancer	(Average indoor radon level)	Reducing radon levels below 2 pCi/L is difficult
0.4	About 3 people could get lung cancer	(Average outdoor radon level)	
NON-SMOKERS			
20	About 36 people could get lung cancer	35 times the risk of drowning	Fix structure
10	About 18 people could get lung cancer	20 times the risk of dying in a home fire	
8	About 15 people could get lung cancer	4 times the risk of dying in a fall	
4	About 7 people could get lung cancer	The risk of dying in a car crash	
2	About 4 people could get lung cancer	The risk of dying from poison	Consider fixing structure between 2 and 4 pCi/L
1.3	About 2 people could get lung cancer	(Average indoor radon level)	Reducing radon levels below 2pCi/L is difficult
0.4	-	(Average outdoor radon level)	

Note: Risk may be lower for former smokers.
* Lifetime risk of lung cancer deaths from EPA Assessment of Risks from Radon in Homes (EPA 402-R-03-003).
** Comparison data calculated using the Centers for Disease Control and Prevention's 1999-2001 National Center for Injury Prevention and Control Reports.

Source: EPA 2013

According to the EPA, the average radon concentration in the indoor air in homes in the United States is about 1.3 pCi/L. The EPA recommends that homes be repaired if the radon level is 4 pCi/L or more. However, the

EPA also recommends that Americans consider repairing or renovating their home if radon levels are between 2 and 4 pCi/L because there is no known safe level of exposure to radon. As listed in Table 4.3.12-1, a smoker exposed to radon has a much higher risk of lung cancer.

The worst-case scenario for radon exposure would be a large area of tightly sealed homes inducing high levels of exposure to residents over a prolonged period of time without awareness by the residents. This worst-case scenario exposure then could lead to a large number of people contracting cancer attributed to the radon exposure (PEMA 2013). The most likely scenario, however, is a single household exposed to a very low concentration of radon, with no adverse health effects on residents.

4.3.12.3 Past Occurrence

PADEP Bureau of Radiation Protection (Bureau) provides information for homeowners on how to test for radon in their houses. If results of a test reported to the Bureau exceed 4 pCi/L, the Bureau works to help the homeowner repair the house to mitigate high radon levels. The total number of tests reported to the Bureau since 1990 and test results by zip code are accessible on the Bureau's website. However, to best approximate the average for an area, information is provided only if more than 30 tests within that area were reported.

The Bureau collected the sufficient number of radon results from residences in 25 zip codes within Dauphin County to allow them to report the findings (summarized in Table 4.3.12-2). PADEP does not publish results unless a zip code has had at least 30 tests conducted. PADEP only publishes the average and maximum results for a zip code; it does not offer a range of results for a zip code, municipality, or region. The PADEP Radon Division recommends that all homeowners test for radon, regardless of test results within their respective zip codes. Despite a low average test result within a zip code, many homes in that zip code may have elevated radon levels.

Table 4.3.12-2. Radon Level Tests and Results by Zip Codes

ZIP Code	Location	Area in Home	Number of Tests	Maximum Result (pCi/L)	Average Result (pCi/L)
17005	Berrysburg	Basement	Insufficient Data	Insufficient Data	Insufficient Data
		First Floor	Insufficient Data	Insufficient Data	Insufficient Data
17109	Colonial Park	Basement	3085	127.1	11.3
		First Floor	539	60.6	6.6
17018	Dauphin	Basement	550	91.9	10.8
		First Floor	104	41.1	5.6
17023	Elizabethville	Basement	285	92.5	11.4
		First Floor	46	50.3	8.5
17028	Grantville	Basement	307	565.3	12.3
		First Floor	55	34.1	5.0
17030	Gratz	Basement	57	78.4	11.2
		First Floor	Insufficient Data	Insufficient Data	Insufficient Data
17032	Halifax	Basement	982	416.3	30.3
		First Floor	148	138.6	10.5
17110	Harrisburg	Basement	3694	250.3	7.0
		First Floor	1034	66.0	3.1
17111	Harrisburg	Basement	5697	918.2	16.5
		First Floor	1185	102.2	8.8
17112	Harrisburg	Basement	7200	772.2	9.4
		First Floor	1171	90.8	5.5
17101	Harrisburg	Basement	205	81.3	6.6
		First Floor	60	12.3	1.3
17102	Harrisburg	Basement	554	508.0	6.7
		First Floor	252	8.1	1.1
17103	Harrisburg	Basement	398	147.8	7.4
		First Floor	113	40.5	2.8

ZIP Code	Location	Area in Home	Number of Tests	Maximum Result (pCi/L)	Average Result (pCi/L)
17104	Harrisburg	Basement	775	134.1	11.1
		First Floor	286	72.8	4.9
17120	Harrisburg	Basement	Insufficient Data	Insufficient Data	Insufficient Data
		First Floor	Insufficient Data	Insufficient Data	Insufficient Data
17033	Hershey	Basement	3923	140.2	7.6
		First Floor	1957	113.3	2.9
17034	Highspire	Basement	190	38.1	4.2
		First Floor	30	4.8	1.5
17036	Hummelstown	Basement	5898	435.5	13.4
		First Floor	969	224.0	7.4
17048	Lykens	Basement	140	77.9	12.9
		First Floor	30	32.2	4.0
17057	Middletown	Basement	1890	231.0	7.0
		First Floor	335	45.2	3.2
17061	Millersburg	Basement	540	115.5	13.2
		First Floor	106	46.7	6.4
17080	Pillow	Basement	Insufficient Data	Insufficient Data	Insufficient Data
		First Floor	Insufficient Data	Insufficient Data	Insufficient Data
17113	Steelton	Basement	626	126.7	13.4
		First Floor	146	439.6	13.5
17097	Wiconsico	Basement	Insufficient Data	Insufficient Data	Insufficient Data
		First Floor	Insufficient Data	Insufficient Data	Insufficient Data
17098	Williamstown	Basement	77	90.6	10.2
		First Floor	Insufficient Data	Insufficient Data	Insufficient Data

Source: PADEP 2020

4.3.12.4 Future Occurrence

Radon exposure is inevitable given present soil, geologic, and geomorphic factors across Pennsylvania. Residents who live in developments within areas where radon levels previously have been found to be 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 by conducting proper testing within both existing and future developments and implementing appropriate mitigation measures (PEMA 2018). As part of a 2014 initiative to raise awareness, EPA implemented the "Test, Fix, Save a Life" radon action campaign to highlight radon testing and mitigation as a simple and affordable step to significantly reduce the risk of lung cancer. Through this initiative, the "Test, Fix, Save a Life" mantra specifies activities and facts for the public regarding radon poisoning, as indicated below:

- **Test:** All homes (with or without basements) should be tested for radon. Affordable, do-it-yourself radon test kits are available online and at home improvement and hardware stores, or you can hire a qualified radon tester.
- **Fix:** EPA recommends taking corrective action to repair a home with radon levels at or above 4 pCi/L and contacting a qualified radon-reduction contractor. In most cases, a system with a vent pipe and fan is used to reduce radon. Remediating high radon levels often costs the same as other minor home repairs.
- **Save a Life:** More than 20,000 Americans die from radon-related lung cancer each year. By decreasing elevated levels in the home, residents can help prevent lung cancer while creating a healthier home (EPA 2013).

Future occurrences of radon exposure can be considered *likely* as defined by the Risk Factor Methodology probability criteria (discussed in Section 4.4).

4.3.12.5 Vulnerability Assessment

To understand risk, a community must evaluate the assets that are exposed or vulnerable within the identified hazard area. This section evaluates and estimates the potential impact of the radon exposure hazard on Dauphin County in the following sections:

- Overview of vulnerability
- Data and methodology used for the evaluation
- Impacts on (1) life, health, and safety; (2) general building stock and critical facilities; (3) the economy; (4) the environment; and (5) future growth and development
- Further data collections that will assist in understanding this hazard over time

Overview of Vulnerability

Radon exposure is of concern in Dauphin County because of the county's location within a High Potential (Level 1) EPA Radon Zone. While structural factors (such as building construction and engineered mitigation measures) can influence the level of radon exposure, all residents and structures within Dauphin County are vulnerable to radon exposure.

Data and Methodology

The 2018 U.S. Census data and the Hazards U.S. - Multi Hazard (HAZUS-MH) building inventory for Dauphin County were referenced to support an evaluation of assets exposed to this hazard and potential impacts associated with this hazard. Per the 2018 Pennsylvania HMP, an average radon mitigation system cost of $1,200 was applied to 20 percent of the building stock to evaluate economic vulnerability (PEMA 2019).

Impact on Life, Health, and Safety

For the purposes of this plan, the entire population of the county is assumed to the risk of radon exposure. Radon is responsible for more than 20,000 of lung cancer deaths every year. Lung cancer is the only known effect on human health from exposure to radon in air, and thus far, no evidence indicates that children are at greater risk of lung cancer than are adults (EPA 2013).

As shown in Table 4.3.12-2 above, 21 out of 25 homes (84 percent) in Dauphin County have measured radon levels exceeding 4 pCi/L. Excess human cancer risk posed by radon exposure at this elevated level is identified in Table 4.3.12-1.

Impact on General Building Stock and Critical Facilities

While the entire general building stock and critical facility inventory in Dauphin County is exposed to the risk of radon, radon does not result in direct damage to structures and facilities. Rather, engineering methods used to mitigate human exposure to radon in structures results in economic costs described in the following subsection.

Impact on the Economy

EPA has concluded that an average radon mitigation system costs $1,200. EPA also states that current Pennsylvania surveys indicate one home in five contains elevated levels of radon. Using this information, radon loss estimation is factored by assuming that 20 percent of the residential buildings within High Potential (Level 1) counties have elevated radon levels, and each would require a radon mitigation system installed at the EPA estimated average of $1,200 (PEMA 2013). Therefore, estimated radon mitigation costs for residential structures in Dauphin County could exceed $41 million. However, 4 percent of households in the county have measured radon-level average radon levels exceeding 4 pCi/L (shown in Table 4.3.12-2), indicating that the cost of radon mitigation may be higher than the estimate based on the above-cited information from EPA, whereby only 20 percent of structures are considered for mitigation.

Impact on the Environment

Radon exposure exerts minimal environmental impacts. Because of the relatively short half-life of radon, it tends to affect only living and breathing organisms, such as humans or pets that are routinely within contained areas (basement or house) where the gas is released (PEMA 2018).

Future Growth and Development

Because the entirety of Dauphin County has been determined to br at risk for the radon exposure hazard, any new development will be exposed to this risk. Measures to reduce human exposure to radon in structures are readily available and can be incorporated during new construction at significantly lower cost and greater effectiveness than retrofitting existing structures to implement these measures.

Additional Data and Next Steps

The assessment above identifies human health and economic losses associated with this hazard of concern; however, these estimates are based on national epidemiological statistics and generalized estimates of costs to mitigate structures in Dauphin County. Because specific structural conditions affect human exposure to radon, to properly assess the level of health risk and determine the need for mitigation measures, radon must be measured within individual facilities. Furthermore, EPA recommends consideration of radon exposure risk and installation of mitigation measures as appropriate during all new construction.

4.3.13 Subsidence and Sinkholes

This section provides a profile and vulnerability assessment for the subsidence and sinkhole hazard for Dauphin County. Subsidence and sinkholes may be natural or related to underground mining activities. The predominant cause of subsidence and sinkholes in Dauphin County is its underlying carbonite bedrock composition, which can include limestone and dolomite. Although underground mining is not considered the primary cause of sinkholes or subsidence in the County, subsidence/sinkholes may still occur in the future because of mining activity. Thus, information will be presented to highlight this hazard cause and its potential impacts. Although underground mining is not considered a geologic hazard, it will be treated as such in this document due to its relation with the potential for subsidence events.

Land subsidence can be defined as the sudden sinking or gradual downward settling of the earth's surface with little or no horizontal motion, owing to the subsurface movement of earth materials (U.S. Geological Survey [USGS] 2007). Subsidence often occurs through the loss of subsurface support due to mining or in karst terrain, which may result from a number of natural and human-caused occurrences. Karst is a distinctive topography, in which the landscape is largely shaped by the dissolving action of water on carbonate bedrock (usually limestone, dolomite, or marble).

Karst features are defined as pockets of limestone or dolomite bedrock located within more stable geological formations that could cause subsidence or sinkholes. The density of karst features ranges from 0 to 600 features per square mile, with wide variations in size. Fewer karst features have been mapped in existing urban areas; however, this is likely a result of development activities that disguise, cover, or fill existing features rather than an absence of the features themselves (Pennsylvania Emergency Management Agency [PEMA] 2018).

Sinkholes are a natural and common geologic feature in areas with underlying limestone, carbonate rock, salt beds, or other rocks that are soluble in water. Over periods of time measured in thousands of years, the carbonate bedrock can be dissolved through acidic rainwater moving through fractures or cracks in the bedrock. This creates larger openings in the rock through which water and overlying soil materials travel. Over time, the deposited soils compromise the strength of the bedrock until it is unable to support the land surface above, causing a collapse or sinkhole. In this example, the sinkhole occurs naturally; however, in other cases, the root causes of a sinkhole are anthropogenic, especially those that involve changes to the water balance of an area, including over-withdrawal of groundwater, diverting surface water from a large area, and concentrating it in a single point, artificially creating ponds of surface water, and drilling new water wells. These actions can also serve to accelerate the natural processes of bedrock degradation, which can directly impact sinkhole creation.

Both natural and man-made sinkholes can occur without warning. Specific signs that a sinkhole is forming include slumping or falling fence posts, trees, or foundations; sudden formation of small ponds; wilting vegetation; discolored well water; and/or structural cracks in walls and floors. Sinkholes can form into steep-walled holes or into bowl- or cone-shaped depressions. When sinkholes occur in developed areas, they can cause severe property damage, injury, and loss of life; disruption of utilities; and damage to roadways. In urban and suburban areas, sinkholes can destroy highways and buildings.

Two common causes of subsidence in Pennsylvania are (1) dissolution of carbonate rock, such as limestone or dolomite, and (2) mining activity. 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 features associated with karst topography include sinkholes, linear depressions, and caves. Often, subsurface solution of limestone will not result in the immediate formation of karst features. Collapse sometimes occurs only after a large amount of activity or when a heavy burden is placed on the overlying material (PEMA 2018).

The following sections discuss the location and extent, range of magnitude, previous occurrence, future occurrence, and vulnerability assessment associated with the subsidence/sinkhole hazard for Dauphin County.

4.3.13.1 Location and Extent

Approximately 14.1 percent of Dauphin County (78.3 square miles) is underlain by carbonate bedrock (e.g., limestone). Dauphin County has some susceptibility to subsidence and sinkholes attributable to abandoned mines in the northeast. Additionally, there are surface mines around the County that attribute to the susceptibility. Figure 4.3.13-1 illustrates the bedrock geology of Dauphin County. Figure 4.3.13-2 highlights the areas of Pennsylvania subject to natural subsidence caused by the presence of limestone bedrock, and Figure 4.3.13-3 more specifically illustrates the limestone bedrock across Dauphin County. The following municipalities have identified near-surface limestone and/or limestone bedrock:

- Derry Township
- East Hanover Township
- Halifax Township
- Harrisburg City
- Hummelstown Borough
- Londonderry Township
- Lower Paxton Township
- Lower Swatara Township
- Middle Paxton Township
- Paxtang Borough
- Penbrook Borough
- South Hanover Township
- Steelton Borough
- Susquehanna Township
- Swatara Township
- Upper Paxton Township
- West Hanover Township

According to a subset of data contained in the Office of Surface Mining Reclamation and Enforcement (OSMRE) Abandoned Mine Land Inventory, there are 19 abandon mine problem areas located in Dauphin County. These are located primarily in Haldeman State Forest, one close to State Gamelands 211, and seven are unknown. Figure 4.3.13-4 illustrates the areas of abandoned mines in Dauphin County.

Figure 4.3.13-1. Dauphin County Geology

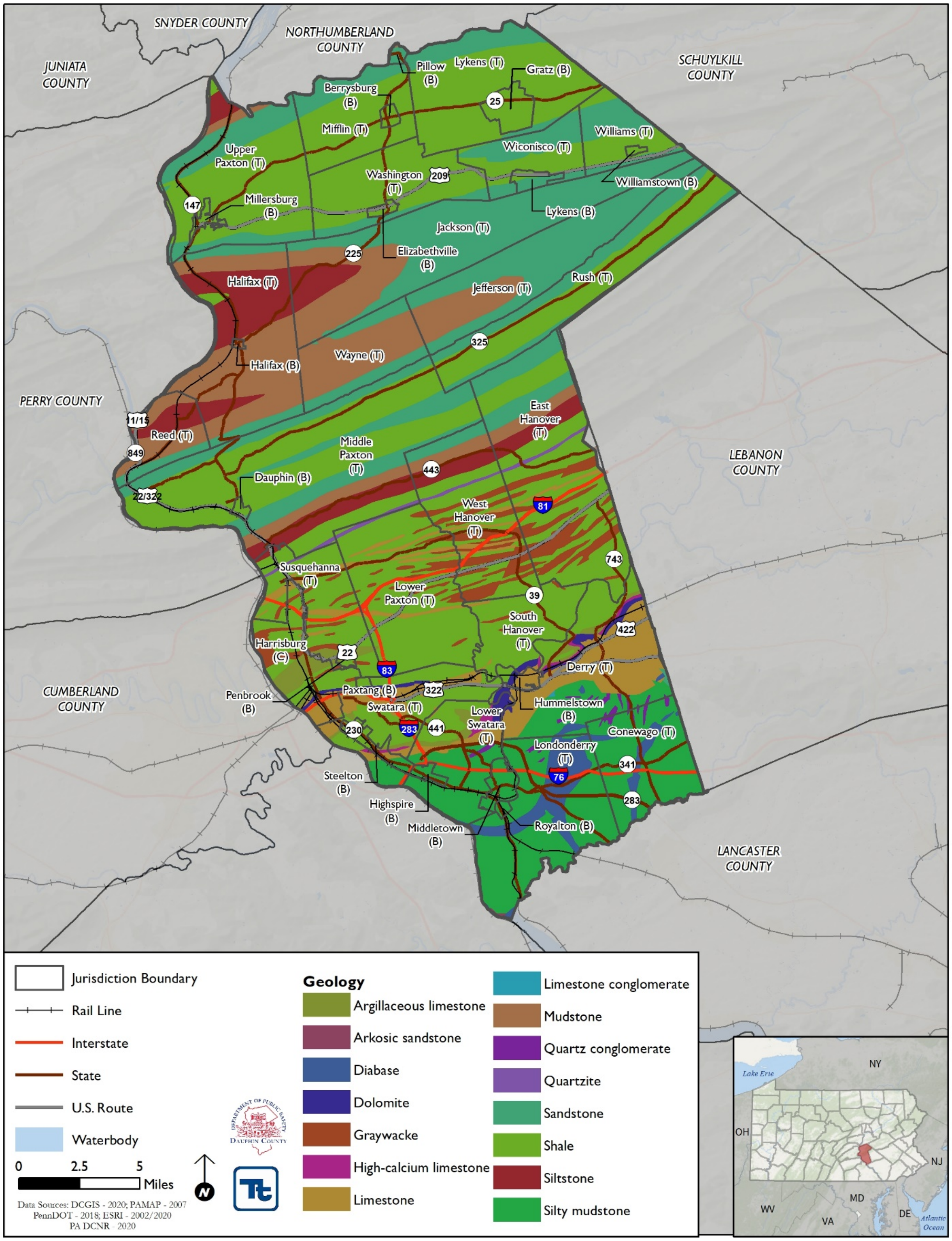
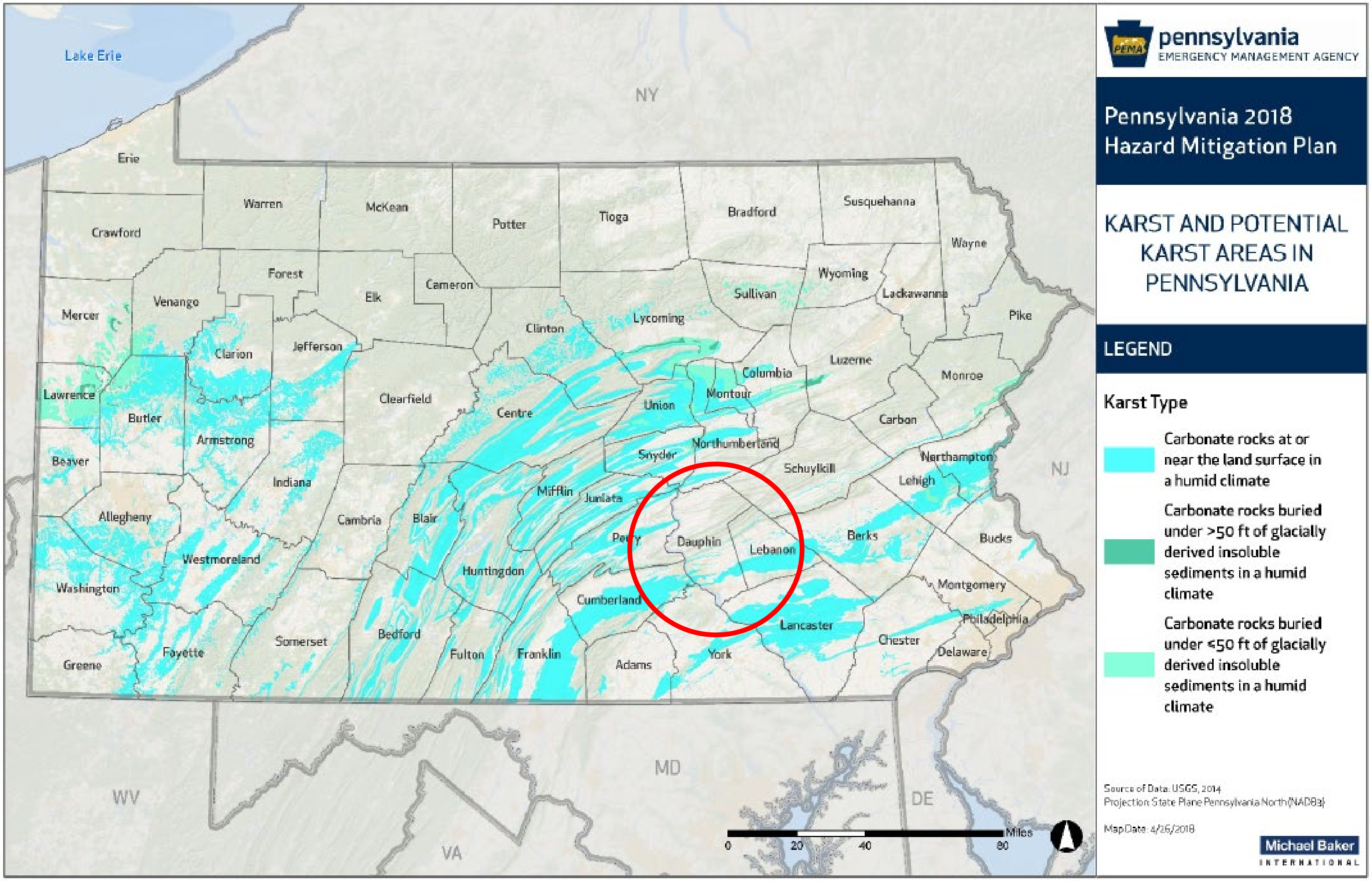


Figure 4.3.13-2. Areas of Pennsylvania Subject to Natural Subsidence Due to the Presence of Limestone Bedrock



Source: PEMA 2018 (red circle identifies the location of Dauphin County)

Figure 4.3.13-3. Dauphin County Limestone Bedrock Geology

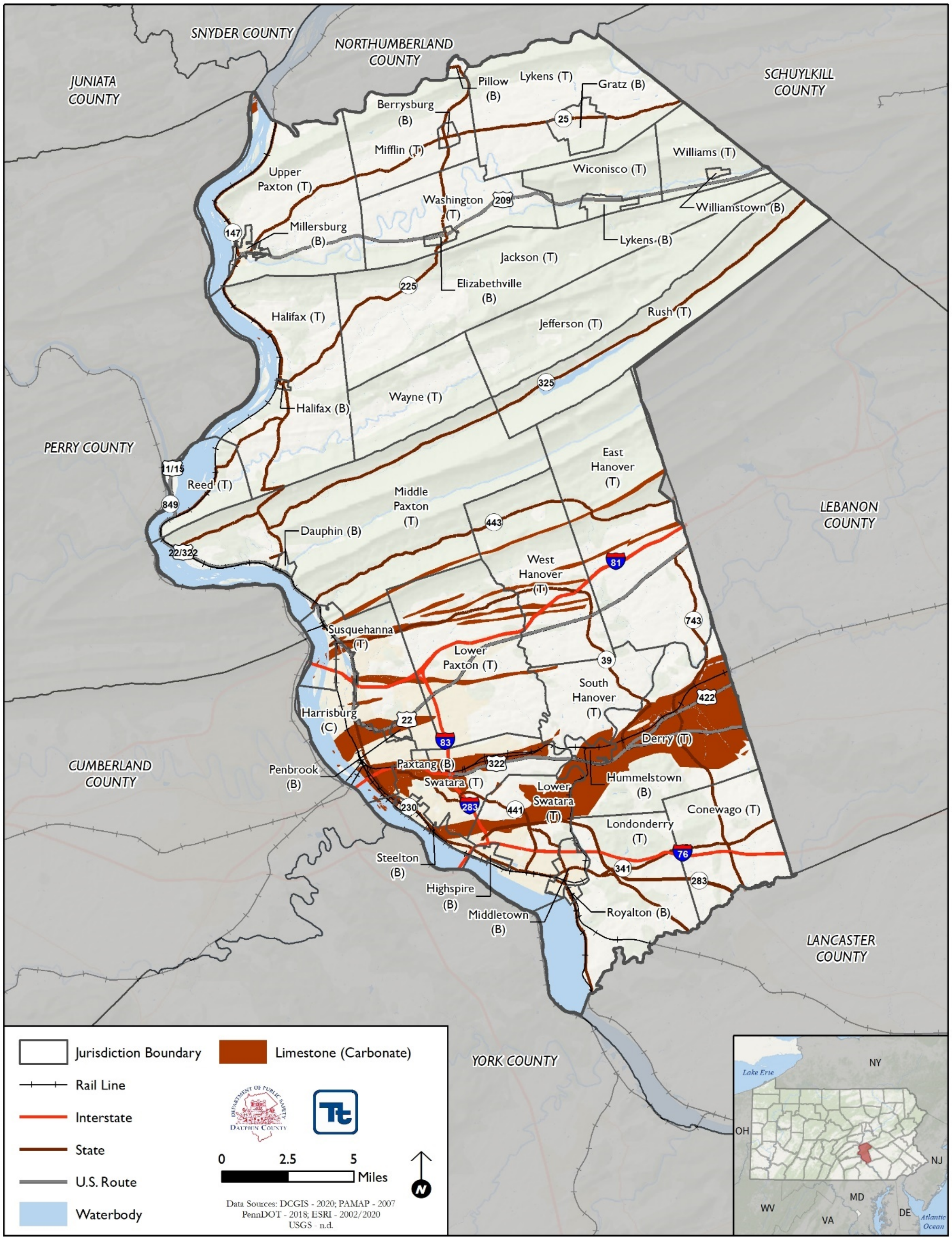
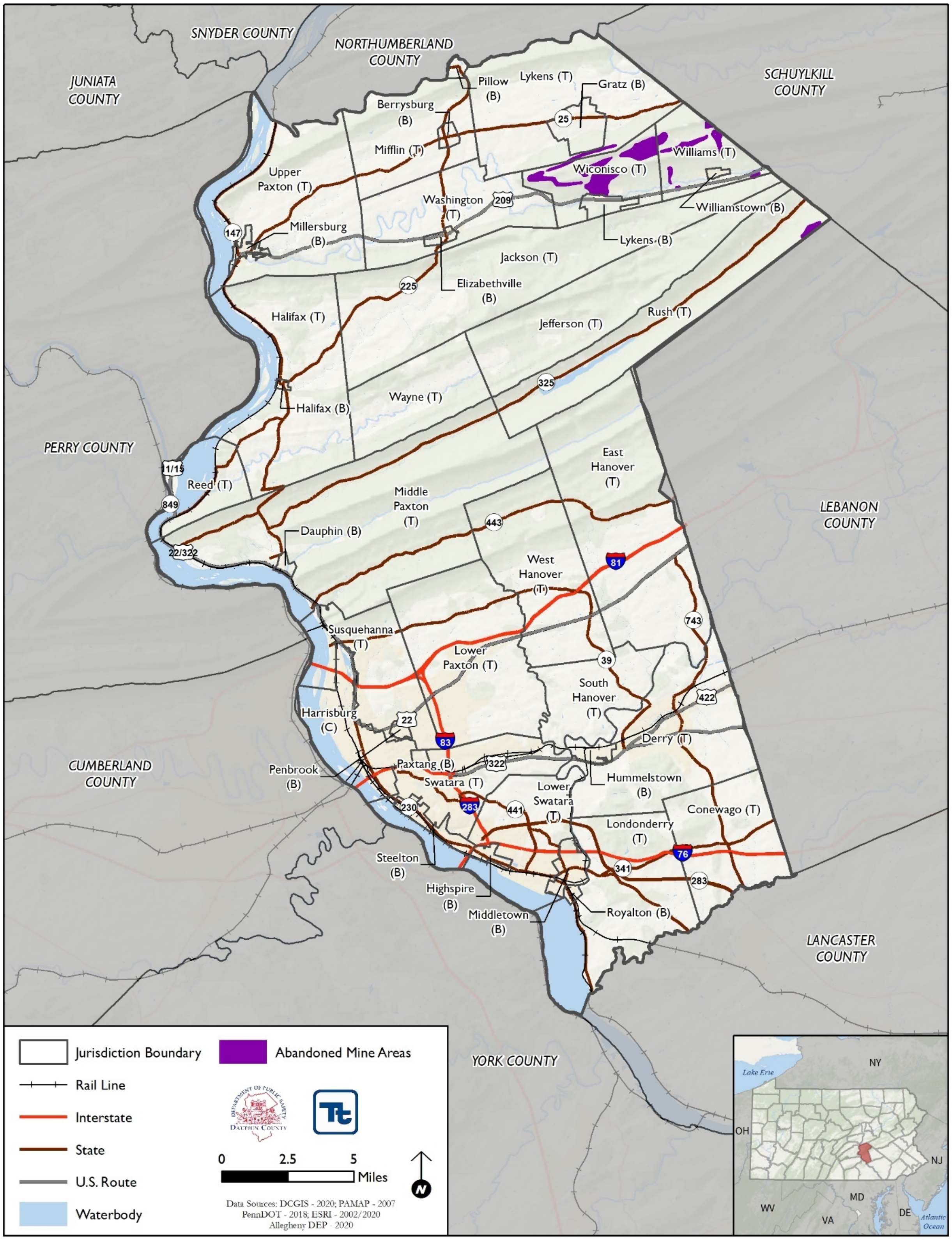


Figure 4.3.13-4. Abandoned Mine Areas in Dauphin County



While fewer karst features have been mapped in existing urban areas, human activity can often be the cause of a subsidence area or sinkhole. Leaking water pipes or structures that convey stormwater runoff may also result in areas of subsidence as the water dissolves substantial amounts of rock over time. In some cases, construction, land grading, or earth-moving activities that cause changes in stormwater flow can trigger sinkhole events. Subsidence or sinkhole events may occur during mining activities, especially in areas where the cover of a mine is thin, or in areas where bedrock is not necessarily conducive to their formation. In their article titled "Sinkholes are Bad," authors Piggott and Eynon indicated that sinkhole development normally occurs where the interval to the ground surface is less than three to five times the thickness of the extracted seam, and the maximum interval is up to ten times the thickness of the extracted seam. Subsurface (i.e., underground) extraction of materials such as oil, gas, coal, metal ores (i.e., copper, iron, and zinc), clay, shale, limestone, or water may result in slow-moving or abrupt shifts in the ground surface (Piggott and Eynon 1978).

4.3.13.2 Range of Magnitude

Based on the geologic formations underlying parts of Dauphin 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. Abrupt subsidence and sinkhole events can cause severe damage in urban environments; gradual events can be addressed before significant damage occurs. 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.

Sinkholes also may have negative effects on local groundwater. 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.

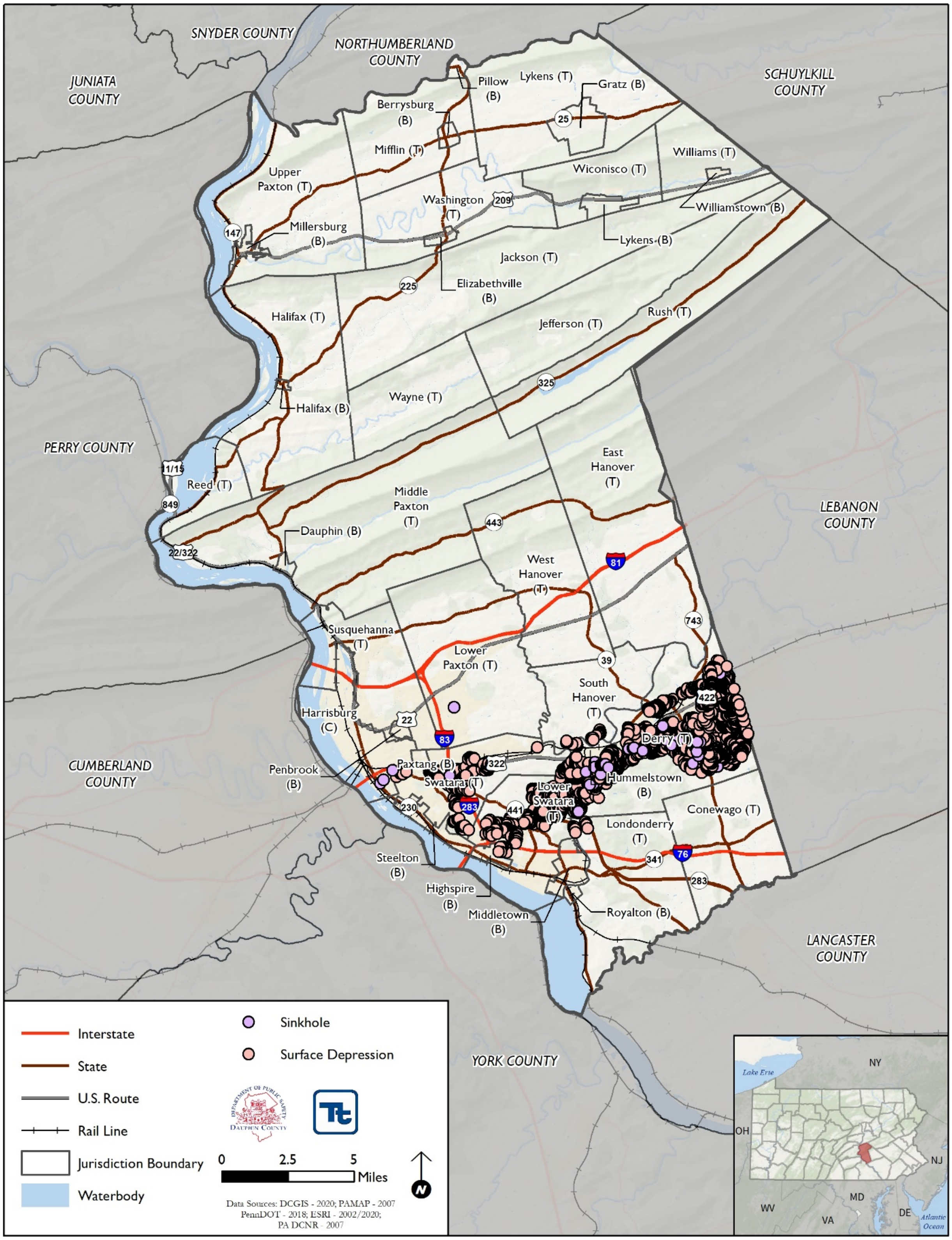
The worst-case scenario for the subsidence/sinkhole hazard in Dauphin County would be a series of large sinkholes opening in Harrisburg City. The majority of the city has near-surface limestone, making it vulnerable to sinkholes. The city is home to 371 critical infrastructure facilities, 138 of which are exposed to carbonate rock. One hundred of these critical facilities are considered lifelines. Additionally, approximately 16,101 residents in Harrisburg City reside atop carbonate rock. A sinkhole in Harrisburg could potentially cause significant property damage. This series of sinkholes could close roads, cause power outages, prevent the delivery of emergency services, cause injuries or death to residents, and could cost millions of dollars in property damage ($28.1 billion of replacement cost value for structures and contents built on limestone bedrock). Additionally, with Harrisburg being the state capital, sinkholes could impact government functions as well.

4.3.13.3 Past Occurrence

Figure 4.3.13-5 shows dozens of sinkholes and hundreds of surface depressions in Dauphin County. These include the following municipalities:

- Derry Township
- Harrisburg City
- Hummelstown Borough
- Londonderry Township
- Lower Paxton Township
- Lower Swatara Township
- Paxtang Borough
- South Hanover Township
- Swatara Township
- West Hanover Township

Figure 4.3.13-5. Sinkholes and Surface Depressions in Dauphin County



A specific project to note includes the 14th Street Sinkhole Mitigation Project located in the City of Harrisburg. A sinkhole at the 1400 block of South 14th Street developed that affected 53 homes in March of 2014. As the Federal Emergency Management Agency's (FEMA) first Sinkhole Mitigation Project, the positive outcome of the project was an open space with a pedestrian walkway that included a deed restriction of no future development to occur on the property. Grants that contributed to the completed 2019 project include FEMA's Predisaster Mitigation Grant and U.S. Department of Housing and Urban Development (HUD) funds through PA Department of Community and Economic Development, HUD Community Development Block Grant-Disaster Relief funds. The total project cost about $6,200,000 to mitigate and rehabilitate the area (City of Harrisburg 2019).

Because large-scale or fast-moving subsidence events can trigger landslides, landslides can be an indication of a potentially greater or secondary hazard.

4.3.13.4 Future Occurrence

Although sinkhole occurrence will continue to be a possibility in Dauphin County, the probability of a sinkhole or subsidence event is difficult to predict due to the low number of previous events. Areas to monitor for future sinkhole and subsidence events due to their geologic bedrock are listed above in Section 4.3.13.1.

Potential losses caused by sinkhole formation are difficult to calculate for all existing buildings, critical facilities, and infrastructure, because the hazard area may affect so much of the County. However, the future occurrence of subsidence areas and sinkholes is considered *likely* as defined by the Risk Factor Methodology probability criteria (further discussed in Section 4.4).

4.3.13.5 Vulnerability Assessment

To understand risk, a community must evaluate the assets that are exposed or vulnerable in the identified hazard area. This section discusses the potential impact of the subsidence and sinkhole hazard on Dauphin County.

Approximately 7.3 percent of Dauphin County (25,993 acres) is underlain by carbonate bedrock. For the purposes of this planning effort, the area underlain by carbonate (limestone) bedrock is considered exposed to this hazard. Table 4.3.13-1 summarizes the municipalities potentially vulnerable to sinkholes and subsidence events based on the presence of limestone bedrock and/or abandoned mines.

Table 4.3.13-1. Municipalities Vulnerable to Sinkholes/Subsidence Events

Municipality	Carbonate Rock	Abandoned Mines	Municipality	Carbonate Rock	Abandoned Mines
Berrysburg Borough			Middletown Borough		
Conewago Township			Mifflin Township		
Dauphin Borough			Millersburg Borough		
Derry Township	**X**		Paxtang Borough	X	
East Hanover Township	**X**		Penbrook Borough	X	
Elizabethville Borough			Pillow Borough		
Gratz Borough			Reed Township		
Halifax Borough			Royalton Borough		
Halifax Township	**X**		Rush Township		
Harrisburg City	**X**		South Hanover Township	X	
Highspire Borough			Steelton Borough	X	
Hummelstown Borough	**X**		Susquehanna Township	X	
Jackson Township			Swatara Township	X	

Municipality	Carbonate Rock	Abandoned Mines		Municipality	Carbonate Rock	Abandoned Mines
Jefferson Township				Upper Paxton Township	X	
Londonderry Township	X			Washington Township		
Lower Paxton Township	X			Wayne Township		
Lower Swatara Township	X			West Hanover Township	X	
Lykens Borough		X		Wiconisco Township		X
Lykens Township		X		Williams Township		X
Middle Paxton Township	X			Williamstown Borough		

Source: USGS – n.d; Allegheny DEP -2020

Impact on Life, Health, and Safety

Impacts of land subsidence depends on several factors, including the scale and time of land collapse. Sinkhole events caused by karst terrain or abandoned mines are typically isolated and impact the population within the immediate area of the incident. In addition to causing damages to residential buildings and displacing residents, sinkholes can block off or damage major roadways and inhibit travel for emergency responders or populations trying to evacuate the area.

Table 4.3.13-2 summarizes the Dauphin County population located within areas of carbonate rock. The City of Harrisburg has the greatest number of people located in the carbonate hazard area, with 49,139 people or 99.8 percent of the city's total population. Table 4.3.13-3 shows the number of people living over abandoned mine areas. The Borough of Lykens has the greatest number of people living in areas over abandoned mines, with 86 people or 5.1 percent of the borough's total population.

Table 4.3.13-2. Estimated Population Located over Carbonate Rock

Jurisdiction	American Community Survey (2014-2018) Population	Estimated Population Exposed to Karst Topography Hazard Area	
		Number of People	Percent of Total
Berrysburg (B)	323	0	0.0%
Conewago (T)	3,069	2,679	87.3%
Dauphin (B)	855	0	0.0%
Derry (T)	25,036	17,471	69.8%
East Hanover (T)	5,919	0	0.0%
Elizabethville (B)	1,609	0	0.0%
Gratz (B)	805	0	0.0%
Halifax (B)	954	0	0.0%
Halifax (T)	3,561	0	0.0%
Harrisburg (C)	49,230	49,139	99.8%
Highspire (B)	2,667	98	3.7%
Hummelstown (B)	4,650	0	0.0%
Jackson (T)	1,727	0	0.0%
Jefferson (T)	302	0	0.0%
Londonderry (T)	5,211	2,697	51.8%
Lower Paxton (T)	48,739	2,207	4.5%
Lower Swatara (T)	8,788	3,012	34.3%
Lykens (B)	1,673	0	0.0%

Jurisdiction	American Community Survey (2014-2018) Population	Estimated Population Exposed to Karst Topography Hazard Area	
		Number of People	Percent of Total
Lykens (T)	1,631	0	0.0%
Middle Paxton (T)	5,067	0	0.0%
Middletown (B)	9,176	9,176	100.0%
Mifflin (T)	727	0	0.0%
Millersburg (B)	2,546	0	0.0%
Paxtang (B)	1,650	1,650	100.0%
Penbrook (B)	2,981	2,981	100.0%
Pillow (B)	256	0	0.0%
Reed (T)	209	0	0.0%
Royalton (B)	1,259	1,259	100.0%
Rush (T)	305	0	0.0%
South Hanover (T)	6,766	0	0.0%
Steelton (B)	5,954	4,969	83.5%
Susquehanna (T)	24,857	10,133	40.8%
Swatara (T)	24,685	10,458	42.4%
Upper Paxton (T)	4,219	0	0.0%
Washington (T)	2,166	0	0.0%
Wayne (T)	1,365	0	0.0%
West Hanover (T)	10,165	0	0.0%
Wiconisco (T)	1,122	0	0.0%
Williams (T)	1,104	0	0.0%
Williamstown (B)	1,187	0	0.0%
Dauphin County (Total)	**274,515**	**117,930**	**43.0%**

Source: American Community Survey 2018 5-year estimates; USGS – n.d
Note: B – Borough; T - Township; C – City

Table 4.3.13-3 Estimated Population Located Over Abandoned Mine Areas

Jurisdiction	American Community Survey (2014-2018) Population	Estimated Population Exposed to Abandoned Mine Area	
		Number of People	Percent of Total
Berrysburg (B)	323	0	0.0%
Conewago (T)	3,069	0	0.0%
Dauphin (B)	855	0	0.0%
Derry (T)	25,036	0	0.0%
East Hanover (T)	5,919	0	0.0%
Elizabethville (B)	1,609	0	0.0%
Gratz (B)	805	0	0.0%
Halifax (B)	954	0	0.0%
Halifax (T)	3,561	0	0.0%
Harrisburg (C)	49,230	0	0.0%
Highspire (B)	2,667	0	0.0%

Jurisdiction	American Community Survey (2014-2018) Population	Estimated Population Exposed to Abandoned Mine Area	
		Number of People	Percent of Total
Hummelstown (B)	4,650	0	0.0%
Jackson (T)	1,727	0	0.0%
Jefferson (T)	302	0	0.0%
Londonderry (T)	5,211	0	0.0%
Lower Paxton (T)	48,739	0	0.0%
Lower Swatara (T)	8,788	0	0.0%
Lykens (B)	1,673	86	5.1%
Lykens (T)	1,631	1	0.1%
Middle Paxton (T)	5,067	0	0.0%
Middletown (B)	9,176	0	0.0%
Mifflin (T)	727	0	0.0%
Millersburg (B)	2,546	0	0.0%
Paxtang (B)	1,650	0	0.0%
Penbrook (B)	2,981	0	0.0%
Pillow (B)	256	0	0.0%
Reed (T)	209	0	0.0%
Royalton (B)	1,259	0	0.0%
Rush (T)	305	0	0.0%
South Hanover (T)	6,766	0	0.0%
Steelton (B)	5,954	0	0.0%
Susquehanna (T)	24,857	0	0.0%
Swatara (T)	24,685	0	0.0%
Upper Paxton (T)	4,219	0	0.0%
Washington (T)	2,166	0	0.0%
Wayne (T)	1,365	0	0.0%
West Hanover (T)	10,165	0	0.0%
Wiconisco (T)	1,122	46	4.1%
Williams (T)	1,104	43	3.9%
Williamstown (B)	1,187	0	0.0%
Dauphin County (Total)	**274,515**	**176**	**0.1%**

Source: American Community Survey 2018 5-year estimates; Allegheny DEP -2020
Note: B – Borough; T - Township; C – City

Impact on General Building Stock

Standard loss estimation models do not exist for the subsidence/sinkhole hazard. In general, the built environment located on limestone (carbonate) and abandoned mines is exposed to this hazard. There are 26,925 buildings with a replacement cost value of $28.5 billion located atop carbonate rock countywide. The Township of Derry has the greatest number of buildings and estimated replacement cost value located in carbonate rock areas, with 8,559 buildings totaling $11.9 billion. There are 172 buildings with a replacement cost of $61.7 million located atop abandoned mine areas. The Township of Wiconisco has the greatest number of buildings and estimated replacement cost value located in abandoned mine areas, with 63 buildings totaling in $33.3 million. Table 4.3.13-4 and Table 4.3.13-5 summarize the exposed building stock located in the sinkhole-susceptibility area throughout the County by jurisdiction.

Table 4.3.13-4. Estimated General Building Stock Located over Limestone (Carbonate) Bedrock

Jurisdiction	Number of Buildings	Total Replacement Cost Value	Estimated Building Stock Exposed to Carbonate Rock Hazard Area: Number of Buildings	Percent of Total	Replacement Cost Value (RCV)	Percent of Total
Berrysburg (B)	366	$131,114,498	0	0.0%	$0	0.0%
Conewago (T)	2,495	$1,131,218,434	0	0.0%	$0	0.0%
Dauphin (B)	456	$160,174,274	0	0.0%	$0	0.0%
Derry (T)	11,617	$13,980,976,171	8,559	73.7%	$11,872,567,863	84.9%
East Hanover (T)	5,054	$2,617,412,647	347	6.9%	$101,144,981	3.9%
Elizabethville (B)	949	$396,035,763	0	0.0%	$0	0.0%
Gratz (B)	715	$432,294,298	0	0.0%	$0	0.0%
Halifax (B)	469	$181,049,719	0	0.0%	$0	0.0%
Halifax (T)	3,457	$1,457,192,513	31	0.9%	$6,648,251	0.5%
Harrisburg (C)	18,718	$15,182,832,338	6,483	34.6%	$4,649,461,241	30.6%
Highspire (B)	1,374	$550,466,766	0	0.0%	$0	0.0%
Hummelstown (B)	2,337	$1,082,835,134	2,005	85.8%	$948,742,810	87.6%
Jackson (T)	2,371	$776,111,853	0	0.0%	$0	0.0%
Jefferson (T)	666	$230,110,295	0	0.0%	$0	0.0%
Londonderry (T)	5,080	$2,360,384,847	1	<0.1%	$224,870	<0.1%
Lower Paxton (T)	20,948	$14,635,453,846	1,914	9.1%	$1,178,911,221	8.1%
Lower Swatara (T)	4,771	$5,522,875,069	669	14.0%	$1,976,681,544	35.8%
Lykens (B)	1,322	$517,534,065	0	0.0%	$0	0.0%
Lykens (T)	2,155	$941,126,374	0	0.0%	$0	0.0%
Middle Paxton (T)	4,093	$1,462,655,724	17	0.4%	$5,263,860	0.4%
Middletown (B)	3,582	$1,981,507,138	0	0.0%	$0	0.0%
Mifflin (T)	1,125	$603,453,937	0	0.0%	$0	0.0%
Millersburg (B)	1,439	$770,504,424	0	0.0%	$0	0.0%
Paxtang (B)	869	$403,915,987	538	61.9%	$276,780,373	68.5%
Penbrook (B)	1,525	$602,189,726	858	56.3%	$395,839,983	65.7%
Pillow (B)	301	$101,661,910	0	0.0%	$0	0.0%
Reed (T)	299	$117,139,877	0	0.0%	$0	0.0%
Royalton (B)	630	$196,935,626	0	0.0%	$0	0.0%
Rush (T)	343	$71,032,585	0	0.0%	$0	0.0%
South Hanover (T)	3,972	$1,935,844,099	120	3.0%	$46,867,374	2.4%
Steelton (B)	2,721	$2,111,932,612	151	5.5%	$103,246,366	4.9%
Susquehanna (T)	11,785	$8,633,889,539	2,270	19.3%	$1,890,228,433	21.9%
Swatara (T)	11,354	$8,581,237,561	2,495	22.0%	$4,425,074,733	51.6%
Upper Paxton (T)	3,560	$1,473,328,502	0	0.0%	$0	0.0%
Washington (T)	2,270	$1,106,223,564	0	0.0%	$0	0.0%
Wayne (T)	1,324	$398,741,088	0	0.0%	$0	0.0%
West Hanover (T)	6,505	$3,228,343,376	467	7.2%	$182,019,299	5.6%
Wiconisco (T)	995	$297,597,257	0	0.0%	$0	0.0%

Jurisdiction	Number of Buildings	Total Replacement Cost Value	Estimated Building Stock Exposed to Carbonate Rock Hazard Area			
			Number of Buildings	Percent of Total	Replacement Cost Value (RCV)	Percent of Total
Williams (T)	957	$390,058,854	0	0.0%	$0	0.0%
Williamstown (B)	908	$345,185,743	0	0.0%	$0	0.0%
Dauphin County (Total)	**145,877**	**$97,100,578,032**	**26,925**	**18.5%**	**$28,059,703,202**	**28.9%**

Source: USGS – n.d; RS Means 2020
Note: B – Borough; T - Township; C – City

Table 4.3.13-5 Estimated General Building Stock Located over Abandoned Mine Areas

Jurisdiction	Number of Buildings	Total Replacement Cost Value	Estimated Building Stock Exposed to Abandoned Mine Area			
			Number of Buildings	Percent of Total	Replacement Cost Value (RCV)	Percent of Total
Berrysburg (B)	366	$131,114,498	0	0.0%	$0	0.0%
Conewago (T)	2,495	$1,131,218,434	0	0.0%	$0	0.0%
Dauphin (B)	456	$160,174,274	0	0.0%	$0	0.0%
Derry (T)	11,617	$13,980,976,171	0	0.0%	$0	0.0%
East Hanover (T)	5,054	$2,617,412,647	0	0.0%	$0	0.0%
Elizabethville (B)	949	$396,035,763	0	0.0%	$0	0.0%
Gratz (B)	715	$432,294,298	0	0.0%	$0	0.0%
Halifax (B)	469	$181,049,719	0	0.0%	$0	0.0%
Halifax (T)	3,457	$1,457,192,513	0	0.0%	$0	0.0%
Harrisburg (C)	18,718	$15,182,832,338	0	0.0%	$0	0.0%
Highspire (B)	1,374	$550,466,766	0	0.0%	$0	0.0%
Hummelstown (B)	2,337	$1,082,835,134	0	0.0%	$0	0.0%
Jackson (T)	2,371	$776,111,853	0	0.0%	$0	0.0%
Jefferson (T)	666	$230,110,295	0	0.0%	$0	0.0%
Londonderry (T)	5,080	$2,360,384,847	0	0.0%	$0	0.0%
Lower Paxton (T)	20,948	$14,635,453,846	0	0.0%	$0	0.0%
Lower Swatara (T)	4,771	$5,522,875,069	0	0.0%	$0	0.0%
Lykens (B)	1,322	$517,534,065	62	4.7%	$14,403,035	2.8%
Lykens (T)	2,155	$941,126,374	1	<0.1%	$109,624	<0.1%
Middle Paxton (T)	4,093	$1,462,655,724	0	0.0%	$0	0.0%
Middletown (B)	3,582	$1,981,507,138	0	0.0%	$0	0.0%
Mifflin (T)	1,125	$603,453,937	0	0.0%	$0	0.0%
Millersburg (B)	1,439	$770,504,424	0	0.0%	$0	0.0%
Paxtang (B)	869	$403,915,987	0	0.0%	$0	0.0%
Penbrook (B)	1,525	$602,189,726	0	0.0%	$0	0.0%
Pillow (B)	301	$101,661,910	0	0.0%	$0	0.0%
Reed (T)	299	$117,139,877	0	0.0%	$0	0.0%
Royalton (B)	630	$196,935,626	0	0.0%	$0	0.0%
Rush (T)	343	$71,032,585	0	0.0%	$0	0.0%

Jurisdiction	Number of Buildings	Total Replacement Cost Value	Estimated Building Stock Exposed to Abandoned Mine Area			
			Number of Buildings	Percent of Total	Replacement Cost Value (RCV)	Percent of Total
South Hanover (T)	3,972	$1,935,844,099	0	0.0%	$0	0.0%
Steelton (B)	2,721	$2,111,932,612	0	0.0%	$0	0.0%
Susquehanna (T)	11,785	$8,633,889,539	0	0.0%	$0	0.0%
Swatara (T)	11,354	$8,581,237,561	0	0.0%	$0	0.0%
Upper Paxton (T)	3,560	$1,473,328,502	0	0.0%	$0	0.0%
Washington (T)	2,270	$1,106,223,564	2	0.1%	$1,661,046	0.2%
Wayne (T)	1,324	$398,741,088	0	0.0%	$0	0.0%
West Hanover (T)	6,505	$3,228,343,376	0	0.0%	$0	0.0%
Wiconisco (T)	995	$297,597,257	63	6.3%	$33,306,831	11.2%
Williams (T)	957	$390,058,854	44	4.6%	$12,266,541	3.1%
Williamstown (B)	908	$345,185,743	0	0.0%	$0	0.0%
Dauphin County (Total)	**145,877**	**$97,100,578,032**	**172**	**0.1%**	**$61,747,077**	**0.1%**

Source: Allegheny DEP -2020; RS Means 2020
Note: B – Borough; T - Township; C – City

Impact on Critical Facilities

There are 468 critical facilities in carbonate rock areas and 10 critical facilities in abandoned mine areas (Table 4.3.13-6 and Table 4.3.13-7). Hazardous Material Facilities are the primary type of critical facility that is in these sinkhole-susceptible areas (97 in total). Furthermore, Table 4.3.13-8 and Table 4.3.13-9 show the number of lifelines exposed to the carbonate rock areas and abandoned mines areas in the County. Overall, 327 of the critical facilities in carbonate rock areas and eight of the critical facilities in abandoned mine areas are considered lifelines. Section 4, County Profile, provides more information about these critical facilities and lifelines.

Table 4.3.13-6. Number of Critical Facilities Located in Limestone (Carbonate) Bedrock Areas

Jurisdiction	Critical Facilities Exposed to Carbonate Rock																													
	Bridge	Communication	Correctional Facility	County Building	Dam	Day Care	District Magistrate	Drug and Alcohol Treatment	Electric Power	EMS	EOC	Evacuation Shelters	Fire Station	Hazardous Material Facility	Historic Sites	Homeless Shelters	Hospitals and Medical Centers	Library	Military Facility	Municipal Office	Police Station	Polling Site	Post Office	Potable Water	Primary School	Rail	Religious	Senior Facility	State Building	Wastewater
Berrysburg (B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Conewago (T)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dauphin (B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Derry (T)	3	2	0	0	5	5	1	0	1	1	0	3	1	12	11	0	3	1	1	1	0	12	1	0	10	0	14	3	0	1
East Hanover (T)	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elizabethville (B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gratz (B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Halifax (B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Halifax (T)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harrisburg (C)	8	3	0	3	1	3	2	4	0	1	0	4	1	16	35	4	0	0	1	1	0	10	1	0	12	1	21	2	3	1
Highspire (B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hummelstown (B)	1	1	0	0	0	1	0	0	0	1	1	1	1	3	6	0	0	1	0	1	1	2	1	1	2	0	5	1	0	0
Jackson (T)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jefferson (T)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Londonderry (T)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lower Paxton (T)	0	2	0	0	0	1	0	0	0	0	0	0	0	3	0	0	0	1	0	0	0	2	0	0	1	0	2	1	0	0
Lower Swatara (T)	1	0	0	0	0	1	0	0	0	1	0	1	1	17	3	0	0	0	0	0	0	2	0	0	1	0	2	0	0	1
Lykens (B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lykens (T)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Middle Paxton (T)	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Middletown (B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mifflin (T)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Millersburg (B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paxtang (B)	0	1	0	0	0	3	0	0	0	0	1	0	0	1	1	0	0	0	0	2	1	1	0	0	1	0	0	0	0	0
Penbrook (B)	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	1	1	4	0	0	1	0	4	0	0	0

Jurisdiction	Critical Facilities Exposed to Carbonate Rock																												
	Bridge	Communication	Correctional Facility	County Building	Dam	Day Care	District Magistrate	Drug and Alcohol Treatment	Electric Power	EMS	EOC	Evacuation Shelters	Fire Station	Hazardous Material Facility	Historic Sites	Homeless Shelters	Hospitals and Medical Centers	Library	Military Facility	Municipal Office	Police Station	Polling Site	Post Office	Potable Water	Primary School	Rail	Religious	Senior Facility	State Building	Wastewater
Pillow (B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Reed (T)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Royalton (B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rush (T)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
South Hanover (T)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Steelton (B)	0	0	0	0	0	1	0	0	0	0	0	1	0	2	1	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0
Susquehanna (T)	2	1	0	0	0	1	0	1	0	1	0	1	1	6	3	0	0	0	0	2	1	3	0	2	2	1	3	1	1	0
Swatara (T)	5	3	3	4	0	3	2	1	0	0	1	3	1	33	4	0	0	0	0	1	1	3	1	0	2	2	4	5	0	2
Upper Paxton (T)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Washington (T)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wayne (T)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
West Hanover (T)	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	1	0	0	2	0	0	1
Wiconisco (T)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Williams (T)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Williamstown (B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dauphin County (Total)	**22**	**14**	**3**	**7**	**6**	**19**	**5**	**6**	**1**	**5**	**4**	**15**	**7**	**96**	**65**	**4**	**3**	**3**	**2**	**9**	**5**	**41**	**4**	**4**	**32**	**4**	**59**	**13**	**4**	**6**

Source: USGS – n.d; Dauphin County - 2020

Note: B – Borough; T - Township; C – City

Table 4.3.13-7 Number of Critical Facilities Located in Abandoned Mine Hazard Areas

Jurisdiction	Critical Facilities Exposed to Abandoned Mines Hazard Area							
	Bridge	Communication	Fire Station	Hazardous Material Facility	Municipal Office	Police Station	Polling Site	Wastewater
Berrysburg (B)	0	0	0	0	0	0	0	0
Conewago (T)	0	0	0	0	0	0	0	0
Dauphin (B)	0	0	0	0	0	0	0	0
Derry (T)	0	0	0	0	0	0	0	0
East Hanover (T)	0	0	0	0	0	0	0	0
Elizabethville (B)	0	0	0	0	0	0	0	0
Gratz (B)	0	0	0	0	0	0	0	0
Halifax (B)	0	0	0	0	0	0	0	0
Halifax (T)	0	0	0	0	0	0	0	0
Harrisburg (C)	0	0	0	0	0	0	0	0
Highspire (B)	0	0	0	0	0	0	0	0
Hummelstown (B)	0	0	0	0	0	0	0	0
Jackson (T)	0	0	0	0	0	0	0	0
Jefferson (T)	0	0	0	0	0	0	0	0
Londonderry (T)	0	0	0	0	0	0	0	0
Lower Paxton (T)	0	0	0	0	0	0	0	0
Lower Swatara (T)	0	0	0	0	0	0	0	0
Lykens (B)	2	0	0	0	0	0	0	0
Lykens (T)	0	0	0	0	0	0	0	0
Middle Paxton (T)	0	0	0	0	0	0	0	0
Middletown (B)	0	0	0	0	0	0	0	0
Mifflin (T)	0	0	0	0	0	0	0	0
Millersburg (B)	0	0	0	0	0	0	0	0
Paxtang (B)	0	0	0	0	0	0	0	0
Penbrook (B)	0	0	0	0	0	0	0	0
Pillow (B)	0	0	0	0	0	0	0	0
Reed (T)	0	0	0	0	0	0	0	0
Royalton (B)	0	0	0	0	0	0	0	0
Rush (T)	0	0	0	0	0	0	0	0
South Hanover (T)	0	0	0	0	0	0	0	0
Steelton (B)	0	0	0	0	0	0	0	0
Susquehanna (T)	0	0	0	0	0	0	0	0
Swatara (T)	0	0	0	0	0	0	0	0
Upper Paxton (T)	0	0	0	0	0	0	0	0
Washington (T)	0	0	0	0	0	0	0	0
Wayne (T)	0	0	0	0	0	0	0	0
West Hanover (T)	0	0	0	0	0	0	0	0
Wiconisco (T)	0	1	1	1	1	1	2	1
Williams (T)	0	0	0	0	0	0	0	0
Williamstown (B)	0	0	0	0	0	0	0	0
Dauphin County (Total)	**2**	**1**	**1**	**1**	**1**	**1**	**2**	**1**

Source: Allegheny DEP -2020; Dauphin County -
Note: B – Borough; T - Township; C – City

Table 4.3.13-8 Critical Facilities and Lifelines Located in the Limestone (Carbonate) Bedrock Area

Jurisdiction	Total Critical Facilities Located in Jurisdiction	Total Lifelines Located in Jurisdiction	Number of Critical Facilities and Lifeline Facilities Exposed to the Carbonate Rock Hazard Area			
			Critical Facilities	Percent of Total Critical Facilities	Lifelines	Percent of Total Lifelines
Berrysburg (B)	6	5	0	0.0%	0	0.0%
Conewago (T)	12	7	0	0.0%	0	0.0%
Dauphin (B)	27	23	0	0.0%	0	0.0%
Derry (T)	122	74	92	75.4%	54	73.0%
East Hanover (T)	41	29	3	7.3%	3	10.3%
Elizabethville (B)	12	9	0	0.0%	0	0.0%
Gratz (B)	9	7	0	0.0%	0	0.0%
Halifax (B)	8	7	0	0.0%	0	0.0%
Halifax (T)	37	24	0	0.0%	0	0.0%
Harrisburg (C)	371	271	138	37.2%	100	36.9%
Highspire (B)	15	9	0	0.0%	0	0.0%
Hummelstown (B)	33	23	31	93.9%	21	91.3%
Jackson (T)	26	15	0	0.0%	0	0.0%
Jefferson (T)	8	6	0	0.0%	0	0.0%
Londonderry (T)	47	31	0	0.0%	0	0.0%
Lower Paxton (T)	149	73	13	8.7%	7	9.6%
Lower Swatara (T)	94	75	31	33.0%	25	33.3%
Lykens (B)	22	17	0	0.0%	0	0.0%
Lykens (T)	16	10	0	0.0%	0	0.0%
Middle Paxton (T)	38	23	2	5.3%	2	8.7%
Middletown (B)	48	27	0	0.0%	0	0.0%
Mifflin (T)	11	8	0	0.0%	0	0.0%
Millersburg (B)	28	16	0	0.0%	0	0.0%
Paxtang (B)	14	9	12	85.7%	8	88.9%
Penbrook (B)	16	5	14	87.5%	5	100.0%
Pillow (B)	7	4	0	0.0%	0	0.0%
Reed (T)	8	7	0	0.0%	0	0.0%
Royalton (B)	12	9	0	0.0%	0	0.0%
Rush (T)	6	5	0	0.0%	0	0.0%
South Hanover (T)	25	17	0	0.0%	0	0.0%
Steelton (B)	34	17	8	23.5%	3	17.6%
Susquehanna (T)	112	72	33	29.5%	25	34.7%
Swatara (T)	146	95	84	57.5%	70	73.7%
Upper Paxton (T)	37	25	0	0.0%	0	0.0%
Washington (T)	34	27	0	0.0%	0	0.0%
Wayne (T)	9	8	0	0.0%	0	0.0%
West Hanover (T)	48	31	7	14.6%	4	12.9%
Wiconisco (T)	15	11	0	0.0%	0	0.0%
Williams (T)	16	12	0	0.0%	0	0.0%
Williamstown (B)	10	6	0	0.0%	0	0.0%
Dauphin County (Total)	**1,729**	**1,149**	**468**	**27.1%**	**327**	**28.5%**

Source: *USGS – n.d; Dauphin County - 2020*
Note: *B – Borough; T - Township; C – City*

Table 4.3.13-9 Critical Facilities and Lifelines Located in the Abandoned Mine Areas

Jurisdiction	Total Critical Facilities Located in Jurisdiction	Total Lifelines Located in Jurisdiction	Number of Critical Facilities and Lifeline Facilities Exposed to the Abandoned Mine Area			
			Critical Facilities	Percent of Total Critical Facilities	Lifelines	Percent of Total Lifelines
Berrysburg (B)	6	5	0	0.0%	0	0.0%
Conewago (T)	12	7	0	0.0%	0	0.0%
Dauphin (B)	27	23	0	0.0%	0	0.0%
Derry (T)	122	74	0	0.0%	0	0.0%
East Hanover (T)	41	29	0	0.0%	0	0.0%
Elizabethville (B)	12	9	0	0.0%	0	0.0%
Gratz (B)	9	7	0	0.0%	0	0.0%
Halifax (B)	8	7	0	0.0%	0	0.0%
Halifax (T)	37	24	0	0.0%	0	0.0%
Harrisburg (C)	371	271	0	0.0%	0	0.0%
Highspire (B)	15	9	0	0.0%	0	0.0%
Hummelstown (B)	33	23	0	0.0%	0	0.0%
Jackson (T)	26	15	0	0.0%	0	0.0%
Jefferson (T)	8	6	0	0.0%	0	0.0%
Londonderry (T)	47	31	0	0.0%	0	0.0%
Lower Paxton (T)	149	73	0	0.0%	0	0.0%
Lower Swatara (T)	94	75	0	0.0%	0	0.0%
Lykens (B)	22	17	2	9.1%	2	11.8%
Lykens (T)	16	10	0	0.0%	0	0.0%
Middle Paxton (T)	38	23	0	0.0%	0	0.0%
Middletown (B)	48	27	0	0.0%	0	0.0%
Mifflin (T)	11	8	0	0.0%	0	0.0%
Millersburg (B)	28	16	0	0.0%	0	0.0%
Paxtang (B)	14	9	0	0.0%	0	0.0%
Penbrook (B)	16	5	0	0.0%	0	0.0%
Pillow (B)	7	4	0	0.0%	0	0.0%
Reed (T)	8	7	0	0.0%	0	0.0%
Royalton (B)	12	9	0	0.0%	0	0.0%
Rush (T)	6	5	0	0.0%	0	0.0%
South Hanover (T)	25	17	0	0.0%	0	0.0%
Steelton (B)	34	17	0	0.0%	0	0.0%
Susquehanna (T)	112	72	0	0.0%	0	0.0%
Swatara (T)	146	95	0	0.0%	0	0.0%
Upper Paxton (T)	37	25	0	0.0%	0	0.0%
Washington (T)	34	27	0	0.0%	0	0.0%
Wayne (T)	9	8	0	0.0%	0	0.0%
West Hanover (T)	48	31	0	0.0%	0	0.0%
Wiconisco (T)	15	11	8	53.3%	6	54.5%
Williams (T)	16	12	0	0.0%	0	0.0%
Williamstown (B)	10	6	0	0.0%	0	0.0%
Dauphin County (Total)	**1,729**	**1,149**	**10**	**0.6%**	**8**	**0.7%**

Source: Allegheny DEP -2020; Dauphin County -
Note: B – Borough; T - Township; C – City

Impact on the Economy

Subsidence and sinkholes can severely impact roads and infrastructure. As noted earlier, limestone formations and abandoned mine areas underly approximately 7.3 percent and 0.7 percent of the County, respectively.

Major roadways that serve the County include Interstate I-76, I-83, I-283 I-81; Routes US-209, US-22, US-422, and US-322; and multiple State Routes, including PA-230, PA-441, PA-39, and PA-743. Portions of these roadways are located in the identified subsidence/sinkhole hazard area. While there is no clear way to track subsidence costs in Pennsylvania, USGS estimates that sinkhole damages cost $300 million each year. However, because there is no national tracking system for sinkholes, the total cost is likely less (USGS n.d.).

Cascading Impacts on Other Hazards

Subsidence events can have cascading impacts on landslides and utility failure. As discussed in earlier sections, large-scale subsidence events could trigger a landslide and disrupt debris further. Sinkholes can also bring about utility interruption if they occur on land that houses utilities. For example, electric utilities may become disconnected if power lines are broken from displaced geologic material. More information about landslide and utility interruptions can be found in Sections 4.3.9 and 4.3.16.

Future Changes that May Impact Vulnerability

Understanding future changes that effect vulnerability in the County can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The County considered the following factors to examine potential conditions that may affect hazard vulnerability:

- Potential or projected development
- Projected changes in population
- Other identified conditions as relevant and appropriate, including the impacts of climate change

Projected Development

An increase in development and population can increase likelihood of a sinkhole incident. Future migration to larger jurisdictions may also increase the likelihood of an incident. The maps in Section 4.4 show growth area locations throughout the County and their proximity to

Projected Changes in Population

Estimated population projections provided by the Center of Rural Pennsylvania indicates that Dauphin's population will continue to increase into 2040, increasing total population to approximately 296,766 persons (The Center of Rural Pennsylvania 2013). This is approximately a 10.6 percent increase from the County's 2010 population. Persons that move into areas that are vulnerable to subsidence are at greater risk to be impacted if a sinkhole were to occur.

Climate Change

Climate is defined not simply as average temperature and precipitation but also by the type, frequency, and intensity of weather events. Both globally and at the local level, climate change has the potential to alter the prevalence and severity of weather extremes (EPA 2021).

Climate change factors such as an extended growing season, higher temperatures, and the possibility of more intense and less frequent summer rainfall may lead to changes in water resource availability. As stated earlier in this profile, changes to the water balance of an area (including over-withdrawal of groundwater, diverting surface water from a large area and concentrating it in a single point, artificially creating ponds of surface water, and drilling new water wells) will cause sinkholes. These actions can also serve to accelerate the natural processes of bedrock degradation, which can have a direct impact on sinkhole creation. The potential effects of climate change on Dauphin County's vulnerability to subsidence/sinkhole events will need to be considered as more information develops regarding regional climate change impacts.

Change of Vulnerability Since the 2015 Hazard Mitigation Plan

Since the 2015 analysis, population statistics have been updated using the 5-Year 2014–2018 American Community Survey Population Estimates. The general building stock was also established using RS Means 2020 building valuations that estimated replacement cost value for each building in the inventory. Additionally, a critical facility dataset was provided from the County. This HMP was enhanced by using 2014 USGS Carbonate Rock layer and the 2020 PASDA abandoned mines layer to identify areas of subsidence and possible sinkholes.

4.3.14 Tornado, Windstorm

This section provides a profile and vulnerability assessment for the tornado and windstorm hazard.

Wind is air moving from high to low pressure. It is the rough horizontal movement of air (as opposed to an air current) caused by uneven heating of the earth's surface. Wind occurs at all scales, from local breezes generated by heating of land surfaces and lasting tens of minutes, to global winds resulting from solar heating of the earth (Federal Emergency Management Agency [FEMA] 1997). Different types of damaging winds include straight-line wind, downdraft, downburst, microburst, gust front, derecho, bow echo, and hook echo. Each wind type is described below:

- **Straight-line wind** is a term used to define any thunderstorm wind that is not associated with rotation. Straight-line winds are the movement of air from areas of higher pressure to areas of lower pressure – the greater the difference in pressure, the stronger the winds. It is used mainly to differentiate from tornadic winds.
- A **downdraft** is a small-scale column of air that rapidly sinks toward the ground and usually results in a downburst.
- A **downburst** is a strong downdraft with horizontal dimensions larger than 2.5 miles, resulting in an outward burst or damaging winds on or near the ground. It is usually associated with thunderstorms, but can occur with rain storms too weak to produce thunder.
- A **microburst** is a small, concentrated downburst that produces an outward burst of damaging winds near the surface. It is typically short-lived, lasting only 5 to 10 minutes, with maximum wind speeds of up to 168 miles per hour (mph).
- A **gust front** is the leading edge of rain-cooled air that clashes with warmer thunderstorm inflow. It is characterized by a wind shift, temperature drop, and gusty winds out ahead of a thunderstorm (National Severe Storms Laboratory [NSSL] 2015).
- A **derecho** is a widespread and long-lived windstorm associated with thunderstorms that are often curved (Johns et al. 2011). The two major influences on the atmospheric circulation are the differential heating between the equator and the poles, and the rotation of the planet (FEMA 1997).
- A **bow echo** is a radar echo that is linear but bent outward in a bow shape. Damaging straight-line winds often occur near the center of a bow echo (crest). A bow echo can be more than 300 kilometers long, last for several hours, and produce extensive swaths of wind damage at the ground (NSSL 2015).
- A **hook echo** is a radar echo that is the most recognized and well-known radar signature for tornadic supercells. This "hook-like" feature occurs when the strong counter-clockwise winds circling the mesocyclone (rotating updraft) are strong enough to wrap precipitation around the rain-free updraft area of the storm (Provic 2013).

High winds, other than tornadoes, are experienced in all parts of the United States. Areas that experience the highest wind speeds are coastal regions from Texas to Maine and the Alaskan coast; however, exposed mountain areas experience winds at least as high as those along the coast (FEMA 1997, Robinson 2013). Wind begins with differences in air pressures and is essentially the horizontal movement of air caused by uneven heating of the earth. Wind occurs everywhere. Effects from high winds can include downed trees and power lines, and damaged roofs and windows. Table 4.3.14-1 describes wind classifications used by the National Weather Service (NWS).

Table 4.3.14-1. NWS Wind Descriptions

Descriptive Term	Sustained Wind Speed (mph)
Strong, dangerous, or damaging	≥40
Very windy	30-40
Windy	20-30
Breezy, brisk, or blustery	15-25
None	5-15 or 10-20
Light, or light and variable wind	0-5

Source: NWS 2009
mph Miles per hour

Extreme windstorm events are associated with extra-tropical and tropical cyclones, winter cyclones, severe thunderstorms, and accompanying mesoscale offspring, such as tornadoes and downbursts. Wind speeds vary from 0 mph at ground level to 200 mph in the upper atmospheric jet stream 6 to 8 miles above the earth's surface (FEMA 1997).

A derecho is a type of windstorm that can occur during a rapidly moving thunderstorm. A derecho is a long-lived windstorm associated with a moving squall line of thunderstorms. It produces straight-line winds gusts of at least 58 mph and often has isolated gusts exceeding 75 mph. As a result, trees generally fall and debris is blown in one direction. To be considered a derecho, these conditions must continue along a path of at least 240 miles. Derechos are more common in the Great Lakes and Midwest regions of the United States, though, on occasion, can persist into the mid-Atlantic and northeast United States (Office of the New Jersey State Climatologist [ONJSC] Rutgers University 2015).

Tornadoes are nature's most violent storms and can cause fatalities and devastate neighborhoods in seconds. A tornado appears as a rotating, funnel-shaped cloud that extends from a thunderstorm to the ground with whirling winds that can reach 250 mph. Damage paths can be greater than 1 mile wide and 50 miles long. Tornadoes typically develop from either a severe thunderstorm or hurricane as cool air rapidly overrides a layer of warm air. Tornadoes typically move at speeds between 30 and 125 mph and can generate internal winds exceeding 300 mph. The lifespan of a tornado rarely is longer than 30 minutes (FEMA 1997). Tornadoes cause high wind velocity generating wind-blown debris, along with lightning or hail, resulting in additional damage. Destruction caused by tornadoes depends on the size, intensity, and duration of the storm. Tornadoes cause the greatest damage to structures that are light, such as residential and mobile homes, and tend to remain localized during impact (Northern Virginia Regional Commission [NVRC] 2006).

The following sections discuss the location and extent, range of magnitude, previous occurrence, future occurrence, and vulnerability assessment associated with the wind and tornado hazard for Dauphin County.

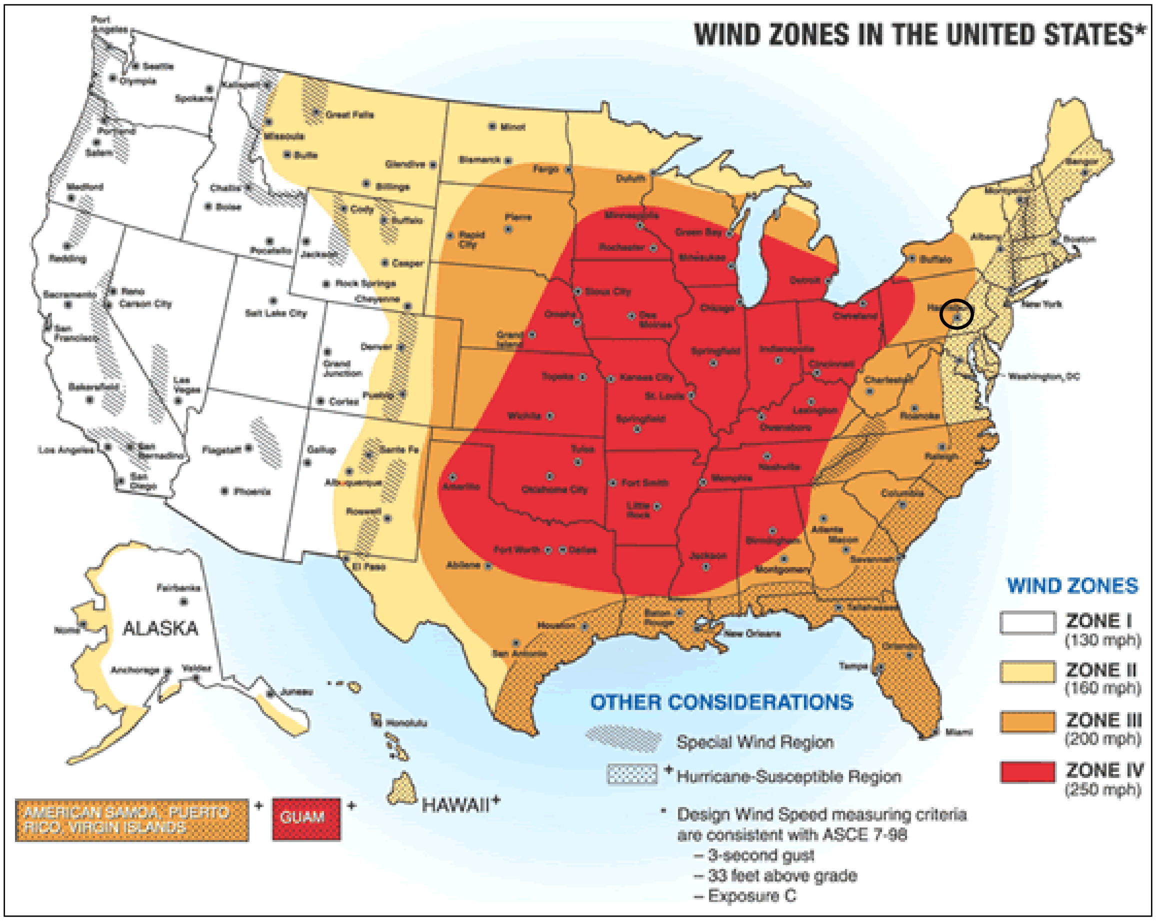
4.3.15.1 Location and Extent

Tornadoes and windstorms can occur throughout Pennsylvania. Tornadoes are usually localized; however, severe thunderstorms can result in conditions favorable to the formation of numerous or long-lived tornadoes. Straight-line winds and windstorms are experienced on a region-wide scale (Pennsylvania Emergency Management Agency [PEMA] 2018).

Windstorms

Figure 4.3.14-1 illustrates the ways in which the frequency and strength of windstorms affect the United States and indicates the general locations of wind activity. This figure is based on 40 years of tornado history and 100 years of hurricane history collected by FEMA. States located in Wind Zone IV have experienced the greatest number of tornadoes and the strongest tornadoes (NVRC 2006). Dauphin County is located in both Wind Zone II and Wind Zone III with tornado speeds up to 160 mph and 200 mph respectively.

Figure 4.3.14-1. Wind Zones in the United States



Source: FEMA 2012
Note: The black oval indicates the approximate location of Dauphin County.

Tornadoes

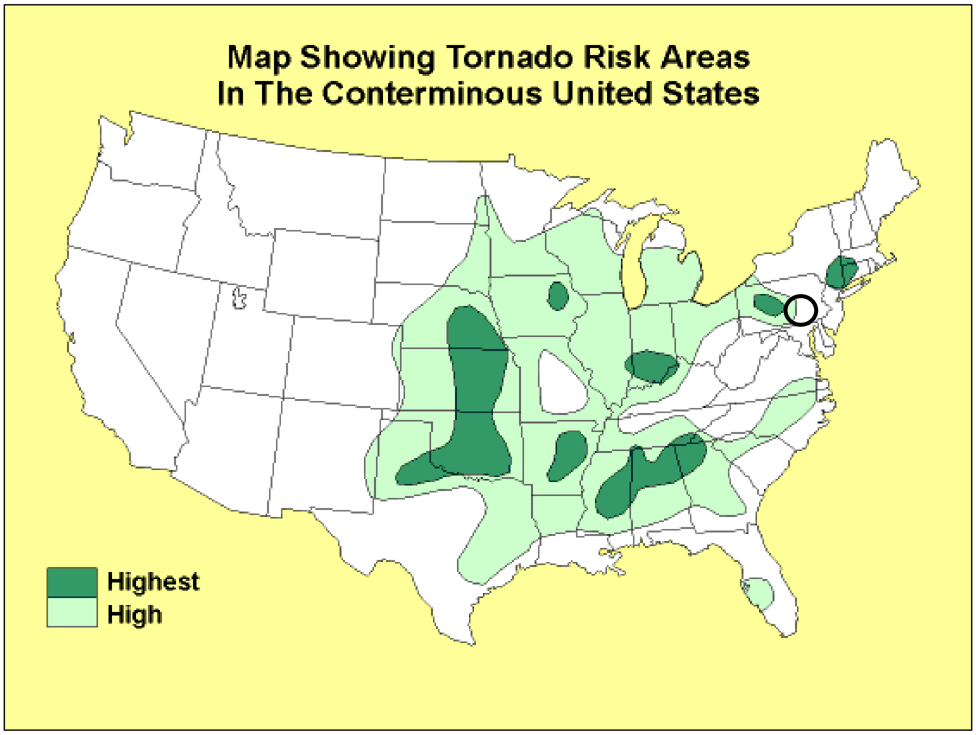
The United States experiences more tornadoes than any other country with approximately 1,000 occurring in a typical year. The peak of the U.S. tornado season is April through June, although tornadoes can occur at any time of year, with the highest concentration of tornadoes occurring in the central United States, (NWS 2011). Tornadoes tend to strike in the afternoons and evening, the warmest hours of the day; typically tornadoes strike between 4:00 p.m. and 9:00 p.m. (National Oceanic and Atmospheric Administration [NOAA] NSSL 2015).

Tornado movement is characterized in two ways: direction and speed of the spinning winds and forward movement of the tornado and 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 0 to 45 or 50 mph. Therefore, some estimates place the maximum velocity (combination of ground speed, wind speed, and upper winds) of tornadoes at about 300 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 they generally range in size from less than 100 feet to more than a mile in width. Some tornadoes never touch the ground and are short-lived, while others may touch the ground several times.

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.

Figure 4.3.14-2 indicates that a large area of Pennsylvania is at high risk for tornadoes; with a portion considered to be at the highest risk. According to this graphic, Dauphin County has a moderate risk for tornado. Details regarding historical tornado events are discussed in the Past Occurrences section (Section 4.3.15.3) of this profile.

Figure 4.3.14-2. Tornado Risk in the United States



Source: American Red Cross 2010
Note: The black circle indicates the general location of Dauphin County.

A study from the NOAA NSSL provided estimates of the long-term threat from tornadoes. The NSSL used historical data to estimate the daily probability of tornado occurrences across the United States, without considering the magnitude of the tornado. In Pennsylvania, it is estimated that the probability of a tornado occurring is 0.2 to 0.8 day per year. In Dauphin County, it is estimated that the probability of a tornado occurring is 0.6 to 0.8 day per year (NSSL 2013).

4.3.15.2 Range of Magnitude

Windstorms are generally defined as sustained wind speeds of 40 mph or greater, lasting for 1 hour or longer, or winds of 58 mph or greater for any duration. A tornado's magnitude is classified using the Enhanced Fujita Scale, which is further discussed below.

The magnitude or severity of a tornado was originally categorized using the Fujita Scale (F-Scale) or the Pearson Fujita Scale introduced in 1971, based on a relationship between the Beaufort Wind Scales (B-Scales) (measure of wind intensity) and the Mach number scale (measure of relative speed). It is used to rate the intensity of a tornado by examining the damage caused by the tornado after it has passed over a man-made structure (Tornado Project Date Unknown). The F-Scale categorizes each tornado by intensity and area. The scale is divided into six categories, F0 (Gale) to F5 (Incredible) (Edwards 2013).

Although the F-Scale has been in use for more than 30 years, the scale has limitations. The primary limitations are a lack of Damage Indicators (DI), no account of construction quality and variability, and no definitive correlation between damage and wind speed. These limitations have led to the inconsistent rating of tornadoes and, in some cases, an overestimate of tornado wind speeds. The limitations listed above led to the development of the Enhanced Fujita Scale (EF Scale). The Texas Tech University Wind Science and Engineering (WISE) Center, along with a forum of nationally renowned meteorologists and wind engineers from across the country, developed the EF Scale (Texas Tech University 2015).

The EF Scale was adopted on February 1, 2007. It is used to assign a tornado with a rating based on estimated wind speeds and related damage. When tornado-related damage is surveyed, it is compared with a list of DIs and Degrees of Damage (DOD), which help better estimate the range of wind speeds produced by the tornado. From that, a rating is assigned, similar to that of the F-Scale, with six categories from EF0 to EF5, representing increasing DOD. The EF Scale was revised from the original F-Scale to reflect better examinations of tornado damage. The EF Scale also relates to how most structures are designed (NWS 2007). Table 4.3.14-2 displays each of its six categories of the EF Scale.

Table 4.3.14-2. Enhanced Fujita Damage Scale

EF Scale Number	Intensity Phrase	Wind Speed (mph)	Type of Damage Done
EF0	Light tornado	65–85	Light damage. Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over.
EF1	Moderate tornado	86-110	Moderate damage. Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
EF2	Significant tornado	111-135	Considerable damage. Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
EF3	Severe tornado	136-165	Severe damage. Entire stories of well-constructed houses destroyed; severe damage to large buildings, such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.
EF4	Devastating tornado	166-200	Devastating damage. Well-constructed houses and whole-frame houses completely leveled; cars thrown; and small missiles generated.
EF5	Incredible tornado	>200	Incredible damage. Strong-frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 meters (109 yards); high-rise buildings have significant structural deformation; incredible phenomena will occur.

Source: SPC 2016
mph Miles per hour

The EF Scale takes into account more variables than the original F-Scale did in assigning a wind speed rating to a tornado. The EF Scale incorporates 28 DIs, such as building type, structures, and trees. There are eight DODs for each damage indicator, ranging from the beginning of visible damage to complete destruction of the damage indicator. Table 4.3.14-3 lists the 28 DIs. A description is provided for each one of these indicators of the typical construction for that category. Each DOD in every category is assigned an expected estimate of wind speed, a lower bound of wind speed, and an upper bound of wind speed.

Table 4.3.14-3. EF Scale Damage Indicators

Number	Damage Indicator	Abbreviation	Number	Damage Indicator	Abbreviation
1	Small barns, farm outbuildings	SBO	15	School - 1-story elementary (interior or exterior halls)	ES
2	One- or two-family residences	FR12	16	School - junior or senior high school	JHSH
3	Single-wide mobile home	MHSW	17	Low-rise (1-4 story) building	LRB
4	Double-wide mobile home	MHDW	18	Mid-rise (5-20 story) building	MRB
5	Apartment, condominium, townhouse (3 stories or less)	ACT	19	High-rise (over 20 stories)	HRB
6	Motel	M	20	Institutional building (hospital, government. or university)	IB
7	Masonry apartment or motel	MAM	21	Metal building system	MBS
8	Small retail building (fast food)	SRB	22	Service station canopy	SSC
9	Small professional (doctor office, branch bank)	SPB	23	Warehouse (tilt-up walls or heavy timber)	WHB
10	Strip mall	SM	24	Transmission line tower	TLT
11	Large shopping mall	LSM	25	Free-standing tower	FST
12	Large, isolated ("big box") retail building	LIRB	26	Free-standing pole (light, flag, luminary)	FSP
13	Automobile showroom	ASR	27	Tree - hardwood	TH
14	Automotive service building	ASB	28	Tree - softwood	TS

Source: SPC 2016

Since the EF Scale went into effect in February 2007, previous occurrences and losses associated with historical tornado events (described in Section 4.3.15.3, Past Occurrences) are classified based on the former Fujita Scale. Events after February 2007 are classified based on the Enhance Fujita Scale.

Dauphin County's worst tornado event occurred on February 24, 2016, when an EF2 tornado moved across the County near Gap. The storm blew over trees and damaged an estimated fifty structures, including two large farm outbuildings, an Amish school building, and a two-story residence. Total damage was estimated at $8,000,000. (NOAA 2021)

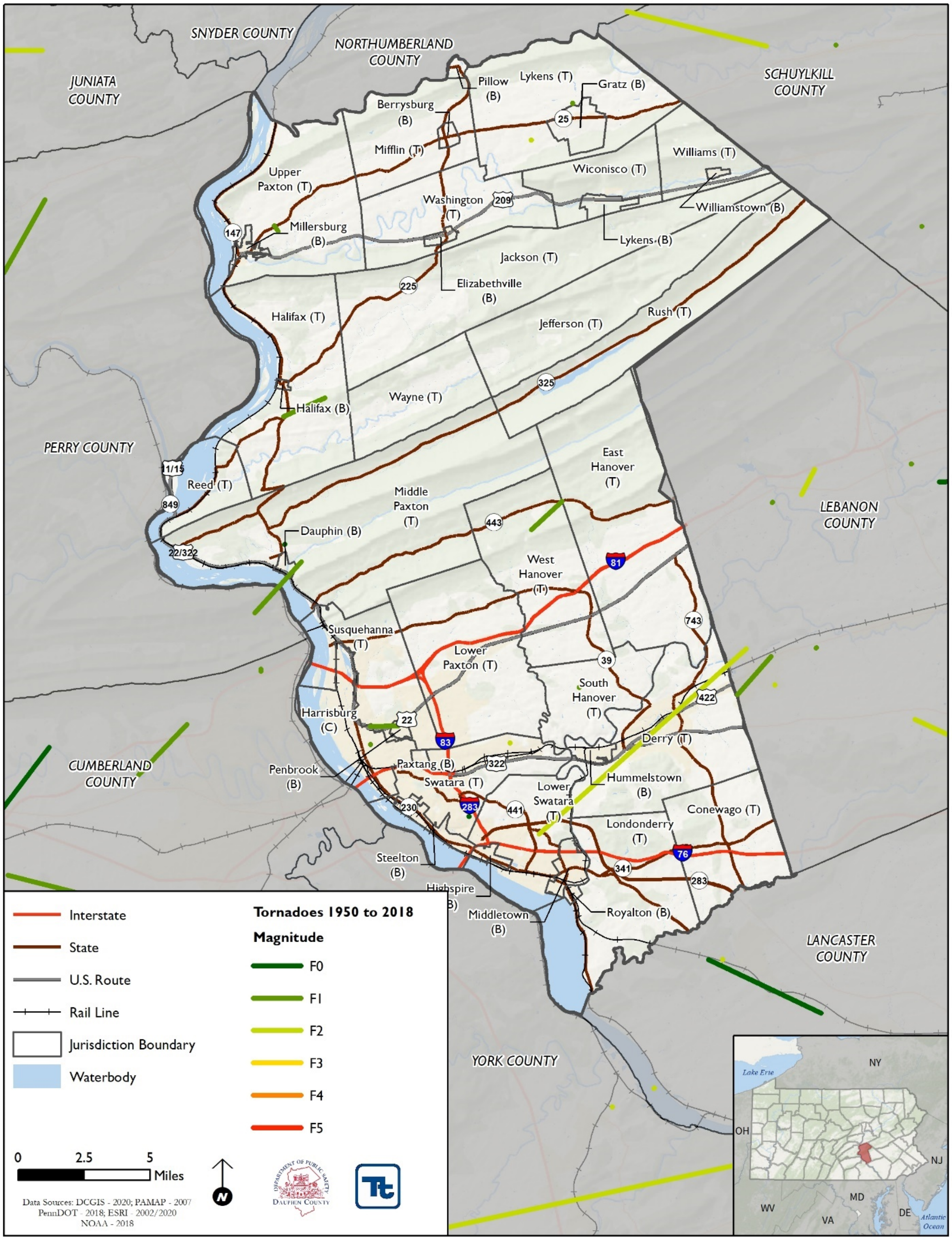
4.3.15.3 Past Occurrence

Many sources provided historical information regarding previous occurrences and losses associated with tornado and windstorm events throughout the Commonwealth of Pennsylvania and Dauphin County. With so many sources reviewed for this plan, loss and impact information varies depending on the source. Therefore, the accuracy of monetary figures discussed is based only on the available information identified during research for this HMP.

According to NOAA's National Climatic Data Center (NCDC) storm events database, Dauphin County experienced 206 tornado and windstorm events between January 1, 1950, and December 31, 2020. These events include high winds, strong winds, thunderstorm winds, and tornadoes. Total property damage as a result of these tornado and windstorm events was estimated at over $8 million. This total also includes damage to other counties.

Figure 4.3.14-3 shows the tornadoes that have occurred across Pennsylvania from 1950 to 2020. The last tornado that was reported was in 2018. (NOAA 2021).

Figure 4.3.14-3. Dauphin County Tornado History



According to NOAA's NCEI, ten tornadoes were recorded in Dauphin County between 1950 and 2020. These tornadoes included two with an intensity of F/EF0 and eight with an intensity of F/EF1. Dauphin County's worst tornado in recent years occurred on December 1, 2006, when an EF1 tornado caused damage and one fatality around Halifax.

Between 1954 and 2020, the Commonwealth of Pennsylvania experienced 15 federally declared windstorm, tornado-related disasters, or severe storms (DR) or emergencies (EM) classified as one or a combination of the following disaster types: hurricane, tropical storm, tropical depression, severe storm, flash flooding, flooding, and high winds. Generally, these disasters cover a wide region of the Commonwealth; therefore, they may have affected many counties. Dauphin County was involved with DR-340 (1972), DR-485 (1975), DR-523 (1976), DR-1298 (1999), DR-1557 (2004), DR-1649 (2006), EM-3340 (2011), DR-4030 (2011), EM 3356 (2012), and DR-4099 (2012) (FEMA 2021).

Based on all sources researched, select significant windstorms (those with damage of at least $5,000 or that caused injuries/fatalities or downed wires), and tornado events that have affected Dauphin County and its municipalities between 1950 and 2020 are identified in Table 4.3.14-4. With tornado and windstorm documentation for the Commonwealth of Pennsylvania being so extensive, not all sources have been identified or researched. Therefore, Table 4.3.14-4 may not include all events that have occurred throughout Dauphin County.

Table 4.3.14-4. Tornado and Windstorm Events in Dauphin County, 1950 to 2020

Dates of Event	Event Type	Location	Magnitude(1)	Losses/Impacts(2)
July 5, 1950	Tornado	Countywide	F2	$2,500 in property damage.
April 5, 1952	Tornado	Countywide	F0	$250,000 in property damage and 6 people injured.
August 16, 1952	Tornado	Countywide	F1	$2,500 in property damage.
October 18, 1967	Tornado	Countywide	F2	$250,000 in property damage and 11 people injured.
March 26, 1970	Tornado	Countywide	F2	$250,000 in property damage.
April 5, 1977	Tornado	Countywide	F2	$2,500,000 in property damage and 1 person injured.
August 30, 1984	Thunderstorm Wind	Countywide	0	1 person injured.
July 12, 1987	Thunderstorm Wind	Countywide	0	1 person injured.
July 17, 1992	Tornado	Countywide	F1	$250,000 in property damage.
July 6, 1994	Thunderstorm Wind	Borough of Halifax and City of Harrisburg	0	Numerous trees were uprooted in Halifax. A large limb fell on and injured a 15-year-old girl, narrowly missing the baby she was pushing in the stroller in Harrisburg.
July 15, 1994	Thunderstorm Wind	City of Harrisburg	0	A total of $500,000 in property damage occurred. Thunderstorm wind gusts to 63 mph were recorded at both the Harrisburg Federal Building and Harrisburg International Airport. Within the City of Harrisburg, damaging winds at Riverfront Park uprooted trees that were more than a century old. Damage to cars and homes was estimated at $100,000. About 2,000 customers lost power due to downed trees and wires.
May 24, 1995	Thunderstorm Wind	Millersburg, Hershey, And City of Harrisburg	0	A severe thunderstorm snapped many old and tall trees in Millersburg. The roof was peeled from a house on Union Street. Wind gusts were estimated at 90 to 100 mph. A couple of trees were also uprooted in communities surrounding Millersburg, uprooted trees and dropped hail as big as golf balls around Harrisburg, and uprooted trees Linglestown and farther east within Derry Township. About 378 homes lost power within Harrisburg.
July 6, 1995	Tornado and Thunderstorm	Borough of Dauphin	F0	A tornado briefly touched down just northwest of the town of Dauphin. The path length was only 300 feet. The tornado blew down or damaged about a dozen trees. The tornado embedded two branches in a hill east of the main damage. The same parent thunderstorm uprooted trees in Middle Paxton Township. Eight trees were uprooted on one property. No injuries were reported with either phenomena.
July 16, 1995	Thunderstorm Wind	Countywide	69	Damage estimates in Harrisburg were around $1 million as wind gusts reached 80 mph. Falling trees damaged twenty-five cars. At least two trees fell on houses. Wind damage was not confined to Harrisburg. Near Middletown, a two-story high, 80-foot long cinder block wall addition of an elementary school was flattened. Numerous trees were downed blocking roads. About 40,000 Pennsylvania Power and Light customers lost power.
November 11, 1995	Thunderstorm Wind	City of Harrisburg And Borough of Middletown	50	Trees and power lines were downed in the Harrisburg area and across the county. Winds gusted to 58 mph at Harrisburg International Airport in Middletown. Tree on vehicle 5 miles south of Hershey.
May 11, 1996	Tornado	City of Harrisburg	F1	An F1 tornado (73 - 112 mph) touched down in the city of Harrisburg demolishing the east side of a truck parts factory along Cameron Street, and peeling the siding off a three story building across the street. A 16-ton railroad caboose was knocked over by the

Dates of Event	Event Type	Location	Magnitude(1)	Losses/Impacts(2)
				wind. The tornado then skipped east for 1/2 mile damaging a second building and downing numerous trees. Overall damage extended for about 2 miles with a combination of downburst winds and small tornado.
June 17, 1996	Thunderstorm Wind	City of Harrisburg	-	Strong winds knocked trees down and blew limbs onto power lines in the Harrisburg area and Swatara Township.
June 24, 1996	Thunderstorm Wind	Borough of Penbrook	-	Strong winds knocked a tree onto power lines in the Penbrook area.
September 28, 1996	Thunderstorm Wind	Borough of Steelton	50	Thunderstorms moved rapidly east across the area, taking down trees and power lines. A water spout was spotted on the Susquehanna River near Duncannon.
February 22, 1997	High Wind	Countywide	60	High winds gusting to 58 mph at Middletown blew down trees and caused many power outages.
May 29, 1998	Thunderstorm Wind	City of Harrisburg And Hershey	51	Trees down and one tree blown down on a car.
June 30, 1998	Thunderstorm Wind	Hershey and Borough of Middletown	51	Trees blocked roads and winds downed power lines in Hershey. Gusts to 60 mph at the airport in Middletown and trees down in Elizabethville.
September 7, 1998	Thunderstorm Wind	City of Harrisburg and Borough of Hummelstown	51	Winds damaged tents at the Kipona Arts Festival in Harrisburg. Four people were injured. Many trees were down in the area. 67mph thunderstorm gust recorded by Middletown Airport Observer. Trees were blown down in Hummelstown and Hershey, closing several roads. A camper was crushed by a tree, but no one was in the camper at the time.
June 2, 1999	Thunderstorm Wind	Lucknow And Borough of Middletown	50	Trees down on front street. Winds gusted to 58 mph at the Harrisburg International Airport, and wires were down in Hummelstown.
July 22, 1999	Thunderstorm Wind	Linglestown	-	Trees and wires down.
June 2, 2000	Thunderstorm Wind	Linglestown	-	$5,000 in property damages. Trees down in Linglestown and Millersburg.
June 21, 2000	Thunderstorm Wind	Borough of Hummelstown	-	$2,000 in property damages from downed trees.
December 12, 2000	High Wind	Countywide	-	$13,900 in property damages.
February 10, 2001	High Wind	Countywide	-	$5,550 in property damages.
July 1, 2001	Thunderstorm Wind	Borough of Halifax	50	Trees and wires were reported down on Peter's Mountain Road in Halifax.
July 10, 2001	Thunderstorm Wind	City of Harrisburg, Borough of Halifax, Lykens	50	Numerous trees and wires were reported down in Swatara Township, including the City of Harrisburg. Trees were reported down in Halifax and Lykens.
July 25, 2001	Thunderstorm Wind	City of Harrisburg	50	$3,000 in property damage. Trees were reported down in Harrisburg. One tree caused damage to the Patriot News building at 23rd and Market Streets, damaging the gutters and punching holes in the roof.
March 9, 2002	High Wind and Thunderstorm Wind	Countywide	50	Trees and wires were down.
August 3, 2002	Thunderstorm Wind	Borough of Middletown	50	Trees and wires were down 2 miles north of Middletown.
August 24, 2002	Thunderstorm Wind	City of Harrisburg	50	Trees and wires were reported down in Harrisburg.
September 27, 2002	Thunderstorm Wind	Hershey And Borough of Middletown	50	Trees were reported down on power lines in Hershey and Middletown.

Dates of Event	Event Type	Location	Magnitude(1)	Losses/Impacts(2)
July 18 - 22, 2003	Thunderstorm Wind and Tornado	Township of Wiconisco, City of Harrisburg, Township of Halifax	F0	$100,000 in property damage. Numerous trees and power lines were reported down. Thunderstorms produced wind gusts of 65 to 70 mph in the greater Harrisburg area. About 40 cars were damaged by falling trees, along with some damage to homes. An F0 tornado touched down just south of Paxton in Dauphin County. The storm produced large hail. A trailer court just was hit by golf ball to tennis ball size hail. A Ford dealership reported 300 cars damaged by hail. Damage to cars ranged from dents, to broken tail lights, and to a few cars with windows broken out by the hail.
August 29, 2003	Thunderstorm Wind	Township of Halifax	50	Trees and wires reported down 5 miles east of Halifax.
November 13, 2003	High Wind	Countywide	60	In addition to trees and wires being downed in the warned counties. Across all of Pennsylvania, more than 80,000 persons were without power from the high winds.
May 15, 2004	Thunderstorm Wind	Borough of Halifax	50	Trees and wires reported down in Halifax
August 4, 2004	Tornado	City of Harrisburg and Borough of Hummelstown	F1	$300,000 in property damage. Thunderstorms spawned an F1 tornado. Peak winds were estimated at 80 to 90 mph. There were no injuries or deaths. The tornado knocked down hundreds of trees, several falling on homes and cars.
July 19, 2005	Thunderstorm Wind	Susquehanna Township	50	Thunderstorm winds knocked down trees and wires in Susquehanna Township.
January 24, 2006	Strong Wind	Countywide	54	$10,000 in property damage. Thunderstorms produced locally strong wind gusts of up to 54 mph. These strong wind gusts ripped a roof off of a barn east of Halifax, and propelled it 100 feet into a chicken coop. In addition, a wind gust of 54 mph was recorded at Harrisburg International Airport as this squall moved through.
June 22, 2006	Thunderstorm Wind	Borough of Lykens	50	Thunderstorm winds knocked down trees and wires in Lykens.
July 4, 2006	Thunderstorm Wind	Countywide	50	Thunderstorm winds knocked down trees and wires throughout the county.
July 12, 2006	Thunderstorm Wind	City of Harrisburg	50	Thunderstorms knocked down numerous trees and wires in and near the city of Harrisburg.
December 1, 2006	Tornado and High Winds	Township of Halifax and Countywide	F1	Major damage was sustained by 4 businesses and 1 home. Moderate damage was sustained by 4 additional residences. Minor damage occurred to several dozen homes. Top winds were estimated between 100 and 110 mph, categorizing the storm as an F1. Damage amounts from the tornado were estimated at nearly $2.2 million. There was one fatality caused by a tree falling onto a car. High winds occurred throughout the county that knocked down trees.
July 29, 2007	Thunderstorm Wind	Linglestown	50	Dauphin County law enforcement reported trees down in Linglestown. Wires were also reported down between Linglestown and Harrisburg.
December 23, 2007	High Wind	Countywide	50	Dauphin County emergency management reported trees and wires down in the Middletown area. The high winds were non-convective in nature.
March 8, 2008	High Wind	Countywide	52	The Middletown and Capital City ASOS recorded peak winds of 50 to 60 mph. The high winds downed numerous trees and utility lines, leaving several customers without power.
December 31, 2008	High Wind	Countywide	50	$10,000 in property damage. Non-thunderstorm winds knocked down several trees, large branches and power lines across Dauphin County. A few trees fell on vehicles, but no injuries were reported. Over 1,000 PPL customers were without power.
February 12, 2009	High Wind	Countywide	50	$25,000 in property damage. Non-thunderstorm wind gusts between 55 and 65 mph toppled numerous trees and power lines across Dauphin County. The high winds caused isolated power outages. The Capital City and Middletown Airports recorded peak gusts of 52 and 56 mph respectively.

Dates of Event	Event Type	Location	Magnitude(1)	Losses/Impacts(2)
May 16, 2009	Thunderstorm Wind	Borough of Dauphin and Elizabethville	50	$10,000 in property damage. Thunderstorm winds estimated near 60 mph knocked down trees and wires in Dauphin and Elizabethville.
June 30, 2009	Thunderstorm Wind	East Hanover Township and Grantville	50	$10,000 in property damage. Thunderstorm winds estimated near 60 mph knocked down trees near Penn National Raceway and Skyline View.
July 11, 2009	Thunderstorm Wind	City of Harrisburg	50	$5,000 in property damage. Thunderstorm winds estimated near 60 mph knocked down trees just north of Harrisburg.
August 9, 2009	Thunderstorm Wind	Paxtonia	50	$5,000 in property damage. Thunderstorm winds estimated near 60 mph knocked down trees and wires in Paxtonia.
August 18 - 21, 2009	Thunderstorm Wind	City of Harrisburg and Township of Middle Paxton	50	$15,000 in property damage. Thunderstorm winds estimated near 60 mph knocked down several trees and wires around Harrisburg and Waynesville.
January 25, 2010	Strong Wind	Countywide	43	$1,000 in property damage. Strong winds estimated between 40 and 50 mph brought down several trees and wires across the county.
April 16, 2010	Thunderstorm Wind	East Hanover Township	50	$5,000 in property damage. Thunderstorm winds estimated near 60 mph brought down ten large pine trees on the 500 block of North Mill Road. The incident occurred a few miles east-northeast of Skyline View or near Grantsville.
June 22, 2010	Thunderstorm Wind	Township of Derry and Hershey	50	Significant thunderstorm winds estimated between 60-80 mph damaged eight buildings. Several large trees, poles, and branches were down across Route 322. Numerous large trees and branches were down, some causing damage to buildings and roofs. A farm house across from the school lost its roof and two other nearby barns and outbuildings sustained significant damage. Nearly 60 acres of fruit, corn and soybean crops were destroyed. The storm caused $45,000 in property damage and $20,000 in crop damage.
July 25, 2010	Thunderstorm Wind	City of Harrisburg and Borough of Middletown	50	$5,000 in property damage. Thunderstorm winds estimated near 60 mph knocked down trees in Harrisburg, Paxtonia, Estherton, Rutherford Heights, Royalton, and Hershey. The trees blocked street access for a brief time and created power outages.
May 18, 2011	Tornado	Borough of Millersburg	EF1	$10,000 in property damage. A survey team from the National Weather Service in State College confirmed a brief EF1 tornado between Millersburg and Killinger in Upper Paxton Township. The tornado touched down on Zimmerman Road and damaged several homes in the area. A portion of the roof to the Queen of Peace Church Rectory was blown off. The tornado moved northwest across PA 25, snapping off and uprooting approximately 15 large trees. Several outbuildings were also destroyed. Maximum wind speeds were estimated at 95 mph, placing this tornado on the lower end of the EF1 category. Two residents also reported seeing a funnel cloud.
May 26 -27, 2011	Thunderstorm Wind and Tornado	Countywide	EF1	Straight-line thunderstorm winds estimated near 80 mph produced damage to the west of an EF1 tornado path near Dauphin Borough. The damage extended from about 1.5 miles west of Dauphin Borough, into the Borough itself. Numerous trees were knocked down immediately along the river. Six homes suffered damage. There were no injuries or fatalities. Total damage was $110,000.
July 18, 2011	Thunderstorm Wind	Township of Middle Paxton, Township of Lower Paxton, and Township of Susquehanna	50	$5,000 in property damage. Thunderstorm winds estimated near 60 mph knocked down trees and wires.
August 1, 2011	Thunderstorm Wind	Township of Steelton	50	$5,000 in property damage. Thunderstorm winds estimated near 60 mph knocked down several trees in Steelton.

Dates of Event	Event Type	Location	Magnitude(1)	Losses/Impacts(2)
August 21, 2011	Thunderstorm Wind	Deodate	50	$10,000 in property damage. Thunderstorm winds estimated near 60 mph knocked down trees and damaged several farm buildings.
August 28, 2011	Strong Wind	Countywide	44	$25,000 in property damage. Strong to damaging non-thunderstorm winds associated with Hurricane Irene knocked down several trees and utility wires, causing widespread road closures and thousands of power outages. One tree fell and killed a 56-year old man who was camping in a tent near Manda Gap. A woman who was also in the tent survived but sustained serious injuries. Peak wind gusts at Capital City and Harrisburg International were 44 and 51 mph respectively.
September 28, 2011	Thunderstorm Wind	Borough of Dauphin	50	$5,000 in property damage. Thunderstorm winds estimated near 60 mph knocked down several trees and utility wires near Dauphin. One tree fell on a house causing minor damage.
May 27, 2012	Thunderstorm Wind	City of Harrisburg	50	$5,000 in property damage. Thunderstorm winds estimated near 60 mph knocked down trees in Harrisburg.
June 29, 2012	Thunderstorm Wind	Township of Derry, Township of South Hanover, and Township of East Hanover	83	$25,000 in property damage. Thunderstorm winds estimated near 95 mph knocked down hundreds of trees and numerous utility wires. Two businesses and 8 homes were also damaged, mainly from falling trees. PPL reported about 7,000 people without power. A macroburst was confirmed. The macroburst, straight-line wind event with estimated highest wind gusts to 95 mph. A house roof was lifted off and over 50 trees were damaged or destroyed. Throughout the area from 200 to 300 trees were estimated to have been damaged or downed.
July 18, 2012	Thunderstorm Wind	City of Harrisburg and Paxtonia	50	$10,000 in property damage. Thunderstorm winds estimated near 60 mph knocked down trees in the Harrisburg area and Paxtonia.
July 23, 2012	Thunderstorm Wind	Township of East Hanover and Township of Derry	50	$15,000 in property damage. Thunderstorm winds estimated near 60 mph knocked down trees and wires near Linglestown, Skyline View, and Hershey.
July 26, 2012	Thunderstorm Wind	Borough of Lykens	50	$5,000 in property damage. Thunderstorm winds estimated near 60 mph knocked down numerous trees in and around Lykens.
July 31, 2012	Thunderstorm Wind	Township of Lower Paxton Township and Borough of Middletown	50	$10,000 in property damage. Thunderstorm winds estimated near 60 mph knocked down tree.
August 5, 2012	Thunderstorm Wind	Township of Lower Paxton Township and Township of Derry	50	$8,000 in property damage. Thunderstorm winds estimated near 60 mph ripped siding off a home in Paxtonia and trees knocked down in Derry Township.
September 18, 2012	Thunderstorm Wind	Borough of Dauphin	50	$5,000 in property damage. Thunderstorm winds estimated near 60 mph toppled numerous trees in Dauphin Borough.
October 29, 2012	High Wind	Countywide	50	High winds knocked down several trees and utility wires, resulting in approximately 10,000 power outages. Several roads were also closed. Multiple homes sustained significant structural damage due to the high winds and falling trees. Property damage cost estimate is unknown.
April 19, 2013	Thunderstorm Wind	Borough of Elizabethville	70	$20,000 in property damage. Straight line winds affected a small area near Elizabethville along Route 209. Several homes sustained roof damage, and a small farm out-building collapsed from the wind. A fiberglass horse was removed from a business and deposited on Route 209. Several utility poles and trees were also knocked down in the area.
June 25 - 26, 2013	Thunderstorm Wind	Countywide	50	$45,000 in property damage. Thunderstorm winds estimated near 60 mph knocked down trees and utility wires.

Dates of Event	Event Type	Location	Magnitude(1)	Losses/Impacts(2)
July 7, 2013	Thunderstorm Wind	Township of Lower Paxton	50	$5,000 in property damage. Thunderstorm winds estimated near 60 mph knocked down several trees near Linglestown.
July 19, 2013	Thunderstorm Wind	Township of Lower Paxton and City of Harrisburg	50	$7,000 in property damage. Thunderstorm winds estimated near 60 mph knocked down trees and utility wires.
September 11, 2013	Thunderstorm Wind	Borough of Lykens and Borough of Gratz	50	$4,000 in property damage. Thunderstorm winds estimated near 60 mph knocked down trees, utility wires, and damaged a home.
November 18, 2013	Thunderstorm Wind	City of Harrisburg	50	A line of heavy showers with estimated winds near 60 mph knocked down trees along the Parkway East.
May 27, 2014	Thunderstorm Wind	Township of Halifax	50	$5,000 in property damage. Thunderstorm winds estimated near 60 mph knocked down multiple trees and utility wires.
July 8, 2014	Thunderstorm Wind	Township of Londonderry and Lucknow	50	$2,000 in property damage. Thunderstorm winds estimated near 60 mph knocked down trees and wires near Rockville and Londonderry Township.
May 27 - 31, 2015	Thunderstorm Wind	Countywide	50	$3,500 in property damage. Thunderstorm winds estimated near 60 mph knocked down a tree on a vehicles and wires.
June 8 - 14, 2015	Thunderstorm Wind	Countywide	50	A thunderstorm producing winds estimated near 60 mph knocked down trees causing $45,000 in property damage.
April 3, 2016	High Wind	Countywide	52	$1,000 in crop damage and $1,000 in property damage. Non-thunderstorm wind gusts estimated around 60 mph knocked down trees and wires.
June 28, 2016	Thunderstorm Wind	City of Harrisburg	52	$8,000 in property damage. A severe thunderstorm produced winds near 60 mph and knocked down trees in several locations across the Harrisburg area.
June 19, 2017	Thunderstorm Wind	Countywide	52	$31,000 in property damage. A severe thunderstorm producing winds estimated near 60 mph knocked down trees, poles, wires.
August 2, 2017	Thunderstorm Wind	Skyline View	52	$4,000 in property damage. Severe thunderstorms producing winds estimated near 60 mph knocked down trees and power lines.
August 18 - 22, 2017	Thunderstorm Wind	Township of South Hanover	52	$13,000 in property damage. A severe thunderstorm producing winds estimated near 60 mph knocked down trees and pulled shingles off of roofs.
October 29, 2017	High Wind	Countywide	61	$25,000 in property damage. High winds knocked down trees and wires were reported down across northern Dauphin County, and a large barn/building in Grantville collapsed in the wind. Route 209 was closed between Lykens and Williamstown due to downed trees and wires.
April 4, 2018	High Wind	Countywide	52	Non-thunderstorm wind gusts estimated near 60 mph knocked down trees and wires across Dauphin County.
May 15, 2018	Thunderstorm Wind	Harrisburg Area	59	$24,000 in property damage. A severe thunderstorm producing winds estimated near 60 mph knocked down trees and wires.
June 27, 2018	Tornado	Piketown	EF-1	$50,000 in property damage. An EF-1 tornado touched down. Hundreds of trees were uprooted or snapped, and downed trees caused damage to the roofs of 4 homes and several sheds.
February 24, 2019	High Wind	Countywide	52	Non-thunderstorm wind gusts near 60 mph were observed. Trees and wires were reported down across the northern part of the county.
April 14, 2019	Thunderstorm Wind	Borough of Millersburg and Borough of Elizabethville	78	$39,000 in property damage. A microburst knocked down a number of trees, wires down, a church sustained significant roof damage, and a roof was blown off a warehouse.
April 26, 2019	Thunderstorm Wind	Township of Wayne	61	$37,000 in property damage. A severe thunderstorm producing winds estimated near 70 mph knocked down trees and blew a portion of a roof off of a barn.

Dates of Event	Event Type	Location	Magnitude(1)	Losses/Impacts(2)
May 19, 2019	Thunderstorm Wind	Borough of Williamstown	52	$11,000 in property damage. A severe thunderstorm producing winds estimated near 60 mph knocked down trees across Route 325 northeast of Dehart Dam and producing winds estimated near 60 mph knocked down trees onto vehicles in Williamstown.
May 29, 2019	Tornado	Inglenook	EF1	$20,000 in property damage. The tornado produced intermittent damage, which consisted of many uprooted trees, snapped tree trunks and a few cabins sustained roof damage. Maximum winds were estimated around 105 mph.
August 20, 2019	Thunderstorm Wind	Harrisburg/Hershey Area	52	$12,000 in property damage. A severe thunderstorm producing winds estimated near 60 mph knocked down trees on wires and homes.
September 28, 2019	Thunderstorm Wind	Township of East Hanover	52	$3,000 in property damage. A severe thunderstorm producing winds estimated near 60 mph knocked down trees and wires.
October 31, 2019	Thunderstorm Wind	Countywide	50	Severe thunderstorm winds knocked down multiple trees and causing power outages.
June 3 - 4, 2020	Thunderstorm Wind	Countywide	52	$36,000 in property damage. A severe thunderstorm producing winds estimated near 60 mph knocked down trees and wires.
June 10, 2020	Thunderstorm Wind	Hershey	52	$5,000 in property damage. A severe thunderstorm producing wind estimated near 60 mph downed multiple trees.
June 22, 2020	Thunderstorm Wind	Linglestown	52	$2,000 in property damage. A severe thunderstorm producing winds estimated near 60 mph uprooted a tree and knocked down multiple large branches, including one on wires, to the east of Linglestown.
July 6, 2020	Thunderstorm Wind	Hanoverdale	52	$2,000 in property damage. A severe thunderstorm producing winds estimated near 60 mph snapped trees and left debris on Route 39 near Orchard Road in Hanoverdale.

Source: NOAA-NCEI 2021
Notes: (1) Magnitude includes tornadoes and wind speeds recorded at miles per hour.
(2) Monetary figures within this table were U.S. Dollar (USD) figures calculated during or within the approximate time of the event. If such an event would occur in the present day, monetary losses would be considerably higher in US dollars as a result of increased U.S. inflation rates.
Notes:
NCEI National Centers for Environmental Information
NOAA National Oceanic Atmospheric Administration
mph Miles per hour

4.3.15.4 Future Occurrence

In Section 4.4, the hazards of concern identified for Dauphin County are ranked according to relative risk. The probability of occurrence, or likelihood of the event, is one parameter used for ranking hazards. The probability of occurrence for severe tornado and windstorm events in Dauphin County is considered *likely* (between 50 and 90 percent annual probability) as defined by the Risk Factor Methodology probability criteria (Section 4.4).

Dauphin County experiences strong winds on a frequent basis, and when those winds occur, they can result in significant property damage, downed trees, and utility outages. It can be reasonably assumed that future tornadoes and windstorms will be similar in nature to those that have affected Dauphin County in the past. It is estimated that Dauphin County will continue to experience direct and indirect impacts of annual windstorms and tornadoes that may induce secondary hazards, such as infrastructure deterioration or failure; utility failures; power outages; water quality and supply concerns; and transportation delays, accidents, and inconveniences.

4.3.15.5 Vulnerability Assessment

To understand risk, a community must evaluate assets exposed and vulnerable within the identified hazard area. The following section discusses potential impacts of the tornado hazard on Dauphin County, including:

- Impacts on (1) life, health, and safety; (2) general building stock and critical facilities; (3) the economy; (4) the environment; and (5) future growth and development
- Effect of climate change on vulnerability
- Further data collections that will assist in understanding this hazard over time.

A qualitative assessment on potential impacts to life, health, and safety; buildings and critical facilities; and the economy are summarized below. Refer to Section 4.3.7 (Hurricane and Tropical Storms) for further details on estimated potential losses as a result of the 500-year mean return period wind events using HAZUS-MH v4.2.

Impact on Life, Health, and Safety

Impacts of a tornado or windstorm on life, health, and safety depend on several factors, including severity of the event and whether adequate warning time was provided to residents. All residents in Dauphin County are exposed to the tornado hazard.

Residents may be displaced or require temporary to long-term sheltering. In addition, downed trees, damaged buildings, and debris carried by high winds can lead to injury or loss of life. Similar to other natural hazards, socially vulnerable populations are most susceptible based on a number of factors, including their physical and financial ability to react or respond during a hazard, and locations and construction quality of their housing. Economically disadvantaged populations are more vulnerable because they are likely to evaluate their risk and make decisions based on the major economic impact on their family and may not have funds to evacuate. The population over the age of 65 is also more vulnerable and, physically, they may have more difficulty evacuating. The elderly are considered most vulnerable because they may require extra time or outside assistance during evacuations and are more likely to seek or need medical attention that may not be available due to isolation during a storm event. Section 2 (County Profile) presents the statistical information regarding these populations in the county.

Impact on General Building Stock and Critical Facilities

While the chance of being affected by a tornado is small, the damage that results when a tornado occurs can be devastating. An EF4 tornado can carry wind velocities of 200 mph, resulting in a force of more than 100 pounds per square foot of surface area. This is a "wind load" that exceeds the design limits of most buildings.

The entire county's building stock and critical facilities are exposed to the tornado hazard. Manufactured housing (i.e., mobiles homes) is particularly vulnerable to high winds and tornadoes. The U.S. Census Bureau defines manufactured homes as "movable dwellings, 8 feet or wider and 40 feet or more long, designed 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 2010)." They can include multi-wide types and expandable manufactured homes but exclude travel trailers, motor homes, and modular housing. Because of their lightweight and often unanchored design, manufactured housing is extremely vulnerable to high winds and will generally sustain the most damage.

Table 4.3.14-5 displays the number of manufactured housing units per municipality in Dauphin County.

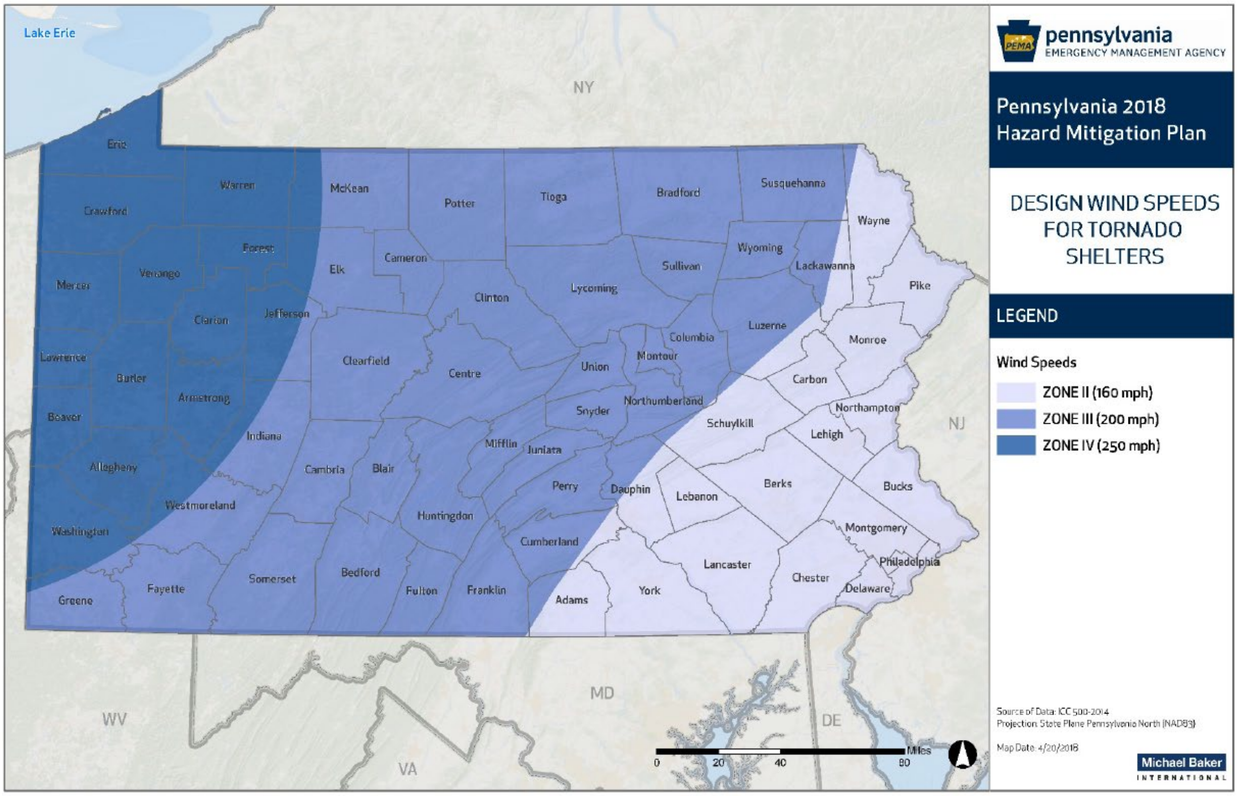
Table 4.3.14-5. Manufactured Housing Units per Jurisdiction in Dauphin County

Jurisdiction	Number of Manufactured Homes	Jurisdiction	Number of Manufactured Homes
Berrysburg (B)	15	Middletown (B)	164
Conewago (T)	129	Mifflin (T)	33
Dauphin (B)	2	Millersburg (B)	5
Derry (T)	97	Paxtang (B)	0
East Hanover (T)	563	Penbrook (B)	6
Elizabethville (B)	5	Pillow (B)	6
Gratz (B)	28	Reed (T)	5
Halifax (B)	10	Royalton (B)	50
Halifax (T)	236	Rush (T)	15
Harrisburg (C)	0	South Hanover (T)	80
Highspire (B)	86	Steelton (B)	3
Hummelstown (B)	17	Susquehanna (T)	69
Jackson (T)	134	Swatara (T)	1
Jefferson (T)	39	Upper Paxton (T)	303
Londonderry (T)	874	Washington (T)	66
Lower Paxton (T)	85	Wayne (T)	89
Lower Swatara (T)	723	West Hanover (T)	243
Lykens (B)	59	Wiconisco (T)	61
Lykens (T)	68	Williams (T)	62
Middle Paxton (T)	112	Williamstown (B)	20
Dauphin County (Total)		**4,563**	

Source: Dauphin County GIS 2020

According to the 2018 Pennsylvania HMP, wind speed zones have been developed when designing tornado shelters; refer to Figure 4.3.14-4. As displayed, Dauphin County is located in wind speed Zones II and III, meaning design wind speeds for shelters and critical facilities should withstand 3-second gusts up to 160-200 mph, regardless if the wind is from a tornado, hurricane, tropical storm, or windstorm event. It should be noted that these wind speeds represent the strongest anticipated throughout the Commonwealth and are not the normal wind speeds expected statewide (PEMA 2018).

Figure 4.3.14-4. Design Wind Speeds for Tornado Shelters



Source: PEMA 2018

Impact on Economy

Tornadoes also impact the economy, including loss of business function (e.g., tourism, recreation), damage to inventory, relocation costs, and wage loss and rental loss because of repair/replacement of buildings. Impacts on transportation lifelines affect both short-term (e.g., evacuation activities) and long-term (e.g., day-to-day commuting and goods transport) transportation needs. Utility infrastructure (power lines, gas lines, electrical systems) could sustain damage and impacts could result in loss of power, which could also affect business operations and provision of heating or cooling to the population.

Impact on the Environment

Tornado events are typically localized; therefore, environmental impacts are rarely widespread. Severe damage to plant species is likely from both tornado and windstorm events. This includes uprooting or total destruction of trees, and increased threat to wildfire in areas of tree debris. Hazardous material facilities should meet design requirements for the wind zones identified in Figure 4.3.14-4 above (PEMA 2018).

Future Growth and Development

As discussed in Section 2 (County Profile), areas targeted for future growth, development, and re-development have been identified across Dauphin County. Any areas of growth could be affected by the tornado and windstorm hazard because the entire county is exposed and potentially vulnerable to the wind hazard. Residential development, specifically manufactured homes, may be considered more vulnerable to the tornado hazard.

Effect of Climate Change on Vulnerability

An increase in storms will produce more wind events and may increase tornado activity. Additionally, an increase in temperature will provide more energy to produce storms that generate tornadoes (Climate Central 2016). With an increased likelihood of strong winds and tornado events, all of the county's assets are at risk for losses as a result of extreme wind events.

Additional Data and Next Steps

In time, HAZUS versions will be released with modules that address straight-line wind and tornado events. As updated versions are released, the county will be able to run analyses for an overall picture of the wind damage and debris generated from tornado events. Over time, Dauphin County can obtain additional data to support the analysis of this hazard. This additional data would include details on past hazard events and impacts, and an updated building inventory that would provide specific building information, such as type of construction and details on protective features (for example, shutters and safe rooms).

4.3.15 Transportation Accident

This section describes the location and extent, range of magnitude, past occurrence, future occurrence, and vulnerability assessment for the transportation accident hazard for the Dauphin County Hazard Mitigation Plan (HMP).

Transportation hazards include hazardous materials in transit (Section 4.3.5), vehicular accidents, aviation accidents, at-grade railroad crossings, and roadways vulnerable to floods. A transportation hazard may be defined as a condition created by movement of anything by common carrier. Transportation hazards can be divided into two categories: hazards created by the material being transported and hazards created by the transportation medium. Transportation systems available in Dauphin County include roadways, railways, one commercial airport, and a couple private airstrips. A major road accident in the county is probable; however, aviation or rail accidents are unlikely. All county systems and supporting transportation resources provide services locally, regionally, and nationally. Transportation accidents defined below include incidents involving road, air, and rail travel.

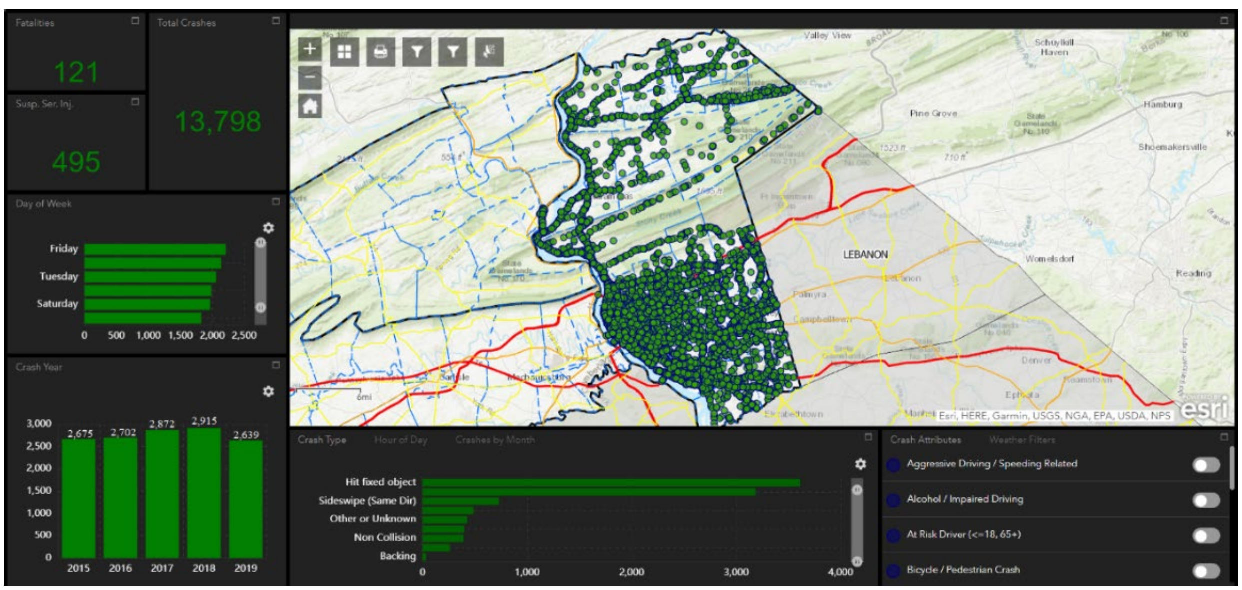
- Vehicular Accidents: A vehicular accident is an incident that usually involves one vehicle colliding with another vehicle or other road user, such as an animal or a stationary roadside object. A vehicular accident may result in injury, property damage, or possible fatalities. Many factors contribute to vehicular accidents, including equipment failure, poor road conditions, weather, traffic volume, and driver behavior.
- Aviation Accidents: According to the International Civil Aviation Organization, an aviation accident is an occurrence during operation of an aircraft from the time a person boards the aircraft with intent to fly to a destination to the time the person has disembarked the aircraft. Three different situations qualify as an aviation accident: a person is fatally or seriously injured, the aircraft sustains damage or structural failure, or the aircraft is missing or inaccessible. An aviation incident is an occurrence, other than an accident, associated with operation of an aircraft that affects or could affect the safety of operation (International Civil Aviation Organization 2015).

  Dauphin County contains 22 airports and heliports, four of which are public, including the Harrisburg International Airport and three state-owned heliports. Privately owned airports and heliports include the following:
  - Carsonville Airport – 0PS3 Airport
  - Tallman West Airport – PS00
  - Harman Airport – 0PS7
  - Gusler Airport – PA74
  - Chestnut Street Garage Heliport - 3PS2
  - Harrisburg Hospital Heliport - 5PN9
  - Sciavoni Heliport – 06PN
  - State Police Area Iii Heliport – 05PN
  - Turnpike Nr 1 Heliport – PA95
  - Yigst Airport – 3PS8
  - Brookside Farms Airport – 59PN
  - Hershey Medical Center Heliport – 64PN
  - Hmc Hanger Heliport – 8PS5
  - Ecko Field Airport – 0PA4
  - Sheepshead Airport – 4PA7
  - Three Mile Island Heliport – PS14
  - B S Corporation Steelton Plant Heliport – 7PS0
  - Bendigo Airport – 74N

- Hazardous Materials (HazMat) in Transit: HazMat is defined as a substance or material determined capable of posing an unreasonable risk to health, safety, or property when transported. "Unreasonable risk" covers a broad range of health, fire, and environmental considerations. HazMats come in various forms, some of which can cause death, serious injury, long-lasting health effects, and damage to buildings, homes, and other property. HazMat substances include explosives, flammable solids, substances that become dangerous when wet, oxidizing substances, and toxic liquids. An accident involving a vehicle carrying HazMats becomes a HazMat incident if the HazMat leaks; is involved in a fire; or if the potential for release, fire, or other hazard exists. Hazards can occur during production, storage, transportation, use, or disposal of HazMats (Illinois Emergency Management Agency 2012).
- Railway Accidents: Railway accidents involve one or more trains. They can involve a train derailment or one train impacting another train, vehicle, or pedestrian. Dauphin County's rail line system includes:
  - NS Norfolk Railway Company
  - Amtrak
  - SH Steelton & Highspire Railroad

The Harrisburg Area Transportation Study (HATS) made a GIS-based web application (app) available to the public in an effort to reduce vehicle crashes. The app uses five years of data from the Pennsylvania Department of Transportation's (PennDOT) Pennsylvania Crash Information Tool (PCIT) and puts it in a format that makes it easy to visualize and analyze. The app includes filters such as county, year, and accidents involving attributes such as aggressive driving, alcohol, bicycle and pedestrian, deer, heavy trucks, fatalities, serious injuries, and speeding. The figure below shows transportation accidents from 2015-2019 in the county (Tri-County Regional Planning 2021).

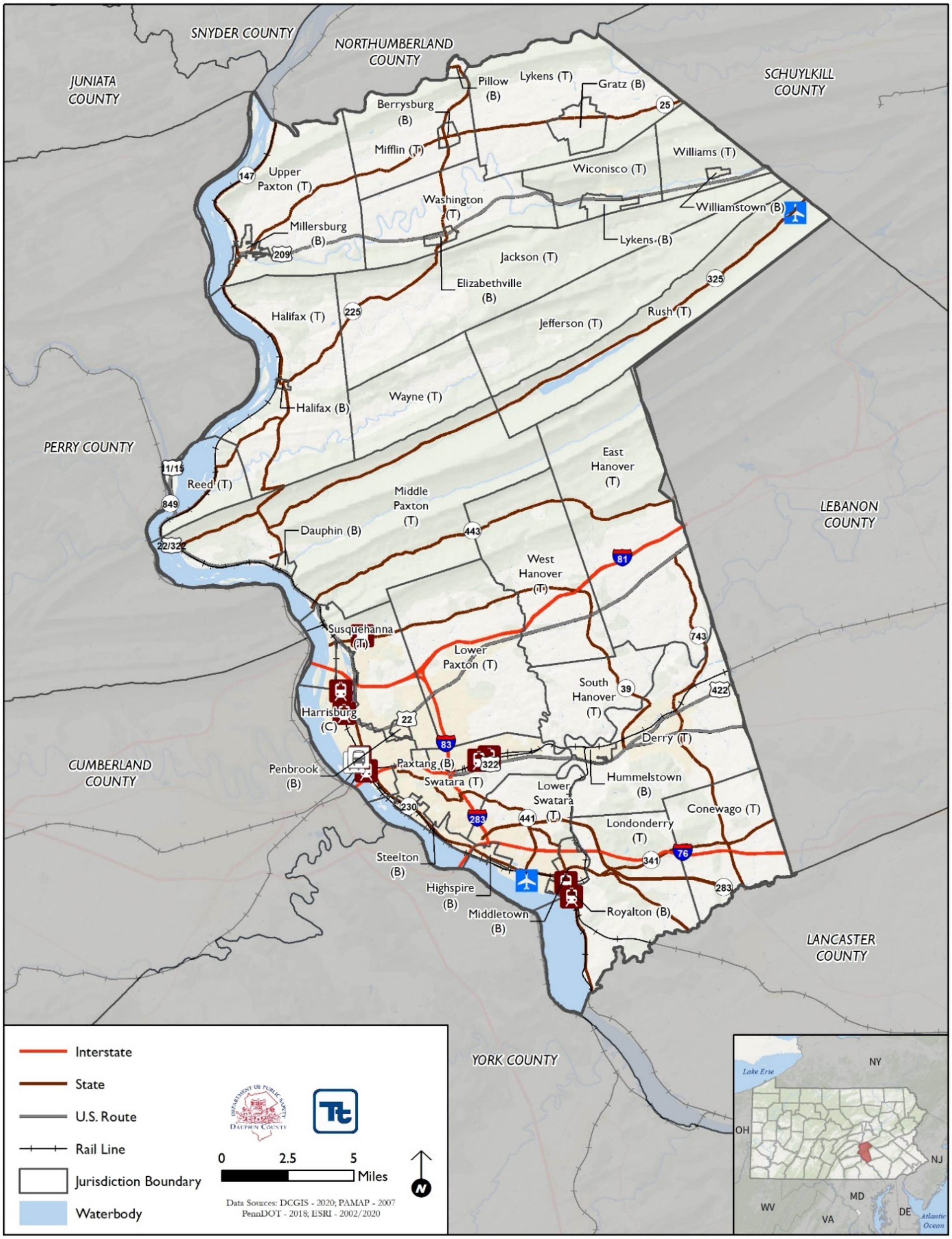
Figure 4.3.15-1. 2015-2019 Transportation Accidents in Dauphin County



4.3.15.1 Location and Extent

Dauphin County's transportation network is extensive, as shown in Figure 4.3.15-2. Transportation accidents can occur on any roadway or rail line, or at any location in the county when considering aviation accidents.

Figure 4.3.15-2. Major Transportation Routes in Dauphin County



Vehicular Accidents

Dauphin County is home to several major roadways, including the Pennsylvania Turnpike (I-76), I-81, I-83, I-283, US-22, US-322, US-422, and PA-283. Dauphin County, as a whole, is at risk for traffic accidents of all degrees. Transportation accidents occur throughout the county, as shown in the Figure 4.3.15-1.

Additional major roadways in Dauphin County include US-11, US 209, PA-25, PA-39, PA-147, PA-225, PA-230, PA-283, PA-325, PA-581, PA-341, PA-441, PA-443, PA-743, and PA-849. Dauphin County has nearly 1,988 miles of roadways, divided as listed in Table 4.3.15-1, and illustrated in Figure 4.3.15-2. Transportation accidents can occur at any point along these roadways, with many occurring at an intersection of two or more roadways.

Table 4.3.15-1. Dauphin County Transportation Network

Road Type	Total Miles for County	Roadway Miles Exposed to Flood Hazard Areas			
		1 Percent Annual Chance Flood Hazard Event Area		0.2 Percent Annual Chance Flood Hazard Event Area	
		Miles	Percent of Total	Miles	Percent of Total
Interstate	81	7	8.2%	8	9.6%
U.S. Highways	107	7	6.2%	14	12.8%
State Highways	205	14	6.6%	24	11.5%
Local Roads	1,595	79	4.9%	117	7.4%
Dauphin County (Total)	**1,988**	**106**	**5.3%**	**163**	**8.2%**

Source: PennDOT 2018

Structurally deficient bridges pose a risk for transportation accidents. In response to the collapse of the I-35W Bridge in Minneapolis in August 2007, PennDOT assessed the structural integrity of all bridges in the Commonwealth. Table 4.3.15-2 lists the total number of bridges in Dauphin County as well as the number of bridges that are structurally deficient (in parentheses).

Table 4.3.15-2. Bridges in Dauphin County

On State Roads	On Local Roads
441 (28)	562 (27)

Source: PennDOT 2017

There is no warning time for vehicular accidents. Factors contributing to these accidents are typically associated with the driver, vehicle, and the environment. Factors associated with the driver include error, speeding, lack of experience, and blood-alcohol level. Factors associated with the vehicle include type, condition, and center of gravity. Environmental factors include quality of the infrastructure, weather, and obstacles. The majority of vehicular accidents are attributed to the driver. Vehicular accidents can severely affect those directly involved as well as others not directly involved. Other effects may include severe traffic delays, lost sales to businesses, delayed commodity shipments, and increased insurance costs (Cova and Conger 2004).

PennDOT identified the areas listed below as especially problematic for transportation accidents. The Tri-County Regional Planning Commission incorporated this information into the county's Long Range Transportation Plan.

Interstate Roads

- I-76 (PA Turnpike)
- I-81
- I-83
- I-283

Urban Roads

- Elizabethtown Road – Derry Township
- Governor Road – Derry Township
- Middletown Road – Derry Township
- Waltonville Road – Derry Township
- Cameron Street – City of Harrisburg
- Mulberry Street – City of Harrisburg
- Nineteenth Street – City of Harrisburg
- Twenty-fifth Street – City of Harrisburg
- Colonial Road – Lower Paxton Township
- Jonestown Road – Lower Paxton Township
- Linglestown Road – Lower Paxton Township
- Nyes Road – Lower Paxton Township
- Rutherford Road – Lower Paxton Township
- Union Deposit Road – Lower Paxton Township, Susquehanna Township
- Main Street – Middletown Borough
- Progress Avenue – Susquehanna Township
- Derry Street – Swatara Township
- Eisenhower Boulevard – Swatara Township
- Harrisburg Street – Swatara Township
- Paxton Street – Swatara Township

Rural Roads

- Deodate Road – Conewago Township
- Elizabethtown Road – Conewago Township
- Laudermilch Road – East Hanover Township
- Mountain Road – East Hanover Township
- Sandbeach Road – East Hanover Township
- Peters Mountain Road – Halifax Township, Middle Paxton Township
- Powells Valley Road – Halifax Township
- South River Road – Halifax Township, Reed Township
- Colebrook Road – Londonderry Township
- Harrisburg Pike- Londonderry Township, Middletown Borough
- Roundtop Road – Londonderry Township
- North Crossroads Road – Lykens Township
- Gold Mine Road – Rush Township
- Grandview Road – South Hanover Township
- Union Deposit Road – South Hanover Township
- Hershey Road – West Hanover Township
- Linglestown Road – West Hanover Township
- Market Street – Williams Township

Railway Accidents

Pennsylvania offers freight, passenger, and commuter rail services. In its 2035 Intercity Passenger and Freight Rail Plan, the Pennsylvania Bureau of Rail Freight, Ports, and Waterways cites that the freight rail network totals 5,095 miles of track with over 60 railroads, making Pennsylvania the fifth-largest rail network in the nation and the state with the greatest number of railroads. Three railroad systems offer Pennsylvania passenger service: (1) Southeastern Pennsylvania Transportation Authority (SEPTA) – Rapid Transit, Trolley and Light Rail, and

Commuter Rail; the Port Authority of Allegheny County (PAAC) – Light Rail; and Amtrak – Intercity Passenger Rail. Amtrak is the only rail service that crosses the entire Commonwealth.

Rail accidents generally fit into one of three categories (PEMA 2018):

- Derailment – the train leaves the rails
- Collision – a train strikes another train or a vehicle
- Other – including objects on the rails, fires, or explosions.

Aviation Accidents

Dauphin County contains 23 airports and heliports; four of which are public, including the Harrisburg International Airport and three state-owned heliports. In addition, Dauphin County is in the flight path of several airports.

Approximately 80 percent of all aviation accidents occur shortly before or during take-off and landing. Reportedly, most of these accidents are caused by human error. Mid-flight accidents are rare but not unheard of. A survey of 1,843 plane crashes between 1950 and 2006 showed that 53 percent were the result of pilot (human) error, 21 percent were caused by mechanical failure, 11 percent were caused by weather, 8 percent were attributed to other human error (lack of communication or improper maintenance), 6 percent were caused by sabotage and terrorism, and 1 percent resulted from other causes (Krasner 2009).

Aviation accidents are often devastating incidents that may result in serious injuries or fatalities. The Federal Aviation Administration (FAA) and the National Transportation Safety Board (NTSB) are the agencies responsible for monitoring air travel and investigating accidents. Some of the most common causes of aviation accidents occur as a result of violations of FAA and NTSB regulations. Some other causes of accidents include, but are not limited to, those listed below.

- Pilot or flight crew errors – Pilot error is the number one cause of aviation accidents and accounts for the highest number of fatalities. Pilots have the responsibility to transport passengers safely from one place to another and follow the FAA and NTSB regulations to better ensure passenger safety. If a pilot or flight crew member makes an error, an accident may occur.
- Faulty equipment – Faulty aircraft equipment such as engine failure or landing gear issues is another common cause of aviation accidents.
- Aircraft design flaws – The manufacturer of an aircraft is responsible for an aviation accident if the structural design is flawed and results in an accident.
- Failure to properly fuel or maintain the aircraft – If any regulations and safety standards set by the FAA or NTSB are violated, an accident may occur.
- Negligence of Federal Air Traffic Controllers – Failure of air traffic controllers to properly monitor the airways may result in aviation accidents (*Aviation Law News* n.d.).

4.3.15.2 Range of Magnitude

Roadway accidents in Dauphin County range from minor crashes to more serious incidents that involve injuries or fatalities or result in a release of HazMats (described further in Section 4.3.5).

Rail accidents can vary widely in terms of injuries, fatalities, property damage, and interruption of service, depending on the nature and severity of the accident.

Aircraft accidents can vary from a single-engine aircraft having a "hard landing" causing damage to the aircraft, to a crash of a small turboprop or jet aircraft, to a crash of a large jet (such as a Boeing 727). Other aircraft accidents could include helicopter or experimental aircraft crashes. Aviation accidents can also involve radio-controlled or drone aircraft devices, many of which are experimental and not subject to defined regulatory oversight, potentially complicating issues with and for the public that could arise if one of these devices crash.

One of the worst recent transportation-related incidents in the county occurred in Lower Paxton Township on Friday, October 12, 2018, when a truck driver plowed into a string of vehicles on I-83 North, causing an 11 car pileup and killing three people (Thompson 2018).

A worst-case transportation accident scenario within the county would be the overturn of a tractor-trailer carrying an extremely hazardous substance (described in Section 4.3.5), resulting in a massive release of its cargo on a major roadway. This incident would block traffic on Dauphin County's major transportation routes and could threaten the health and safety of individuals on the roadways and in surrounding neighborhoods. In addition, a release could necessitate closure of county critical facilities near the accident. The most likely transportation accident in the county would involve a single vehicle hitting an object and sustaining minimal damage.

4.3.15.3 Past Occurrence

Major roadway accidents (such as multi-vehicle accidents, those that close roads or bridges, or those involving school buses) are reported by Dauphin County to PennDOT. Table 4.3.15-3 summarizes these accidents from 2015 to 2020. While this table lists accidents reported to the counties and Commonwealth, significantly more minor accidents are not reported. Tri-County Regional Planning Commission's safety app was also used to capture transportation accidents in the county from 2015-2019. It is to be noted, the numbers do not match across data sources, but both are being presented to give a general understanding of the real numbers.

Table 4.3.15-3. Summary of Transportation Accidents in Dauphin County, 2015 to 2020

Year	PennDOT Vehicle Accidents	Railroad Incidents	Aircraft Accidents	PennDOT, FRA, and Aviation Data Base Fatalities	TCRPC Vehicle Accidents	TCRPC Fatalities
2015	5,955	28	1	29	2,675	14
2016	6,338	34	1	31	2,702	27
2017	6,651	30	2	36	2,872	30
2018	6,408	32	1	43	2,915	35
2019	6,056	30	3	17	2,639	15
2020	No data*	14	0	No data*	No data *	No data *
Total	**31,408**	**168**	**8**	**156**	**13,803**	**121**

Source: PennDOT 2020; Federal Railroad Administration 2020; Aviation Data Base 2020, Tri-County Regional Planning Commission 2021
Note: TCRPC – Tri-County Regional Planning Commission
*Data for vehicle accidents was not available for 2020 during the time of this update

4.3.15.4 Future Occurrence

Transportation hazards are impossible to predict accurately; however, areas prone to these hazards can be located, quantified through analysis of historical records, and plotted on county-wide and municipality base maps. Areas with certain characteristics that contribute to these hazards or increase vulnerability to these hazards can be identified.

Assuming that transportation accidents are as likely to occur in the future as they have occurred in the past, and based on the available data, Dauphin County can expect the following each year:

- Approximately 6,282 major vehicle accidents according to PennDOT data, or 2,761 major vehicle accidents according to TCRPC. (The actual number of vehicle accidents in Dauphin County may be much higher; however, Table 4.3.15-3 is based on vehicle accidents captured from PennDOT from 2015–2019)
- 1 aircraft incident

- 28 railroad incidents

Based on the Risk Factor Methodology Probability Criteria, the probability of a transportation accident in the categories listed above is considered to be *highly likely* (see Table 4.4-1).

4.3.15.5 Vulnerability Assessment

The entire county has been identified as the hazard area for transportation accidents. This section evaluates and estimates the potential impact of transportation hazards on Dauphin County in the following sections:

- Overview of vulnerability
- Data and methodology used for the evaluation
- Impacts on: (1) life, safety, and health; (2) general building stock; (3) critical facilities; (4) the economy; and (5) future growth and development
- Further data collections that will assist in understanding this hazard over time

Overview of Vulnerability

Several types of county transportation rely on use of roadways. Hazards associated with transportation can include natural hazards affecting the roadway, type of material being transported, or hazards pertaining to the transportation medium itself. Multiple major roadways (interstates and other major highways) within the county are used by residents and commuters, and these are means for transporting all types of materials, including HazMats. A major accident on any of these major roadways is possible and could minimally or severely affect the county.

Data and Methodology

Regarding this hazard, data were obtained from the county, local officials, and federal data sources. In addition, the Planning Team has identified roadways within the county that are vulnerable to other natural hazards (such as flooding).

Impact on Life, Health, and Safety

Transportation hazards could lead to potential losses in categories of human health and life, property, and natural resources. Vehicular accidents, flooded roadways, and other roadway impairments may result in injury or death to drivers and passengers on the road, the public in the immediate vicinity, and emergency services personnel. The number of people exposed to a hazard depends on population density, whether exposure occurs during day or night, and proportions of the population located indoors and outdoors.

The county and its municipalities are prepared to manage and respond to transportation hazards.

Impact on General Building Stock, Critical Facilities, Economy, and Future Development

Because of insufficient data, a full loss estimate was not completed for the transportation hazard. Loss of roadway use and public transportation services would affect thousands of commuters, employment, day-to-day operations within the county, and delivery of critical municipal and emergency services. Disruption of one or more of these modes of transportation can lead to congestion of another and affect both the county and the region as a whole. As discussed in Section 2.4 of this HMP, areas targeted for future growth and development have been identified across Dauphin County. Increased development in the county and region will lead to increased road traffic.

Additional Data and Next Steps

Based on limited data regarding the probability and potential impact of this hazard, a quantitative loss estimate was not completed for this HMP. Over time, the county can work with appropriate agencies to collect additional data to support mitigation planning, consideration of potential risks, and prioritization of mitigation measures for this hazard.

Dauphin County recognizes it must compile and maintain data regarding specific concerns and past losses from this hazard. These data should include specific information regarding damage or loss of life, property, or infrastructure and any reports pertaining to potential or actual cost and logistics of responding to an event caused by this hazard (locations of road closures, map detours, traffic counts, durations of closures and detours, and costs to respond). These data will be included in future revisions of the HMP and can be used to support future mitigation grant efforts (benefit-cost analysis).

Studying traffic and potential transportation accident patterns could provide information on the vulnerability of specific road segments and nearby populations. Increased understanding of the types of HazMats transported through the county will also support mitigation efforts. Maintaining a record of frequently transported materials can facilitate development of preparatory measures to respond to a release. Predicting costs needed to respond to a release, remediate the environment (see Section 4.3.5 for a discussion of environmental impacts due to transportation accidents), or repair damaged infrastructure would be useful for developing mitigation options.

4.3.16 Utility Interruption

A utility interruption could include power failure, potable water service outage, telecommunications infrastructure failure, natural gas infrastructure failure, or sewer infrastructure failure. For the purpose of this plan, utility interruption focuses on power failure, because it is the major cause of utility failure and has had widespread impacts on the county. A power failure is defined as any interruption or loss of electrical service from disruption of power transmission caused by accident, sabotage, natural hazards, or equipment failure. A significant power failure is defined as any incident of a long duration that would require the involvement of the local or Commonwealth emergency management organizations to coordinate provision of food, water, heating, cooling, and shelter. Interruptions in other basic utilities (such as data/telecommunications, water, natural gas, or sewer) can have a detrimental impact on Dauphin County. Utilities that employ aboveground wiring (power and data/telecommunications) are vulnerable to the effects of other hazards, such as high wind, heavy snow, ice, rain, and vehicular accidents. Effects of other hazards are explained in detail in Sections 4.3.6 (Flood, Flash Flood, and Ice Jams), 4.3.14 (Tornado and Windstorms), 4.3.15 (Transportation Accidents), and 4.3.18 (Winter Storm).

This section describes the location and extent, range of magnitude, past occurrence, future occurrence, and vulnerability assessment for the utility interruption hazard for the Dauphin County Hazard Mitigation Plan (HMP).

4.3.16.1 Location and Extent

Utility interruptions occur throughout Dauphin County; however, they are usually of small scale and short duration. These interruptions are primarily power failures and are often a secondary impact of another hazard event. 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 causing loss of power for an extended period. Local outages may be caused by traffic accidents or wind damage.

Local companies, such as PPL, which provide electricity to Dauphin County are capable of handling minor interruptions (Section 4 of this plan describes other utilities in the county). Interruptions are possible anywhere utility service has been installed. Some utility facilities are especially vulnerable. For instance, potable water interruption is possible when water intakes and water control facilities are located in the 1 percent annual chance floodplain and a flood may seriously impair water service. Section 4.3.6 provides more detail on possible flood impacts.

4.3.16.2 Range of Magnitude

Generally speaking, the most severe utility interruptions are regional power outages. Regional loss of power affects lighting; heating, ventilation, and air conditioning (HVAC) and other support equipment; communications; fire and security systems; and refrigerators, which can in turn cause loss of water and sewer service, and food spoilage. These effects are especially severe for individuals with functional needs and the elderly.

At a minimum, power outages can cause short-term disruption in the orderly functioning of businesses, government operations, and private citizen functions and activities. Examples of everyday functions that would be affected by power outages include traffic signals, elevators, and retail sales. A worst-case scenario for utility interruption in Dauphin County would be a countywide power outage during winter months, forcing the evacuation of vulnerable populations.

Sabotage also plays a role in some utility outages. Sabotage may be the direct result of a malicious attack against utilities or may be the secondary effect of the theft of copper wiring. The U.S. Department of Energy (DOE) published a report in October 2010 titled "An Updated Assessment of Copper Wire Theft from Electric Utilities," in which the DOE Office of Electricity Delivery and Energy Reliability reported that United States-based utilities suffer copper thefts costing several million dollars annually (DOE 2010). The estimated minutes of outages experienced by utilities nationwide as a result of copper theft were 456,000 or about 7,600 hours (American Public Power Association [APPA] 2012).

4.3.16.3 Past Occurrence

Every year, Dauphin County is susceptible to minor utility interruptions either through technological failure or as the result of inclement weather. Table 4.3.16-1 below shows major utility interruptions in the county since 2002. In all, over 12 incidents were reported, including downed utility lines from 2002 to July 2020. Events that simply included downed trees and power lines are not listed in Table 4.3.16-1.

Table 4.3.16-1: Utility Interruptions from 2002–2020

Dates of Event	Event Type	Losses / Impacts
November 13, 2003	High Wind	Strong winds caused more than 80,000 persons were without power across all of Pennsylvania.
June 27, 2006	Flash Flood	Heavy rains caused flooding, roads and bridges closed. 7,800 residences were damaged, including damaged utilities, loss of power, and over 275,000 voluntary evacuations orders were given.
December 15, 2007	Winter Storm	A significant winter storm affected much of central Pennsylvania. There was over 64,000 power outages and 25,000 outages were in Dauphin County, many in the Hershey and Harrisburg areas.
March 8, 2008	High Wind	High winds downed numerous trees and utility lines, leaving several customers without power.
December 31, 2008	High Wind	High winds knocked downed several trees, large branches, and power lines across the county, over 1,000 PPL customers were without power.
January 6, 2009	Thunderstorm Winds	Freezing rain resulted in a significant ice accumulation across central Pennsylvania. The ice caused sporadic power outages and brought down several tree limbs.
January 27, 2009	Winter Storm	Heavy snow, sleet, and freezing rain caused sporadic power outages in the region
February 12, 2009	High Wind	High winds caused isolated power outages. The Public Utility Commission reported that utility crews restored power to over 400,000 customers.
August 28, 2011	Strong Wind	The strong winds downed trees and utility wires, leaving thousands of residents without power.
June 29, 2012	Thunderstorm Wind	High winds caused power outages. PPL reported about 7,000 people without power.
October 29, 2012	High Wind	High winds knocked down several trees and utility wires, resulting in approximately 10,000 power outages.
February 2014	Winter Storms	Winter storm event impacted over 2,200 Met Ed and PPL customers. The storm resulted in a Governor's Proclamation of Emergency.
July 8, 2014	Thunderstorm Wind	Damaging winds caused localized structural damage and thousands of power outages.

Source: FEMA 2020, NOAA-NCEI 2020

4.3.16.4 Future Occurrence

Minor power failure (short outage events) may occur several times a year for any given area in the county, while major events (long, widespread outage events) take place once every few years. Power failures often occur during severe weather; therefore, they should be expected during those events. Based on the assumption that the county will experience severe weather annually, in addition to outages from other causes, the future occurrence of utility interruptions in Dauphin County should be considered *highly likely,* as defined by the Risk Factor Methodology probability criteria.

4.3.16.5 Vulnerability Assessment

To understand risk, a community must evaluate the assets that are exposed or vulnerable in the identified hazard area. This section discusses the potential impact of the subsidence and sinkhole hazard on Dauphin County in the following subsections:

- Impact on (1) life, health, and safety; (2) general building stock; (3) economy; (4) environment; and (5) future growth and development
- Effect of climate change on vulnerability
- Further data collections that will assist understanding of this hazard over time

Impact on Life, Health, and Safety

Utility interruptions most severely affect individuals with access and functional needs (such as children, the elderly, and individuals with special medical needs). Special medical equipment will not function without power. Likewise, a loss of air conditioning during periods of extreme heat or the loss of heating during extreme cold can be especially detrimental to those with medical needs, children, and the elderly. Table 4.3.16-2 shows the demographic change in children and the elderly from 2000 through 2018. The population under the age of 5, under 18, and 65 years and over have increased, as shown in Table 4.3.16-2. Data on individuals with special medical needs were not available.

Table 4.3.16-2. Demographic Trends for Vulnerable Populations

Vulnerable Population	2000 Census	2010 Census	2018 Census Estimate	2000 to 2018 Change
Children under 5 years	15,490	16,794	17,182	1,692
Under 18 years	61,113	62,215	61,753	640
65 years and over	35,844	35,841	44,262	8,418

Source: U.S. Census Bureau 2020

Impact on General Building Stock and Critical Facilities

All facility infrastructure considered critical are vulnerable to utility interruptions, especially the loss of power. The establishment of reliable backup power at these facilities is extremely important to continue to provide for the health, safety, and well-being of Dauphin County's population.

Impact on the Economy

No data regarding economic impacts from utility interruptions in Dauphin County are available. However, utility interruptions can cause economic impacts stemming from lost income, spoiled food and other goods, costs to the owners or operators of the utility facilities, and costs to government and community service groups. Calculation of potential impacts of utility interruptions is heavily dependent on the number of rate-paying utility connections affected. The Federal Emergency Management Agency (FEMA) Benefit-Cost Analysis (BCA) Toolkit v.5.3.0 has standard values based on the daily cost per rate-paying connection. The daily cost per value is shown in Table 4.3.16-3.

Table 4.3.16-3. FEMA BCA Toolkit v5.3.0 Daily Standard Values of Utility Services

Utility	Daily Value (per connection/per day)
Electric	$148.00
Potable Water	$105.00
Wastewater	$49.00

Source: FEMA 2017

Impact on the Environment

The most significant impact associated with utility interruptions occurs when the interruption involves a release of hazardous materials. This hazardous material may be released in a pipeline accident or when material is in transit. Section 4.3.5 (Environmental Hazards – Hazardous Materials Releases) includes a complete discussion on the impacts of a hazardous materials release. Pipelines carrying flammable materials also have the possibility of exploding or starting a fire (Pennsylvania Emergency Management Agency [PEMA] 2018).

A number of secondary impacts are associated with utility interruptions. First, interruptions could affect the ability of the government to function, especially if backup power generators or supply is inadequate or unavailable. Utility interruptions can also reduce the efficient and effective communication essential to first responders. Heating loss and severe cold can also impact the health and safety of at-risk populations like young children, the elderly, and individuals with disabilities (PEMA 2018).

Future Growth and Development

Areas targeted for potential future growth and development in the next 5 to 10 years have been identified across Dauphin County (further discussed in Section 2.4 of this HMP). Any areas of growth could be potentially impacted by the utility interruption hazard because the entire county is exposed and potentially vulnerable. An increase in development and population will increase demand for power supply and has the ability to increase the likelihood of utility interruption incidents.

Effect of Climate Change on Vulnerability

According to the Fourth National Climate Assessment, two climate change scenarios were modeled, and temperature change in the northeastern United States is estimated to increase between 3.98 - 5.09°F by 2036-2065 and between 5.27 - 9.11°F by 2071-2100. The annual mean temperature change in Pennsylvania is projected to increase between 5.9 - 6.3°F by 2041 - 2070. Some areas of the world may experience greater temperature changes than others. 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 (PEMA 2018).

Increased average temperatures ,as a result of climate change, make the occurrence of extreme heat more likely. While increased average temperatures would make the occurrence of extreme cold less likely, some climatologists have suggested that warming in the Arctic could impact the position of the jet stream, allowing for more extreme cold weather events to occur. While some research supports this concept, others do not and the impact of climate change on cold weather events is not fully understood (Climate Central 2013). Extreme heat and cold result in greater strain on utilities, increasing the likelihood of utility interruption.

Climatologists expect an increase in the number and intensity of severe weather events. This will include wind events, such as hurricanes, tornadoes, and wind associated with thunderstorms, among other phenomena. More storms with higher winds will increase the chance that the utility infrastructure will be impacted by these storms.

Additionally, climatologists expect an increase in precipitation, which could come in the form of heavy downpours or winter weather thus causing additional utility interruptions. Increased risk of drought may also threaten water utilities.

Additional Data and Next Steps

For future plan updates, Dauphin County can track data on power outage events and obtain additional information on past and future events, particularly in terms of any injuries, deaths, shelter needs, pipe freeze incidents, and other impacts. These data will help to identify any concerns or trends for which mitigation measures should be developed or refined. In time, quantitative modeling of estimated power outage events may be feasible as data are gathered and improved.

4.3.17 Wildfire

This section provides a profile of and vulnerability assessment for the wildfire hazard. 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 that can be seen for miles. A wildland fire is a wildfire in an area where development is essentially nonexistent, except for roads, railroads, power lines, and similar facilities. A wildland-urban interface (WUI) fire is a wildfire in a geographical area where structures and other human development meet or intermingle with wildland or vegetative fuels.

4.3.17.1 Location and Extent

Wildfires take place in less developed or completely undeveloped areas, spreading rapidly through vegetative fuels. They can occur any time of the year, but mostly occur during long, dry, hot spells. Any small fire, if not quickly detected and suppressed, can get out of control. Most wildfires are caused by human carelessness, negligence, and ignorance. However, some are precipitated by lightning strikes, and in rare instances, spontaneous combustion. Wildfires in Pennsylvania can occur in open fields, grass, dense brush, and forests.

Wildfires can occur at any time of the year, but are most likely in Dauphin County during a drought, and can occur in fields, grass, and brush as well as in the forest itself. Under dry conditions or droughts, wildfires have the potential to burn forests as well as croplands.

The majority of Dauphin County is forested land (approximately 50.5-percent) or agricultural land (27.4-percent) and most wildfires are relatively small in size (Dauphin HMP, 2015). The greatest potential for wildfires is in the spring months of March, April, and May, and the autumn months of October and November; 83 percent of all Pennsylvania wildfires occur in these two time periods. 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.

Table 4.3.17-1. Land Use Summary for Dauphin County

Land Use Category	Total Area (square miles)	Percent of Total
Agricultural	143.3	27.4%
Barren Land	0.7	0.1%
Forest	264.5	50.5%
Urban	113.2	21.6%
Wetland	1.8	0.3%
Total	**523.6**	**100.0%**

Source: USGS 2016
Note: Water is excluded from the table above.

Figure 4.3.17-1 illustrates the land cover across Dauphin County. As the figure shows, half of Dauphin County is forested. Figure 4.3.17-2 shows the locations of wildfires throughout Pennsylvania that the Pennsylvania Department of Conservation and Natural Resources (PA DCNR), Bureau of Forestry (BOF) responded to from 1992 to 2015. Wildfires are known to be an underreported event. Many wildfires occur every year and are suppressed by volunteer fire departments without any response or assistance from BOF. Also, some smaller fires may not be identified or responded to at all. Therefore, these locally controlled blazes may not be represented in BOF records.

Figure 4.3.17-1. Land Cover in Dauphin County

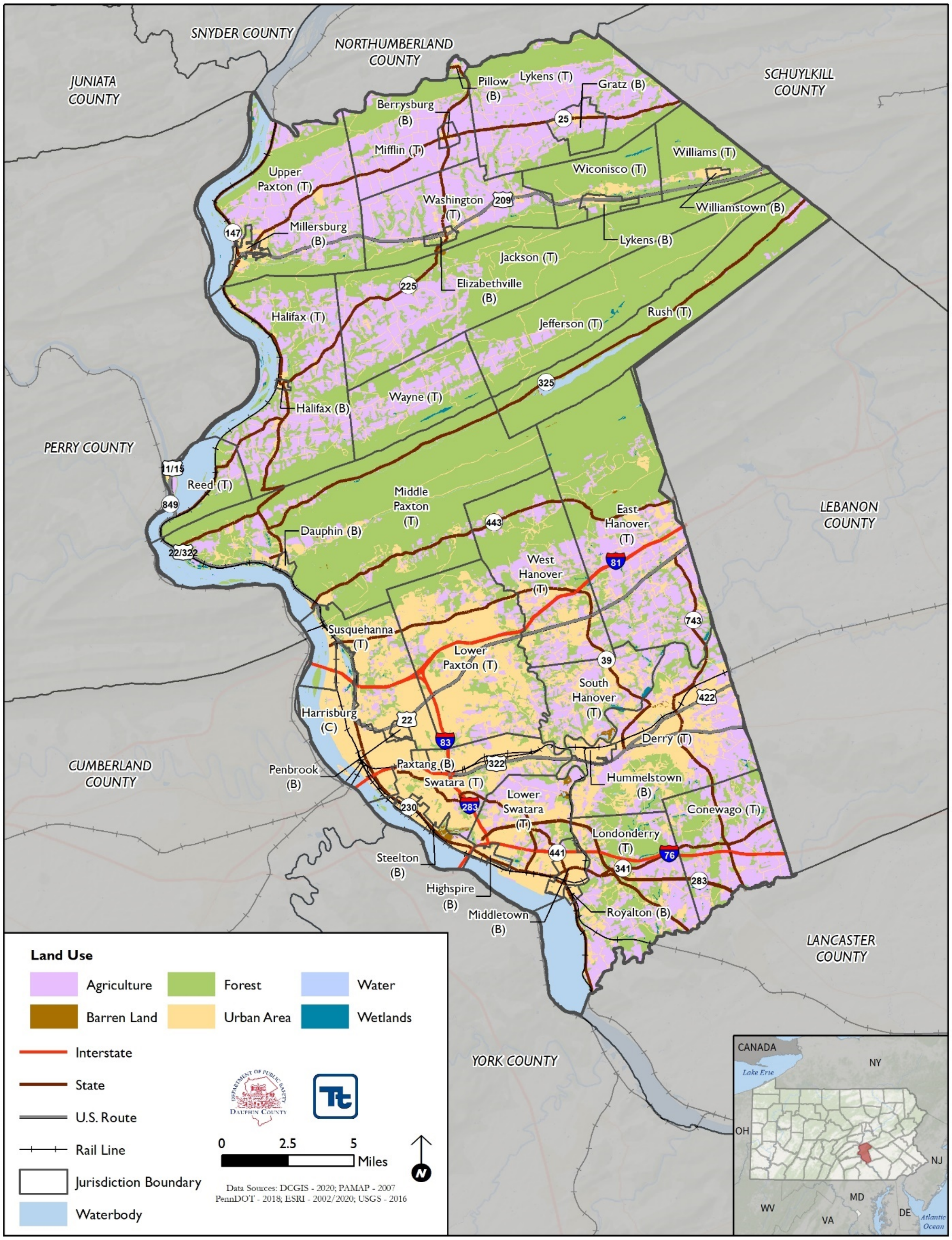
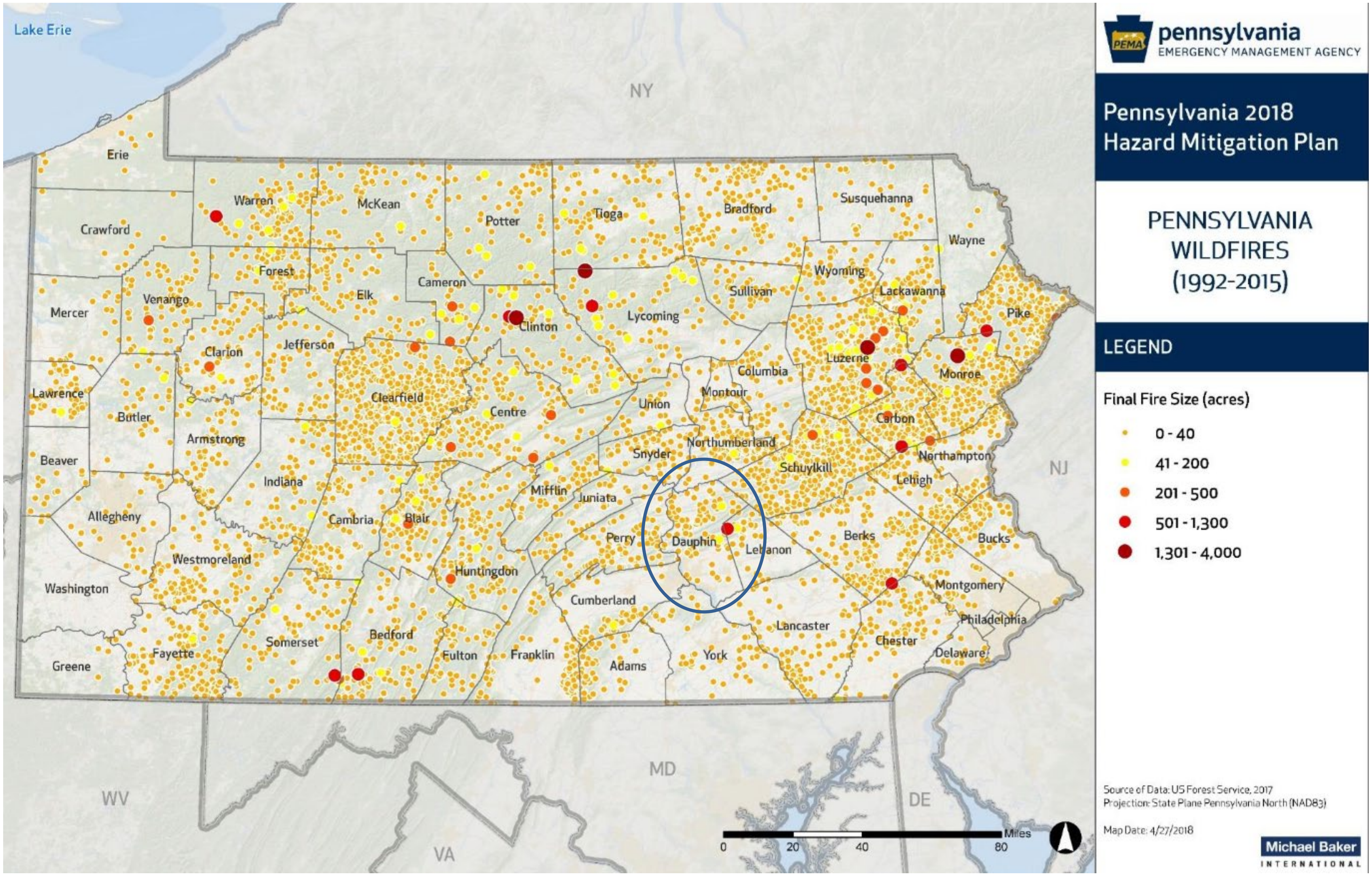


Figure 4.3.17-2. Location of Wildfire Events responded to by BOF from 1992–2015



Source: PEMA 2018

Note: Blue oval was added to highlight Dauphin County's location within Pennsylvania.

According to the Pennsylvania 2019 Standard State All-Hazard Mitigation Plan, areas of the Commonwealth with large home developments built in volatile fuel types are at risk for catastrophic wildfires. Many areas of the state are at risk for large wildfires, but northeastern Pennsylvania is the most at risk for loss of life and/or property because of the number of homes at risk for wildfires. In southeastern Pennsylvania, communities are most susceptible to large fires accidentally started by people; fires of this type include those ignited by sparks from railroads cars that run parallel to and on the banks of the Susquehanna River (PEMA 2018).

Several tools are available to estimate fire potential location and extent, including (but not limited to) the WUI, Wildland Fire Assessment System, and PA DCNR Priority Landscape Analysis. These tools are discussed in further detail below.

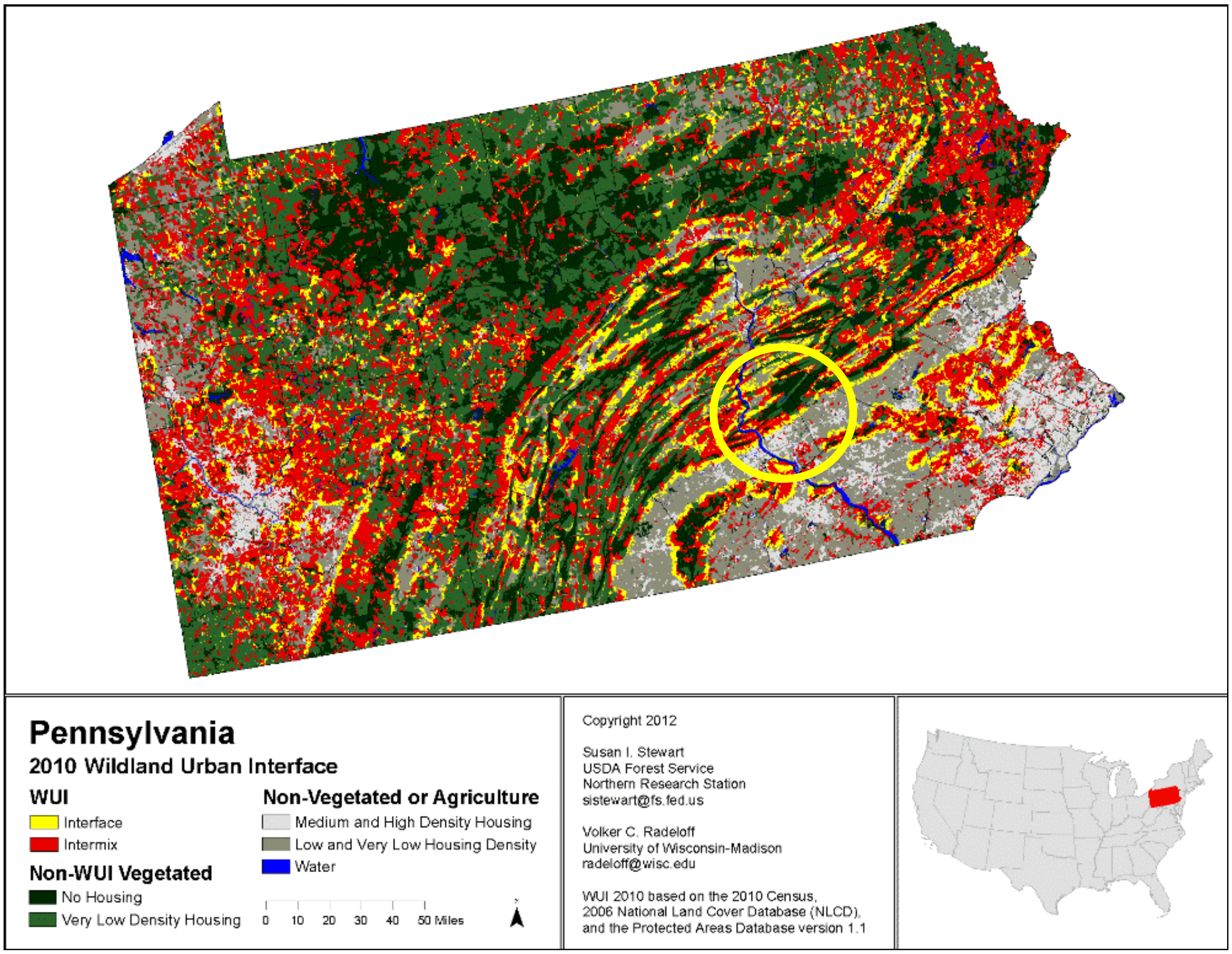
Wildland/Urban Interface (WUI)

The WUI is considered the area where houses and wildland vegetation coincide. The WUI is divided into two categories: intermix and interface. Intermix WUI are areas where housing and vegetation "intermingle." Intermix areas have more than one house per 40 acres and have more than 50 percent vegetation. Interface WUI are areas with housing in the vicinity of contiguous wildland vegetation. Interface areas have more than one house per 40 acres, have less than 50 percent vegetation, and are within 1.5 miles of an area larger than 1,235 acres that is more than 75 percent vegetated (Stewart et al. 2005).

The California Fire Alliance determined that areas within 1.5 miles of wildland vegetation are the approximate distance that firebrands can be carried from a wildland fire to the roof of a house. Therefore, even structures not located within the forest are at risk from wildfire. This buffer distance, along with housing density and vegetation type, were used to define the WUI (Stewart et al. 2005).

Concentrations of WUI can be seen along the east coast of the United States, including the area around Pittsburgh, Pennsylvania, and the eastern half of Pennsylvania. Dauphin County is identified as having many areas of low-density housing or very low-density housing because of the large amount of agricultural area. Areas where recreation and tourism dominate are also places where WUI is common (Stewart et al. 2005). Figure 4.3.17-3 depicts the WUI for Pennsylvania in 2010, and Figure 4.3.17-4 illustrates the WUI for Dauphin County. Concentrations of WUI areas greater than 50 percent are classified as WUI (intermix or interface) in the county.

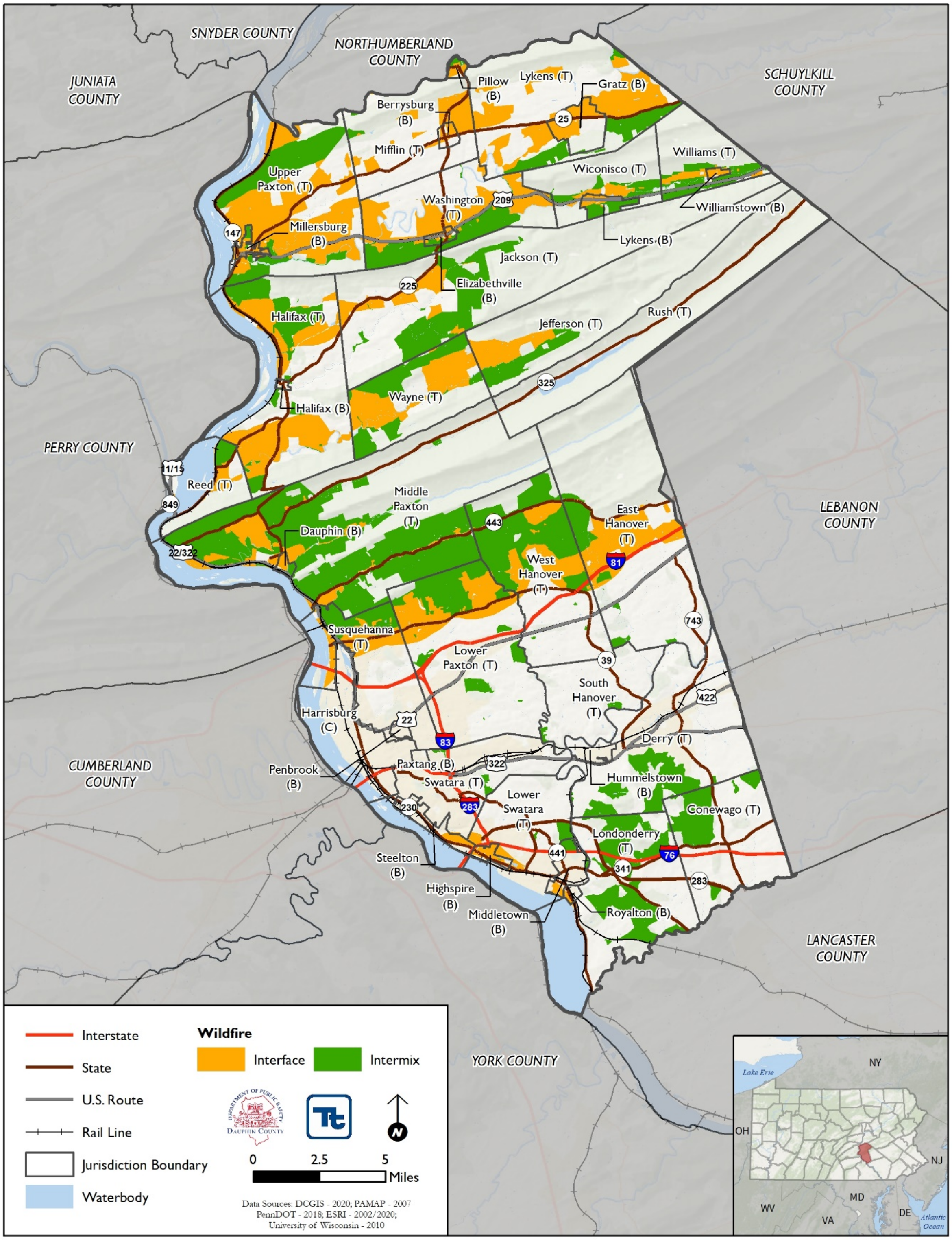
Figure 4.3.17-3. 2010 WUI for Pennsylvania



Source: *Stewart 2015*

Note: *Yellow oval highlights Dauphin County's location within Pennsylvania.*

Figure 4.3.17-4. Wildfire Urban Intermix/Interface for Dauphin County



Wildland Fire Assessment System (WFAS)

The WFAS is an Internet-based information system maintained at the National Interagency Fire Center (NIFC) in Boise, Idaho, that provides a national view of weather and fire potential, including national fire danger information, weather maps, and satellite-derived "Greenness" maps (U.S. Forestry Service [USFS] Date Unknown). Each day during the fire season, national maps of selected fire weather and fire danger components of the National Fire Danger Rating System (NFDRS) are produced by the WFAS (USFS 2012). The Fire Danger Rating level, described in Table 4.3.17-2 below, takes into account current and antecedent weather, fuel types, and both live and dead fuel moisture. The adjective class rating is a method of rating classes across different fuel models, indexes, and station locations. It is based primarily on a fuel model cataloged for the station, the fire danger index selected to reflect staffing levels, and climatological class breakpoints. Local station managers provide this information to USFS (USFS 2012).

Table 4.3.17-2. Fire Danger Rating and Color Code

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

Source: USFS 2012

Pennsylvania Department of Conservation and Natural Resources (PA DCNR) Priority Landscape Analysis

The PA DCNR conducted a wildfire priority landscape analysis identifying areas where wildland fires are predicted to occur and become problematic. The areas are classified into high, medium, and low categories. The high classification is defined as an area prone to extreme fire behavior, with the potential to cause extensive property damage, or that could threaten the safety of the Commonwealth's citizens. The following five datasets were used for this analysis:

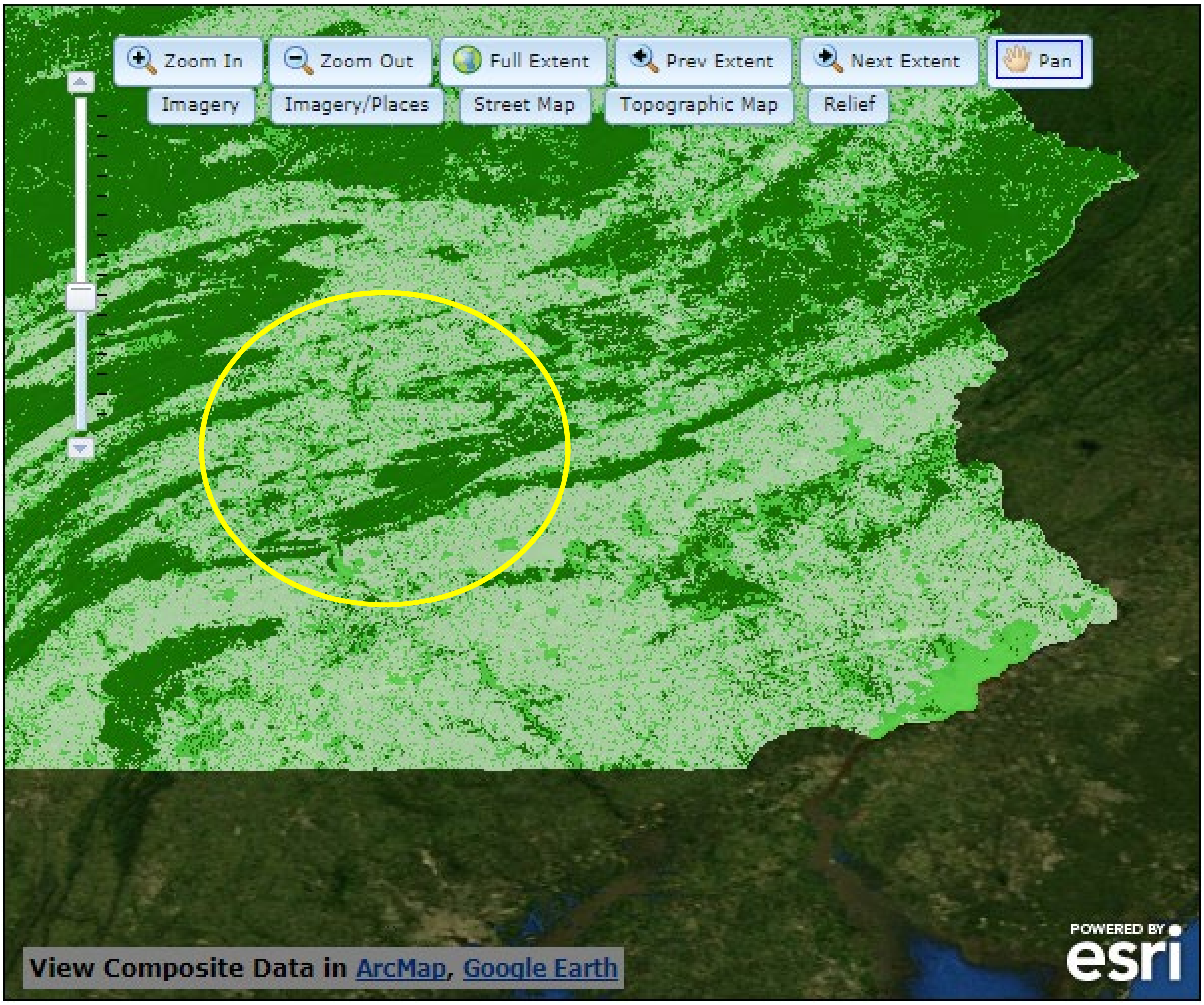
- 2002 WUI

- 2006 LANDFIRE
- 2002–2008 Pennsylvania Wildfire Point Origin Occurrences
- Percent Slope
- 2009 Local Assessment of Values, Risks, Hazards

The WUI classifies areas where homes and other human development meet or intermingle with undeveloped land. LANDFIRE characterizes the land's vegetation into fuel models that predict various fire behavior intensities. The Pennsylvania wildfire Point Origin Occurrences are records of wildland fire origins that have been reported. Percent slope aids in predicting fire behavior from the terrain. The local assessment of values, risks, and hazards is a municipality-based rating system; this assessment has been made by local wildland fire managers (PA DCNR 2017b). Figure 4.3.17-5 illustrates the output for the wildfire priority landscapes model for Dauphin County.

The greatest potential for wildfires is in the spring months of March, April, and May, and the autumn months of October and November. These months generally bring clear skies, high winds, low relative humidity, and prolonged periods of dry weather. In the spring, bare trees allow sunlight to reach the forest floor, drying fallen leaves and other ground debris. The same theory applies for the fall; however, the drier conditions are a more crucial factor. People cause most wildfires in Pennsylvania, often by burning debris. Several fires have been traced to property owners' backyards and these fires then traveled through dead grasses and weeds into bordering woodlands. According to the Pennsylvania Emergency Management Agency (PEMA) Standard All-Hazard Mitigation Plan, 92 percent of Pennsylvania wildfires burn less than 10 acres and are suppressed within the first burning period (PEMA 2013).

Figure 4.3.17-5. Wildfire Priority Landscapes in Dauphin County



Source: PA DCNR 2017b

Notes: Low Priority = 0–0.21 (light green); Medium Priority = 0.21–0.35 (medium green); High Priority = 0.35–1 (dark green)
Dauphin County location within yellow oval

4.3.17.2 Range of Magnitude

Wildfire events in Dauphin County can range from small fires that can be managed by local firefighters to large fires burning 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, forage, and recreational and scenic resources.

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 areas away from the communities that they are chartered to protect.

Some fires are not human-caused and are part of natural succession processes and these fire can kill people, livestock, fish, and wildlife. They often destroy property, valuable timber, forage, and recreational and scenic values. The most significant environmental impact is the potential for severe erosion, silting of stream beds and reservoirs, and flooding because of ground-cover loss following a fire event. Wildfire can also have a positive environmental impact in that they burn dead trees, leaves, and grasses to allow more open spaces for new vegetation to grow and receive sunlight. Fires also stimulate the growth of new shoots on trees and shrubs and the heat can open pinecones and other seed pods.

The worst-case scenario for Dauphin County would occur if an uncontrolled wildfire spread across the northern region of the County, specifically within Middle Paxton Township where 4,961 people (97.9 percent of the population) are located within the WUI hazard area. Additionally, 3,980 structures valued at $1,422,647,835 (97.3 percent) are exposed to the hazard area in Middle Paxton Township.

4.3.17.3 Past Occurrence

Wildfires are a constant threat in Dauphin County. During development of the 2015 HMP, only wildfires reported to PA DCNR from 2002 to 2007 were reflected. For this update, all wildfires and brush fires reported to the PA DCNR from 2002 through May 2020 were reflected in the HMP. Table 4.3.17-3 shows the numbers of wildfire events in the County from 2002 through May 2020. Of all of Dauphin County's jurisdictions, East Hanover Township and Halifax Township had the most wildfires between 2002 and May 2020.

Table 4.3.17-3. List of wildfire events reported in Dauphin County from 2002-2020

Municipality	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total
Berrysburg Borough	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
Conewago Township	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Dauphin Borough	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1
Derry Township	-	1	-	-	2	-	-	-	-	-	-	-	-	-	-	1	-	-	-	4
East Hanover Township	6	-	-	1	1	-	1	-	-	-	13	-	-	-	-	-	-	-	-	22
Elizabethville Borough	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1
Gratz Borough	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
Halifax Borough	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
Halifax Township	-	2	-	3	-	-	1	1	1	-	-	-	-	-	1	3	2	2	6	22
Harrisburg City	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
Highspire Borough	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
Hummelstown Borough	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
Jackson Township	2	-	2	4	-	-	1	-	-	-	2	-	-	-	1	1	1	3	3	20
Jefferson Township	2	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1	4
Londonderry Township	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
Lower Paxton Township	1	-	-	-	-	2	-	-	-	-	1	-	-	-	-	-	-	-	-	4
Lower Swatara Township	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
Lykens Borough	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
Lykens Township	1	-	1	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	4
Middletown Borough	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
Middle Paxton Township	3	2	2	2	2	-	-	-	-	-	1	-	-	-	2	-	-	-	-	14

Municipality	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total
Mifflin Township	2	-	-	-	2	-	1	-	-	-	-	-	-	-	-	-	-	1	-	6
Millersburg Borough	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
Paxtang Borough	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
Penbrook Borough	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
Pillow Borough	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
Reed Township	1	-	-	-	-	-	1	-	-	-	-	-	-	-	2	1	1	-	-	6
Royalton Borough	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
Rush Township	-	-	-	1	-	-	-	2	-	-	1	1	-	-	4	-	-	-	-	9
South Hanover Township	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Steelton Borough	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
Susquehanna Township	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2
Swatara Township	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11	13
Upper Paxton Township	-	-	1	1	1	1	-	-	-	-	2	1	2	-	-	-	-	-	1	9
Washington Township	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Wayne Township	-	-	1	-	-	-	1	-	1	-	2	-	1	-	1	-	1	-	1	9
West Hanover Township	1	-	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	3
Wiconisco Township	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Williams Township	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
Williamstown Borough	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0

Source: PADCNR 2020

Note: 2020 data through May 31, 2020

- None Reported

4.3.17.4 Future Occurrence

In Pennsylvania, wildfire events will continue to occur each year. However, the likelihood of one of those fires attaining significant size and intensity is unpredictable and highly dependent on environmental conditions and firefighting response. Weather conditions, particularly drought events, increase the likelihood of wildfires occurring. Additionally, invasive forest insects can increase the likelihood of wildfires occurring; insects that attack and kill trees increase the total wildfire fuel available in wooded areas. Climate change is also likely to increase the probability of future wildfires. Prolonged periods of drought caused by climate change can potentially increase the length of the wildfire season and provide a more favorable climate for ignition (PEMA 2018).

For this 2021 HMP update, the most up-to-date data was collected to calculate the probability of future occurrence of wildfire events for Dauphin County. Information from PA DCNR was used to identify the number of wildfire events that occurred between 2002 and May 2020 to ensure the most accurate probability estimates possible. The table below shows these statistics as well as the annual average number of events and the estimate percent chance of an incident occurring in a given year, using the PA DCNR's complete records from 2002 to 2020. Based on these statistics, there is an estimated 100 percent chance of a wildfire event occurring in any given year in Dauphin County.

Table 4.3.17-4. Probability of Future Wildfire Events

Hazard Type	Number of Occurrences Between 2002 and 2020	Rate of Occurrence or Annual Number of Events (average)	Percent Chance of Occurrence in Any Given Year
Wildfires	161	2.33	100%

Source: Dauphin County 2020

Based on available historical data, the future occurrence of wildfires in Dauphin County can be considered *highly likely* as defined by the Risk Factor Methodology probability criteria (refer to Section 4.4). However, the likelihood of one of those fires attaining significant size and intensity is unpredictable and highly dependent on environmental conditions and firefighting response. Weather conditions, such as drought and wind, can increase the likelihood of wildfires occurring. Any fire, without the quick response or attention of firefighters, forestry personnel, or visitors to the forest, has the potential to become a wildfire.

4.3.17.5 Vulnerability Assessment

To understand risk, a community must evaluate what assets are exposed and vulnerable to the identified hazard. A spatial analysis was conducted using the University of Wisconsin 2010 Wildfire Urban Interface/Intermix spatial layer. For the purposes of the assessment, an asset (population, structures, critical facilities, and lifelines) is considered exposed and potentially vulnerable to the wildfire hazard if it is located in the wildfire interface or wildfire intermix hazard areas.

Impact on Life, Health, and Safety

Wildfires have the potential to impact human health and life of residents and responders, structures, infrastructure, and natural resources. The most vulnerable populations include emergency responders and those within a short distance of the interface between the built environment and the wildland environment. First responders are exposed to the dangers from the initial incident and after-effects from smoke inhalation and heat stroke. Table 4.3.17-5 summarizes the estimated population exposed to the wildfire hazard by municipality.

Based on the analysis, an estimated 65,380 residents, or approximately 23.8 percent of the County's population, are located in the wildfire urban interface/intermix (WUI) hazard area. Overall, the Township of Lower Paxton has the greatest number of individuals located in the wildfire hazard area (about 11,467 persons).

Of the population exposed, the most vulnerable include the economically disadvantaged and the population over age 65. In Dauphin County, there are 34,158 persons in poverty and 44,262 persons over 65 years old. Economically disadvantaged populations are more vulnerable because they are likely to evaluate their risk and make decisions to evacuate based on net economic impacts on their families. The population over age 65 is also more vulnerable because they are more likely to seek or need medical attention that may not be available during a wildfire event, and they may have more difficulty evacuating.

Table 4.3.17-5. Estimated Population Located within the Wildfire Urban Interface/Intermix in Dauphin County

Jurisdiction	American Community Survey (2014-2018) Population	Estimated Population Exposed to the Wildland Urban Interface/Intermix (WUI) Hazard Area	
		Number of People	Percent of Total
Berrysburg (B)	323	277	85.8%
Conewago (T)	3,069	1,051	34.2%
Dauphin (B)	855	828	96.9%
Derry (T)	25,036	2,428	9.7%
East Hanover (T)	5,919	1,893	32.0%
Elizabethville (B)	1,609	1,570	97.6%
Gratz (B)	805	727	90.4%
Halifax (B)	954	18	1.9%
Halifax (T)	3,561	2,450	68.8%
Harrisburg (C)	49,230	43	0.1%
Highspire (B)	2,667	2,646	99.2%
Hummelstown (B)	4,650	0	0.0%
Jackson (T)	1,727	732	42.4%
Jefferson (T)	302	202	66.8%
Londonderry (T)	5,211	1,861	35.7%
Lower Paxton (T)	48,739	11,467	23.5%
Lower Swatara (T)	8,788	1,870	21.3%
Lykens (B)	1,673	1,667	99.7%
Lykens (T)	1,631	1,011	62.0%
Middle Paxton (T)	5,067	4,961	97.9%
Middletown (B)	9,176	780	8.5%
Mifflin (T)	727	233	32.0%
Millersburg (B)	2,546	2,532	99.4%
Paxtang (B)	1,650	0	0.0%
Penbrook (B)	2,981	0	0.0%
Pillow (B)	256	255	99.6%
Reed (T)	209	155	74.1%
Royalton (B)	1,259	260	20.6%
Rush (T)	305	30	9.7%
South Hanover (T)	6,766	134	2.0%
Steelton (B)	5,954	985	16.5%
Susquehanna (T)	24,857	8,582	34.5%
Swatara (T)	24,685	520	2.1%
Upper Paxton (T)	4,219	3,846	91.2%
Washington (T)	2,166	1,804	83.3%
Wayne (T)	1,365	1,197	87.7%
West Hanover (T)	10,165	3,019	29.7%
Wiconisco (T)	1,122	1,066	95.0%

Jurisdiction	American Community Survey (2014-2018) Population	Estimated Population Exposed to the Wildland Urban Interface/Intermix (WUI) Hazard Area	
		Number of People	Percent of Total
Williams (T)	1,104	1,097	99.4%
Williamstown (B)	1,187	1,183	99.6%
Dauphin County (Total)	**274,515**	**65,380**	**23.8%**

Source: ACS 2018; Dauphin County GIS 2020; University of Wisconsin 2010
Notes: B – Borough; C – City; T – Township; % - Percent

Impact on General Building Stock

The most vulnerable structures to wildfire events are those within the wildfire urban interface/intermix hazard area. Buildings constructed of wood or vinyl siding are generally more likely to be impacted by the fire hazard than buildings constructed of brick or concrete. To estimate the buildings exposed to the wildfire hazard, the WUI was overlaid upon the updated building inventory. The replacement cost value of the structures with their center in the WUI were totaled (refer to Table 4.3.17-6).

Out of the general building stock (145,877 buildings), 19.4 percent sit in the wildfire interface area and 10 percent sit in the wildfire intermix area. The Township of Lower Paxton has the greatest amount of buildings and replacement cost value of those buildings within in the wildfire interface area (3,593 buildings and $2 billion, respectively). The Township of Middle Paxton has the greatest amount of buildings in the wildfire intermix area (2,646 buildings), while the Township of Derry has the greatest replacement cost value ($3.3 billion) in the wildfire intermix area.

Table 4.3.17-6. Building Stock Replacement Value and Structures Located within the Wildfire Urban Interface/Intermix in Dauphin

Jurisdiction	Number of Buildings	Total Replacement Cost Value (RCV)	Estimated Building Stock Exposed to Wildfire Urban Interface/Intermix (WUI) Hazard Area											
			Wildfire Interface Area				Wildfire Intermix Area				WUI (Interface and Intermix)			
			Number of Buildings	Percent of Total	Replacement Cost Value (RCV)	Percent of Total	Number of Buildings	Percent of Total	Replacement Cost Value (RCV)	Percent of Total	Number of Buildings	Percent of Total	Replacement Cost Value (RCV)	Percent of Total
Berrysburg (B)	366	$131,114,498	303	82.8%	$105,475,767	80.4%	0	0.0%	$0	0.0%	303	82.8%	$105,475,767	80.4%
Conewago (T)	2,495	$1,131,218,434	0	0.0%	$0	0.0%	742	29.7%	$288,998,534	25.5%	742	29.7%	$288,998,534	25.5%
Dauphin (B)	456	$160,174,274	388	85.1%	$126,091,704	78.7%	47	10.3%	$20,224,000	12.6%	435	95.4%	$146,315,704	91.3%
Derry (T)	11,617	$13,980,976,171	0	0.0%	$0	0.0%	1,069	9.2%	$3,301,439,277	23.6%	1,069	9.2%	$3,301,439,277	23.6%
East Hanover (T)	5,054	$2,617,412,647	1,372	27.1%	$485,815,794	18.6%	268	5.3%	$79,697,385	3.0%	1,640	32.4%	$565,513,179	21.6%
Elizabethville (B)	949	$396,035,763	714	75.2%	$294,145,331	74.3%	187	19.7%	$68,407,092	17.3%	901	94.9%	$362,552,422	91.5%
Gratz (B)	715	$432,294,298	617	86.3%	$377,906,287	87.4%	2	0.3%	$1,920,882	0.4%	619	86.6%	$379,827,170	87.9%
Halifax (B)	469	$181,049,719	1	0.2%	$496,795	0.3%	11	2.3%	$4,419,034	2.4%	12	2.6%	$4,915,829	2.7%
Halifax (T)	3,457	$1,457,192,513	1,723	49.8%	$654,303,063	44.9%	439	12.7%	$112,168,512	7.7%	2,162	62.5%	$766,471,575	52.6%
Harrisburg (C)	18,718	$15,182,832,338	23	0.1%	$13,576,393	0.1%	0	0.0%	$0	0.0%	23	0.1%	$13,576,393	0.1%
Highspire (B)	1,374	$550,466,766	1,315	95.7%	$460,738,436	83.7%	15	1.1%	$3,125,785	0.6%	1,330	96.8%	$463,864,221	84.3%
Hummelstown (B)	2,337	$1,082,835,134	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%
Jackson (T)	2,371	$776,111,853	389	16.4%	$138,906,384	17.9%	613	25.9%	$179,584,272	23.1%	1,002	42.3%	$318,490,656	41.0%
Jefferson (T)	666	$230,110,295	198	29.7%	$95,600,456	41.5%	201	30.2%	$45,838,264	19.9%	399	59.9%	$141,438,719	61.5%
Londonderry (T)	5,080	$2,360,384,847	18	0.4%	$4,407,355	0.2%	1,616	31.8%	$500,554,905	21.2%	1,634	32.2%	$504,962,260	21.4%
Lower Paxton (T)	20,948	$14,635,453,846	3,593	17.2%	$1,997,249,050	13.6%	1,381	6.6%	$703,614,670	4.8%	4,974	23.7%	$2,700,863,720	18.5%
Lower Swatara (T)	4,771	$5,522,875,069	870	18.2%	$286,896,801	5.2%	113	2.4%	$30,552,728	0.6%	983	20.6%	$317,449,529	5.7%
Lykens (B)	1,322	$517,534,065	1,208	91.4%	$445,931,148	86.2%	85	6.4%	$26,729,026	5.2%	1,293	97.8%	$472,660,175	91.3%
Lykens (T)	2,155	$941,126,374	892	41.4%	$352,648,582	37.5%	322	14.9%	$136,569,893	14.5%	1,214	56.3%	$489,218,475	52.0%
Middle Paxton (T)	4,093	$1,462,655,724	1,334	32.6%	$509,918,963	34.9%	2,646	64.6%	$912,728,872	62.4%	3,980	97.2%	$1,422,647,835	97.3%
Middletown (B)	3,582	$1,981,507,138	276	7.7%	$121,805,683	6.1%	52	1.5%	$25,199,039	1.3%	328	9.2%	$147,004,722	7.4%
Mifflin (T)	1,125	$603,453,937	325	28.9%	$150,365,410	24.9%	11	1.0%	$2,598,164	0.4%	336	29.9%	$152,963,574	25.3%
Millersburg (B)	1,439	$770,504,424	1,337	92.9%	$620,537,958	80.5%	57	4.0%	$42,102,646	5.5%	1,394	96.9%	$662,640,604	86.0%
Paxtang (B)	869	$403,915,987	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%
Penbrook (B)	1,525	$602,189,726	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%
Pillow (B)	301	$101,661,910	276	91.7%	$92,431,125	90.9%	23	7.6%	$7,640,763	7.5%	299	99.3%	$100,071,888	98.4%
Reed (T)	299	$117,139,877	122	40.8%	$48,777,243	41.6%	81	27.1%	$32,067,193	27.4%	203	67.9%	$80,844,436	69.0%
Royalton (B)	630	$196,935,626	128	20.3%	$29,124,246	14.8%	0	0.0%	$0	0.0%	128	20.3%	$29,124,246	14.8%
Rush (T)	343	$71,032,585	32	9.3%	$7,860,993	11.1%	0	0.0%	$0	0.0%	32	9.3%	$7,860,993	11.1%
South Hanover (T)	3,972	$1,935,844,099	0	0.0%	$0	0.0%	79	2.0%	$20,816,851	1.1%	79	2.0%	$20,816,851	1.1%

Jurisdiction	Number of Buildings	Total Replacement Cost Value (RCV)	Estimated Building Stock Exposed to Wildfire Urban Interface/Intermix (WUI) Hazard Area											
			Wildfire Interface Area				Wildfire Intermix Area				WUI (Interface and Intermix)			
			Number of Buildings	Percent of Total	Replacement Cost Value (RCV)	Percent of Total	Number of Buildings	Percent of Total	Replacement Cost Value (RCV)	Percent of Total	Number of Buildings	Percent of Total	Replacement Cost Value (RCV)	Percent of Total
Steelton (B)	2,721	$2,111,932,612	395	14.5%	$121,948,465	5.8%	0	0.0%	$0	0.0%	395	14.5%	$121,948,465	5.8%
Susquehanna (T)	11,785	$8,633,889,539	2,979	25.3%	$1,757,772,235	20.4%	1,041	8.8%	$460,565,013	5.3%	4,020	34.1%	$2,218,337,248	25.7%
Swatara (T)	11,354	$8,581,237,561	0	0.0%	$0	0.0%	229	2.0%	$71,101,831	0.8%	229	2.0%	$71,101,831	0.8%
Upper Paxton (T)	3,560	$1,473,328,502	2,552	71.7%	$1,088,771,960	73.9%	549	15.4%	$183,755,471	12.5%	3,101	87.1%	$1,272,527,431	86.4%
Washington (T)	2,270	$1,106,223,564	1,290	56.8%	$617,251,794	55.8%	437	19.3%	$269,420,213	24.4%	1,727	76.1%	$886,672,006	80.2%
Wayne (T)	1,324	$398,741,088	771	58.2%	$253,784,099	63.6%	352	26.6%	$87,221,949	21.9%	1,123	84.8%	$341,006,048	85.5%
West Hanover (T)	6,505	$3,228,343,376	781	12.0%	$248,974,544	7.7%	1,263	19.4%	$430,721,573	13.3%	2,044	31.4%	$679,696,118	21.1%
Wiconisco (T)	995	$297,597,257	666	66.9%	$199,293,667	67.0%	265	26.6%	$81,837,722	27.5%	931	93.6%	$281,131,389	94.5%
Williams (T)	957	$390,058,854	498	52.0%	$198,674,614	50.9%	423	44.2%	$149,485,436	38.3%	921	96.2%	$348,160,051	89.3%
Williamstown (B)	908	$345,185,743	892	98.2%	$313,150,373	90.7%	0	0.0%	$0	0.0%	892	98.2%	$313,150,373	90.7%
Dauphin County (Total)	**145,877**	**$97,100,578,032**	**28,278**	**19.4%**	**$12,220,632,718**	**12.6%**	**14,619**	**10.0%**	**$8,281,106,994**	**8.5%**	**42,897**	**29.4%**	**$20,501,739,712**	**21.1%**

Source: Dauphin County GIS 2020; University of Wisconsin 2010; RS Means 2020
Notes: B – Borough; C – City; T – Township; % - Percent

Impact on Critical Facilities

It is recognized that a number of critical facilities are located in the wildfire hazard area. Facilities at risk of impact from a wildfire include locations for vulnerable populations (i.e., schools and senior facilities) and emergency response agencies (i.e., fire and police). Table 4.3.17-7 summarizes the distribution of the 384 critical facilities located within the wildfire hazard area by jurisdiction. Of this total, 246 of the critical facilities are considered lifelines. The Township of Middle Paxton has the greatest number of critical facilities built in the wildfire urban interface/intermix hazard areas (34). The exposed lifelines are categorized into FEMA lifeline groupings and are summarized in Table 4.3.17-8.

Table 4.3.17-7. Number of Critical Facilities in the Wildfire Urban Interface/Intermix in Dauphin County

Jurisdiction	Total Critical Facilities Located in Jurisdiction	Total Lifelines Located in Jurisdiction	Number of Critical Facilities and Lifeline Facilities Exposed to the Wildfire Urban Interface/Intermix Area			
			Critical Facilities	Percent of Total Critical Facilities	Lifelines	Percent of Total Lifelines
Berrysburg (B)	6	5	5	83.3%	4	80.0%
Conewago (T)	12	7	2	16.7%	1	14.3%
Dauphin (B)	27	23	14	51.9%	11	47.8%
Derry (T)	122	74	19	15.6%	11	14.9%
East Hanover (T)	41	29	12	29.3%	10	34.5%
Elizabethville (B)	12	9	10	83.3%	7	77.8%
Gratz (B)	9	7	9	100.0%	7	100.0%
Halifax (B)	8	7	0	0.0%	0	0.0%
Halifax (T)	37	24	14	37.8%	10	41.7%
Harrisburg (C)	371	271	3	0.8%	2	0.7%
Highspire (B)	15	9	10	66.7%	5	55.6%
Hummelstown (B)	33	23	0	0.0%	0	0.0%
Jackson (T)	26	15	4	15.4%	1	6.7%
Jefferson (T)	8	6	6	75.0%	5	83.3%
Londonderry (T)	47	31	14	29.8%	10	32.3%
Lower Paxton (T)	149	73	26	17.4%	11	15.1%
Lower Swatara (T)	94	75	3	3.2%	3	4.0%
Lykens (B)	22	17	19	86.4%	16	94.1%
Lykens (T)	16	10	3	18.8%	2	20.0%
Middle Paxton (T)	38	23	34	89.5%	19	82.6%
Middletown (B)	48	27	7	14.6%	2	7.4%
Mifflin (T)	11	8	2	18.2%	1	12.5%
Millersburg (B)	28	16	18	64.3%	9	56.3%
Paxtang (B)	14	9	0	0.0%	0	0.0%
Penbrook (B)	16	5	0	0.0%	0	0.0%
Pillow (B)	7	4	7	100.0%	4	100.0%
Reed (T)	8	7	5	62.5%	4	57.1%
Royalton (B)	12	9	0	0.0%	0	0.0%
Rush (T)	6	5	3	50.0%	2	40.0%
South Hanover (T)	25	17	0	0.0%	0	0.0%
Steelton (B)	34	17	3	8.8%	1	5.9%
Susquehanna (T)	112	72	29	25.9%	17	23.6%
Swatara (T)	146	95	0	0.0%	0	0.0%
Upper Paxton (T)	37	25	28	75.7%	17	68.0%
Washington (T)	34	27	29	85.3%	22	81.5%

Jurisdiction	Total Critical Facilities Located in Jurisdiction	Total Lifelines Located in Jurisdiction	Number of Critical Facilities and Lifeline Facilities Exposed to the Wildfire Urban Interface/Intermix Area			
			Critical Facilities	Percent of Total Critical Facilities	Lifelines	Percent of Total Lifelines
Wayne (T)	9	8	5	55.6%	4	50.0%
West Hanover (T)	48	31	12	25.0%	8	25.8%
Wiconisco (T)	15	11	12	80.0%	8	72.7%
Williams (T)	16	12	14	87.5%	11	91.7%
Williamstown (B)	10	6	3	30.0%	1	16.7%
Dauphin County (Total)	**1,729**	**1,149**	**384**	**22.2%**	**246**	**21.4%**

Source: Dauphin County GIS 2020; University of Wisconsin 2010
Notes: B – Borough; C – City; T – Township; % - Percent

Table 4.3.17-8. Number Lifelines Exposed to the Wildfire Urban Interface/Intermix Hazard Area

FEMA Lifeline Category	Total Number of Lifelines	Estimated Lifeline Exposed to Wildfire Urban Interface (WUI) Hazard Area	
		Wildfire Interface Area	Wildfire Intermix Area
		Number of Lifelines	Number of Lifelines
Communications	44	2	6
Energy	6	1	0
Food, Water, Shelter	60	10	5
Hazardous Material	237	29	14
Health and Medical	78	8	2
Safety and Security	595	105	**28**
Transportation	129	25	11
Dauphin County (Total)	**1,149**	**180**	**66**

Source: Dauphin County GIS 2020; University of Wisconsin 2010; FEMA 2020

Impact on the Economy

Wildfire events can have major economic impacts on a community from the initial loss of structures and the subsequent loss of revenue from destroyed business. These events may cost thousands of taxpayer dollars to suppress and control and may involve hundreds of operating hours on fire apparatus and thousands of volunteer man hours from the volunteer firefighters. There are also many direct and indirect costs to local businesses that excuse volunteers from working to fight these fires.

Wildfire can also severely damage roads and infrastructure. Portions of Interstates I-76, I-81, US Routes US-209, US-22, US-322, and State Routes PA-283, PA-443, PA-39, PA-25, PA-225, PA-147, PA-743, PA-325, PA-441, PA-230 run through WUI areas. This factor should be considered to determine evacuation routes for Dauphin County residents. Table 4.3.18-9 indicates the length of roadways exposed to wildfire.

Table 4.3.17-9. Roadways exposed to Wildfire Urban Intermix/Interface

Road Type	Total Miles for County	Roadway Miles Exposed to Flood Hazard Areas			
		Wildfire Interface Area		Wildfire Intermix Area	
		Miles	Percent of Total	Miles	Percent of Total
Interstate	81	4	4.9%	2	2.5%

Road Type	Total Miles for County	Roadway Miles Exposed to Flood Hazard Areas			
		Wildfire Interface Area		Wildfire Intermix Area	
		Miles	Percent of Total	Miles	Percent of Total
U.S. Highways	107	18	16.7%	8	7.5%
State Highways	205	47	22.9%	25	12.2%
Local Roads	1,595	302	18.9%	178	11.2%
Dauphin County (Total)	**1,988**	**371**	**18.7%**	**213**	**10.7%**

Source: PennDOT 2018; University of Wisconsin 2010

Impact on the Environment

According to the USGS, post-fire runoff polluted with debris and contaminants can be extremely harmful to ecosystem and aquatic life (Tecle A., Neary D. 2015). Studies show that urban fires, in particular, are more harmful to the environment than forest fires (Radeloff et al.. 2018). The age and density of infrastructure within Dauphin County can exacerbate consequences of fires on the environment because of the increased amount of chemicals and contaminants that would be released from burning infrastructure. These chemicals, such as iron, lead, and zinc, may leach into the storm water, contaminate nearby streams, and impair aquatic life.

Cascading Impacts on Other Hazards

Wildfires result in the uncontrolled destruction of forests, brush, field crops, grasslands, real estate, and personal property, and have secondary impacts on other hazards, such as flooding, by removing vegetation and impacting surface and groundwater quality. Additionally, wildfires can destroy infrastructure used to house hazardous substances. If these structures are destroyed, there is the risk of hazardous material release. Section 4.3.5 provides more information on these hazards.

Future Changes That May Impact Vulnerability

Understanding future changes that affect vulnerability in the County can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. Changes in the natural environment and built environment, and how these environments interact, can also provide insight about ways to plan for the future.

Projected Development

It is anticipated that any new development and new residents in the Wildfire Urban Intermix/Interface will be exposed to the wildfire hazard. Areas targeted for potential future growth and development in the next 5 years have been identified across the County at the municipal level.

Projected Changes in Population

Dauphin County has experienced population increase since 2010. According to the U.S. Census Bureau, the County's population has increased 2.4 percent between 2010 and 2018 (U.S. Census Bureau 2020). Royalton Borough and Rush Township have experienced the greatest population rise with an increase of 32.5-percent and 27.6-percent, respectively. These two jurisdictions currently have about 290 combined persons within the wildfire hazard area. If the population continues to increase, it is likely that number of exposed persons would as well.

Climate Change

According to USFS, climate change will likely alter the atmospheric patterns that affect fire weather. Changes in fire patterns will, in turn, affect carbon cycling, forest structure, and species composition. Climate change associated with elevated greenhouse gas concentrations may create an atmospheric and fuel environment that is more conducive to large, severe fires (USFS 2012).

Fire interacts with climate and vegetation (fuel) in predictable ways. Understanding the interactions of climate, fire, and vegetation is essential for addressing issues associated with climate change that include:

- Effects on regional circulation and other atmospheric patterns that affect fire weather
- Effects of changing fire regimes on the carbon cycle, forest structure, and species composition, and
- Complications from land use change, invasive species, and an increasing WUI (USFS 2012)

It is projected that higher summer temperatures will likely increase the fire risk by 10 to 30-percent. Fire occurrence and areas burned could increase across the United States as a result of the increase of lightning activity; the frequency of surface pressure and associated circulation patterns conducive to surface drying; and fire weather conditions, in general, which are conducive to severe wildfires. Warmer temperatures will also increase the effects of drought and increase the number of days each year with flammable fuels, extending fire seasons and areas burned (USFS 2012).

Pennsylvania's Department of Environmental Protection (PADEP) was directed by the Climate Change Act (Act 70 of 2008) to initiate a study of the potential impacts of global climate change on the Commonwealth. The June 2009 Pennsylvania Climate Impact Assessment's main findings indicate Pennsylvania may be at increased risk for wildfires; however, the findings could not determine how large the increase in risk would be (Shortle and others 2009).

Future changes in fire frequency and severity are difficult to predict. Global and regional climate changes associated with elevated greenhouse gas concentrations could alter large weather patterns, thereby affecting fire weather conditions that are conducive to extreme fire behavior (USFS 2012).

Change of Vulnerability Since the 2015 HMP

Since the 2015 HMP was drafted, updated hazard and inventory data has become available to assess the wildfire hazard in Dauphin County. This data includes the University of Wisconsin 2010 wildfire urban interface/intermix available at the Census block, the 5-Year 2014-2018 American Community Survey population estimates, and general building stock and critical facility data with RS Means 2020 building valuations. Overall, this vulnerability assessment uses a more accurate and updated asset inventory to provide a more accurate estimate of the County's exposure to the wildfire hazard.

4.3.18 Winter Storm

The following section provides the hazard profile (hazard description, location, extent, previous occurrences and losses, probability of future occurrences, and impact of climate change) and vulnerability assessment for the Winter Storm hazard in Dauphin County.

This section provides a profile and vulnerability assessment of the winter storm hazard in Dauphin County. Winter storms occur, on average, approximately five times each year in Pennsylvania. From November through March, Pennsylvania is exposed to winter storms that move up the Atlantic coast or sweep in from the west. Every county in the Commonwealth is vulnerable to severe winter storms; however, the northern tier, western counties, and mountainous regions tend to experience winter weather more frequently and with greater severity. Dauphin County does not fall within these areas.

Complications caused by winter storms can lead to road closures (especially secondary and farm roads); business losses to commercial centers built in outlying areas because of supply interruption and loss of customers; property losses and roof damages from snow and ice loading and fallen trees; utility interruptions; and loss of water supplies. Flooding can result from winter storm events as well. More information on flooding from winter storms can be found in Section 4.3.6 (Flood, Flash Flood, and Ice Jams hazard profile).

Most severe winter storm hazards include heavy snow (snowstorms), blizzards, sleet or freezing rain, ice storms, and mid-Atlantic cyclones locally known as Northeasters or Nor'easters. Because most Nor'easters generally occur during winter weather months, these hazards have also been grouped as a type of severe winter weather storm. Types of severe winter weather events or conditions are further defined as follows:

- **Heavy Snow:** According to the National Weather Service (NWS), heavy snow is generally considered snowfall accumulating to depth of 4 inches or more within 12 hours or less or snowfall accumulating to depth of 6 inches or more within 24 hours or less. A snow squall is an intense but limited-duration period of moderate to heavy snowfall, also known as a snowstorm, accompanied by strong, gusty surface winds and possibly lightning (generally moderate to heavy snow showers) (NWS 2009). Snowstorms are complex phenomena involving heavy snow and winds whose impact can be affected by a great many factors, including a region's climatological susceptibility to snowstorms, snowfall amounts, snowfall rates, wind speeds, temperatures, visibility, storm duration, topography, and occurrence during the course of the day, weekday versus weekend, and time of season (Kocin and Uccellini 2013).

- **Blizzard:** Blizzards are characterized by low temperatures, wind gusts of 35 miles per hour (mph) or more, and falling and/or blowing snow that reduces visibility to 0.25 mile or less for an extended period of time (3 or more hours) (NWS 2009). A severe blizzard is defined as having a wind velocity of 45 mph, temperatures of 10°F or lower, and a high density of blowing snow with visibility frequently measured in feet over an extended period of time.

- **Sleet or Freezing Rain:** Sleet is defined as pellets of ice composed of frozen or mostly frozen raindrops or refrozen, partially melted snowflakes. These pellets of ice usually bounce after hitting the ground or other hard surfaces. Freezing rain is rain that falls as a liquid but freezes into glaze upon contact with the ground. Both types of precipitation, even in small accumulations, can cause significant hazards to a community (NWS 2009).

- **Ice Storm:** An ice storm is described as an occasion when damaging volumes of ice are expected to accumulate during freezing rain situations. Significant accumulations of ice pull down trees and utility lines, resulting in loss of power and means of communication. These accumulations of ice render walking and driving extremely dangerous and can create extreme hazards to motorists and pedestrians (NWS 2009).

- **Nor'easter:** Nor'easters are macro-scale, extra-tropical storms named for the strong northeasterly winds that blow in from the Atlantic Ocean ahead of the storm and over coastal areas of the northeastern United States and Atlantic Canada. They are also referred to as a type of extra-tropical cyclone (mid-latitude storms or Great Lake storms). Wind gusts associated with Nor'easters can exceed hurricane forces in intensity. Unlike tropical cyclones that form in the tropics and have warm cores (including tropical depressions, tropical storms, and hurricanes), Nor'easters contain a cold core of low barometric pressure that forms in the mid-latitudes. Their strongest winds are close to the earth's surface and often extend several hundred miles across. Nor'easters may occur at any time of the year but are more common during fall and winter months (September through April) (NWS 2019).

  Nor'easters can induce heavy snow, rain, and gale-force winds that can cause structural damage, power outages, and unsafe human conditions. If a Nor'easter cyclone travels up the coast on an inland track, it is more impactful than if it stays just offshore. Nor'easters can be stronger if they stay offshore, but impacts are usually focused closer to the coast. Nor'easters that stay inland usually cause strong winds and rain. Those that stay offshore can bring heavy snow, blizzards, ice, and strong winds. In these storms, the warmer air is aloft. Precipitation falling from this warm air moves into the colder air at the surface, causing crippling sleet or freezing rain (McNoldy Multi-Community Environmental Storm Observatory [MESO], n.d.). While some of the most devastating effects of Nor'easters occur in coastal areas (e.g., beach erosion, coastal flooding), effects on inland areas like Dauphin County may include heavy snow, strong winds, and blizzards.

4.3.18.1 Location and Extent

Winter storms are regional events, most of which impact a large area of the entire Commonwealth. In many cases, surrounding states and even the northeast region of the United States is affected by a single winter storm incident.

The magnitude or severity of a severe winter storm depends on several factors, including a region's climatological susceptibility to snowstorms, snowfall amounts, snowfall rates, wind speeds, temperatures, visibility, storm duration, topography, time of occurrence during the day (e.g., weekday versus weekend), and time of season.

The extent of a severe winter storm can be classified by meteorological measurements and by evaluating its societal impacts. National Oceanic and Atmospheric Administration (NOAA)'s National Centers for Environmental Information (NCEI) is currently producing the Regional Snowfall Index (RSI) for significant snowstorms that affect the eastern two-thirds of the United States. The RSI ranks snowstorm impacts on a scale from 1 to 5. The index is based on spatial extent of the storm, amount of snowfall, and interaction of the extent and snowfall totals with population (based on the 2018 U.S. Census). NCEI has analyzed and assigned RSI values to over 500 storms since 1900 (NCEI 2011). Table 4.3.18-1 lists the five RSI ranking categories.

Table 4.3.18-1. RSI Ranking Categories

Category	Description	Regional Snowfall Index (RSI)
1	Notable	1–3
2	Significant	3–6
3	Major	6–10
4	Crippling	10–18
5	Extreme	18.0+

Source: NCEI 2011

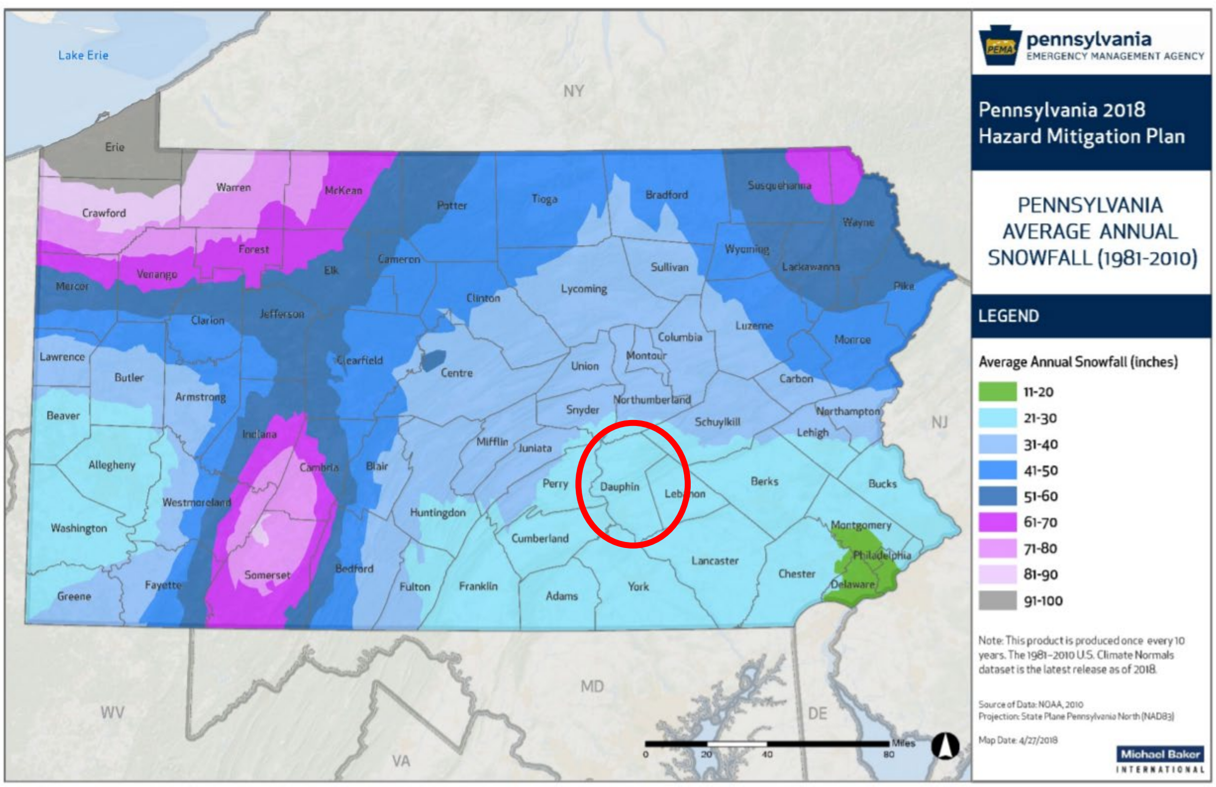
4.3.18.2 Range in Magnitude

A winter storm can adversely affect roadways, utilities, and businesses and can cause loss of life, frostbite, and freezing conditions. These storms typically fall into one of the following categories, defined in the previous section:

- Heavy snow
- Sleet or freezing rain
- Ice storm
- Blizzard
- Nor'easter

All of Dauphin County is susceptible to winter storms. Based on annual snowfall averages according to the 2018 State Hazard Mitigation Plan (HMP) (Figure 4.3.18-1), snowfall accumulation during the winter season in Dauphin County averages 21–30 inches.

Figure 4.3.18-1. Annual Snowfall



Source: Pennsylvania Emergency Management Agency (PEMA) 2018
Note: The red circle surrounds Dauphin County.

In the winter of 1993–1994, the state was hit by a series of protracted winter storms. The first of these winter storms occurred in early January, with a record snowfall depth in excess of 33 inches in the state, strong winds, and sleet/freezing rain. PPL stated it was the worst winter storm in the history of the company, and related damage repair cost exceeded $5,000,000. The March 1993 snowstorm has been referred to as the "storm of the century," where 20.4 inches of snow fell between March 13–15, 1993. The worst-case scenario of a winter storm in Dauphin County occurred on January 22–23, 2016, when 30.2 inches fell in the county, and nine deaths were reported in Pennsylvania.

4.3.18.3 Past Occurrence

Many sources provided historical information regarding previous occurrences and losses associated with winter storm events throughout the Commonwealth of Pennsylvania and Dauphin County. With so many sources reviewed for the purpose of this plan, loss and impact information for many events varied depending on the source. Therefore, accuracy of monetary figures discussed is based only on available information identified during research for this plan. Monetary figures may also have been calculated for the region as a whole, based on entire storm damage, and include damage from other counties.

Between 1954 and 2020, the Federal Emergency Management Agency (FEMA) declared that the Commonwealth of Pennsylvania experienced eight winter storm-related disasters (DR) or emergencies (EM) classified as one or a combination of the following disaster types: severe winter storms, snowstorms, blizzards, winter storms, severe storms, and snowfalls. Generally, these disasters covered a wide region of the Commonwealth, and therefore may have impacted many counties. However, not all counties were included in the disaster declarations. PEMA and other sources indicate that Dauphin County has been declared as a disaster area as a result of six of the declarations for winter storm events (FEMA 2020).

According to the NOAA-NCEI storm events database, Dauphin County experienced 52 major winter storm events between March 1993 and December 2020. Based on all sources researched, known winter storm events that have affected Dauphin County are listed in Table 4.3.18-2. Because winter storm documentation for the Commonwealth of Pennsylvania is so extensive, not all sources have been identified or researched. Therefore, Table 4.3.18-2 may not include all events that have occurred throughout the county.

Table 4.3.18-2. Major Winter Storm Events in Dauphin County between 1993 and 2020

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts
March 13–17, 1993	Blizzard	EM-3105	Yes	A winter storm with heavy snowfall occurred in Dauphin County and other counties through Pennsylvania. Nearly 20.4 inches fell within the county.
January 4–February 25, 1994	Winter Storm, Severe Storm	DR-1015	Yes	A winter storm affected several counties in Pennsylvania including Dauphin with freezing temperatures and more than 15 inches of snow.
January 6–12, 1996	Blizzard	DR-1085	Yes	More than 2 feet of snow fell across the county. The storm was termed the Blizzard of '96. Transportation and commerce came to a halt as cities of south-central PA were buried under heavy snow. New snow of 38 inches was reported in southern York County at Glenville. 2 feet or more was reported near Harrisburg. The storm had a major impact on commerce across south-central PA and was to set the stage for the Great Flood on January 19.
January12–13, 1996	Heavy Snow	N/A	No	A foot of snow fell in Harrisburg, and snow in excess of 1 1/2 feet fell across areas from Sunbury northward to Muncy and Laporte.
November 28, 1996	Heavy Snow	N/A	No	One to two inches of snow fell across the county with hundreds of traffic accidents and injuries.
December 5–6, 1996	Heavy Snow	No	No	5.8 inches of snow fell on Harrisburg.
February 13, 1997	Winter Storm	N/A	N/A	3 to 7 inches of snow fell across the area with an ice coating on top.
January 2, 1999	Winer Storm	N/A	N/A	Maximum sustained wind speed was 17.26 MPH, no damages were reported
January 8, 1999	Winter Storm	N/A	N/A	A minimum temperature of 17.6 degrees Fahrenheit was reported.
January 14, 1999	Winter Storm	N/A	N/A	A minimum temperature of 12 degrees Fahrenheit was reported for Harrisburg.

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts
March 14, 1999	Heavy Snow	N/A	N/A	8.3 inches of snow were reported.
January 25, 2000	Heavy Snow	N/A	N/A	0-4 inches of snow was recorded for Dauphin County.
January 30–31, 2000	Heavy Snow	N/A	N/A	Temperatures ranged from 17-26 degrees Fahrenheit.
February 13, 2000	Ice Storm	N/A	N/A	Temperatures as low as 19 degrees Fahrenheit were reported for the county.
February 18–19, 2000	Winter Storm	N/A	N/A	A maximum sustained wind speed of 11.39 MPH were reported with a visibility of 3.2 miles.
December 13–14, 2000	Winter Storm	N/A	N/A	Temperatures as low as 15 degrees Fahrenheit were reported for Dauphin County.
March 4–7, 2001	Heavy Snow	N/A	N/A	Maximum wind speed of 23 MPH was reported, about one inch of snow fell across the county.
January 6–7, 2002	Heavy Snow	N/A	N/A	Less than an inch of snow fell throughout the county.
December 5, 2002	Heavy Snow	N/A	N/A	5-7 inches of snow fell throughout Dauphin County.
December 25, 2002	Heavy Snow	N/A	N/A	Less than an inch of snow fell throughout the county with a visibility of 2.1 miles.
February 6–7, 2003	Heavy Snow	N/A	N/A	5 to 8 inches of snow fell across the county.
February 14–19, 2003	Heavy Snow	EM-3180	Yes	Total snowfall accumulations ranged from 22 to 30 inches. Some power outages were reported.
December 5–6, 2003	Heavy Snow	N/A	N/A	15–30 inches were reported for Dauphin County.
March 19, 2004	Heavy Snow	N/A	N/A	About a half inch of snow fell in Harrisburg.
January 22–23, 2005	Winer Storm	N/A	N/A	Low temperatures were in the single numbers with below zero low temperatures in parts of the county.
February 24–25, 2005	Heavy Snow	N/A	N/A	3-7 inches of snow fell throughout the county.
March 1–2, 2005	Heavy Snow	N/A	N/A	6-12 inches of snow fell throughout the county.
December 9, 2005	Heavy Snow	N/A	N/A	Less than an inch of snow fell throughout the county.
February 13–14, 2007	Winter Storm	N/A	N/A	In Dauphin County, a mix of sleet and freezing rain fell in addition to 6 to 9 inches of snow.
March 16–17, 2007	Heavy Snow	N/A	N/A	7-10 inches of heavy snow fell throughout the county.
December 15–16, 2007	Winer Storm	N/A	N/A	A quarter to one-half inch of ice build-up brought down numerous trees and wires across the southern half of Dauphin County. Over 25,000 customers were without power in the county.
February 1, 2008	Winter Storm	N/A	N/A	Over a quarter-inch of freezing rain and sleet fell across the county.
February 12, 2008	Ice Storm	N/A	N/A	A wintry mix of sleet and freezing rain affected Central Pennsylvania with significant ice accumulations ranging from a quarter to one-half inch.
January 6, 2009	Ice Storm	N/A	N/A	A prolonged period of freezing rain resulted in a significant ice accumulation across much of Central Pennsylvania. Many locations received one quarter to one half inch of ice accumulation. The icing caused sporadic power outages and brought down several tree limbs.
January 27–28, 2009	Winter Storm	N/A	N/A	1-3 inches of snow and sleet along with a significant ice accretion was reported.
December 19, 2009	Winter Storm	N/A	N/A	Total snow accumulations ranged from 6 to 9 inches.

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts
February 5–11, 2010	Winter Storm	DR-1898	Yes	Storm total snow accumulation ranged from 15 to 20 inches
January 26, 2011	Heavy Snow	N/A	N/A	Snowfall totals up to 6 inches were observed in the southern half of the county
February 1-2, 2001	Winter Storm	N/A	N/A	Snow and sleet accumulation were around 1 to 2 inches
October 29, 2011	Heavy Snow	N/A	N/A	Snow accumulations ranged from 4 to 8 inches. There were more than a half-million (520,000) power outages state-wide at the height of the storm.
December 14–15, 2013	Winter Storm	N/A	N/A	Snow, sleet, and freezing rain/drizzle with over a quarter-inch of ice topping storm total snow accumulations between 3 and 6 inches. The mixed wintry precipitation adversely impacted travel, especially along the PA Turnpike and I-81 corridors.
February 3, 2014	Heavy Snow	N/A	N/A	Heavy snow accumulations ranged from 4 to 8 inches.
February 4–5, 2014	Winter Storm	N/A	N/A	Snow accumulations ranged from 1 to 2 inches. Ice accumulations from sleet and heavy freezing rain averaged between 0.25 and 0.50 inches.
February 13–14, 2014	Heavy Snow	N/A	N/A	Storm total snow accumulations ranged from 8 to 12 inches.
November 25–26, 2014	Heavy Snow	N/A	N/A	A high-impact snowfall of 3 to 6 inches fell across the county.
January 22-23, 2016	Winter Storm	DR-4267	Yes	Heavy snowfall amounts of 30.2 inches were observed across the county. A Halifax man suffered cardiac arrest and died while shoveling snow.
February 15–16, 2016	Winter Storm	N/A	N/A	A quarter of an inch or more of ice accumulation was observed across the county.
January 29 2017	Winter Storm	N/A	N/A	Select school closures throughout the county.
February 8–9, 2017	Winter Storm	N/A	N/A	A winter storm produced 4 to 8 inches of snow from south to north across Dauphin County. All schools in the county were closed.
March 13–14, 2017	Winter Storm	N/A	N/A	A winter storm produced 15-20 inches of snow across Dauphin County.
January 16, 2018	Winter Storm	N/A	N/A	Northern Dauphin County snowstorm and school closures.
February 17, 2018	Winter Storm	N/A	N/A	A winter storm produced 6 to 7 inches of snow in a 12-hour period across Dauphin County.
March 20–21, 2018	Winter Storm	N/A	N/A	A winter storm produced 10 to 15 inches of snow in a 24-hour period across Dauphin County
November 15–16, 2018	Winter Storm	N/A	N/A	A winter storm produced 6 to 10 inches of snow and sleet across Dauphin County.
February 11–12, 2019	Winter Storm	N/A	N/A	A winter storm produced 3 to 5 inches of snow and sleet, and greater than 0.25 of freezing rain across Dauphin County.
February 20–21, 2019	Winter Storm	N/A	N/A	A winter storm produced 4 to 6 inches of snow and sleet followed by greater than 0.25 of freezing rain across Dauphin County.
March 3–4, 2019	Winter Storm	N/A	N/A	A winter storm produced up to 6 inches of snow across Dauphin County.

Source: FEMA 2020, NOAA-NCEI 2020.

Notes:

Monetary figures within this table were U.S. Dollar (USD) figures calculated during or within the approximate time of the event. If such an event would occur in the present day, many monetary losses earlier than 2017 would be considerably higher in USDs as a result of increased U.S. Inflation Rates.

DR	Federal Disaster Declaration	NCEI	National Centers for Environmental Information

FEMA	Federal Emergency Management Agency	NOAA	National Oceanic Atmospheric Administration
N/A	Not applicable/available		

4.3.18.4 Future Occurrence

Apparently, given the history of winter storm events that have impacted Dauphin County, future winter storm events of varying degrees will occur every year, and thus many people and properties are at risk from the winter storm hazard in the future.

Based on available historical data, future occurrences of winter storm events are considered likely, according to Risk Factor Methodology probability criteria (further discussed in Section 4.4).

4.3.18.5 Vulnerability Assessment

All of Dauphin County is vulnerable to severe winter storm events. The following subsections discuss Dauphin County's vulnerability, in a qualitative nature, to the severe winter weather hazard.

Impact on Life, Health, and Safety

According to the NOAA National Severe Storms Laboratory (NSSL), winter weather indirectly and deceptively kills hundreds of people in the United States every year, primarily from automobile accidents, overexertion, and exposure. Winter storms are often accompanied by strong winds creating blizzard conditions with blinding wind-driven snow, drifting snow, extreme cold temperatures, and dangerous wind chill. Winter storms are considered deceptive killers because most deaths and other impacts or losses are indirectly related to the storm. People can die in traffic accidents on icy roads, of heart attacks while shoveling snow, or of hypothermia from prolonged exposure to cold.

Heavy snow can immobilize a region and paralyze a city, shutting down air and rail transportation, stopping flow of supplies, and disrupting medical and emergency services. Accumulations of snow can collapse buildings and knock down trees and power lines. In rural areas, homes and farms may be isolated for days, and unprotected livestock may be lost. In the mountains, heavy snow can lead to avalanches (NSSL 2015c).

Heavy accumulations of ice can bring down trees, electrical wires, telephone poles and lines, and communication towers. Communications and power can be disrupted for days while utility companies work to repair the extensive damage. Even small accumulations of ice may cause extreme hazards to motorists and pedestrians. Bridges and overpasses are particularly dangerous because they freeze before other surfaces (NSSL 2015c).

For the purposes of this HMP, the entire population of Dauphin County is considered exposed to winter storm events (U.S. Census 2018). The elderly are considered most susceptible to this hazard because of their increased risk of injuries and death from falls and overexertion, and/or hypothermia from exposure while attempting to clear snow and ice. In addition, winter storm events can reduce ability of these populations to access emergency services. Residents with low incomes may not have access to housing, or their housing may be less able to withstand cold temperatures (e.g., homes with poor insulation and heating supply). The County Profile (Section 2) of this HMP provides population statistics regarding each participating municipality and a summary of the more vulnerable populations (over the age of 65 and individuals living below the U.S. Census poverty threshold).

Impact on General Building Stock

The entire general building stock inventory in Dauphin County is exposed and vulnerable to the winter storm hazard. In general, structural impacts include damage to roofs and building frames rather than building content. Current modeling tools are not available to estimate specific losses from this hazard. As an alternate approach, this plan considers percentage damages that could result from winter storm conditions. Table 4.3.18-3 below summarizes percent damages from winter storm conditions on Dauphin County's total general building stock.. Given professional knowledge and currently available information, potential losses from this hazard are considered overestimated; hence, the listed values in Table 4.3.18-3 represent conservative estimates of losses associated with severe winter storm events.

Table 4.3.18-3. General Building Stock Exposure and Estimated Losses from Winter Storm Events in Dauphin County

Jurisdiction	Number of Buildings	Total Replacement Cost Value	1-Percent of Total Replacement Cost Value	5-Percent of Total Replacement Cost Value	10-Percent of Total Replacement Cost Value
Berrysburg (B)	366	$131,114,498	$1,311,145	$6,555,725	$13,111,450
Conewago (T)	2,495	$1,131,218,434	$11,312,184	$56,560,922	$113,121,843
Dauphin (B)	456	$160,174,274	$1,601,743	$8,008,714	$16,017,427
Derry (T)	11,617	$13,980,976,171	$139,809,762	$699,048,809	$1,398,097,617
East Hanover (T)	5,054	$2,617,412,647	$26,174,126	$130,870,632	$261,741,265
Elizabethville (B)	949	$396,035,763	$3,960,358	$19,801,788	$39,603,576
Gratz (B)	715	$432,294,298	$4,322,943	$21,614,715	$43,229,430
Halifax (B)	469	$181,049,719	$1,810,497	$9,052,486	$18,104,972
Halifax (T)	3,457	$1,457,192,513	$14,571,925	$72,859,626	$145,719,251
Harrisburg (C)	18,718	$15,182,832,338	$151,828,323	$759,141,617	$1,518,283,234
Highspire (B)	1,374	$550,466,766	$5,504,668	$27,523,338	$55,046,677
Hummelstown (B)	2,337	$1,082,835,134	$10,828,351	$54,141,757	$108,283,513
Jackson (T)	2,371	$776,111,853	$7,761,119	$38,805,593	$77,611,185
Jefferson (T)	666	$230,110,295	$2,301,103	$11,505,515	$23,011,029
Londonderry (T)	5,080	$2,360,384,847	$23,603,848	$118,019,242	$236,038,485
Lower Paxton (T)	20,948	$14,635,453,846	$146,354,538	$731,772,692	$1,463,545,385
Lower Swatara (T)	4,771	$5,522,875,069	$55,228,751	$276,143,753	$552,287,507
Lykens (B)	1,322	$517,534,065	$5,175,341	$25,876,703	$51,753,406
Lykens (T)	2,155	$941,126,374	$9,411,264	$47,056,319	$94,112,637
Middle Paxton (T)	4,093	$1,462,655,724	$14,626,557	$73,132,786	$146,265,572
Middletown (B)	3,582	$1,981,507,138	$19,815,071	$99,075,357	$198,150,714
Mifflin (T)	1,125	$603,453,937	$6,034,539	$30,172,697	$60,345,394
Millersburg (B)	1,439	$770,504,424	$7,705,044	$38,525,221	$77,050,442
Paxtang (B)	869	$403,915,987	$4,039,160	$20,195,799	$40,391,599
Penbrook (B)	1525	$602,189,726	$6,021,897	$30,109,486	$60,218,973
Pillow (B)	301	$101,661,910	$1,016,619	$5,083,096	$10,166,191
Reed (T)	299	$117,139,877	$1,171,399	$5,856,994	$11,713,988
Royalton (B)	630	$196,935,626	$1,969,356	$9,846,781	$19,693,563

Jurisdiction	Number of Buildings	Total Replacement Cost Value	1-Percent of Total Replacement Cost Value	5-Percent of Total Replacement Cost Value	10-Percent of Total Replacement Cost Value
Rush (T)	343	$71,032,585	$710,326	$3,551,629	$7,103,259
South Hanover (T)	3,972	$1,935,844,099	$19,358,441	$96,792,205	$193,584,410
Steelton (B)	2,721	$2,111,932,612	$21,119,326	$105,596,631	$211,193,261
Susquehanna (T)	11,785	$8,633,889,539	$86,338,895	$431,694,477	$863,388,954
Swatara (T)	11,354	$8,581,237,561	$85,812,376	$429,061,878	$858,123,756
Upper Paxton (T)	3,560	$1,473,328,502	$14,733,285	$73,666,425	$147,332,850
Washington (T)	2,270	$1,106,223,564	$11,062,236	$55,311,178	$110,622,356
Wayne (T)	1,324	$398,741,088	$3,987,411	$19,937,054	$39,874,109
West Hanover (T)	6505	$3,228,343,376	$32,283,434	$161,417,169	$322,834,338
Wiconisco (T)	995	$297,597,257	$2,975,973	$14,879,863	$29,759,726
Williams (T)	957	$390,058,854	$3,900,589	$19,502,943	$39,005,885
Williamstown (B)	908	$345,185,743	$3,451,857	$17,259,287	$34,518,574
Dauphin County (Total)	**145,877**	**$97,100,578,032**	**$971,005,780**	**$4,855,028,902**	**$9,710,057,803**

Source: Dauphin County GIS 2020; RS Means 2020
Notes: B – Borough; C – City; T – Township; % - Percent

An area especially vulnerable to the winter storm hazard is the floodplain. At-risk building stock and infrastructure in floodplains are presented in the flood hazard profile (Section 4.3.6). Generally, losses from flooding associated with winter storms should be less than those associated with a 1 percent or 0.2 percent flood. Snow and ice melt can cause both riverine and urban flooding. Estimated losses caused by riverine flooding in the county are discussed in Section 4.3.6.

Impact on Critical Facilities

Full functionality of critical facilities such as police, fire, and medical services is essential for response during and after a winter storm event. These critical facility structures are largely constructed of concrete and masonry; therefore, these should undergo only minimal structural damage from severe winter storm events. Because power interruption can occur, backup power is recommended for critical facilities and infrastructure.

Impact on the Economy

Infrastructure at risk from the winter storm hazard includes roadways that could be damaged by application of salt and intermittent freezing and warming conditions that can damage roads over time. Costs of snow and ice removals, as well as repairs of roads undergoing freeze/thaw cycles, can drain local financial resources. Potential secondary impacts from winter storms also impact the local economy, including loss of utilities, interruption of transportation corridors, and loss of business function.

Impact on the Environment

Environmental impacts often include damage to trees and shrubs caused by heavy snow loading, ice build-up, and/or high winds, which can break limbs and down large trees. Indirect effects of winter storms include possible damage to surfaces and contamination of groundwater adjacent to roadway surfaces treated with salt, chemicals, and other de-icing materials (PEMA 2013).

Winter storms have a positive environmental impact: gradual melting of snow and ice recharges groundwater. However, abrupt high temperatures following a heavy snowfall can accelerate snowmelt, leading to rapid surface water runoff and severe flooding (PEMA 2013).

Future Changes That May Impact Vulnerability

Understanding future changes that impact vulnerability in the County can assist in planning for future development and ensure that appropriate mitigation, planning, and preparedness measures are in place. The County considered the following factors to examine potential conditions that can affect hazard vulnerability:

- Potential or projected development.
- Projected changes in population.
- Other identified conditions as relevant and appropriate, including the impacts of climate change.

Projected Development

Growth areas have been identified across Dauphin County (refer to Section 4.4). Any areas of growth could be potentially impacted by the severe winter storm hazard because the entire planning area is exposed and vulnerable. However, due to increased standards and codes, new development may be less vulnerable to the hazard.

Projected Changes in Population

Estimated population projections provided by the Center of Rural Pennsylvania indicates that Dauphin's population will continue to increase into 2040, increasing total population to approximately 296,766 persons (The Center of Rural Pennsylvania 2013). This is approximately a 10.6-percent increase from the County's 2010 population. As more persons move into flood zones, an increased amount of the population will be vulnerable to flood hazards.

Climate Change

Climate is defined not just as average temperature and precipitation, but also by type, frequency, and intensity of weather events. Both globally and at the local level, climate change potentially can alter prevalence and severity of weather extremes such as winter storms. While predicting changes in winter storm events under a changing climate is difficult, understanding vulnerabilities to potential changes is a critical part of estimating future climate change impacts on human health, society, and the environment.

The climate of Pennsylvania has changed in several ways. Over the past 100 years, annual average temperatures have been rising across the Commonwealth. Warmer winters have led to decrease in snow cover and earlier arrival of spring. Recent analyses based on the Intergovernmental Panel on Climate Change models suggest a decrease in frequency and an increase in intensity of extra-tropical winter cyclones. However, based on the methodology applied, some models show no significant change in the storm track, whereas others indicate a northward displacement of the storm track in the North Atlantic. For the mid-Atlantic region, there is little indication of a change in storm activity or track over Pennsylvania. An overall increase in winter precipitation is anticipated, with decrease in snow and increase in rain during the winter months. Projections regarding future occurrences of extra-tropical cyclones in Pennsylvania are substantially uncertain. Based on available information and projections, winter storms are anticipated to continue to affect Pennsylvania in the future. Future improvements in modeling smaller-scale climatic processes can be expected and will lead to improved understanding of ways in which changing climate will alter temperature, precipitation, and storm events in Pennsylvania (Shortle and Others 2009).

Vulnerability Change Since the 2015 HMP

Overall, the County's exposure and vulnerability have not changed, and the entire County will continue to be exposed and vulnerable to severe winter storm events.

4.4 HAZARD VULNERABILITY SUMMARY

This section describes the methodology and tools used to support the risk assessment process.

4.4.1 Methodology

A risk assessment is a process that involves measuring the potential loss of life, personal injury, economic losses, and property damage resulting from identified hazards. It allows planning personnel to address and reduce hazard impacts and emergency management personnel to establish early response priorities by identifying potential hazards and vulnerable assets. Results of the risk assessment are used in subsequent mitigation planning processes, including determining and prioritizing mitigation actions that reduce each jurisdiction's risk to a specified hazard. Past, present, and future conditions must be evaluated to assess risk most accurately for the county and each jurisdiction. The process focuses on the following elements:

- **Hazard Identification** – Use all available information to determine what types of hazards might affect a jurisdiction
- **Profile Each Hazard** – Understand each hazard in terms of:
  - Location – geographic area most affected by the hazard
  - Extent – severity of each hazard
  - Range of magnitude
  - Previous occurrences and losses
  - Probability of future hazard events
- **Assess Vulnerability**
  - **Exposure identification** – Estimate the total number of assets in the jurisdiction that are likely to experience a hazard event if it occurs by overlaying hazard maps with the asset inventories.
  - **Vulnerability identification and loss estimation** – Assess the impact of hazard events on the people, property, environment, economy, and lands of the region, including estimates of the cost of potential damage or cost that can be avoided by mitigation.

The following summarizes the asset inventories, methodology, and tools used to support the risk assessment process.

Asset Inventories

Dauphin County assets were identified to assess potential exposure and loss associated with the hazards of concern. For the Hazard Mitigation Plan (HMP) update, Dauphin County assessed the vulnerability of the following types of assets: population, buildings and critical facilities/infrastructure, and the environment. Some assets are more vulnerable because of their physical characteristics or socioeconomic uses. To protect individual privacy and the security of critical facilities, information on properties assessed is presented in aggregate without details about specific individual personal or public properties.

Population

Total population statistics from the 2014-2018 American Community Survey (ACS) 5-year estimate were used to estimate the exposure and potential impacts to the county's population in place of the 2010 U.S. Census block estimates. Borough, city, and township populations were extracted directly from ACS. Population counts at the jurisdictional level were averaged among the residential structures in the county to estimate the population at the structure level. This estimate is a more precise distribution of population across the county compared to only using the Census block or Census tract boundaries. Limitations of these analyses are recognized, and thus the results are used only to provide a general estimate for planning purposes.

As discussed in Section 2 (County Profile), research has shown that some populations are at greater risk from hazard events because of decreased resources or physical abilities. Vulnerable populations in Dauphin County included in the risk assessment are children, elderly, population below the poverty level, non-English speaking individuals, and persons institutionalized with a disability.

Buildings

A custom general building stock was created countywide. The building inventory attributes were completed using parcel tax assessor information provided by Dauphin County Geographic Information System (GIS). Attributes provided in the spatial files were used to further define each structure, such as year built, number of stories, basement type, occupancy class, and square footage. The centroid of each building footprint was used to estimate the building location. Structural and content replacement cost values (RCV) were calculated for each building using the available assessor data, the building footprint, and RSMeans 2020 values. The analysis used the location factors associated with the zip codes that are in the county. There were three zip codes within Dauphin County: 179XX/170XX/171XX. Therefore, the zip codes' associated location factors of.96/1.0/1.0 and.90/.90/.90 were applied for residential occupancy and non-residential occupancy classes, respectively. Replacement cost value is the current cost of returning an asset to its pre-damaged condition using present-day cost of labor and materials. Total replacement cost value consists of both the structural cost to replace a building and the estimated value of contents of a building. The occupancy classes available in Hazus were condensed into the categories of residential, commercial, industrial, agricultural, religious, governmental, and educational to facilitate analysis and presentation of results. Residential loss estimates addressed both multi-family and single-family dwellings.

Critical Facilities

The critical facility inventory, which includes essential facilities, utilities, transportation features, and user-defined facilities as outlined in Section 2, was updated beginning with all GIS data provided by the Dauphin County. To protect individual privacy and the security of assets, information is presented in aggregate, without details about specific individual properties or facilities. The default inventory in Hazus was updated with the critical facility inventory generated for this plan.

New Development

The county has identified Suburban Core, Rural Core, and Urban Growth Areas, as described in Section 4.4.4, below. The 2018 American Community Survey estimates that Dauphin County has seen construction of 2,615 housing units from 2014 to 2018 (ACS 2018).

Methodology

To address the requirements of the DMA 2000 and better understand potential vulnerability and losses associated with hazards of concern, Dauphin County used standardized tools, combined with local, state, and federal data and expertise to conduct the risk assessment. Three different levels of analysis were used depending upon the data available for each hazard as described below.

1. ***Historical Occurrences and Qualitative Analysis*** – *This analysis includes an examination of historical impacts to understand potential impacts of future events of similar size. In addition, potential impacts and losses are discussed qualitatively using best available data and professional judgment.*
2. ***Exposure Assessment*** – *This analysis involves overlaying available spatial hazard layers, or hazards with defined extent and locations, with assets in GIS to determine which assets are located*

in the impact area of the hazard. The analysis highlights which assets might be affected by the hazard. If the center of each asset is located in the hazard area, it is deemed exposed and potentially vulnerable to the hazard.

3. ***Loss estimation** – The FEMA HAZUS modeling software was used to estimate potential losses for the following hazards: Flood, Earthquake, Hurricane (Wind). In addition, an examination of historical impacts and an exposure assessment was conducted for these spatially delineated hazards.*

Table 4.4-1. Summary of Risk Assessment Analyses

Hazard	Data Analyzed			
	Population	General Building Stock	Critical Facilities	Environment
Building Collapse	Q	Q	Q	Q
Cyber Attack	Q	Q	Q	Q
Dam Failure	E	E	E	Q
Drought and Water Supply Deficiencies	Q	Q	Q	Q
Environmental Hazard Hazardous Materials Release	E	E	E	Q
Flood, Flash Flood, Ice Jam	E, H	E, H	E, H	Q
Hurricane Tropical Storm	H	H	H	Q
Invasive Species	Q	Q	Q	Q
Landslide	E	E	E	Q
Opioid Addiction Response	Q	Q	Q	Q
Pandemic and Infectious Disease	Q	Q	Q	Q
Radon Exposure	Q	Q	Q	Q
Subsidence and Sinkholes	E	E	E	Q
Tornado, Windstorm	Q	Q	Q	Q
Transportation Accident	Q	Q	Q	Q
Utility Interruption	Q	Q	Q	Q
Wildfire	E	E	E	Q
Winter Storm	Q	Q	Q	Q

E – Exposure analysis; H – HAZUS analysis; Q – Qualitative analysis

Hazards U.S. – Multi-Hazard (HAZUS)

In 1997, FEMA developed a standardized model for estimating losses caused by earthquakes, known as Hazards U.S. or Hazus. Hazus was developed in response to the need for more effective national-, state-, and community-level planning and for identification of areas that face the highest risk and potential for loss. Hazus was expanded into a multi-hazard methodology, Hazus, with new models for estimating potential losses from wind (severe storms) and flood (riverine) hazards. Hazus is a GIS-based software tool that applies engineering and scientific risk calculations, which have been developed by hazard and information technology experts, to provide defensible damage and loss estimates. These methodologies are accepted by FEMA and provide a consistent framework for assessing risk across a variety of hazards. The GIS framework also supports the evaluation of hazards and assessment of inventory and loss estimates for these hazards.

Hazus uses GIS technology to produce damage reports, detailed maps, and analytical reports that estimate a community's direct physical damage to building stock, critical facilities, transportation systems, and utility systems. To generate this information, Hazus uses default Hazus provided data for inventory, vulnerability, and hazards. This default data can be supplemented with local data to provide a more refined analysis. Damage reports can include induced damage (inundation, fire, threats posed by hazardous materials and debris) and direct economic and social losses (casualties, shelter requirements, economic impact) depending on the hazard and available local data. Hazus' open data architecture can be used to manage community GIS data in a central location. The use of this software also promotes consistency of data output now and in the future and standardization of data collection and storage. More information on Hazus is available at http://www.fema.gov/hazus.

In general, probabilistic analyses were performed to develop expected and estimated distribution of losses (mean return period losses) for the flood and wind hazards. The probabilistic model generates estimated damages and losses for specified return periods (e.g., 100- and 500-year). For annualized losses, Hazus calculates the maximum potential annual dollar loss resulting from various return periods averaged on a per year basis. The model sums all Hazus-supplied return periods (e.g., 10, 50, 100, 200, 500) multiplied by the return period probability (as a weighted calculation) to calculate the estimated cost of a hazard each year. Table 5.1-2 displays the various levels of analyses that can be conducted using the Hazus software.

Table 4.4-2. Summary of HAZUS Analysis Levels

Hazus-MH Analysis Levels	
Level 1	*Hazus-MH provided hazard and inventory data with minimal outside data collection or mapping.*
Level 2	*Analysis involves augmenting the Hazus-MH provided hazard and inventory data with more recent or detailed data for the study region, referred to as local data.*
Level 3	*Analysis involves adjusting the built-in loss estimation models used for the hazard loss analyses and is typically done in conjunction with the use of local data.*

Source: FEMA 2019

Dam Failure

To assess the vulnerability of Dauphin County to dam failure, an exposure assessment was conducted. The county's assets (population, buildings, and critical facilities) were analyzed to determine if they were within the dam inundation areas. Dam Safety organizations and regulations, including the PADEP, FEMA, U.S. Army Corps of Engineers, and Federal Energy Regulatory Commission were examined.

Environmental Hazard – Hazardous Material Release

Overall, potential losses from hazardous materials incidents are difficult to quantify due to the many variables and human elements. Data regarding this hazard were obtained from Dauphin County and the Planning Partnership as well as appropriate state and federal resources.

The exposure analysis was conducted for the county's assets (population, building stock, critical facilities) using a radius around potential hazardous materials incident sites as follows: exposure within a half-mile of major roadways, railways, and pipelines, as well as exposure within unique radii supplied by the county for hazardous material facilities.

Flood, Flash Flood, Ice Jam

The 1 percent and 0.2 percent annual chance flood events were examined to evaluate the county's risk from the flood hazard. These flood events are generally those considered by planners and evaluated under federal programs such as NFIP.

The following data was used to evaluate exposure and determine potential future losses for this plan update:

- The effective Dauphin County FEMA Digital Flood Insurance Rate Maps (DFIRMs) dated August 2012.
- The 1 percent annual chance flood depth grid generated using the 2012 FEMA DFIRM and Dauphin County Digital Elevation Model (DEM).

The effective Dauphin County FEMA DFIRM published in 2012 was used to evaluate exposure and determine potential future losses. The depth grid was integrated into the Hazus riverine flood model used to estimate potential losses for the 1 percent annual chance flood event.

To estimate exposure to the 1 percent- and 0.2 percent annual chance flood events, the DFIRM flood boundaries were overlaid on the centroids of updated assets (population, building stock, and critical facilities). Centroids that intersected the flood boundaries were totaled to estimate the building replacement cost value and population vulnerable to the flood inundation areas. A Level 2 Hazus riverine flood analysis was performed. Both the critical facility and building inventories were formatted to be compatible with Hazus and its Comprehensive Data Management System (CDMS). Once updated with the inventories, the Hazus riverine flood model was run to estimate potential losses in Dauphin County for the 1 percent annual chance flood events. A user-defined analysis was also performed for the building stock. Buildings located within the floodplain were imported as user-defined facilities to estimate potential losses to the building stock at the structural level. Hazus calculated the estimated potential losses to the population (default 2010 U.S. Census data across dasymetric blocks), potential damages to the general building stock, and potential damages to critical facility inventories based on the depth grids generated and the default Hazus damage functions in the flood model.

Hurricane

A Hazus probabilistic analysis was performed to analyze the wind hazard losses for Dauphin County for the 500-year mean return period (MRP) event. The probabilistic Hazus hurricane model activates a database of thousands of potential storms that have tracks and intensities reflecting the full spectrum of Atlantic hurricanes observed since 1886 and identifies those with tracks associated with Dauphin County. Hazus contains data on historic hurricane events and wind speeds. It also includes surface roughness and vegetation (tree coverage) maps for the area. Surface roughness and vegetation data support the modeling of wind force across various types of land surfaces. Default demographic and updated building and critical facility inventories in Hazus were used for the analysis. Although damages are estimated at the Census tract level, results were presented at the municipal level. Since there are multiple Census tracts that contain more than one jurisdiction, a density analysis was used to extract the percent of building structures that fall within each tract and jurisdiction. The percentage was multiplied against the results calculated for each tract and summed for each jurisdiction.

Wildfire

The Wildfire-Urban Interface (Interface and Intermix) obtained through the SILVIS Laboratory, Department of Forest Ecology and Management, University of Wisconsin – Madison, was referenced to delineate wildfire hazard areas. The University of Wisconsin – Madison wildland fire hazard areas are based on the 2010 Census and 2006 National Land Cover Dataset and the Protected Areas Database. For this risk assessment, the high-, medium-, and low-density interface areas were combined and used as the "Interface" hazard area, and the high-, medium-, and low-density intermix areas were combined and used as the "Intermix" hazard areas.

Asset data (population, building stock, and critical facilities) presented in the County Profile (Section 2) were used to support an evaluation of assets exposed and potential impacts and losses associated with this hazard. To determine what assets are exposed to wildfire, available and appropriate GIS data were overlaid with the hazard area.

Winter Storm

All of Dauphin County is exposed and vulnerable to the winter storm hazard. In general, structural impacts include damage to roofs and building frames, rather than building content. Current modeling tools are not available to estimate specific losses for this hazard. A percentage of the custom-building stock structural replacement cost value was utilized to estimate damages that could result from winter storm conditions (i.e., 1 percent, 5 percent, and 10 percent of total replacement cost value). Given professional knowledge and currently available information, the potential losses for this hazard are considered to be overestimated; hence, providing a conservative estimate for losses associated with winter storm events.

Qualitative Analyses

For many of the hazards evaluated in this risk assessment, historical data are not adequate to model future losses at this time. Where GIS data are not available, a qualitative analysis was conducted for the following hazards using the best available data and professional judgment. Multiple federal, state, and academic sources were used to evaluate these hazards:

- Building Collapse
- Cyber Attack
- Drought
- Invasive Species
- Opioid Addiction Response
- Pandemic
- Radon Exposure
- Tornado, Windstorm
- Transportation Accident
- Utility Interruption

Data Source Summary

Table 4.4-3 summarizes the sources of data used in the risk assessment.

Table 4.4-3. Data Source Summary

Data	Source	Date	Format
Population data	U.S. Census Bureau; American Community Survey 5-Year Estimates	2010; 2014-2018	Digital (GIS) format
Building Inventory	Dauphin Parcel Data, MODIV, Tetra Tech	2020; 2018	Digital (GIS) format
Critical facilities	Dauphin Planning Partnership and County Jurisdictions	2020	Digital (GIS) format
Digitized Effective FIRM maps	FEMA	2012	Digital (GIS) format
Digital Elevation Model	Dauphin County	n.d.	Digital (GIS) format
Road Network	PAMAP	2007	Digital (GIS) format
Rail Network	PennDot	2018	Digital (GIS) format
EPA Superfund and TRI Sites	EPA	2020	Digital (GIS) format
Planned Growth Areas	Tri-County Regional Planning Commission	2018	Digital (GIS) Format
Wildfire Fuel Hazard	University of Wisconsin	2010	Digital (GIS) format
Carbonate Hazard Area	USGS	2014	Digital (GIS) format
Abandoned Mine Areas	PA DEP	2020	Digital (GIS) format
SARA Sites	Dauphin County	2020	CSV converted to Digital (GIS) format
Natural Gas Pipelines	EIA	2020	Digital (GIS) format
Petroleum Gas Pipelines	EIA	2020	Digital (GIS) format
HGL Pipelines	EIA	2020	Digital (GIS) format

Limitations

For this risk assessment, the loss estimates, exposure assessments, and hazard-specific vulnerability evaluations rely on the best available data and methodologies. Uncertainties are inherent in any loss estimation methodology and arise in part from incomplete scientific knowledge concerning natural hazards and their effects on the built environment. Uncertainties also result from the following:

1) Approximations and simplifications necessary to conduct such a study
2) Incomplete or dated inventory, demographic, or economic parameter data
3) The unique nature, geographic extent, and severity of each hazard
4) Mitigation measures already employed by the participating municipalities
5) The amount of advance notice residents have to prepare for a specific hazard event

These factors can result in a range of uncertainty in loss estimates, possibly by a factor of two or more. Therefore, potential exposure and loss estimates are approximate. These results do not predict precise results and should be used to understand relative risk. Over the long term, Dauphin County will collect additional data to collect additional data and update and refine existing inventories to assist in estimating potential losses.

Potential economic loss is based on the present value of the general building stock utilizing best available data. The county acknowledges significant impacts could occur to critical facilities and infrastructure as a result of these hazard events, causing great economic loss. However, monetized damage estimates to critical facilities and infrastructure and economic impacts were not quantified and require more detailed loss analyses. In addition, economic impacts to industries such as tourism and the real-estate market were not analyzed.

4.4.2 Ranking Results

As discussed in Section 4.2, Hazard Identification, a comprehensive range of natural and non-natural hazards that pose significant risk to Dauphin County were selected and considered in this plan. However, the communities in Dauphin County have differing levels of exposure and vulnerability to each of these hazards. It is important for each community participating in this plan to recognize those hazards that pose the greatest risk to their community and direct their attention and resources accordingly to manage risk effectively and efficiently.

To this end, a relative hazard risk ranking process was conducted for the county using the Risk Factor (RF) methodology identified in Section 5 and Appendix 9 of the Pennsylvania Emergency Management Agency's (PEMA) All-Hazard Planning Standard Operating Guide (PEMA 2020). The guidance states:

> 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 are obtained by assigning varying degrees of risk to five categories for each hazard: *probability, impact, spatial extent, warning time,* and *duration*.
>
> To calculate the RF value for a given hazard, the assigned risk value for each category is multiplied by the weighting factor. The sum of all five categories equals the final RF value, as demonstrated in the example equation below:

Risk Factor Methodology Equation

RF Value = [(Probability x .30) + (Impact x .30) +
(Spatial Extent x .20) + (Warning Time x .10) + (Duration x .10)]

Hazards identified as high-risk have RFs greater than or equal to 2.5. RFs ranging from 2.0 to 2.4 are considered moderate-risk hazards. Hazards with RFs less than 2.0 are considered low-risk.

Table 4.4-4 identifies the five risk assessment categories, the criteria and associated risk level indices used to quantify their risk, and the suggested weighting factor (weight value) applied to each risk assessment category. Table 4.4-5 shows the five risk assessment categories' values for each of Dauphin County's hazards and each hazard's RF.

Table 4.4-4. Summary of Risk Factor (RF) Approach

Summary of Risk Factor (RF) 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	LESS THAN 1% ANNUAL PROBABILITY	1	30%
	POSSIBLE	BETWEEN 1% & 49.9% ANNUAL PROBABILITY	2	
	LIKELY	BETWEEN 50% & 90% ANNUAL PROBABILITY	3	
	HIGHLY LIKELY	GREATER THAN 90% ANNUAL PROBABILTY	4	
IMPACT *In terms of injuries, damage, or death, would you anticipate impacts to be minor, limited, critical, or catastrophic when a significant hazard event occurs?*	MINOR	VERY FEW INJURIES, IF ANY. ONLY MINOR PROPERTY DAMAGE & MINIMAL DISRUPTION ON QUALITY OF LIFE. TEMPORARY SHUTDOWN OF CRITICAL FACILITIES.	1	30%
	LIMITED	MINOR INJURIES ONLY. MORE THAN 10% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR MORE THAN ONE DAY.	2	
	CRITICAL	MULTIPLE DEATHS/INJURIES POSSIBLE. MORE THAN 25% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR MORE THAN ONE WEEK.	3	
	CATASTROPHIC	HIGH NUMBER OF DEATHS/INJURIES POSSIBLE. MORE THAN 50% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR 30 DAYS OR MORE.	4	
SPATIAL EXTENT *How large of an area could be impacted by a hazard event? Are impacts localized or regional?*	NEGLIGIBLE	LESS THAN 1% OF AREA AFFECTED	1	20%
	SMALL	BETWEEN 1 & 10.9% OF AREA AFFECTED	2	
	MODERATE	BETWEEN 11 & 25% OF AREA AFFECTED	3	
	LARGE	GREATER THAN 25% OF AREA AFFECTED	4	
WARNING TIME *Is there usually some lead time associated with the hazard event? Have warning measures been implemented?*	MORE THAN 24 HRS	SELF-DEFINED *(NOTE: Levels of warning time and criteria that define them may be adjusted based on hazard addressed.)*	1	10%
	12 TO 24 HRS	SELF-DEFINED	2	
	6 TO 12 HRS	SELF-DEFINED	3	
	LESS THAN 6 HRS	SELF-DEFINED	4	
DURATION *How long does the hazard event usually last?*	LESS THAN 6 HRS	SELF-DEFINED *(NOTE: Levels of warning time and criteria that define them may be adjusted based on hazard addressed.)*	1	10%
	LESS THAN 24 HRS	SELF-DEFINED	2	
	LESS THAN 1 WEEK	SELF-DEFINED	3	
	MORE THAN 1 WEEK	SELF-DEFINED	4	

Source: PEMA 2020

Table 4.4-5. Risk Ranking for Dauphin County

HAZARD RISK	HAZARDS	RISK ASSESSMENT CATEGORY					RISK FACTOR (RF)
		PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION	
HIGH	Opioid Addiction Response	4	4	4	1	4	3.7
	Floods, Flash Floods, and Ice Jams	4	4	3	3	4	3.7
	Environmental Hazards: Hazardous Materials Releases	4	3	2	4	2	3.1
	Pandemic and Infectious Disease	2	4	4	1	4	3.1
	Utility Interruption	4	2	3	4	2	3
	Hurricane, Tropical Storm, Nor'easter	2	4	3	1	4	2.9
	Subsidence, Sinkholes	3	2	3	4	4	2.9
	Cyber Attack	4	2	2	4	3	2.9
	Invasive Species	4	1	4	1	4	2.8
	Winter Storm	3	2	4	1	3	2.7
	Tornado, Windstorm	3	3	2	4	1	2.7
	Drought	3	1	4	1	4	2.5
	Transportation Accidents	4	2	1	4	1	2.5
	Wildfire	4	2	1	3	2	2.5
MODERATE	Radon Exposure	3	1	3	1	4	2.3
	Dam Failure	1	3	2	4	2	2.2
	Building or Structure Collapse	1	3	1	4	2	2
	Landslide	1	3	1	4	2	2

Based on these results, there are 14 high-risk hazards, 5 moderate-risk hazards, and no low-risk hazards in Dauphin County. Mitigation actions were developed for all hazards (see Section 6.4). The threat posed to life and property for moderate-risk and high-risk hazards is considered significant enough to warrant the need for establishing hazard-specific mitigation actions.

A risk assessment result for the entire county does not mean that each municipality is at the same amount of risk to each hazard. Table 4.4-6 shows the different municipalities in Dauphin County and whether they believe their risk is greater than (>), less than (<), or equal to (=) the RF assigned to the county as a whole. Municipal officials' responses were then reviewed and updated (as appropriate) by the Planning Team.

Table 4.4-6. Jurisdictional Risk by Municipality

Municipality	Building or Structure Collapse	Cyber Attack	Dam Failure	Drought	Environmental Hazards: Hazardous Materials Releases	Floods, Flash Floods, and Ice Jams	Hurricane, Tropical Storm, Nor'easter	Invasive Species	Landslide	Opioid Addiction Response	Pandemic and Infectious Disease	Radon Exposure	Subsidence, Sinkholes	Tornado, Windstorm	Transportation Accidents	Utility Interruption	Wildfire	Winter Storm
	2.0	2.9	2.2	2.5	3.1	3.7	2.9	2.8	2.0	3.7	3.1	2.3	2.9	2.7	2.5	3.0	2.5	2.7
Berrysburg Borough	<	=	<	<	=	<	<	<	<	<	<	=	<	=	<	=	=	=
Conewago Township	<	=	<	>	=	<	=	>	<	<	<	=	<	=	=	=	=	=
Dauphin Borough	=	<	>	=	>	>	=	=	<	=	=	=	<	=	>	=	<	=
Derry Township	<	=	=	>	=	<	=	>	<	=	=	=	>	=	=	=	<	=
East Hanover Township	<	=	<	=	=	=	=	=	=	<	=	=	<	=	=	>	>	=
Elizabethville Borough	<	=	=	<	=	=	=	=	>	=	=	>	<	=	<	=	=	>
Gratz Borough	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<
Halifax Borough	<	=	<	<	=	<	=	<	>	=	=	=	<	=	=	=	<	=
Halifax Township	=	=	>	>	<	>	=	=	<	=	=	>	=	=	=	=	>	=
Harrisburg City	>	=	=	=	>	>	=	=	>	>	=	=	>	=	=	>	<	=
Highspire Borough	<	=	=	<	=	>	=	<	<	=	=	=	<	=	=	=	>	=
Hummelstown Borough	=	=	=	=	=	=	=	=	=	=	=	=	=	=	<	=	<	=
Jackson Township	=	>	=	>	>	=	=	>	=	<	=	>	=	>	=	>	>	=
Jefferson Township	=	=	<	=	<	<	=	=	>	=	<	=	<	=	<	=	>	=
Londonderry Township	<	=	<	=	=	>	=	=	<	<	=	=	=	=	=	=	=	=
Lower Paxton Township	=	=	<	<	=	<	=	=	<	>	=	=	=	=	=	=	>	=
Lower Swatara Township	=	>	<	=	=	=	=	<	<	=	=	=	<	=	>	<	<	=
Lykens Borough	=	=	<	<	=	>	=	<	<	=	=	=	<	=	=	=	>	=
Lykens Township	=	=	<	=	=	=	=	=	>	=	<	=	<	=	=	=	>	=
Middle Paxton T	=	=	>	=	>	>	=	=	>	=	=	=	<	=	>	=	>	=

Municipality	Building or Structure Collapse	Cyber Attack	Dam Failure	Drought	Environmental Hazards: Hazardous Materials Releases	Floods, Flash Floods, and Ice Jams	Hurricane, Tropical Storm, Nor'easter	Invasive Species	Landslide	Opioid Addiction Response	Pandemic and Infectious Disease	Radon Exposure	Subsidence, Sinkholes	Tornado, Windstorm	Transportation Accidents	Utility Interruption	Wildfire	Winter Storm
	2.0	2.9	2.2	2.5	3.1	3.7	2.9	2.8	2.0	3.7	3.1	2.3	2.9	2.7	2.5	3.0	2.5	2.7
Middletown Borough	=	=	<	=	>	>	=	<	<	=	=	=	<	=	=	=	<	=
Mifflin Township	<	=	<	=	<	<	=	=	=	=	<	=	<	=	<	=	=	=
Millersburg Borough	=	=	<	<	=	=	=	<	<	=	=	=	<	=	=	=	>	=
Paxtang Borough	=	=	<	<	=	>	=	<	<	=	=	=	>	=	=	=	<	=
Penbrook Borough	<	>	<	<	<	<	=	=	<	=	=	=	<	=	<	=	<	=
Pillow Borough	>	=	<	=	<	=	=	=	=	=	=	>	<	=	<	>	=	=
Reed Township	=	>	>	>	>	>	>	=	=	<	=	=	<	=	>	=	>	>
Royalton Borough	=	=	=	=	>	>	=	=	=	=	=	=	=	=	=	=	=	=
Rush Township	<	=	>	<	<	=	=	=	<	=	<	=	<	=	<	=	<	=
South Hanover Township	=	=	<	=	=	>	=	=	=	=	=	=	=	=	>	>	>	=
Steelton Borough	=	=	<	<	=	>	=	<	>	=	=	=	<	=	=	=	<	=
Susquehanna Township	=	=	<	=	=	>	=	=	=	>	=	=	=	>	=	=	=	=
Swatara Township	=	=	=	<	=	>	=	<	=	>	=	>	>	=	>	>	=	=
Upper Paxton Township	=	=	<	<	=	=	=	=	=	=	<	=	<	=	=	=	>	=
Washington Township	<	=	=	=	<	=	=	=	<	=	=	=	<	=	<	=	=	=
Wayne Township	=	>	=	>	>	>	>	=	=	<	=	=	=	>	=	>	>	>
West Hanover Township	=	=	=	=	>	=	=	=	=	=	=	=	=	=	>	=	>	=
Wiconisco Township	<	<	<	>	>	>	>	<	<	<	<	<	>	>	>	>	>	>
Williams Township	=	=	<	=	=	<	=	<	>	=	<	=	<	=	=	=	>	=
Williamstown Borough	=	=	<	<	=	<	=	=	<	=	=	=	<	=	=	=	>	=

4.4.3 Potential Loss Estimates

Potential loss estimates for hazard events help a community understand the monetary value of what might be at stake during a hazard event. Estimates are considered *potential* in that they generally represent losses that could occur in a countywide hazard scenario. Localized events could yield lower losses, while regional events could yield higher losses.

The data utilized to conduct the vulnerability assessment came from a variety of sources, as noted throughout each hazard profile and Appendix A. As summarized in the Methodology subsection, the 2018 U.S. Census demographic data, HAZUS v4.2 default building inventory and its associated replacement cost value of the structures and contents, and the comprehensive critical facility inventory update in HAZUS v4.2 were used for Dauphin County.

Potential loss estimates provided in Section 4.3 (Hazard Profiles) were either based on historical losses, current-condition losses, and/or predictive losses by performing spatial analyses in GIS and hazard probabilistic modeling. In summary, HAZUS v4.2 was used to estimate potential losses for the flood, hurricane/tropical storm, and tornado/windstorm hazards. For many of the hazards evaluated, historical data are not adequate to model future losses at this time. For these hazards of concern, areas and inventory susceptible to specific hazards were mapped, and exposure was evaluated to help guide mitigation efforts (mitigation efforts are discussed further in Section 6). Spatial analyses were conducted to assess potential exposure for hazards of concern with delineated hazard areas: dam failure; environmental hazard hazardous materials release; flood, flash flood, and ice jam; landslide; subsidence and sinkhole; and wildfire. Where GIS data are not available for some hazards, a qualitative analysis was conducted using the best available data and professional judgment.

4.4.4 Future Development and Vulnerability

Risk and vulnerability to natural and human-caused 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. Population change (in terms of total and demographics) and the age of the housing stock continue to be the main indicators of vulnerability change in Dauphin County.

Dauphin County experienced a 9.0 percent increase in population from 2000 to 2018, as summarized in Section 2 of this HMP. According to PA DEP Projections, the population in Dauphin County is projected to increase over the coming decades. The range of projected change in population varies from a 25 percent population decrease in Royalton Borough to a 53 percent increase in population in West Hanover Township (PA DEP 2012).

Continued analysis of the age structure in Dauphin County will provide deeper understanding of future vulnerability to at-risk populations. Approximately 17 percent of Dauphin County's population is age 65 or older (ACS 2018). As these residents continue to age in the county, they might have increased access and functional needs. For example, many residents in this age bracket might be unable to drive; therefore, development of special evacuation plans for them will be necessary. They might also have hearing or vision impairments that could hinder their reception of emergency instructions. Both older and younger populations are at higher risks for contracting certain diseases. Dauphin County's combined under-5-years-of-age and over-65 populations constitute approximately 23.2 percent of its population (ACS 2018).

Approximately 2.7 percent of Dauphin County's population lives in group quarters, which are communal settings that can include inmates in a prison, students in a dorm, or elderly or mentally disabled in group-care homes. Many residents living in group quarters have special needs. It is important to ensure that each group-quarter facility has an emergency plan to account for the unique needs of its residents during a hazard event.

12.5 percent of Dauphin County's population is not proficient in English. Future hazard mitigation strategies should consider addressing language barriers to ensure that all residents can receive emergency instructions.

In addition, remote and sparsely populated municipalities face higher vulnerability to hazards because they do not have as easy access to care facilities or response personnel. For instance, sparsely populated municipalities such as Jefferson Township face increased vulnerability to tornadoes, windstorms, and winter storms due to isolation, access issues, and longer emergency response times.

The aging housing stock in Dauphin County is another source of current and future vulnerability in many hazard events. As discussed throughout Section 4, Risk Assessment, Dauphin County can experience strong gusts of wind during windstorms, tornadoes, hurricanes, tropical storms, or Nor'easters. The structure of these older houses can cause them to be at greater risk of destruction under these strong wind conditions. These structures might 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.

While any development increases the risk of damage and loss to natural hazards, a number of factors indicate that this increase in risk is low and mitigated by existing federal, state, county, and local regulations, policies, and programs. A total of 27 municipalities in Dauphin County have adopted subdivision regulations, one municipality is developing subdivision regulations, and 27 municipalities have adopted local zoning regulations. The Dauphin County Planning Commission, through the Tri-County Regional Planning Commission (TCRPC), reviews and reports on subdivisions, land developments, comprehensive plans, and municipal land use ordinance amendments. This broad range of planning review services is separated into two areas of activity: (1) subdivision and land development reviews, and (2) community planning reviews. Most types of reviews are presented to the commission for its consideration at a public meeting prior to them being forwarded on to the respective municipalities and/or applicants.

Dauphin County, its municipalities, and the TCRPC identified areas of new potential growth. Figure 4.4-1 through Figure 4.4-12 show the Dauphin County growth areas and their vulnerability to hazards.

Figure 4.4-1. Dauphin County Growth Areas and Flood, Dam Inundation and Wildfire Hazards

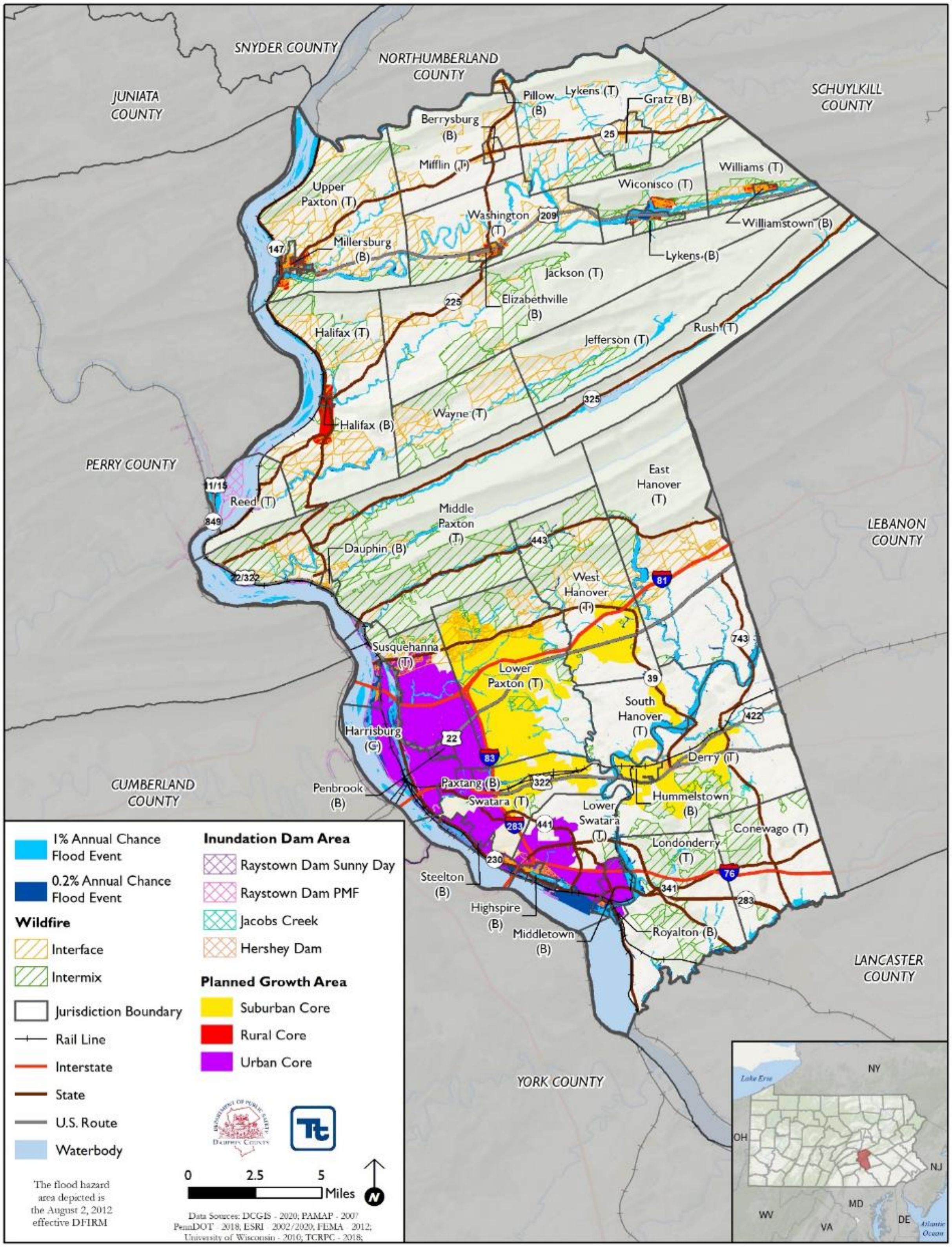


Figure 4.4-2. Dauphin County Growth Areas and Steep Slope, Abandoned Mines, and Carbonate Rock Hazards

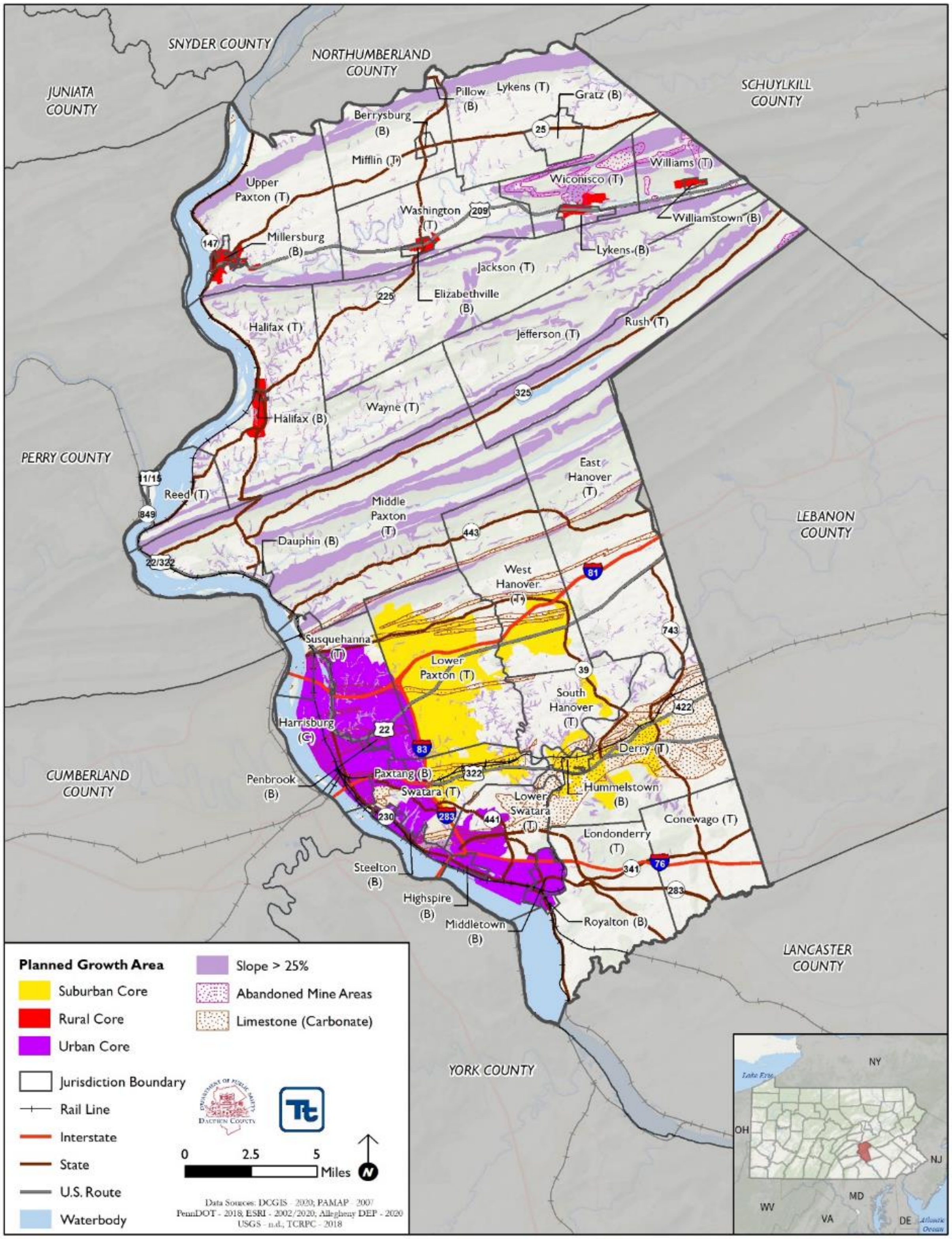


Figure 4.4-3. Dauphin County Growth Areas and Environmental Hazards – Hazardous Materials Releases Hazard

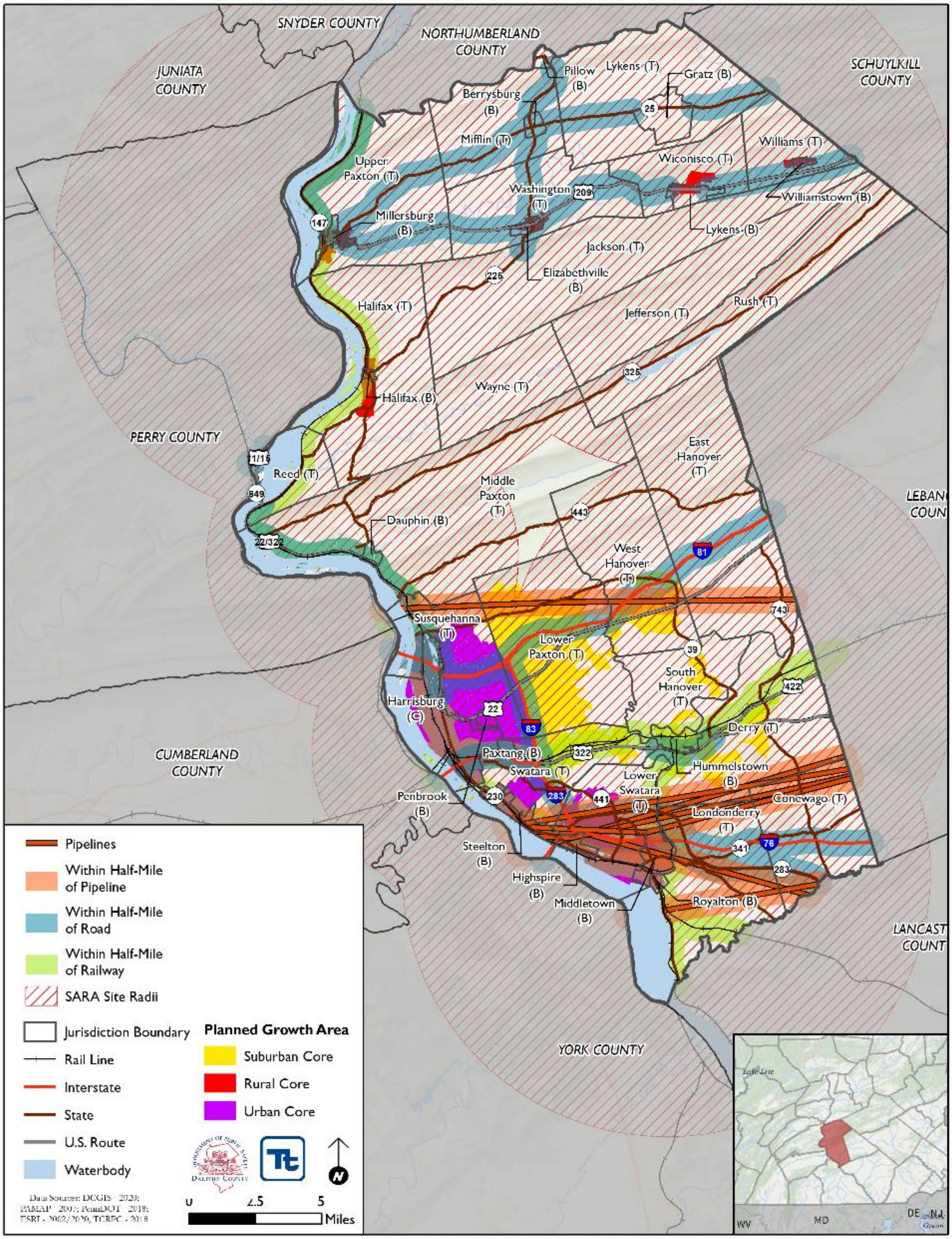


Figure 4.4-4. Dauphin County Rural Core and Flood, Dam Inundation and Wildfire Hazards

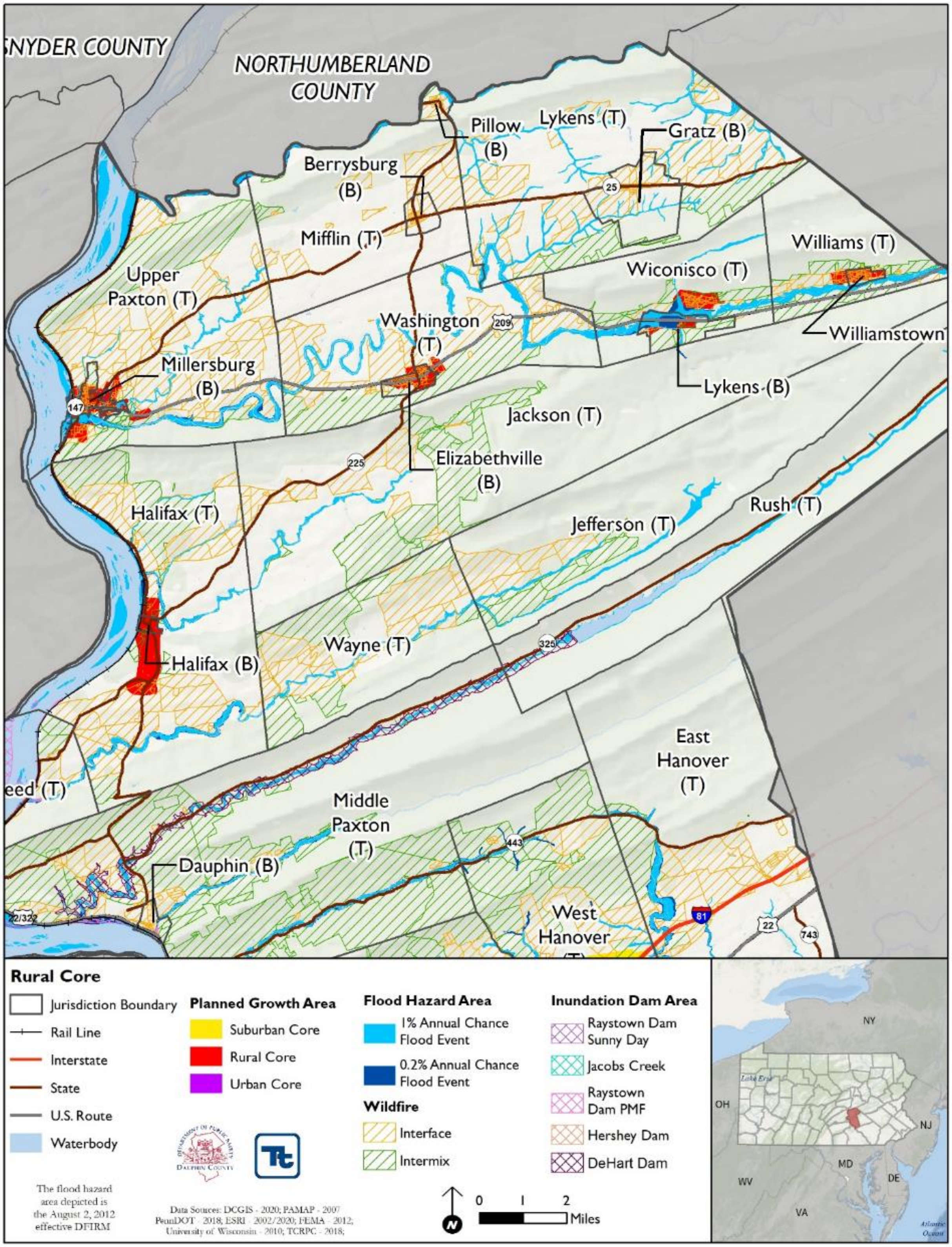


Figure 4.4-5. Dauphin County Suburban Core and Flood, Dam Inundation and Wildfire Hazards

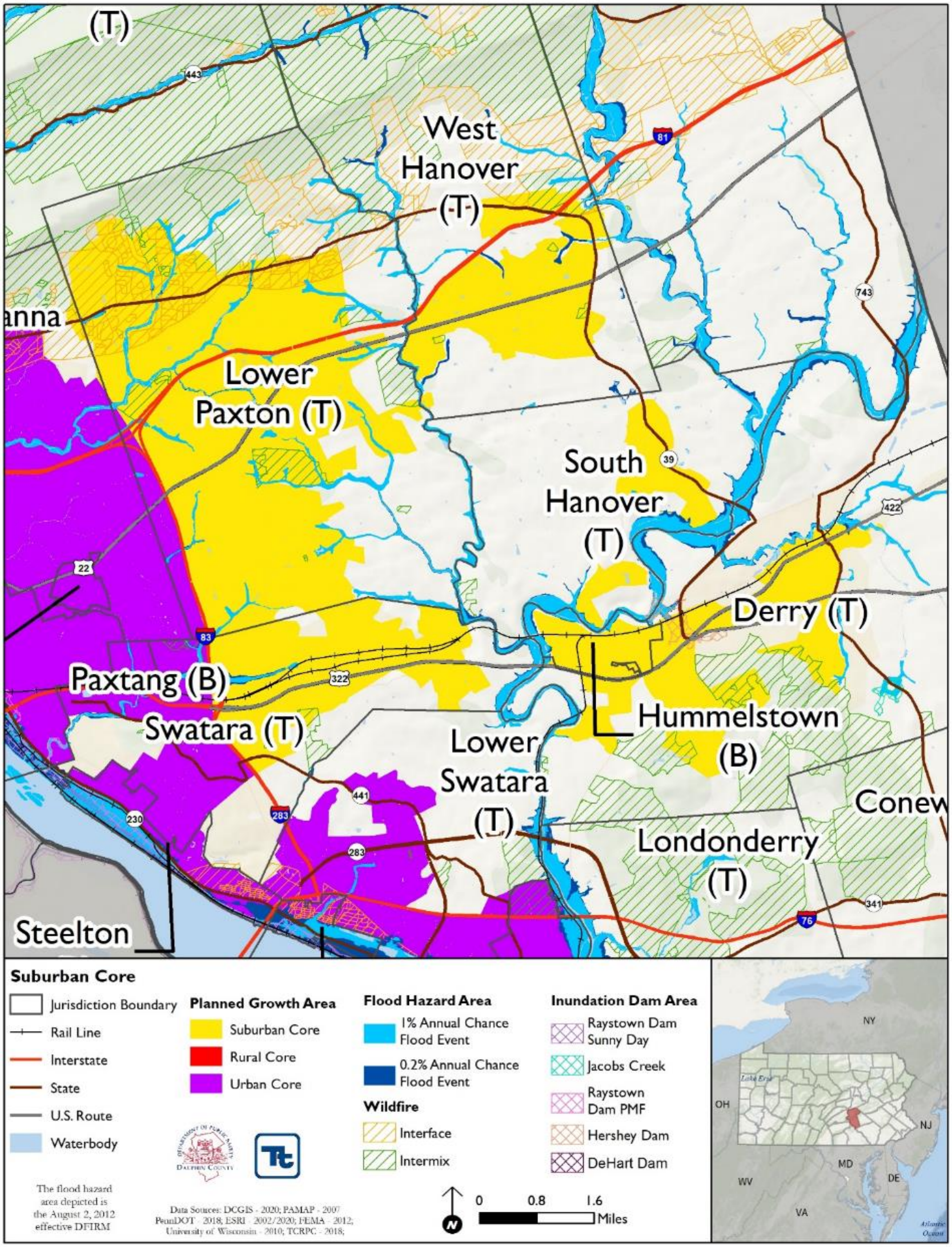


Figure 4.4-6. Dauphin County Urban Core and Flood, Dam Inundation and Wildfire Hazards

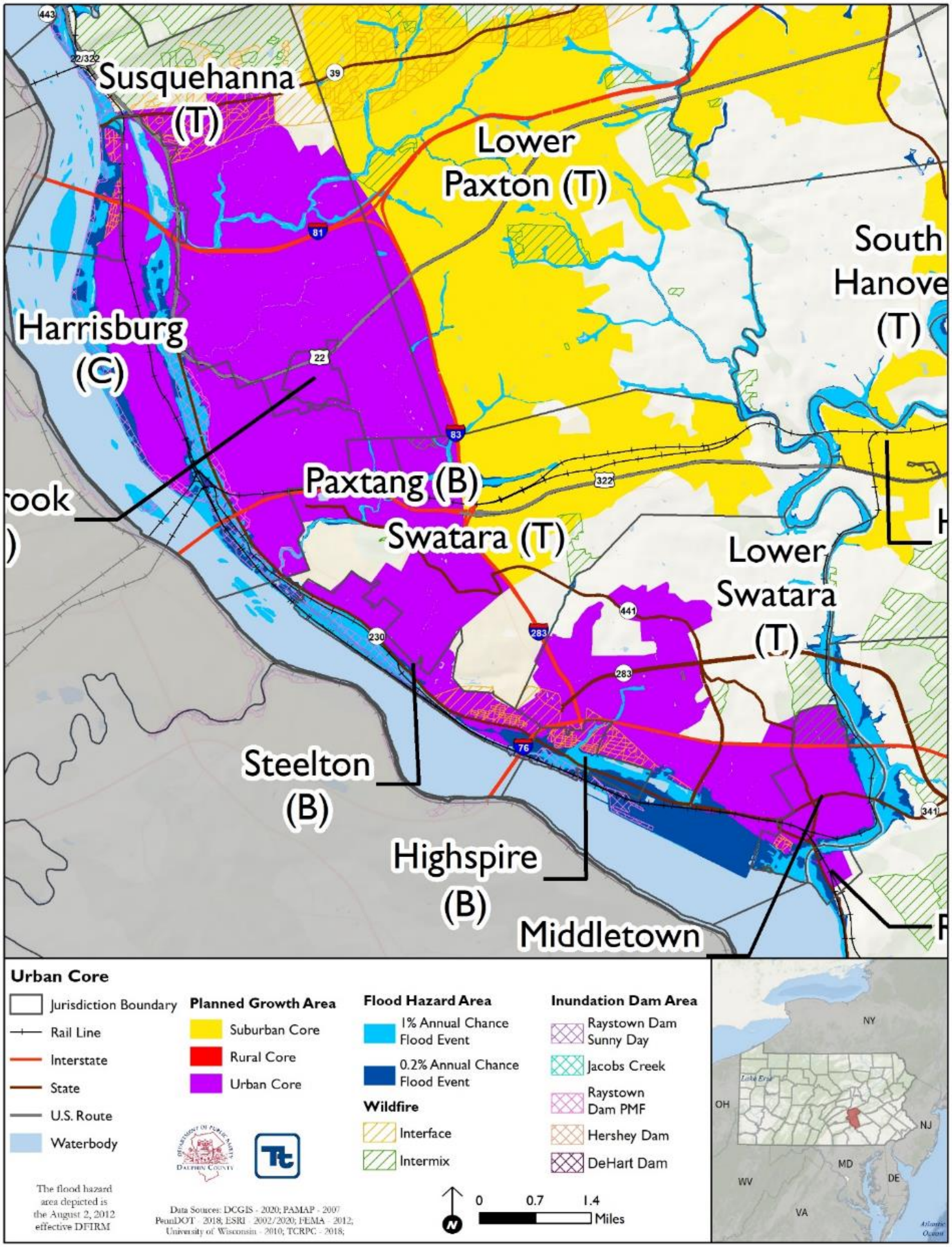


Figure 4.4-7. Dauphin County Rural Core and Steep Slope, Abandoned Mines, and Carbonate Rock Hazards

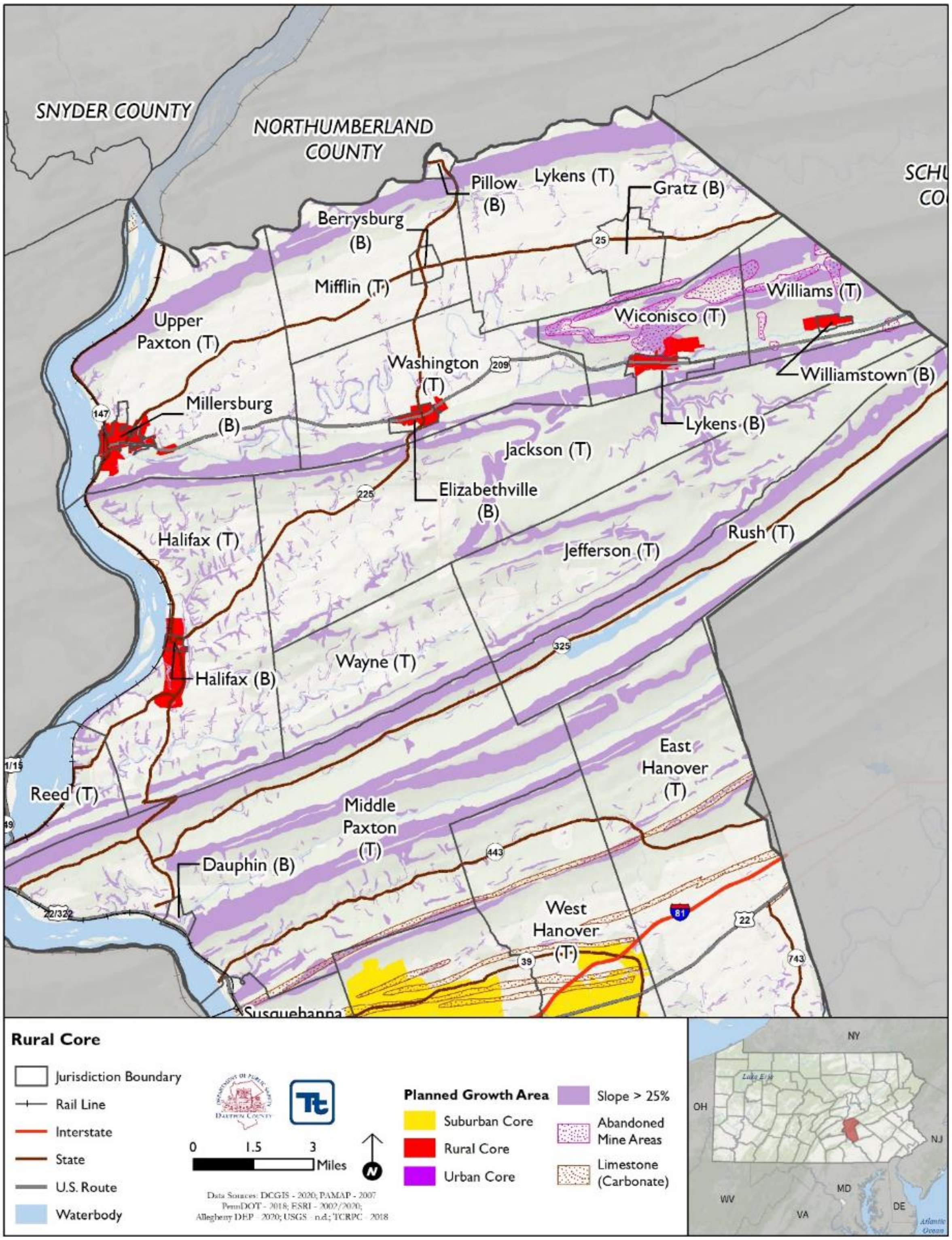


Figure 4.4-8. Dauphin County Suburban Core and Steep Slope, Abandoned Mines, and Carbonate Rock Hazards

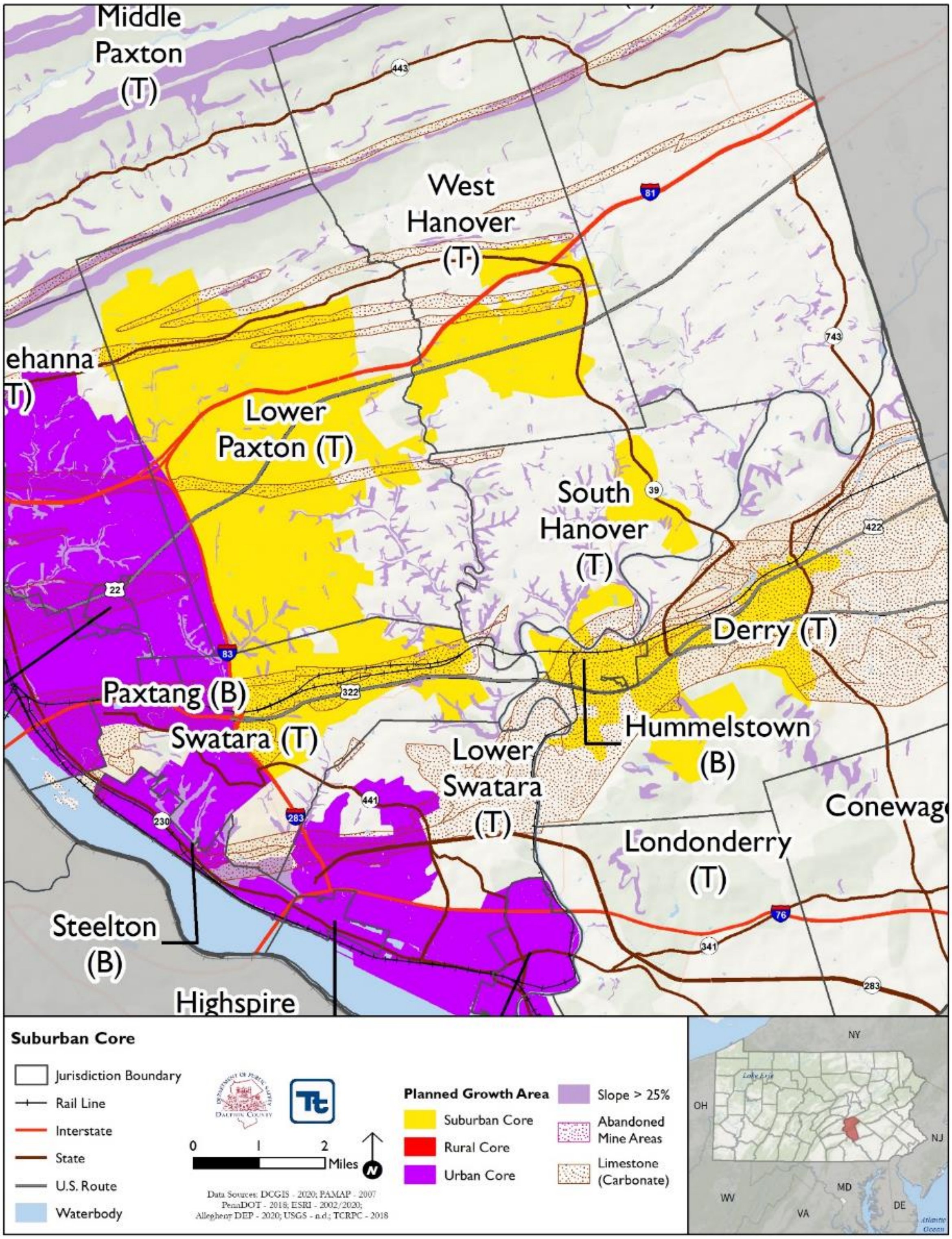


Figure 4.4-9. Dauphin Urban Core and Steep Slope, Abandoned Mines, and Carbonate Rock Hazards

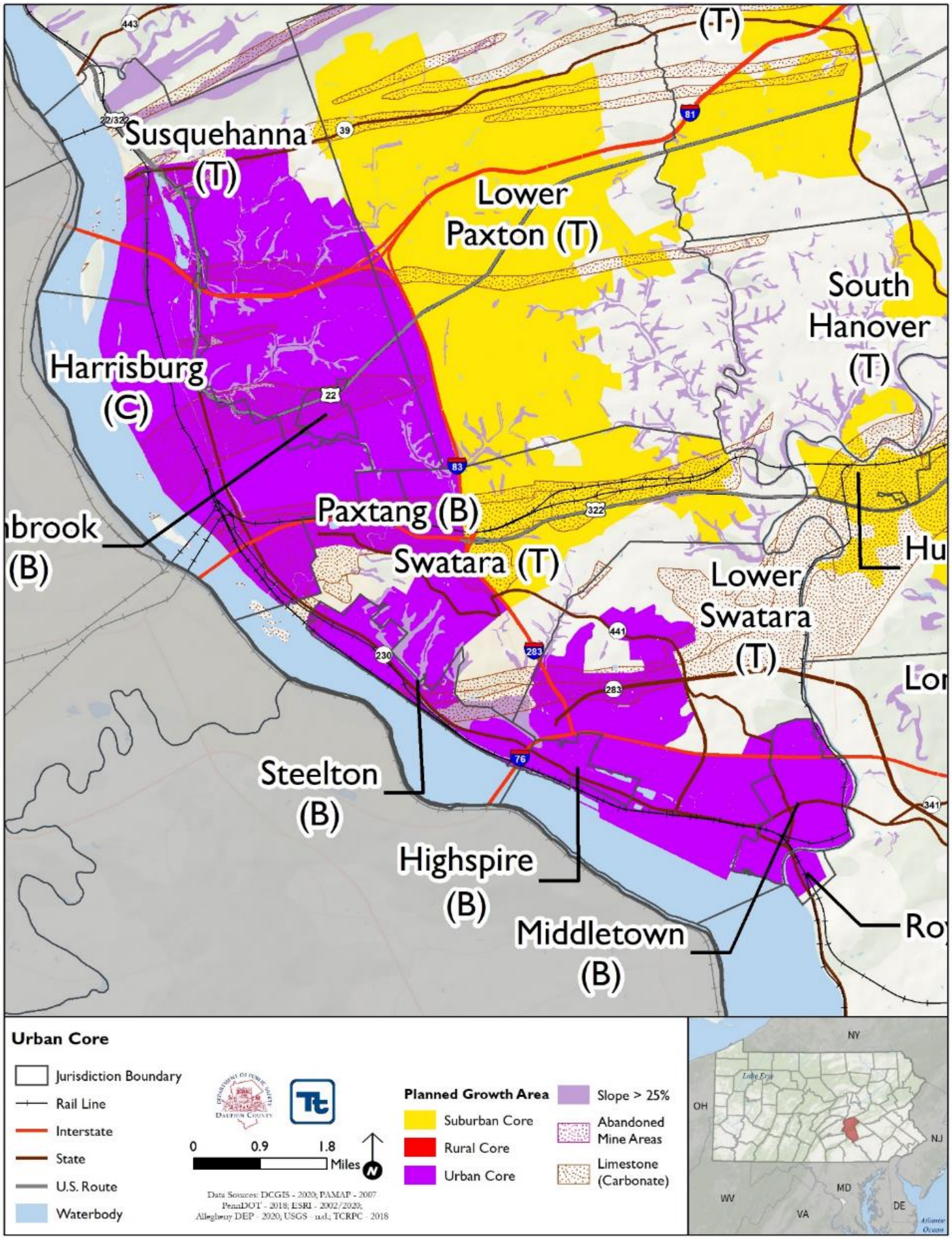


Figure 4.4-10. Dauphin Rural Core and Hazardous Materials Hazards

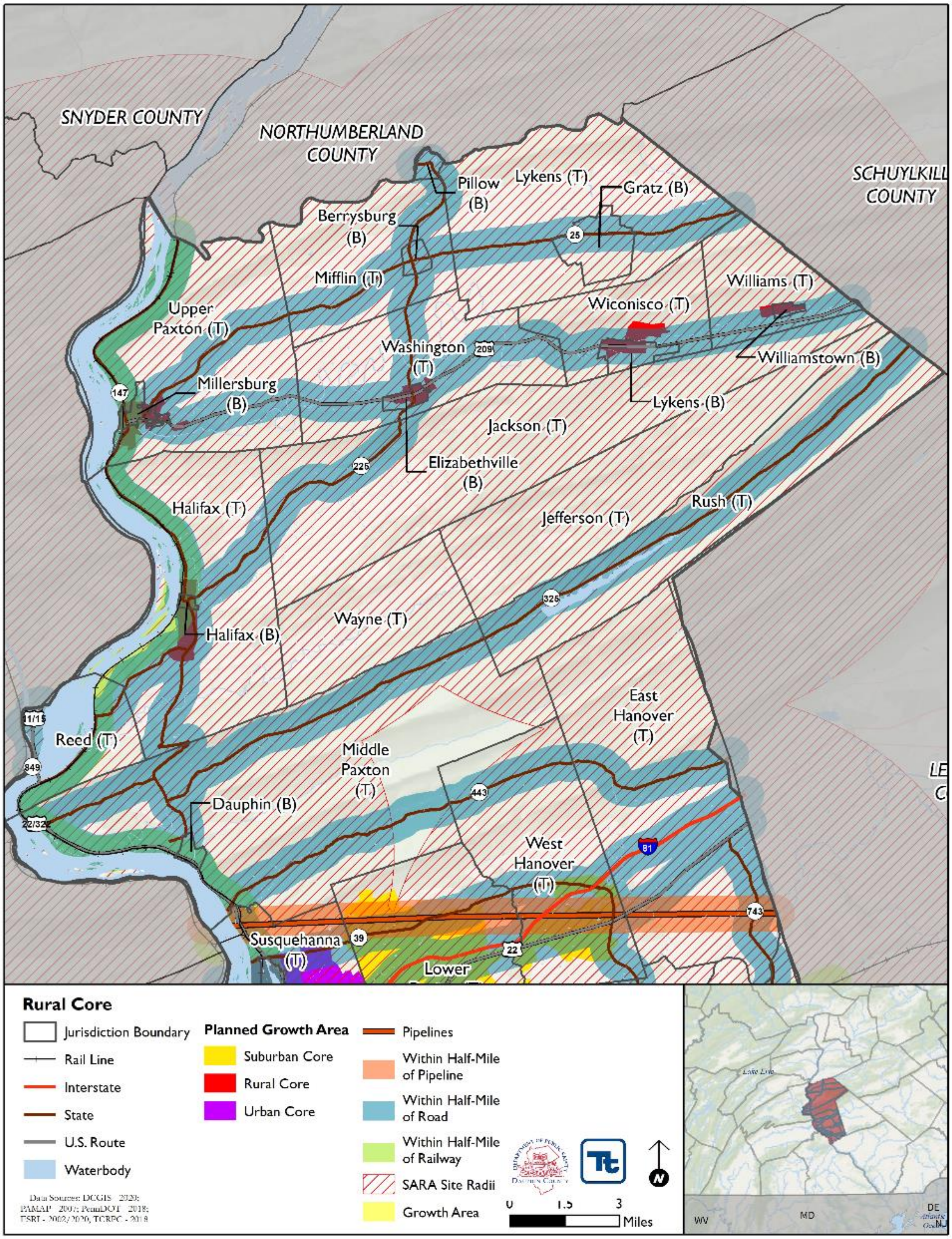


Figure 4.4-11. Dauphin Suburban Core and Hazardous Materials Hazards

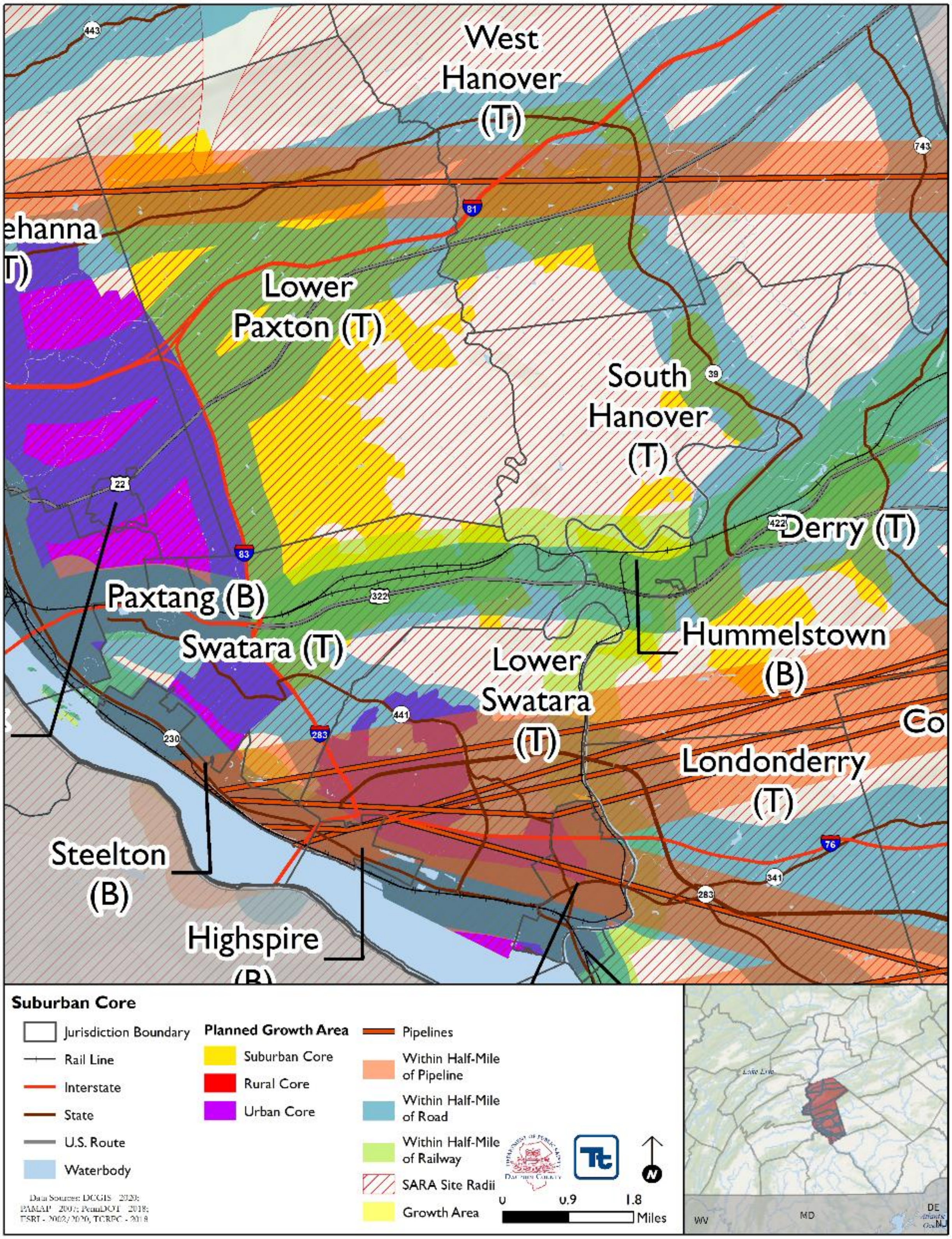
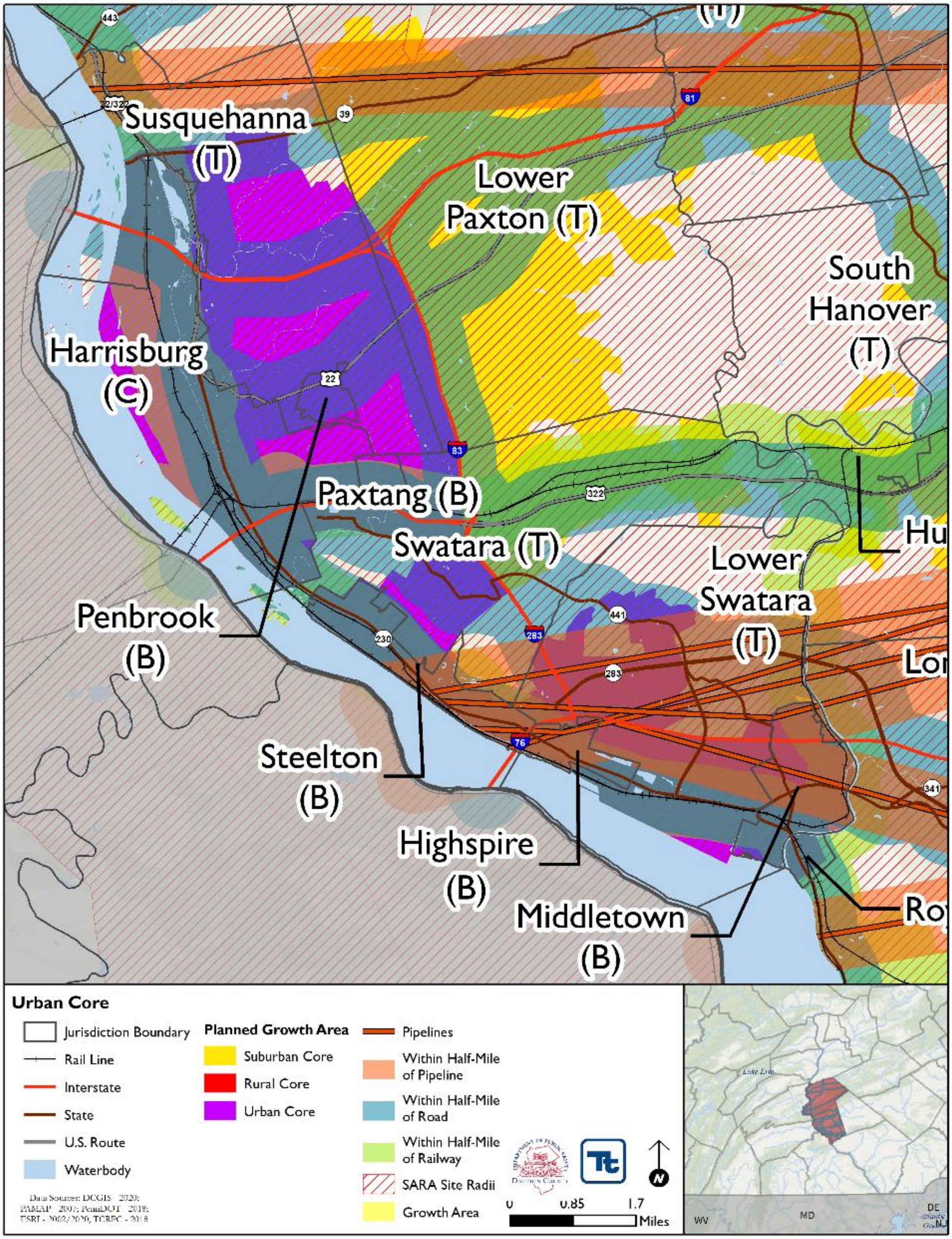


Figure 4.4-12. Dauphin Urban Core and Hazardous Materials Hazards



SECTION 5 CAPABILITY ASSESSMENT

The capability assessment evaluates the community's capabilities and resources already in place at the municipal, county, state, and federal levels to reduce hazard risks. The assessment also identifies where improvements can be made to increase disaster resistance in the community.

The first step in organizing hazard mitigation capabilities or resources is to describe the basic approaches available to reduce hazard risks. According to the 2020 Pennsylvania Emergency Management Agency (PEMA) All-Hazard Mitigation Planning Standard Operating Guide (SOG), the following four general approaches may reduce hazard risks: (1) local plans and regulations, (2) structure and infrastructure, (3) natural systems protection, and (4) education and awareness. A brief description of each (according to the PEMA All-Hazard Mitigation Planning SOG) is provided below:

- **Local Plans and Regulations** – These actions include government authorities, policies, or codes that influence the ways land and buildings are developed and built.
- **Structure and Infrastructure** – These actions involve modifying existing structures and infrastructure or constructing new structures to reduce hazard vulnerability.
- **Natural Systems Protection** – These actions minimize damage and losses and preserve or restore the functions of natural systems.
- **Education and Awareness** – These actions inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate these hazards, including participation in national programs.

Capability assessments document the existing resources available to local communities to reduce hazard risks. Resources can be divided into five categories: human, physical, technical, informational, and financial. For each basic capability or approach, one or more of the five resources may be available. A brief description of each resource (PEMA 2020) is provided below:

- **Human resources** include local police, fire, ambulance, and emergency management and response personnel; local government services; and electric, gas, and other utility providers that are critical during disasters.
- **Physical resources** include the equipment and vehicles (such as emergency response and recovery equipment and vehicles), public lands, facilities, and buildings available to the community.
- **Technical/technological resources** include early warning systems, weather alert radios, stream-level monitoring gauges, and 9-1-1 communications systems. Technical/technological resources also include technical requirements established by law, regulation, or ordinance.
- **Informational resources** include materials about disasters and hazard mitigation and planning; these resources are available from a wide variety of sources, such as applicable websites, libraries, and state and federal agencies.
- **Financial resources** identify the sources of funding available for hazard mitigation. Most state and federal grant programs require local communities to provide at least part of the necessary project funding in real dollars or through in-kind services. Local communities need to assess their financial capability and resources to implement hazard mitigation action plans.

This section describes and summarizes the federal, state, county, and local capabilities to address hazard risk in Dauphin County.

5.1 UPDATE PROCESS SUMMARY

During the plan update process, Dauphin County and all participating municipalities were asked to provide an updated assessment of their mitigation planning capabilities. Each municipality was provided with a Capability Assessment Survey based on Appendix 3 of the October 2020 edition of the PEMA All-Hazard Mitigation Planning SOG (PEMA 2020). The survey was provided to each of the municipal planning points of contact at the Planning Team kickoff meeting. Completed Capability Assessment Surveys, whether completed by hand, electronically, or filled in working alongside the county Department of Public Safety (DPS) staff or planning consultant, are provided in Appendix D.

Dauphin County has several resources available 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. These resources enable community resiliency through actions taken before, during, and after a hazard event. Emergency services, manpower, equipment, and fiscal resources are important tools in addressing hazard potential and mitigation in Dauphin County communities.

This section describes and summarizes the federal, state, county, and local capabilities to address hazard risk in Dauphin County.

5.2 CAPABILITY ASSESSMENT FINDINGS

A jurisdiction's ability to effectively manage natural hazard risk is directly related to its level of hazard mitigation capabilities. As such, mitigation strategies developed in coordination with Dauphin County's municipalities have a direct effect on establishing new capability functions in the community or strengthening existing capabilities.

Dauphin County and most of its municipalities updated and completed the Capability Assessment Survey (Appendix D: Municipal Participation Documentation). If municipalities did not update or partially updated their capabilities information, the same information provided by those municipalities for the 2015 Hazard Mitigation Plan (HMP) was carried forward into this plan update.

The following sections further detail the capability assessment findings.

5.2.1 Planning and Regulatory Capability

While municipalities in Pennsylvania must comply with the minimum regulatory requirements established under the Pennsylvania Municipal Planning Code, they otherwise have considerable latitude in adopting ordinances, policies, and programs that can be used to manage natural and non-natural hazard risks. Specifically, municipalities can manage these risks through comprehensive land use planning, hazard-specific ordinances (for example, flood damage prevention, sinkholes, and steep slopes), zoning, site-plan approval, and building code enforcement. When effectively prepared and administered, these regulations can lead to hazard mitigation. Guiding documents, known as the "Planning Series" can assist municipalities develop regulations and best management practices. These *Series* can be found on Pennsylvania Department of Community and Economic Development Library under Local Government – Handbooks and Guides – Community Planning.

For example, the adoption of the National Flood Insurance Program (NFIP) and the Pennsylvania Flood Plain 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.

County and Municipal Planning Capabilities

Dauphin County Comprehensive Plan

A comprehensive plan is a policy document that states objectives and guides the future growth and physical development of a municipality. The comprehensive plan is a blueprint for housing, transportation, community facilities, utilities, and land use. It examines how the past led to the present and charts the community's future path. The Pennsylvania Municipalities Planning Code (MPC) Act 247 of 1968, as reauthorized and amended, requires counties to prepare and maintain a comprehensive plan. In addition, the MPC requires counties to update the comprehensive plan every 10 years.

Section 301a.(2) of the MPC requires comprehensive plans to include a plan for land use, which, among other provisions, suggests that the plan should 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 county's comprehensive plan, "Growing Together," is slated to guide Dauphin County through 2027. The "Growing Together" comprehensive plan is composed of three components: "Growing Our Communities", "Growing Within Our Environment", and "Growing Our Economy" (Tri-County Regional Planning Commission [TCRPC] 2017). Each category subsection ends with primary goals and key action items. The purpose of this Comprehensive Plan is to have planning efforts use this document as a process document than a static document. It contains findings from community surveys, goals for each topic, and associated projects.

"Enhancing Our Communities" contains the vision and goals of the community by preserving each communities' unique identity while creating sustainable development through housing, public facilities and services. The comprehensive plan goals in this section include the following taken directly from the Dauphin County Comprehensive Plan of 2017 (TCRPC 2017):

- *Manage growth toward areas with existing or planned public facilities and services;*
- *Promote the use of planning and stormwater best management practices (BMPs);*
- *Promote the creation of livable, sustainable communities;*
- *Promote economic development in conjunction with regional needs;*
- *Integrate land use with transportation and other public infrastructure;*
- *Expand fair housing choice and access to opportunity;*
- *Help build cooperative relationships between new housing developers, local municipal governments, and other key stakeholders;*
- *Evaluate and improve regulations & zoning ordinances to address key housing challenges;*
- *Conduct research and educate residents, officials, and developers on key housing issues;*
- *Maintain or improve the level of emergency services (police, fire, and ambulance) and enhance hazard protection for all Dauphin County residents;*
- *Provide appropriate parks & recreation facilities and services that are readily accessible to all residents;*
- *Strengthen access and strive to have the highest quality healthcare services possible for all residents;*
- *Educate the public and provide opportunities for healthy living for all residents;*
- *Enhance educational resources and strengthen our communities through the library system and other similar facilities;*
- *Enhance educational and skill development opportunities for students and residents.*

"Growing Within Our Environment" focuses on growth within the current environment natural resources while focusing on preservation of these same resources. Resources identified within the plan include water through water quality, stormwater management, floodplain, and riparian areas, agriculture, forest land, and limestone (karst) geology. Taken directly from the Dauphin County Comprehensive Plan of 2017 (TCRPC 2017), below lists goals for the environment section of the plan:

- *Enhance the quality of ground and surface water resources;*

- *Reduce development-related impacts on water quality and increased runoff through improved regulatory and policy tools;*
- *Support the efforts of municipalities and others to address MS4 storm water requirements;*
- *Reduce the impacts from flooding for homeowners and businesses;*
- *Seek to minimize the cost to property owners for hazard mitigation and flood insurance;*
- *Coordinate preservation/protection efforts with the identification of natural hazard potential to minimize future damage due to flooding by the Susquehanna River and its tributaries;*
- *Preserve and/or protect our agricultural, historic, and cultural resources along with other important environmental features.*

The final section, "Growing Our Economy", supports the diverse economic development activities currently occurring while encourages economic growth for the future. To encourage economic development, this section focuses on programs, policies, transportation network, water infrastructure, and wastewater infrastructure. Goals listed under each of these subsections were taken directly from the Dauphin County Comprehensive Plan and are as follows:

- *Focus future economic growth across Dauphin County near existing development areas, including downtowns and office/commercial/industrial centers;*
- *The downtowns of smaller boroughs and townships should be maintained and promoted as local economic centers and/or reinvented to meet current business opportunities;*
- *Maintain Harrisburg as the region's cultural center to boost economic development;*
- *Strengthen and enhance the relationships between businesses and local municipalities;*
- *Prioritize general economic development efforts for: 1) retaining businesses; 2) expanding businesses; 3) starting new businesses; 4) redeveloping sites; and 5) attracting businesses;*
- *Help build cooperative relations between transportation providers, employers, commercial facilities, governmental agencies & local municipalities;*
- *Enhance safety for all transportation system users;*
- *Maintain a focus on all modes for moving people and goods efficiently;*
- *Provide effective transportation for persons with disabilities;*
- *Encourage coordination between the provision of public utilities with the Regional Growth Management Plan (RGMP) and municipal plans;*
- *Identify and address limitations in public infrastructure relating to economic development that are consistent with the RGMP and municipal plans.*

Although the MPC requires that municipal plans be in accord with the county plan, the code provides no measures for ensuring this occurs.

Stormwater Management Planning

In 1978, the Pennsylvania General Assembly passed the Stormwater Management Act (Act 167) of 1978 (Pennsylvania State Data Center 1978). Act 167 requires counties to prepare stormwater management plans on a watershed-by-watershed basis. The plans must be developed in consultation with the affected municipalities. Each new plan is required to provide standards for control of runoff from new development, based on a detailed hydrologic assessment. A key objective of each plan is to coordinate the stormwater management decisions of the watershed municipalities. Implementation of each plan is through mandatory municipal adoption of ordinance provisions consistent with the plan.

Plans prepared under Act 167 will not resolve all drainage issues. A key goal of the planning process is to maintain existing peak runoff rates throughout a watershed as land development continues to take place. While the planning process does not solve existing flooding problems, it aims to prevent these problems from getting worse. Each municipality is responsible for correcting existing flooding problems.

The Dauphin County Act 167 Stormwater Management Plan last update was in April 2010. This plan promotes county-wide planning efforts while breaking out into watershed planning regions. The plan incorporates Best Management Practices. The plan also includes model ordinances for municipalities to adopt. Dauphin County

Conservation District worked with municipalities to adopt both the Stormwater Management Plan and Ordinance (Dauphin County Conservation District 2010).

Under the National Pollutant Discharge Elimination System (NPDES) and for small Municipal Separate Storm Sewer Systems (MS4), Dauphin County is a regulated entity. NPDES MS4s program purpose is to limit the amount of pollutants that enter into waterways and water bodies through separate storm sewer systems. These systems include, but not limited to, inlets, pipes, outlets, and gutters. The MS4s Program has six minimum control standards that includes public education, public participation, illicit discharge detection and elimination, construction site stormwater management, post-construction stormwater management, and pollution prevention and good housekeeping at municipal facilities. Dauphin County has a NPDES Phase II Regulations for Small MS4s Implementation Plan with the plan ending June 30, 2021 (Dauphin County Conservation District 2020).

Natural Resource Planning

Dauphin County Parks and Recreation Plan, also titled the Dauphin County Parks, Recreation, Open Space, and Greenways Study, was developed to enhance land conservation efforts in the county by creating a unified greenway system. This plan includes agricultural easements, conservancy lands, environmentally sensitive and natural areas like floodplains and wetlands, conservation greenways, multiuse greenways, and recreational/cultural greenways (Dauphin County 2009).

Capital Region Water, a company that operates the greater Harrisburg area's water infrastructure systems, has the Green Infrastructure Plan for the Harrisburg regional water system to help reduce stormwater runoff and pollution through different projects, including community tree plantings (Capital Region Water 2009). Capital Region Water also has the Source Water Protection Plan guided by the Source Water Assessment and Protection Program (SWAP) that was established under US EPA's 1996 Safe Drinking Water Act, Section 1453. This plan includes the identification of potential water source contaminates, mitigation of these contaminates, and the potential risk level to the water sources (Capital Region Water and SRBC 2015).

Informational Resources

Dauphin County has a variety of informational resources available, and many of the publications discussed previously are available for review by the public on the Dauphin County Department of Community and Economic Development website: https://www.dauphincounty.org/government/departments/community_and_economic_development/resources.php. Information is also posted on municipal websites, and hard copies of informational materials are available in municipal offices.

Dauphin County Department of Public Safety

The Dauphin County DPS maintains a strong emergency management capability that supports Dauphin County. The county operates an emergency 9-1-1 call center and activates its own emergency operations center (EOC) during emergencies. In addition, the county provides or supports emergency service programs and measures, including emergency response, public alert and warning systems, emergency communications systems, hazard event monitoring systems, and public information and outreach programs. Capabilities include the 9-1-1 center, EOC, emergency service measures, emergency response planning, public information programs, and geographic information system, which are described in the sections below.

9-1-1 Center

9-1-1 is the telephone number used to report emergencies. Citizens use the service in the event of the presence or potential for an immediate threat to life or property and to request response from police, fire, or emergency medical services (EMS) agencies. Examples include reporting a crime that has just occurred or is in progress; describing an odor such as gas or reporting a fire; or calling for assistance with a sick or injured person who requires treatment and possibly transportation to a hospital emergency department. The 9-1-1 system is capable of accepting calls from hearing or speech-impaired callers using a Telecommunications Device for the Deaf (TDD), and text messages. Each county in Pennsylvania operates a 9-1-1 Public Safety Answering Point (PSAP). Personnel at these PSAPs would need to coordinate their efforts in a regional hazard event. Computerized mapping of streets with address information is critical for emergency response purposes. The 9-1-1 center is also used to alert citizens during an emergency.

Emergency Operations Center

In the event of an impending emergency or disaster that cannot be managed by the county 9-1-1 staff, Dauphin County would activate its EOC. The purpose of the EOC is to manage an emergency response and coordinate the distribution of resources to a disaster incident. When the EOC is activated and becomes operational, it is staffed with highly trained, experienced personnel who have the authority, flexibility, imagination, and initiative needed to take command and make coordinated decisions relative to their field of expertise. EOC staffing includes personnel with skills from the disciplines below, in accordance with the National Response Framework (NRF) and the Commonwealth Emergency Operations Plan (EOP). Each discipline is assigned a coordinating agency and at least one primary agency and one support agency. In cases where more than one agency has primary jurisdiction over a discipline, a coordinating agency is designated from among them. Where there is only one agency with primary jurisdiction, that agency is also the coordinating agency. EOC disciplines are listed below:

- Transportation
- Communications and Warning
- Public Works and Engineering
- Firefighting
- Emergency Management
- Mass Care, Evacuation and Human Services
- Logistics Management and Resource Support
- Public Health and Medical Services
- Search and Rescue
- Oil and Hazardous Materials /Radiation
- Agriculture and Natural Resources
- Energy and Utilities
- Public Safety and Security
- Long-Term Community Recovery
- Public Information Officer (PIO) External Affairs

When activated, the EOC is in constant communication with the 9-1-1 center to ensure coordination of activities.

The DPS/9-1-1 capabilities fall under two categories: emergency service measures and emergency response planning. These capabilities are described below.

Emergency Service Measures

Emergency service measures protect people during and immediately following a disaster. The county monitors several systems that will disseminate emergency information and warnings. These monitoring systems include: Satellite Emergency Voice Alerting Network (SEVAN), Radio Amateur Civil Emergency Services (RACES), National Oceanic and Atmospheric Administration (NOAA) radios, 800-megahertz (MHz) Statewide radios, and EMNet, which are described below.

- SEVAN is the voice component of the satellite warning system. This allows PEMA, Pennsylvania counties, regional offices, and cities to communicate directly in real time, regardless of the status of the telephone system. Warning messages are routinely broadcast by PEMA using the system.
- RACES is a group of amateur radio operators who donate their services in times of natural disaster or emergency. They provide communication to fire, police, and other agencies that need assistance.
- NOAA Weather Radio All-Hazards (NWR) is a nationwide network of radio stations broadcasting continuous weather information directly from a nearby National Weather System (NWS) office. NWR broadcasts NWS warnings, watches, forecasts, and other hazard information 24 hours a day. NWR also broadcasts warning and post-event information for all types of hazards, including natural, human-caused (such as chemical releases or oil spills), and public safety (such as AMBER alerts or 9-1-1 telephone

outages). Dauphin County provided radios to all public schools in the county in 2005 and purchased another 100 radios in early 2021 to distribute to schools, hospitals, and long-term care facilities.
- The 800-MHz radio system provides two-way voice and data communications for all Dauphin County and Commonwealth agencies. The primary function of this system is to provide redundant communications between the county and partner agency facilities in the event that the primary means of communication becomes interrupted.
- EMNet is a fast, reliable alert and warning system, with 362 terminals across Pennsylvania over 214 broadcast stations and 62 cable networks. It provides an avenue for text-based messages to be sent among system users.

Emergency Planning

Emergency Operations Plan (EOP)

The Dauphin County EOP documents the county's emergency preparedness planning. The EOP includes county-specific emergency response procedures during significant emergency events. Dauphin County's EOP complies with the National Incident Management System (NIMS) and is updated every 2 years. The updated risk assessment information from this HMP will be incorporated into subsequent updates to the EOP. The county's EOP was last adopted in January 2021.

Mutual Aid Agreements

Dauphin County has mutual aid agreements (formal agreements) with the contiguous Pennsylvania counties as a result of the Pennsylvania Intrastate Mutual Assistance Program. Every county participates in this program. Dauphin County is also part of a larger county consortium, the South Central Task Force (SCTF), which works together and shares resources during times of emergency. Originally formed in response to the increasing threat of weapons of mass destruction (WMD) and other terroristic activity, the Task Force also provides all-hazards preparedness, mitigation, prevention, response, and recovery services to citizens in its purview (South Central Alert 2020). This intergovernmental agreement is between the following counties:

- Adams
- Cumberland
- Dauphin
- Franklin
- Lancaster
- Lebanon
- Perry
- Schuylkill
- York

Regional Planning Initiatives

Dauphin County also assists in county or regional planning and preparation for the following:

- Local (Municipal) EOPs
- Medical facilities
- Dams
- Airports
- Pandemic
- Mass casualty/fatality incidents
- Counterterrorism preparedness
- Special events, such as concerts, parades, etc.
- School emergency planning
- Day care, group home, and special needs facilities
- Evacuation and Detour Plan

- Superfund Amendments and Reauthorization Act of 1986 (SARA) – The Local Emergency Planning Committee program is based on the SARA of 1986, Title III. This legislation requires local planning by businesses and response agencies (such as fire departments and hazardous materials teams) whenever hazardous materials are involved. SARA also requires the establishment of a system in each community that informs the citizens of chemicals used, manufactured, and stored locally.
- In cooperation with the American Red Cross, the county has designated shelters that may be used during emergencies and disasters.

Local Emergency Management Capabilities

According to Pennsylvania Title 35 (Emergency Management Services Code), Chapter 7500, the following stipulations apply:

- Each political subdivision of this Commonwealth is directed and authorized to establish a local emergency management organization in accordance with the plan and program of PEMA. Each local organization shall have responsibility for emergency response and recovery within the territorial limits of the political subdivision within which it is organized and, in addition, shall conduct such services outside of its jurisdictional limits as may be required under this part.
- The governing body of a political subdivision may declare a local disaster emergency upon finding a disaster has occurred or is imminent. The effect of a declaration of a local disaster emergency is to activate the response and recovery aspects of any and all applicable local emergency management plans and to authorize the furnishing of aid and assistance.
- Each local organization of emergency management shall have a coordinator who shall be responsible for the planning, administration, and operation of the local organization.
- Each political subdivision shall adopt an Intergovernmental Cooperation agreement with other political subdivisions to accomplish the following:
  - Prepare, maintain, and keep current a disaster emergency management plan for (1) the prevention and minimization of injury and damage caused by a disaster, (2) prompt and effective response to disaster, and (3) disaster emergency relief and recovery consistent with the Pennsylvania Emergency Management Plan.
  - Establish, equip, and staff an EOC (integrated with warning and communication systems) to support government operations in emergencies and provide other essential facilities and equipment for agencies and activities assigned emergency functions.
  - Provide individual and organizational training programs to ensure prompt, efficient, and effective disaster emergency services.
  - Organize, prepare, and coordinate all locally available manpower, materials, supplies, equipment, facilities, and services necessary for disaster emergency readiness, response, and recovery.
  - Adopt and implement precautionary measures to mitigate the anticipated effects of a disaster. Execute and enforce such rules and orders as the agency shall adopt and promulgate under the authority of this part.
  - Cooperate and coordinate with any public and private agency or entity in achieving any purpose of this part.
  - Have available for inspection at its EOC all emergency management plans, rules, and orders of the Governor and PEMA.
  - Provide prompt and accurate information regarding local disaster emergencies to appropriate Commonwealth and local officials and agencies and the general public.
  - Participate in all tests, drills, and exercises—including remedial drills and exercises—scheduled by the agency or by the federal government.
  - Participate in the program of integrated flood warning systems under Section 7313 (6) (relating to powers and duties).

- Direction of disaster emergency management services is first the responsibility of the lowest level of government affected. When two or more political subdivisions within a county are affected, the county organization shall exercise responsibility for coordination and support to the area of operations. When two or more counties are involved, coordination shall be provided by PEMA or by area organizations established by PEMA.
- When all appropriate locally available forces and resources are fully committed by the affected political subdivision, assistance from a higher level of government shall be provided.
- Local coordinators of emergency management shall develop mutual aid agreements with adjacent political subdivisions for reciprocal emergency assistance. The agreements shall be consistent with the plans and programs of PEMA.

Mutual Aid Agreements

Dauphin County has formal mutual aid agreements in place with its municipalities.

Emergency Operations Centers

In the event of an impending emergency or disaster, the local EOC may be activated. The purpose of the EOC is to manage the emergency response and coordinate distribution of resources to a disaster incident at the local level.

Emergency Response

Each municipality is responsible for providing emergency response to their municipality consisting of EMS, fire, and police. If a municipality does not have one of these providers in their community, they should have mutual aid agreements with an adjacent political subdivision or the Commonwealth (e.g., law enforcement coverage by the Pennsylvania State Police [PSP]) to respond.

Monitoring Systems

The municipalities may also be equipped with several systems to monitor emergency information and warnings, including RACES and the NWS, which have been described previously.

Emergency Response Planning

The municipalities may also assist with planning for:

1. Municipal EOPs
2. Medical facilities
3. Dams
4. Counterterrorism preparedness
5. Special events
6. School emergency planning
7. Day care, group homes, and special needs facilities
8. Evacuation

A summary of existing federal, state, regional, and county programs (regulatory and otherwise) to manage specific hazard risks may be found in the hazard profiles in Section 4 of this plan update. While the risk of certain hazards can be addressed at least partially through mitigation, the risks of other hazards (particularly certain non-natural hazards) are primarily managed through the preparedness and response elements of emergency management or through other regulatory programs at the federal and state levels.

Participation in the National Flood Insurance Program

According to Federal Emergency Management Agency's (FEMA) 2002 NFIP: Program Description, the U.S. Congress established the NFIP with the passage of the National Flood Insurance Act of 1968 (FEMA 2002). The NFIP is a federal program enabling property owners in participating communities to purchase insurance as a protection against flood losses in exchange for state and community floodplain management regulations that reduce future flood damages.

Participation in the NFIP is based on an agreement between communities and the federal government. If a community adopts and enforces a floodplain management ordinance to reduce future flood risk to new construction and substantial improvements in floodplains, the federal government will make flood insurance available within the community as a financial protection against flood losses. This insurance is designed to provide an alternative to disaster assistance and reduce the escalating costs of repairing damage to buildings and their contents caused by floods (FEMA 2002).

NFIP-participating communities in Dauphin County are required to adopt a flood damage prevention ordinance (also sometimes called a "floodplain" or "floodplain management ordinance") and update this ordinance when the regulatory NFIP Flood Insurance Rate Maps (FIRM) are officially updated. The Pennsylvania Department of Community and Economic Development (PA DCED) (the legislated Commonwealth coordinating agency for the NFIP) and PEMA (the Commonwealth agency that carries out floodplain coordination in practice) provide support to municipalities by providing suggested text for floodplain management ordinances.

All the county's municipalities, except Berrysburg Borough, participate in the NFIP. Berrysburg Borough has no delineated special flood hazard area. Penbrook Borough also does not have any delineated special flood hazard area, but does participate in the NFIP. Dauphin County's municipalities' FIRMs were made effective in August 2012. All participating municipalities have adopted a floodplain ordinance, and many have adopted a stormwater management ordinance.

The municipalities' floodplain administrators, who are often either the code enforcement officer or zoning officer for the municipality, enforce the floodplain ordinances locally. Throughout Dauphin County, all municipalities enforce the Uniform Construction Code, and most enforce zoning regulations. Rather than using a specific Floodplain Development Permit, the county's municipalities include on zoning and/or building permit applications a space for applicants to state whether the proposed development is in the floodplain. The permit application reviewer confirms whether the property in question is in the floodplain. If it is, the municipal floodplain administrator reviews the proposed development against the municipality's floodplain management ordinance. The floodplain administrator conducts similar reviews of any revisions to the permit application until all requirements are met. As the proposed activity is conducted, the floodplain administrator works with the code enforcement officer and/or zoning officer to conduct inspections and ensure that the proposed activity is carried out as it was permitted.

NFIP-participating communities in Dauphin County are required to make current NFIP FIRMs available to their residents for review and may provide mapping assistance through their floodplain administrators. Typically, this mapping is available at the municipal offices in each community. Floodplain administrators provide information about mapping to their residents using established outreach methods such as municipal websites, newsletters, and mailings. At the time of this plan update, the Dauphin County FEMA Digitized Flood Insurance Rate Maps (DFIRM) (dated August 2012) were used to evaluate exposure and determine potential future losses.

Floodplain administrators also use established outreach methods to provide information about flood insurance to residents and business owners. They can provide information on the availability of flood insurance, how to get a flood insurance policy, and determining the appropriate level of coverage.

Municipal participation in and compliance with the NFIP is supported at the federal level by FEMA Region III and the Insurance Services Organization (ISO) and at the state level by the PA DEP, PA DCED, and PEMA. The county's Planning Commission and Conservation District both support flood mitigation efforts, associated training, and public education and awareness programs.

Additional information on the NFIP program and its implementation within the county can be found in the flood hazard profile in Section 4.3.6.

Community Rating System (CRS)

In the 1990s, the Flood Insurance Administration (FIA) established the CRS to encourage local governments to increase their standards for floodplain development. The goal of the program is to encourage communities, through flood insurance rate adjustments, to implement standards beyond the minimum required in order to:

- Reduce losses from floods
- Facilitate accurate insurance ratings
- Promote public awareness of the availability of flood insurance

CRS is a voluntary program designed to reward participating jurisdictions for their efforts to create more disaster-resistant communities using the principles of sustainable development and management. By enrolling in CRS, municipalities can leverage greater flood protection while receiving flood insurance discounts.

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.

Currently, Harrisburg City is the only Dauphin County municipality that participates in the CRS Program, though several of Dauphin County's municipalities applied to FEMA to enter the program in March 2017. As of the time of this plan update, FEMA had not conducted required activities for those municipalities to enter the CRS Program. The county, municipalities, and PEMA's NFIP Program Manager continue to coordinate with FEMA Region III on the issue.

Municipal Capabilities

Participating municipalities in this planning effort were provided a Capability Assessment Survey. Table 5-1 summarizes the responses of the municipalities based on planning and regulatory capability, supplemented by information received from the county regarding municipal capabilities. Detailed information regarding Dauphin County municipalities' planning and regulatory capabilities can be found in the municipal survey responses provided in Appendix D.

Table 5-1. Planning and Regulatory Capability

Municipality	Hazard Mitigation Plan	EOP	Disaster Recovery Plan	Evacuation Plan	COOP Plan	NFIP	NFIP – CRS	Floodplain Regulations	Floodplain Mgmt. Plan	Zoning Regulations	Subdivision Regulations	Comprehensive Land Use Plan (or General, Master, or Growth Mgmt. Plan)	Open Space Mgmt. Plan	Stormwater Mgmt. Plan/Ordinance	Natural Resource Protection Plan	Capital Improvements Plan	Economic Dev. Plan	Historic Preservation Plan	Farmland Preservation	Building Code	Fire Code	Other
Dauphin County	X	X	-	-	X	N/A	N/A	N/A	-	N/A	N/A	X	-	X	-	-	X	-	-	N/A	N/A	
Berrysburg Borough	X	X	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	X	X	
Conewago Township	X	X	+	X	-	X	-	X	X	X	X	X	X	X	-	-	-	-	-	X	X	
Dauphin Borough	X	X	+	X	X	X	-	X	X	X	X	X	-	X	-	+	-	-	-	X	X	
Derry Township	X	X	-	-	-	X	-	X	-	X	X	X	X	X	-	-	-	-	-	X	X	
East Hanover Township	X	X	+	X	+	X	-	X	X	X	X	X	X	X	-	-	-	-	-	X	X	
Elizabethville Borough	X	X	-	-	-	X	-	X	X	-	-	-	-	-	-	-	-	-	-	X	X	
Gratz Borough		X				X	-	X		X										X		
Halifax Borough	X	X	-	-	X	X	-	X	-	-	X	X	-	X	-	-	-	-	-	X	X	
Halifax Township		X				X	-	X		-										X		
Harrisburg City	X	X	X	X	-	X	X	X	-	X	X	X	X	X	-	-	-	X	-	X	X	
Highspire Borough	X	X	X	X	X	X	+	X	-	X	X	X	-	X	X	X	X	-	-	X	-	X
Hummelstown Borough	X	X	X	X	X	X	-	X	-	X	X	X	-	X	-	-	-	-	-	X	X	
Jackson Township	X	X	-	-	-	X	-	X	-	-	X	-	-	X	-	-	-	-	-	X	-	
Jefferson Township	-	X	-	-	-	X	-	X	-	-	-	X	-	X	-	-	-	-	-	X		
Londonderry Township	X	X	X	X	X	X	-	X	-	X	X	X	-	X	-	X	X	-	-	X	X	
Lower Paxton Township	X	X	X	X	X	X	+	X	-	X	X	X	X	X	X	X	X	X	-	X	X	X
Lower Swatara Township	-	X	-	-	-	X	-	X	X	X	X	X	-	X	-	-	-	-	-	X	X	
Lykens Borough	X	X	X	-	-	X	-	X	X	X	X	X	-	X	-	X	-	-	-	X	X	
Lykens Township	X	X	-	X	-	X	-	X	-	X	X	X	X	X	-	-	-	-	X	X	X	
Middle Paxton Township	X	X	-	X	X	X	+	X	-	X	X	X	X	X	-	-	-	-	-	X	X	
Middletown Borough	X	X	X	X	+	X	-	X	-	X	X	X	+	X	-	-	-	X	-	X	X	

Municipality	Hazard Mitigation Plan	EOP	Disaster Recovery Plan	Evacuation Plan	COOP Plan	NFIP	NFIP – CRS	Floodplain Regulations	Floodplain Mgmt. Plan	Zoning Regulations	Subdivision Regulations	Comprehensive Land Use Plan (or General, Master, or Growth Mgmt. Plan)	Open Space Mgmt. Plan	Stormwater Mgmt. Plan/Ordinance	Natural Resource Protection Plan	Capital Improvements Plan	Economic Dev. Plan	Historic Preservation Plan	Farmland Preservation	Building Code	Fire Code	Other
Mifflin Township	X	X	-	-	-	X	-	X	-	-	-	-	-	X	-	-	-	-	-	X	X	
Millersburg Borough	+	X	+	+	X	X	+	X	X	X	+	X	X	X	+	+	+	+	+	X	+	
Paxtang Borough	X	X	X	X	X	X	+	X	X	X	X	X	+	X	-	X	-	-	-	X	X	
Penbrook Borough	X	X	-	X	-	X	-	X	-	X	X	X	-	X	-	X	X	-	-	X	-	
Pillow Borough	X	X	-	-	-	X	-	X	-	-	-	-	-	-	-	-	-	-	-	X	-	
Reed Township	X	X	-	-	-	X	-	X	X	-	X	-	-	X	-	-	-	-	X	X	-	
Royalton Borough	X	X	X	X	X	X	+	X	X	X	X	X	X	X	X	-	-	-	-	X	X	
Rush Township	X	X	-	-	-	X	-	X		-	X	-	-	X	-	-	-	-	-	X	X	
South Hanover Township	X	X	-	-	-	X	-	X	X	X	X	X	X	X	-	-	-	-	-	X	X	
Steelton Borough	X	X	X	X	X	X	+	X	-	X	-	-	-	-	-	-	-	-	-	X	X	
Susquehanna Township	X	X	X	-	X	X	+	X	-	X	X	X	X	X	X	-	-	-	-	X	X	
Swatara Township	X	X	-	-	-	X	-	X	-	X	X	-	X	X	-	-	-	-	-	X	X	
Upper Paxton Township	X	X	-	X	-	X	+	X	X	X	X	X	-	X	-	-	-	-	X	X	X	
Washington Township	X	X	-	-	-	X	-	X	-	X	X	X	-	X	-	-	-	-	-	X	-	
Wayne Township	X	X	-	-	-	X	-	X	X	-	X	-	-	X	-	-	-	-	X	X	-	
West Hanover Township		X				X	-	X		X										X		
Wiconisco Township		X				X	-	X		X										X		
Williams Township	X	X	-	-	-	X	-	X	-	-	-	-	-	-	-	-	-	-	-	X	X	
Williamstown Borough		X				X	-	X		-										X		

Notes:
"X" indicates that the municipality currently has this capability in place.
"-" indicates no capability is currently in place.
"+" indicates that the capability is under development.
Other: Highspire Borough – Pollutant Reduction Plan

"N/A": Not applicable
Blank space indicates no response was received from the municipality in 2015/2016 or 2020/2021.

5.2.2 Administrative and Technical Capability

Administrative capability is described as the 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 skillsets 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, and fiscal staff to handle complex grant application processes.

Municipalities are further supported by county, regional, state, and federal administrative and technical capabilities. For this HMP, most support agencies and resources have been identified and referenced throughout this plan update.

It is noted that the county and many of its municipalities have identified specific mitigation initiatives described in this plan update, which will help build and enhance mitigation-related administrative and technical capabilities in Dauphin County.

Federal and Commonwealth Capabilities

Federal agencies that can provide technical assistance for mitigation activities include, but are not limited to:

- U.S. Army Corp of Engineers
- Department of Housing and Urban Development
- Department of Agriculture
- Economic Development Administration
- Emergency Management Institute
- Environmental Protection Agency
- FEMA
- Small Business Administration

Commonwealth agencies that 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 Emergency Management Agency
- Pennsylvania Department of Environmental Protection
- Pennsylvania Silver Jackets

Municipal Capabilities

Participating municipalities in this planning effort were provided with a capabilities survey. Table 5-2 summarizes the responses of the municipalities based on administrative and technical capability. Copies of the individual municipal responses are found in Appendix D.

Table 5-2. Administrative and Technical Capability

Municipality	Planners (with land use/land development knowledge)	Planners or Engineers (with natural and/or human-caused hazards knowledge)	Engineers or Professionals trained in building and/or infrastructure construction practices	Emergency Manager	NFIP Floodplain Administrator	Land Surveyors	Scientists or Staff familiar with the hazards of the community	Personnel skilled in GIS and/or the FEMA HAZUS program	Grant Writers or Fiscal Staff to handle large/complex grants	Other
Dauphin County	X	X	X	X	N/A	-	-	X	X	
Berrysburg Borough	-	-	X	X	-	-	-	X	-	
Conewago Township	X	X	X	X	X	-	X	X	X	
Dauphin Borough	X	X	X	X	X	X	-	-	-	
Derry Township	X	X	X	X	X	-	-	-	X	
East Hanover Township	-	-	-	X	X	-	-	-	-	
Elizabethville Borough	-	-	X	X	X	-	-	-	-	
Gratz Borough					X					
Halifax Borough	-	-	-	X	X	-	-	-	-	
Halifax Township					X					
Harrisburg City	X	X	X	X	X	-	X	X	X	
Highspire Borough	X	X	X	X	X	X	X	-	X	
Hummelstown Borough	X	X	X	X	X	X	-	X	-	
Jackson Township	-	X	X	X	X	-	-	X	-	
Jefferson Township	X	X	X	X	X	-	-	X	-	
Londonderry Township	X	X	X	X	X	-	X	-	X	
Lower Paxton Township	X	X	X	X	X	-	-	X	X	
Lower Swatara Township	X	X	X	X	X	X	X	-	X	
Lykens Borough	X	X	X	X	X	X	-	X	X	
Lykens Township	-	-	-	X	X	-	-	-	-	
Middle Paxton Township	X	X	X	X	X	X	-	X	X	
Middletown Borough	-	-	-	X	X	-	-	-	X	
Mifflin Township	-	-	-	X	X	-	-	-	-	-
Millersburg Borough	-	X	X	X	X	-	-	X	X	
Paxtang Borough	X	X	X	X	X	X	X	X	X	
Penbrook Borough	X	X	X	X	X	X	X	X	X	
Pillow Borough	-	-	X	-	X	-	-	-	-	
Reed Township	X	X	X	X	X	-	-	-	-	
Royalton Borough	X	X	X	X	X	X	X	X	X	
Rush Township	X	X	X	X	X	-	-	-	-	
South Hanover Township	X	X	X	X	X	-	-	X	X	
Steelton Borough	X	X	X	X	X	-	-	-	X	
Susquehanna Township	X	X	X	X	X	X	X	X	X	

Municipality	Planners (with land use/land development knowledge)	Planners or Engineers (with natural and/or human-caused hazards knowledge)	Engineers or Professionals trained in building and/or infrastructure construction practices	Emergency Manager	NFIP Floodplain Administrator	Land Surveyors	Scientists or Staff familiar with the hazards of the community	Personnel skilled in GIS and/or the FEMA HAZUS program	Grant Writers or Fiscal Staff to handle large/complex grants	Other
Swatara Township	X	X	X	X	X	X	-	-	-	
Upper Paxton Township	X	-	X	X	X	X	X	-	-	
Washington Township	X	X	X	X	X	-	-	-	-	
Wayne Township	X	X	X	X	X	-	-	-	-	
West Hanover Township					X					
Wiconisco Township					X					
Williams Township	-	-	-	X	X	-	-	-	-	
Williamstown Borough					X					

Notes:
"X" indicates that the municipality currently has this capability in place.
"-" indicates no capability is currently in place.
Blank space indicates no response was received from the municipality.

5.2.3 Financial Capability

Mitigation projects and initiatives are largely or entirely dependent on available funding. As such, it is critical to identify all available sources of funding at the local, county, regional, state, and federal level to support implementation of the mitigation strategies identified in this plan update.

Jurisdictions fund mitigation projects though existing local budgets, local appropriations (including referendums and bonding), and through myriad federal and state loan and grant programs.

Federal mitigation grant funding (Stafford Act 404 and 406) (FEMA 2000) is available to all communities with a current HMP (this plan); however, most of these grants require a "local share" in the range of 10 to 25 percent of the total grant amount.

Federal Hazard Mitigation Funding Opportunities

The Hazard Mitigation Grant Program

The Hazard Mitigation Grant Program (HMGP) (Stafford Act 404 and 406) is a post-disaster mitigation program made available to states by FEMA after each federal disaster declaration. The HMGP can provide up to 75 percent funding for hazard mitigation measures and can be used to fund cost-effective projects to protect public or private property in an area covered by a federal disaster declaration or that projects to reduce the likely damage from future disasters. Examples of projects include acquisition and demolition of structures in hazard-prone areas, flood proofing, or elevation to reduce future damage, minor structural improvements, and development of state or local standards.

Projects must fit into an overall mitigation strategy for the area identified as part of a local planning effort. All applicants must have a FEMA-approved HMP. Applicants who are eligible for the HMGP include state and local governments, certain nonprofit organizations or institutions that perform essential government services, and Indian tribes and authorized tribal organizations. Individuals or homeowners cannot apply directly for the HMGP; a local government must apply on their behalf. Applications are submitted to PEMA and ranked order for available funding and submitted to FEMA for final approval. Eligible projects not selected for funding are placed in an inactive status and may be considered as additional HMGP funding becomes available.

Sections 404 and 406 hazard mitigation funding are two distinct criteria associated with mitigation funding. Participation in FEMA 404 HMGP may cover mitigation activities including raising, removing, relocating, or replacing structures within flood hazard areas. FEMA 406 HMGP is applied to parts of a facility that were actually damaged by a disaster, and the mitigation measures that provide protection from subsequent events.

Flood Mitigation Assistance Program

Flood Mitigation Assistance (FMA) provides funding to assist states and communities in implementing measures to reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insurable under the NFIP. FMA is funded annually; no federal disaster declaration is required. Only NFIP-insured homes and businesses are eligible for mitigation in this program. Funding for FMA is limited, and, as with the HMGP, individuals cannot apply directly. Applications must come from local governments or other eligible organizations.

The federal government cost-share for an FMA project is 75 percent. At least 25 percent of the total eligible costs must be provided by a non-federal source, and of this 25 percent, no more than half can be provided as in-kind contributions from third parties. At a minimum, a FEMA-approved local HMP is required before a project can be approved. FMA funds are distributed from FEMA to the Commonwealth. PEMA serves as the grantee and program administrator for FMA.

As of fiscal year 2013, the Severe Repetitive Loss and Repetitive Flood Claims Programs were dismantled and incorporated into the FMA Program. As a result, residential and non-residential properties currently insured with NFIP are eligible to receive FMA funds as long as they meet either the Repetitive Loss Properties (RLP) or Severe Repetitive Loss (SRL) property definitions as described in Section 4.3.6 of this plan.

Pre-Disaster Mitigation Program

Until 2020, the Pre-Disaster Mitigation (PDM) Program was an annually funded, nationwide, competitive grant program. No disaster declaration was required. Federal funds covered 75 percent of a project's cost up to $3 million. As with the HMGP and FMA, a FEMA-approved local HMP was required to be approved for funding under the PDM program.

Building Resilient Infrastructure and Communities Program

The Building Resilient Infrastructure and Communities Program was first implemented in 2020 to replace and expand upon the PDM Program. For FY20, FEMA provided $500 million through the Building Resilient Infrastructure and Communities (BRIC) Program (FEMA 2020). States and territories were allocated $33.6 million. $20 million was set aside for tribal governments. The remaining $446.4 million were included in the competitive portion of the funding program. Like the PDM Program, no disaster declaration is required. Federal funds will cover 75 percent of a project's cost up to $50 million per subapplication, a substantial increase from the $3 million cap under the PDM Program. As with the HMGP, FMA, and (former) PDM Program, a FEMA-approved local HMP is required to be approved for funding under the BRIC program.

Federal Disaster Assistance Programs

Following a disaster, various types of assistance may be made available by local, state, and federal governments. The types and levels of disaster assistance depend on the severity of the damage and the declarations that result from the disaster event. General types of assistance that may be provided, should the President of the United States declare the event a major disaster, include the following:

- Individual Assistance – Provides help for homeowners, renters, businesses, and some nonprofit entities after disasters occur. This program is largely funded by the U.S. Small Business Administration. For homeowners and renters, those who suffered uninsured or underinsured losses may be eligible for a Home Disaster Loan to repair or replace damaged real estate or personal property. Renters are eligible for loans to cover personal property losses. Individuals may borrow up to $200,000 to repair or replace real estate, $40,000 to cover losses to personal property, and an additional 20 percent for mitigation. For businesses, loans may be made to repair or replace disaster damages to property owned by the business, including real estate, machinery and equipment, inventory, and supplies. Businesses of any size are eligible. Nonprofit organizations such as charities, churches, private universities, etc., are also eligible. An Economic Injury Disaster Loan provides necessary working capital until normal operations resume after a physical disaster. These loans are restricted, by law, to small businesses only.

- Public Assistance – Provides cost reimbursement aid to local governments (state, county, local, municipal authorities, and school districts) and certain nonprofit agencies that were involved in disaster response and recovery programs or that suffered loss or damage to facilities or property used to deliver government-like services.

U.S. Department of Housing and Urban Development Community Development Block Grants

The U.S. Department of Housing and Urban Development (HUD) Community Development Block Grants (CDBG) are federal funds intended to provide low- and moderate-income citizens with decent housing, a suitable living environment, and expanded economic opportunities. Eligible activities include community facilities and improvements, roads and infrastructure, housing rehabilitation and preservation, development activities, public services, economic development, planning, and administration. Public improvements may include flood and drainage improvements. In limited instances, and during times of "urgent need" (for example, post-disaster) as defined by the CDBG National Objectives, CDBG funding may be used to acquire a property located in a floodplain that was severely damaged by a recent flood, demolish a structure severely damaged by an earthquake, or repair a public facility severely damaged by a hazard event. All municipalities in the county are eligible for CDBG funds through the county, except for the City of Harrisburg, which receives CDBG funding directly from U.S. HUD.

High Hazard Potential Dam (HHPD) Program

To reduce DeHart Dam's vulnerability, Dauphin County could apply for the FEMA Rehabilitation of HHPD grant program. "The main objective of the HHPD grant program is to provide technical, planning, design, and construction assistance in the form of grants to non-federal sponsors for rehabilitation of eligible high hazard potential dams." (FEMA 2020). New guidance for the HHPD grant program was provided in July 2020.

In order to receive the HHPD funding, the following are basic outline program eligibility requirements:

1. The applicant must be a non-federal government entity or a nonprofit and work with the State Administrative Agency (SSA) designee which will serve as the applicant and/or pass-through entity for a subrecipient.
    a. It is recommended that applicants pursue this grant in coordination with the State Dam Safety Officer and the State Hazard Mitigation Officer (SHMO). For Pennsylvania, Roger Adams is the PA DEP Dam Safety Division Chief, and Tom Hughes is the PA SHMO.
2. The subrecipient must:
    a. Act in accordance with the state dam safety program, and the project must be regulated by the same program.
    b. Must be a full participant in the NFIP and not suspended.
    c. Must commit to operation and maintenance (O&M) for 50 years in addition to providing an O&M plan and assure that the plan will be carried out.
    d. Must have a floodplain management plan in place.
    e. Must comply with the Stafford Act, Davis-Bacon Act, Copeland Anti-Kickback Act, and the Brook Architect-Engineers Act.
3. Eligibility Requirements as identified on page 2-7 of the HHPD guidance document:
    a. Be located in a state with a state dam safety program.

   b. Be classified as "high hazard potential" by the state dam safety program.
   c. Have an emergency action plan (EAP) approved by the state dam safety program/
   d. Fail to meet minimum state dam safety standards and pose an unacceptable risk to the public/
   e. Eligible project must meet non-federal cost-share requirements of 35% of entire project costs.
   f. Phased projects are allowable in the program/
4. Grant Fund Requirements:
   a. Environmental and Historic Preservation compliance
   b. Non-Discrimination compliance
   c. Conflicts of Interest compliance
   d. Procurement compliance
   e. Duplication of Programs
   f. Duplication of Benefits

Additional Federal Resources

Weatherization Assistance Program: Minimizes the adverse effects of high-energy costs on low-income, elderly, and handicapped citizens through client education activities and weatherization services like heating system modifications and insulation (US DOE 2011).

Section 108 Loan Guarantee Programs: Provides loan guarantees as security for federal loans for acquisition, rehabilitation, relocation, clearance, site preparation, special economic development activities, and construction of certain public facilities and housing (HUD 2011).

U.S. Department of Agriculture: Provides disaster assistance through the following:

- The Emergency Conservation Program provides emergency funding for farmers to rehabilitate farmland damaged by natural disasters and for carrying out emergency water conservation measures during periods of severe drought.
- The Non-Insured Crop Disaster Assistance Program provides financial assistance for non-insurable crop losses and planting prevented by disasters.

Emergency Watershed Protection Program: Undertakes emergency measures including the purchase of floodplain easements for runoff retardation and soil erosion prevention to safeguard lives and property from floods, drought, and the products of erosion on any watershed whenever fire, flood, or any other natural occurrence is causing or has caused a sudden impairment of the watershed (NRCS 2011). It is not necessary for an emergency to be declared by the President for an area to be eligible for assistance. The program objective is to assist sponsors and individuals in implementing emergency measures to relieve imminent hazards to life and property created by a natural disaster. Activities include providing financial and technical assistance to remove debris from streams, protecting destabilized stream banks, establishing cover on critically eroding lands, repairing conservation practices, and purchasing of floodplain easements. The program is designed for installation of recovery measures.

Commonwealth Hazard Mitigation Funding Opportunities

Marcellus Shale Legacy Fund - Act 13 of 2012

Watershed Restoration and Protection Program (WRPP): Act 13 of 2012 establishes the Marcellus Legacy Fund and allocates funds to the Commonwealth Financing Authority for watershed restoration and protection projects. The overall goal of this program is to restore, and maintain restored stream reaches impaired by the uncontrolled discharge of non-point source polluted runoff, and ultimately to remove these streams from the PA DEP's Impaired Waters list.

Greenways, Trails and Recreation Program (GTRP): In addition, Act 13 of 2012 allocates funds to the Commonwealth Financing Authority (the "Authority") for planning, acquisition, development, rehabilitation, and repair of greenways, recreational trails, open space, parks, and beautification projects. Projects can involve development, rehabilitation and improvements to public parks, recreation areas, greenways, trails, and river conservation.

Flood Mitigation Projects: Finally, Act 13 of 2012 allocates funds to the Commonwealth Financing Authority (the "Authority") for funding statewide initiatives to assist with flood mitigation projects.

While most of the identified fiscal capabilities are available to all of the municipalities in Dauphin County, the extent to which communities have leveraged these funding sources varies widely. It is expected that communities familiar with accessing grant programs will continue to pursue those grant sources, as appropriate.

Other Commonwealth Hazard Mitigation Funding Opportunities

Commonwealth programs that may provide financial support for mitigation activities include, but are not limited to:

- Community Conservation Partnerships Program
- Community Revitalization Program
- Floodplain Land Use Assistance Program
- Growing Greener Program
- Keystone Grant Program
- Local Government Capital Projects Loan Program
- Land Use Planning and Technical Assistance Program
- Pennsylvania Heritage Areas Program
- Pennsylvania Recreational Trails Program
- Shared Municipal Services
- Technical Assistance Program

Dauphin County Capabilities

Dauphin County Land Bank Authority

The Dauphin County Land Bank Authority (Land Bank) was created by Ordinance 2013-4 and enabled by Act 153 of 2012, 68 Pa. S.S.A. at Section 2107, Creation of Land Banks for the Conversion of Vacant or Tax-Delinquent Properties into Productive Use. The Land Bank was established to use available resources to facilitate the return of vacant, blighted, abandoned and tax-delinquent properties to productive use, thereby combating community deterioration, creating economic growth, and stabilizing the housing and job market. Governed by a seven-member board, the Land Bank acquires, holds, and transfers interest in real property throughout Dauphin County as approved by the Board of Directors for the following purposes consistent with the goals established by the Dauphin County Land Bank Ordinance, local government partners, and other community stakeholders:

- To deter the spread of blight
- To promote redevelopment and reuse of vacant, abandoned, and tax-delinquent properties
- To support targeted efforts to stabilize neighborhoods

Local taxing bodies, including the county, municipalities, and local school district, enter into an Intergovernmental Cooperation Agreement and Memorandum of Understanding (MOU) with the Land Bank. Properties are referred to the Land Bank with the focus on revitalization to improve a property's condition, ultimately increasing the municipal tax base.

Dauphin County Local Share Gaming Fund

The Pennsylvania Race Horse Development and Gaming Act, as amended, established a coordinated system for ensuring that local governments receive a share of the revenues generated by gaming. This "Local Share" system distributes approximately 4 percent of gross revenues of certain licensed gaming facilities to support community and economic well-being and mitigate the impact of gaming and related activities. Those funds are distributed to the licensed facility's host municipality and host county. Dauphin County is a host county. Under the Local Share system, Dauphin County uses a portion of the Local Share monies it receives for awarding municipal grants. Grants may be awarded from two grant pools: (1) a pool for projects with a clear connection to the operations or impacts of the licensed gaming facility; and (2) a pool where a project's connection to the licensed facility may be considered, but is not required, to receive a grant. The Dauphin County Gaming Advisory Board determines whether an application will be considered for funding from one or both grant pools. Eligible uses for funds from Grant Pool 2 include:

- Health: Projects that facilitate, enhance, or otherwise further the health of the residents and communities of the grantee.
- Safety: Projects that facilitate, enhance, or otherwise further the safety of the residents and communities of the grantee.
- Transportation: Projects that address transportation needs or improve transportation systems in the grantee communities.
- Public Interest: Projects that improve the quality of life in the grantee communities.

Dauphin County Infrastructure Bank

Starting in 2013, the Dauphin County Infrastructure Bank (DCIB) provides low-interest loan financing to support surface transportation projects county-wide and is intended to leverage other private, local, state, and federal funding resources. The county is working with Pennsylvania Department of Transportation (PennDOT) on the DCIB and will provide a maximum of $30 million for low-interest loans for qualifying transportation projects. Program funds are run through PennDOT's Pennsylvania Infrastructure Bank (PIB) Program. Public road and bridge repair, improvement, or construction of culverts and drainage structures are some of the eligible uses of DCIB Program funding. The program was a 2014 Achievement Award Winner from the National Association of Counties (NACO).

Additional financial resources can be generated from local fees and taxes. Municipalities may exercise their taxing authority to raise funds for projects as they see fit. This includes special taxes to fund mitigation measures such as, but not limited to, EMS, firefighting, fire equipment, fire hydrants, and infrastructure improvements.

Intergovernmental Cooperation

Intergovernmental cooperation is one manner of accomplishing common goals, solving mutual problems, and reducing expenditures. Dauphin County municipalities have many types of partnering arrangements in place. For instance, the Capital Region Council of Governments (CapCOG) includes 40 municipal members from Dauphin, Cumberland, and York counties. A total of 20 Dauphin County municipalities participate in the CapCOG including: Conewago Township, Dauphin Borough, Derry Township, East Hanover Township, Harrisburg City, Highspire Borough, Hummelstown Borough, Londonderry Township, Lower Paxton Township, Lower Swatara Township, Middle Paxton Township, Middletown Borough, Paxtang Borough, Penbrook Borough, Royalton Borough, and South Hanover Township.

Municipal Capabilities

The implementation of mitigation actions requires time and fiscal resources. While some mitigation actions are less costly than others, it is important that funds are available locally to implement policies and projects. Financial resources are particularly important if jurisdictions are trying to take advantage of Commonwealth or federal mitigation grant funding opportunities that require local-match contributions.

Capital Improvement Planning

Capital improvement plans are often recommended by counties to their municipalities because these plans help identify specific capital projects to be funded and completed according to a defined schedule. Some of these projects involve improvements to facilities and infrastructure that provide hazard mitigation benefits. As such, during this update process, the county and its municipalities have been encouraged to consider the mitigation benefits associated with their known or anticipated capital projects as a way to help prioritize their execution and to develop awareness that mitigation grants may be available to help fund such projects.

Special Purpose Taxes

Communities may exercise their taxing authority to raise funds for any project they see fit. This includes special taxes to fund mitigation measures. Spreading the cost of a community project among the community's taxpayers helps provide the greatest public good for relatively little individual cost.

Gas/Electric Utility Fees

In the same way that special taxes can be levied to fund mitigation projects, another avenue for financing a project that a community may utilize is to dedicate a portion of homeowners' gas and electric utilities' fees to upgrade and maintain the related infrastructure. Burying transmission lines, thereby mitigating from the effects of winds and ice storms, is expensive. These fees help to offset that cost.

Water/Sewer Fees

Water Authorities and 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 and Fees

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.

Stormwater Utility Fees

Stormwater utility fees are assessed and collected to offset the cost of maintaining and upgrading stormwater management structures such as drains, retention ponds, and culverts.

Development Impact Fees

Development impact fees are one-time fees assessed to offset the cost of providing public services to a new development. They may be dedicated to providing the related new water or sewer infrastructure, roads, parks and recreational areas, libraries, schools, etc. The new infrastructure may be less vulnerable to hazard impacts.

General Obligation, Revenue, and/or Special Tax Bonds

Jurisdictions may simply decide to dedicate general fund or similar financing to implement hazard mitigation projects.

Partnering Arrangements or Intergovernmental Agreements

Intergovernmental cooperation is one manner of accomplishing common goals, solving mutual problems, and reducing expenditures. There are 40 municipalities within Dauphin County. Each of these municipalities conducts its daily operations and provides various community services according to local needs and limitations. Each municipality varies in staff size, resource availability, fiscal status, service provision, constituent population, overall size, and vulnerability to the identified hazards.

Circuit Rider Program (Engineer)

The Circuit Rider Program is an example of intergovernmental cooperation. This program offers municipalities the ability to join together to accomplish a common goal. The Circuit Rider is a municipal engineer who serves several small municipalities simultaneously. These are municipalities that may be too small to hire a professional engineer for their own operations yet need the skills and expertise the engineer can offer. Municipalities can jointly obtain what no single municipality could obtain on its own.

Municipalities participating in this planning effort were provided with a capabilities survey. Table 5-3 summarizes the responses of the municipalities based on financial capabilities. Copies of the individual municipal responses are found in Appendix D.

Table 5-3. Fiscal Capability

Municipality	Capital Improvements Program	Community Development Block Grants (CDBG)	Special Purpose Taxes	Gas/Electric Utility Fees	Water/Sewer Fees	Stormwater Utility Fees	Development Impact Fees	General Obligation, Revenue, and/or Special Tax Bonds	Partnering Arrangements or Intergovernmental Agreements	Other
Dauphin County	X	X	-	-	-	-	-	X	X	
Berrysburg Borough	-	-	-	-	X	-	-	-	-	
Conewago Township	-	-	-	-	-	-	-	-	-	
Dauphin Borough	-	X	-	-	X	-	-	-	-	
Derry Township	-	X	-	-	-	-	-	-	-	
East Hanover Township	-	-	-	-	-	-	-	-	-	
Elizabethville Borough	-	-	-	-	-	X	-	-	-	
Gratz Borough										
Halifax Borough	X	X	-	-	X	X	-	-	-	
Halifax Township										
Harrisburg City	-	X	-	-	-	-	-	X	X	
Highspire Borough	-	X	-	-	X	-	-	X	X	
Hummelstown Borough	-	X	-	-	X	-	-	X	X	
Jackson Township	-	-	-	-	-	-	-	-	X	
Jefferson Township	-	-	-	-	-	-	-	-	X	
Londonderry Township	X	X	X	-	-	-	X	X	X	
Lower Paxton Township	-	-	-	-	X	X	-	X	X	X

Municipality	Capital Improvements Program	Community Development Block Grants (CDBG)	Special Purpose Taxes	Gas/Electric Utility Fees	Water/Sewer Fees	Stormwater Utility Fees	Development Impact Fees	General Obligation, Revenue, and/or Special Tax Bonds	Partnering Arrangements or Intergovernmental Agreements	Other
Lower Swatara Township	-	-	-	-	-	X	-	-	X	
Lykens Borough	X	X	-	-	X	-	-	X	-	
Lykens Township	-	-	-	-	-	-	-	-	-	
Middle Paxton Township	X	X	-	-	-	X	-	-	X	
Middletown Borough	X	X	-	X	X	-	-	X	X	
Mifflin Township	-	-	-	-	-	-	-	-	-	
Millersburg Borough	-	-	-	-	-	--	-	X	X	
Paxtang Borough	X	-	-	-	-	-	-	-	-	
Penbrook Borough	-	-	-	-	-	X	X	X	X	
Pillow Borough	-	X	-	-	X	-	-	-	-	
Reed Township	-	-	-	-	-	-	-	-	-	
Royalton Borough	X	X	X	X	X	X	X	X	X	
Rush Township	-	-	-	-	-	-	-	-	-	
South Hanover Township	X	X	-	-	X	-	-	X	-	
Steelton Borough	-	-	-	-	-	-	-	-	-	
Susquehanna Township	X	X	-	-	-	X	-	X	-	
Swatara Township	X	X	X	-	-	-	-	-	X	
Upper Paxton Township	-	X	X	-	X	-	-	-	X	
Washington Township	-	-	-	-	-	-	-	-	-	
Wayne Township	-	-	-	-	-	-	-	-	-	
West Hanover Township										
Wiconisco Township										
Williams Township	-	-	-	-	-	-	-	-	-	
Williamstown Borough										

Notes:
"X" indicates that the municipality currently has this capability in place.
"-" indicates no capability is currently in place.
Blank space indicates no response was received from the municipality.

5.2.4 Education and Outreach

Education and outreach programs and methods are used to implement mitigation activities and communicate hazard-related information. Examples include obtaining certification in programs such as Firewise and StormReady and developing and communicating hazard awareness and safety information to residents.

At the municipal level, education and outreach capabilities vary. Some municipalities have the capability to handle outreach initiatives while others rely on county resources. Several municipal websites post local plans and ordinances, and many municipalities post information regarding hazard-related topics. The local fire departments and emergency managers are active in the schools participating in programs such as fire safety in the fall and attending other community activities to conduct outreach. Appendix D details the outreach and education conducted at the municipal level.

Public Information Programs

Flood Maps

Flood maps and flood data, including new digital maps for Dauphin County, are available at the municipal offices. County and municipality maps, tax maps, and property assessment records are available at the Property Assessment and GIS Services offices, and deeds are available at the Recorder of Deeds Office.

Library Education Tools

Libraries have educational materials, available upon request, which are used at public speaking events or county meetings, when appropriate. The following educational materials are available, but are not limited to:

- Various types of training videos
- Pennsylvania emergency preparedness guides
- American Red Cross packets for flash flooding, hurricane, thunder and lightning, tornado, and winter storms
- Family disaster planning guides
- Homeland security information for businesses, family, individuals, neighborhoods, and schools
- Pandemic brochures

Outreach Projects

Several organizations (both public and private sector) have developed outreach projects, educational tools, and training programs. The county promotes both online and traditional in-person programs to appeal to as wide an audience as possible.

- *Are You Ready?*: This is an in-depth program for citizen preparedness (individual, family, and community) that provides a step-by-step approach to disaster preparedness by walking the participant through steps to become informed about local emergency plans, identify hazards that affect their area, and develop and maintain an emergency communications plan and disaster supply kit. Other topics include evacuation, emergency public shelters, animal handling during disasters, and information specific to people with disabilities. The program includes actions that can be taken before, during, and after each hazard type and provides in-depth information on specific hazards such as the following:
    - Floods
    - Tornadoes
    - Hurricanes
    - Thunderstorms and lightning
    - Winter storms and extreme cold
    - Extreme heat
    - Earthquakes
    - Volcanoes
    - Landslide and debris flows (mudslide)
    - Tsunamis
    - Fires and wildfires
    - Hazardous materials incidents
    - Household chemical emergencies
    - Nuclear power plants
    - Terrorism (explosion, biological, chemical, nuclear, and radiological hazards)
- *ReadyPA Campaign*: Established by the Commonwealth of Pennsylvania, www.readypa.org is a website that aims to prepare the public for times of disaster by providing education on the risks within

Pennsylvania, template emergency plans and kits, and information on ways to get involved with community organizations to help others.

- Emergency management courses are provided through the county DPS to local coordinators and elected officials, including Duties and Responsibilities of the Local Emergency Management Coordinator (LEMC), Damage Assessment, and Basic Orientation.

Local Emergency Planning Committee

The Local Emergency Planning Committee (LEPC) works closely with the business industry community to form a safety net around the chemical industry to protect the general population from the possible outcome of hazardous material incidents. The following features of the LEPC demonstrate the capability of the LEPC to support county emergency management and preparedness initiatives.

- The LEPC shall have a minimum of seven members, with at least one representative from each of the following groups:
  - Group 1 – Elected official representing local government within the county
  - Group 2 – Local law enforcement, first aid, health, environmental, hospital, and transportation personnel
  - Group 3 – Firefighting personnel
  - Group 4 – Civil defense and emergency management personnel
  - Group 5 – Broadcast and print media personnel
  - Group 6 – Community groups not affiliated with emergency service groups
  - Group 7 – Owners and operators of facilities subject to the requirements of SARA Title III
- *Reporting Facilities:* The minimum reporting threshold for which facilities are required to have or prepared a Material Safety Data Sheet is 10,000 pounds of hazardous chemicals. This document provides workers and emergency personnel with procedures for handling or working with hazardous materials in a safe manner. It includes information on the chemicals' physical properties, toxicity, health effects, first aid, reactivity, storage, disposal, protective equipment, and spill-handling procedures.
- *Planning Facilities:* The reporting threshold for Extremely Hazardous Substances (as designated under Section 302 of Title III) is 500 pounds or the threshold planning quantity, whichever is lower. Qualifying facilities are subject to additional reports and accident prevention regulations.

Technical Assistance

The county DPS can support local, public, and private entities as needed through coordination and provision of information and equipment resources. These include both existing county capabilities and predetermined private and public resources.

Municipalities participating in this planning effort were provided with a Capability Assessment Survey. Table 5-4 summarizes the responses of the municipalities based on education and outreach capabilities. Copies of the individual municipal responses are found in Appendix D.

Table 5-4. Education and Outreach Capability

Municipality	Firewise Communities Certification	StormReady Certification	Natural Disaster or Safety-Related School Programs	Ongoing public education or information program (e.g. responsible water use, fire safety, household preparedness, environmental education)	Public-private partnership initiatives addressing disaster-related issues	Local citizen groups or nonprofit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	Other
Dauphin County	-	X	-	X	X	X	
Berrysburg Borough	-	-	-	-	-	-	
Conewago Township	-	-	-	X	-	X	
Dauphin Borough	-	-	X	X	X	-	
Derry Township	-	-	-	-	-	-	
East Hanover Township	-	-	X	-	-	X	X
Elizabethville Borough	-	-	-	X	-	-	
Gratz Borough		-					
Halifax Borough	-	-	X	X	-	-	
Halifax Township		-					
Harrisburg City	-	-	-	X	X	X	
Highspire Borough	-	-	-	-	-	-	
Hummelstown Borough	-	-	-	X	X	X	
Jackson Township	-	-	-	-	-	-	
Jefferson Township	-	-	-	-	-	-	
Londonderry Township	-	-	X	X	-	X	
Lower Paxton Township	-	-	-	X	-	X	
Lower Swatara Township	-	-	-	X	-	-	
Lykens Borough	-	-	-	-	-	-	
Lykens Township	-	-	-	-	-	-	
Middle Paxton Township	-	-	X	X	-	X	
Middletown Borough	-	-	X	X	-	X	
Mifflin Township	-	-	-	-	-	-	
Millersburg Borough	-	-	-	X	-	X	
Paxtang Borough	-	-	X	X	X	X	
Penbrook Borough	-	-	X	X	X	X	
Pillow Borough	-	-	-	X	-	-	
Reed Township	-	-	-	X	-	-	
Royalton Borough	-	-	-	X	-	X	
Rush Township	-	-	-	-	-	-	
South Hanover Township	-	-	X	X	X	X	
Steelton Borough	-	-	-	-	-	-	
Susquehanna Township	-	-	-	X	-	X	

Municipality	Firewise Communities Certification	StormReady Certification	Natural Disaster or Safety-Related School Programs	Ongoing public education or information program (e.g. responsible water use, fire safety, household preparedness, environmental education)	Public-private partnership initiatives addressing disaster-related issues	Local citizen groups or nonprofit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	Other
Swatara Township	-	-	-	-	-	-	
Upper Paxton Township	-	-	-	X	-	-	
Washington Township	-	-	-	-	-	-	
Wayne Township	-	-	-	-	-	-	
West Hanover Township		-					
Wiconisco Township		-					
Williams Township	-	-	-	-	-	-	
Williamstown Borough		-					

Notes:
"X" indicates that the municipality currently has this capability in place.
"-" indicates no capability is currently in place.
Blank space indicates no response was received from the municipality.

5.2.5 Plan Integration

According to FEMA, plan integration is a process where communities look critically at their existing planning framework and align their efforts. Integration of hazard mitigation principles into other local planning mechanisms (comprehensive plans, transportation plans, floodplain ordinances, etc.) and vice versa is vital to build a safer, more resilient community. This two-way exchange of information supports community-wide risk reduction, both before and after disasters occur. Not only will the community's planning efforts be better integrated, but by going through this process, `there is a higher level of interagency coordination, which is just as important as the planning mechanisms themselves.

Within Dauphin County, there are many existing plans and programs that support hazard risk management; thus, it is critical that this HMP integrate and coordinate with, and complement, those mechanisms.

The intention of the Planning Team and participating jurisdictions is to incorporate mitigation planning as an integral component of daily government operations. Planning Team members will work with local government officials to integrate the newly adopted hazard mitigation goals and actions into the general operations of government and partner organizations. Further, the sample adoption resolution (located in Section 8 of this HMP) includes a resolution item stating the intent of the local governing body to incorporate mitigation planning as an integral component of government and partner operations. By doing so, the Planning Team anticipates the following:

1) Hazard mitigation planning will be formally recognized as an integral part of overall emergency management efforts.
2) Hazard mitigation planning will be formally recognized as an integral part of land use policies and mechanisms.
3) The HMP, the county and municipal comprehensive plans, and the county and municipal EOPs will become mutually supportive documents that work in concert to meet the goals and needs of county residents.
4) Duplication of effort can be minimized.

As noted in Section 6 of this plan, Dauphin County has made a concerted effort to reduce its vulnerability to natural and non-natural hazards in its planning and in its daily operations since the Dauphin County HMP was last updated in 2015. The county and its jurisdictions have implemented various programs and projects to reduce the impacts of hazards. These projects, programs, and regulations have reduced risk caused by natural and non-natural hazards and support the goals and objectives of this HMP. It is the intent of the county and its participating municipalities to strengthen this focus on mitigation by continuing existing policies and by further implementing the mitigation policies contained in this HMP.

Implementation actions will include incorporating the goals of the HMP into ongoing planning, zoning, building, and engineering activities. Specifically, the county will urge municipalities to take the following actions:

- Fund hazard mitigation projects or actions in operating budgets to the extent possible.
- Notify other municipalities about grant and other funding opportunities as they arise.
- Use data and maps from this HMP as supporting documentation in grant applications.
- Review mitigation actions when allocating funding for the municipal budgets.
- Include hazard mitigation when updating municipal ordinances.
- Identify hazard areas in updates of comprehensive plans to identify land use issues.
- Review the HMP prior to land use or zoning changes and permitting or development decisions.

The information on hazards, risk, vulnerability, and mitigation contained in this HMP is based on the best science and technology available at the time of the plan's preparation. Additionally, plans were incorporated directly into this HMP update. All participating jurisdictions recognize that this information can be invaluable in making decisions under other planning programs, such as comprehensive, capital improvement, and emergency management plans. Figure 5-1 illustrates the interrelationships between the HMP, the Dauphin County comprehensive plan, the county EOP, and other community planning mechanisms. Existing processes and programs through which the HMP should be implemented are described below.

Plan participants will make every effort to implement the relevant sections and or data contained in the HMP utilizing administrative, budgetary, and regulatory processes as well as partnerships to the maximum extent, as described below.

Administrative

Administrative processes include departmental or organizational work plans, policies, or procedural changes that can be addressed by the following departments:

- Facility Maintenance
- Housing Authority
- Human Services
- Solid Waste Management and Recycling
- Public Safety
- Sheriff's Department

Additional administrative measures may include the creation of paid or unpaid internships to assist in HMP maintenance.

The Dauphin County DPS is responsible for preparing and maintaining the county EOP, including a minimum biennial review. Whenever portions of the plan are implemented in an emergency event or training exercise, a review is performed, and changes are made where necessary. Municipalities are notified of changes to the county EOP, which most of Dauphin County's municipalities have adopted as their own EOP. The risk assessment information presented in the 2015 HMP was used to update the Hazard Vulnerability Assessment section of the county EOP. The updated risk assessment information will affect subsequent updates to the EOP. Recommended changes to the HMP, based on changes to the EOP, will then be coordinated with the Planning Team.

The Dauphin County Planning Commission, which is administered by the TCRPC, is responsible for maintaining and updating the county comprehensive plan, which covers all 40 municipalities. The Planning Commission meets monthly to review, discuss, and comment on municipal subdivision and land development plans, municipal floodplain ordinances, municipal stormwater management plans and ordinances, and other community planning and development matters. Since the adoption of the original Dauphin County HMP, these reviews have included informal cross-referencing of the planned development or regulatory activity with the provisions of the HMP. It uses this information to identify necessary revisions and to amend the county comprehensive plan. The Planning Commission's meetings are open to the public and are advertised according to the Pennsylvania Sunshine Act (65 PA C.S.A.).

The administrative practices described above will continue through the development of subsequent Dauphin County comprehensive plan updates using the information in this updated HMP. In return, the Dauphin County comprehensive plan, located on the TCRPC website, was incorporated into multiple aspects of this HMP. Information from the comprehensive plan and other documents was used to formulate the county profile, identify the history of individual hazards, and detail the population projections in Dauphin County.

Budgetary Process

In terms of budgetary processes, the county will review capital budgets and, if funding is available, include a line item for mitigation actions. In addition, the county will maximize mitigation aspects of proposed projects and will encourage municipalities to do likewise.

Regulatory Measures

Regulatory measures—such as the creation of executive orders, ordinances, and other directives—will be considered to support hazard mitigation in the following areas:

- Comprehensive Planning – Institutionalize hazard mitigation for new construction and land use.
- Zoning and Ordinances
- Building Codes – Enforce codes or higher standard in hazard areas.
- Capital Improvements Plan – Ensure that the person responsible for projects under this plan evaluates whether new construction is in a high hazard area (such as a flood plain) so the construction is designed to mitigate the risk. Revise requirements for this plan to include hazard mitigation in the design of new construction.
- NFIP – Continue participation in this program and explore participation in CRS Program.
- Stormwater Management – Continue to implement storm water management plans.
- HMP Plan Coordination – Prior to formal changes (amendments) to master plans, zoning, ordinances, capital improvement plans, or other mechanisms that control development, all above-mentioned plans must be reviewed to ensure they are consistent with the HMP.

Funding

The county and its jurisdictions will consider multiple grant sources to fund eligible projects. These opportunities may include, but are not limited to:

- Federal
    - FEMA Building Resilient Infrastructure and Communities Program (BRIC)
    - FEMA Flood Mitigation Assistance Program (FMA)
    - FEMA Hazard Mitigation Grant Program (HMGP) – Stafford Act, Section 404
    - U.S. Department of Housing and Urban Development (HUD) – Community Development Block Grant (CDBG)
    - U.S. Department of Agriculture (USDA) – USDA Community Facilities
    - U.S. Economic Development Administration (EDA) Public Works Program

- Commonwealth
  - PennDOT Pennsylvania Infrastructure Bank
  - Act 13 Marcellus Shale Legacy Funds – Flood Mitigation Program
- Nonprofit organizations, foundations, and private sources

Other potential federal funding sources include:

- Stafford Act, Section 406 – Public Assistance Program Mitigation Grants
- Federal Highway Administration
- Catalog of Federal Domestic Assistance
- U.S. Fire Administration – Assistance to Firefighter Grants
- U.S. Small Business Administration Pre- and Post-Disaster Mitigation Loans
- U.S. Department of Economic Development Administration Grants
- U.S. Army Corps of Engineers
- U.S. Department of Interior, Bureau of Land Management
- Other sources as yet to be defined

Partnerships

The following opportunities for partnerships will be encouraged to provide a broader support and understanding of hazard mitigation:

Existing Committees and Councils

- Dauphin County Agricultural Preservation Board (http://www.dauphincd.org/ag/alp.html)
- Dauphin County Conservation District (http://www.dauphincd.org/)
- Dauphin County Economic Development Corporation (https://www.dauphincounty.org/government/departments/community_and_economic_development/economic_development_corporation/index.php)
- Dauphin County Redevelopment Authority (https://www.dauphincounty.org/government/departments/community_and_economic_development/redevelopment_authority.php)
- Dauphin County Land Bank (https://www.dauphincounty.org/government/departments/community_and_economic_development/land_bank_authority.php)
- Dauphin County Local Emergency Planning Committee
- Dauphin County Hospital Authority (https://www.dauphincounty.org/government/departments/community_and_economic_development/hospital_authority.php)

Creative Partnerships for Funding and Incentives

- Public-private partnerships, including utilities and businesses
- State cooperation
- In-kind resources

Working with Other Federal and Commonwealth Agencies

- U.S. Army Corps of Engineers (USACE)

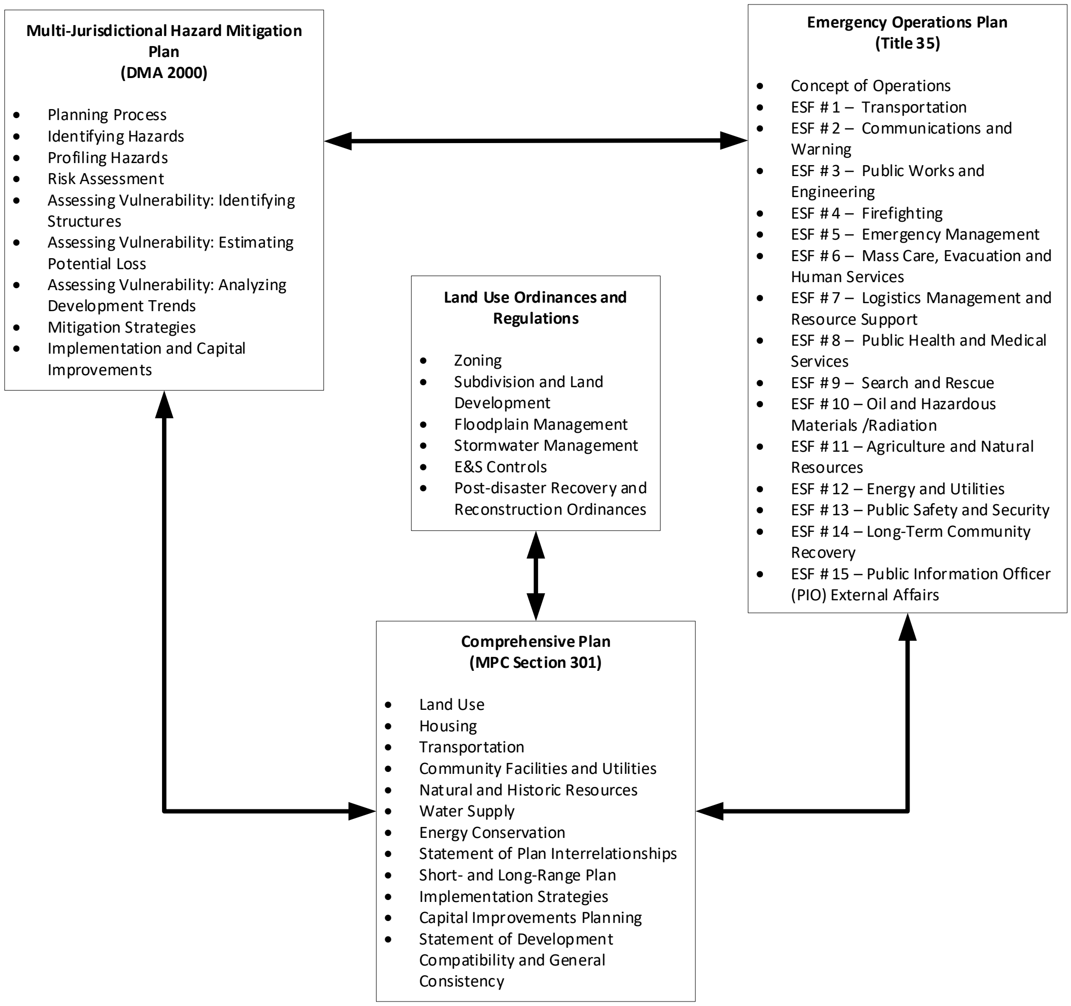
- Department of Homeland Security (DHS)
- Federal Emergency Management Agency (FEMA)
- National Oceanic and Atmosphere Administration (NOAA)
- National Weather Service (NWS)
- Pennsylvania Department of Transportation (PennDOT)
- Pennsylvania Department of Environmental Protection (PADEP)
- Pennsylvania State Police (PSP)
- United States Department of Agriculture (USDA)
- United States Department of Transportation (USDOT)
- United States Geological Service (USGS)

American Red Cross

Watershed Associations

- Twin Valley Conservation Association (uphere@pa.net)
- Clarks Creek Watershed Preservation Association (www.ccwpa.org)
- Tri-County Conewago Creek Association (http://conewagocreek.org/)
- Tri-Valley Watershed Association (hgtwpaut@epix.net)
- Paxton Creek Watershed & Education Association (www.paxtoncreek.org)
- Swatara Creek Watershed Association (www.mbcomp.com/swatara)
- Wiconisco Creek Restoration Association

Figure 5-1. Plan Interrelationships



Note:
E&S Erosion and Sedimentation
MPC Municipal Planning Code

During the plan evaluation process, the Planning Team will identify additional policies, programs, practices, and procedures that could be modified to accommodate hazard mitigation actions and will include these findings and recommendations in the HMP Progress Report.

SECTION 6 MITIGATION STRATEGY

This section describes the process by which the Dauphin County Planning Team will reduce or eliminate potential losses from the natural and non-natural hazards identified in Section 4.2 of this Hazard Mitigation Plan (HMP). The mitigation strategy focuses on existing and potential future mitigation actions to alleviate the effects of hazards on Dauphin County's population, economy, and general building stock.

This section provides a summary of the 2021 HMP update process, outlines the mitigation goals and objectives set forth in the 2021 HMP update, describes the process for identifying and analyzing mitigation techniques, and provides the mitigation action plan.

6.1 UPDATE PROCESS SUMMARY

The goals and objectives listed in the Dauphin County HMP were first examined through the dispersal of the Mitigation Strategy 5-Year Plan Review Worksheet (Mitigation Review Worksheet). During the 5-year review, the Planning Team members were afforded the opportunity to comment on the goals, objectives, and actions that were listed in the existing HMP.

The general mitigation planning approach used to develop this plan is based on (1) the Federal Emergency Management Agency (FEMA) publication, "Local Mitigation Planning Handbook" (FEMA 2013), and (2) the Pennsylvania All-Hazard Mitigation Planning Standard Operating Guide (SOG) (PEMA 2020):

1. **Review of Existing Mitigation Plan Goals, Objectives, and Mitigation Action Plan:** Existing mitigation goals and objectives, and the 2016 HMP mitigation actions were first examined at the Planning Team Kick-Off Meeting and revisited during the Mitigation Strategy Workshop. Both of these meetings were open to members of the Planning Team and stakeholders. The Steering Committee thoroughly reviewed and updated the mitigation goals and objectives utilizing the latest information gathered through the hazard profiles, vulnerability assessments, and the risk assessment; the mitigation goals and objectives were also compared to the State HMP goals and objectives. The updated goals and objectives were then presented at the Mitigation Solutions Workshop for final review and approval. Plan participants continued to review and provide progress on the 2016 mitigation actions throughout the planning process.
2. **Develop and Update Mitigation Strategies:** Mitigation actions were identified based on the risk assessment, mitigation goals and objectives, existing policies, and input from the Planning Team and planning partners.
3. **Mitigation Strategy Prioritization and Implementation:** The potential mitigation actions were qualitatively evaluated and are described in more detail in Section 6.4 of this HMP. Mitigation actions were prioritized into three categories: high, medium, and low. High priority and medium priority mitigation actions are recommended for implementation before low priority actions; however, based on County and municipal-specific needs, cost estimation, and available funding, some low priority mitigation actions may be addressed first.
4. **Document the Mitigation Planning Process:** The entire mitigation planning process is documented throughout this HMP, particularly in Section 3.

This section summarizes past mitigation goals and past mitigation action status, and provides an update of mitigation strategies and additional past mitigation accomplishments.

6.1.1 Review of the Past Mitigation Goals

The mitigation goals identified in the 2016 version of the HMP are listed below:

- **Goal 1:** Increase education and awareness about existing and potential natural and human-made hazards in the County.

- **Goal 2:** Protect citizens and public and private property from the impacts of natural and human-made hazards.
- **Goal 3:** Encourage the integration of hazard mitigation planning principles in County and Local Government regulations, plans, and policies.
- **Goal 4:** Plan for improved infrastructure to protect citizens and public and private property from natural and human-made hazards.

Table 6-1 shows the results of the Steering Committee and Planning Team review of the 2016 goals and objectives.

Table 6-1. Steering and Planning Team Evaluation of 2016 Goals and Objectives

2016 Dauphin County Hazard Mitigation Plan Goals and Objectives		Evaluation
Goal 1	**Increase education and awareness about existing and potential natural and human-made hazards in the County.**	Goal 1 and its objectives are now included in new Goal 4 and its objectives.
Objective 1.A	Encourage awareness of the County's hazards so that residents and business owners are prepared for future hazard events.	
Objective 1.B	Ensure that property owners and buyers are aware of the availability and benefits of obtaining federal flood insurance.	
Objective 1.C	Ensure that local officials and EMA staff are well trained regarding natural hazards and appropriate prevention and mitigation activities.	
Objective 1.D	Increase Dauphin County's municipal participation in FEMA's Community Rating System.	
Goal 2	**Protect citizens and public and private property from the impacts of natural and human-made hazards.**	Still applies.
Objective 2.A	Ensure that existing drainage systems (pipes, culverts, channels) are adequate and functioning properly.	Reflected in new Objective 2.3.
Objective 2.B	Minimize future damage due to flooding of the Susquehanna River and its tributaries.	Remove. Other goals and objectives reduce damage due to flooding.
Objective 2.C	Reduce impacts related to flash flooding and stormwater problems.	Addressed in new Objectives 2.1, 2.3, and 2.4.
Objective 2.D	Encourage the use of retrofitting techniques for repetitive loss structures.	Addressed in new Objective 2.2.
Objective 2.E	Restore degraded natural resources and open space to improve their flood control function.	Addressed in new Objective 3.1.
Objective 2.F	Investigate structural solutions to address natural and human-made hazards.	Remove. It is too generic.
Objective 2.G	Reduce threats from natural and human-made hazards	Remove. It is too generic.
Goal 3	**Encourage the integration of hazard mitigation planning principles in County and Local Government regulations, plans, and policies.**	Remove the goal. Incorporate objectives as shown below.
Objective 3.A	Ensure that local ordinances are consistent with FEMA and PA DCED guidelines and are properly enforced.	Remove. This is an ongoing capability.
Objective 3.B	Preserve areas where natural hazard potential is high (i.e., steeply sloping areas, sinkhole areas, floodplains, wetlands, etc.).	Addressed in new Objective 3.3.
Objective 3.C	Regulate construction/development in the County to prevent increases in runoff and subsequent increases in flood flows.	Addressed in new Objective 1.2.

2016 Dauphin County Hazard Mitigation Plan Goals and Objectives		Evaluation
Objective 3.D	Support FEMA's efforts to prepare detailed floodplain mapping in the Lower Susquehanna-Penns and Lower Susquehanna-Swatara Watersheds.	Remove. Mapping does not reduce vulnerability. Vulnerability will be reduced through ordinance updates based on the maps.
Objective 3.E	Continue mass evacuation planning to provide safe and efficient evacuation during natural and human-made hazard events.	Remove. This is an ongoing capability.
Objective 3.F	Assess the impacts of pandemics and infectious diseases and radon exposure on Dauphin County's citizens.	Remove. The COVID-19 pandemic showed the impacts of pandemics and infectious disease outbreaks. Enhancing public health response is an ongoing capability. New Objective 1.3 addresses upgrading infrastructure, including telecommunications.
Goal 4	**Plan for improved infrastructure to protect citizens and public and private property from natural and human-made hazards.**	Keep as is; still applies.
Objective 4.A	Provide residents and businesses with adequate warning of natural and human-made hazard events.	Keep as is; still applies.
Objective 4.B	Provide adequate shelters during hazard events.	Keep as is; still applies.
Objective 4.C	Provide adequate communication systems for emergency management agencies and emergency response units.	Keep as is; still applies.

6.1.2 Past Mitigation Action Status and Update of Mitigation Strategies

In the 2016 HMP, Dauphin County identified 65 actions and initiatives to support an improved understanding of hazard risk and vulnerability, to enhance mitigation capabilities, and/or to reduce vulnerability of infrastructure. Progress on the 2016 mitigation actions was evaluated during the 2021 update process.

Dauphin County, via various representatives on the Steering Committee and Planning Team, was provided with a Mitigation Review Worksheet identifying all of the County and municipal actions and initiatives from the 2016 HMP. The respondents were asked to indicate the status of each action ("No Progress/Unknown," "In Progress/Not Yet Complete," "Continuous," "Completed," or "Discontinued") and provide review comments on each.

The completed Mitigation Action Plan Review Worksheet is provided in Table 6-2. Projects and initiatives identified as "Complete" and "Discontinued" have been removed from this plan update. The actions that the County has identified as "No Progress/Unknown" or "In Progress/Not Yet Complete" have been carried forward in the updated mitigation strategies identified in Table 6-4 (unless otherwise determined by the County to be a discontinued project). Actions from the 2016 HMP that reflect continuously maintaining capabilities have also been removed. The language in some actions being carried over has been adjusted to reflect changes to County needs and capabilities. Some actions were also merged to reduce redundant efforts on behalf of the County and its municipalities.

Table 6-2. Past Mitigation Action Status

Description	Jurisdiction	Status	Review Comments
1. Integrate hazard mitigation plan data prepared for the 2015 HMP Update into the Dauphin County Comprehensive Plan Update.	Countywide	Complete	• TCRPC staff reported that this action was completed.
2. Develop a new Comprehensive Plan or amend an existing Comprehensive Plan to include an assessment and associated mapping of the municipality's vulnerability to location-specific hazards and appropriate recommendations for the use of these hazard areas.	Countywide	In progress	• Include in the updated HMP. • The analysis conducted during the HMP update will be used for comprehensive plans. • Lower Paxton Township marked this action as continuously implemented. • Lower Swatara Township completed this action in 2017. • Royalton Borough marked this action as completed.
3. Develop a new Zoning Ordinance or revise an existing Zoning Ordinance to include separate zones or districts with appropriate development criteria for known hazard areas.	Countywide	In progress	• Include in the updated HMP. • TCRPC received a grant to update/develop a new model ordinance, which will include stormwater. • East Hanover Township marked this action as completed. • Lower Paxton Township marked this action as completed. • Lykens Borough marked this action as completed. • Millersburg Borough marked this action as completed. • Royalton Borough marked this action as completed. • Upper Paxton Township marked this action as completed.
4. Develop a new Subdivision and Land Development Ordinance or revise an existing Subdivision and Land Development Ordinance to include municipal-specific, hazard mitigation-related development criteria and/or provisions for the mandatory use of conservation subdivision design principles in order to regulate the location and construction of buildings and other infrastructure in known hazard areas.	Countywide	In progress	• Include in the updated HMP. • TCRPC is working on this ordinance. • Lower Paxton Township marked this action as completed. • Lykens Borough marked this action as completed. • Royalton Borough marked this action as completed. • South Hanover Township marked this action as completed. • Upper Paxton Township marked this action as completed.

Description	Jurisdiction	Status	Review Comments
5. Ensure municipal compliance with local watershed-specific Act 167 Stormwater Management Plans and Ordinances.	Countywide	Continuous	• Discontinue. • Countywide Act 167 Plan was approved by PA DEP; updated in 2012/2013. There is no need to update it this point, but it will be regularly updated. TCRPC developed an opt-in program for municipal stormwater management. • East Hanover Township marked this action as continuously implemented. • Londonderry Township marked this as completed. • Lower Paxton Township marked this action as completed. • Lykens Borough marked this action as completed. • Penbrook Borough reported that the borough completed an underground infiltration system in parts of the borough. For the TMDL plan for Spring Creek, they are required to reduce loads by 80,000 pounds. The project will reduce 80,000 pounds per the engineering design, and PA DEP will give credit for exceeding recommendations. The borough is assessing options for Hoffer & 28th Streets. Penbrook averages roughly 5 inlets per year-upgrades with replacement or increased size piping. • Royalton Borough marked this action as completed. • South Hanover Township marked this action as completed. • Upper Paxton Township marked this action as completed.
6. Conduct a detailed inventory and prioritization of local environmental resources via the Comprehensive Planning or similar natural resources planning process.	Countywide	Continuous	• Discontinue. • An inventory was developed in 2019 and is maintained by the Manada Conservancy. • East Hanover Township marked this action as completed. • Lower Paxton Township marked this action as continuously implemented. • Royalton Borough marked this action as completed. • South Hanover Township marked this action as completed.
7. Protect via local ordinance or acquisition, if feasible, environmentally sensitive areas (such as floodplains, steep slopes, forested areas, and wetlands) that could be impacted by hazard events.	Countywide	Continuous	• Discontinue. • A majority of municipalities have these ordinances in place and maintain them. • East Hanover Township marked this action as continuously implemented. • Lower Paxton Township marked this action as completed. • Royalton Borough marked this action as continuously implemented. • South Hanover Township marked this action as completed. • Upper Paxton Township marked this action as completed.
8. Revise existing zoning and/or subdivision and land development ordinances or adopt a separate, standalone ordinance to require the completion of subsurface investigations (i.e., borings, geo- physical surveys, and/or studies by a registered Professional Geologist) for all new subdivision and land development projects in known land subsidence hazard areas.	Countywide	In progress	• Include in the updated HMP. • East Hanover Township marked this action as completed. • Lower Paxton Township marked this action as completed. • Lower Swatara Township marked this action as completed. • Royalton Borough marked this action as continuously implemented. • South Hanover Township marked this action as completed. • Upper Paxton Township marked this action as completed.

Description	Jurisdiction	Status	Review Comments
9. Evaluate current land use controls using FEMA's guidance document "Hazard Mitigation Planning: Practices for Land Use Planning and Development near Pipelines" to enhance pipeline safety and protect surrounding communities.	Countywide	Continuous	• Discontinue • Lower Paxton Township marked this action as completed. • South Hanover Township marked this action as completed. • Upper Paxton Township marked this action as completed.
10. Develop language for potential inclusion in subdivision regulations requiring new power and communications (telephone, cable television) lines to be buried for new construction.	Countywide	Continuous	• Discontinue. • This is encouraged at the municipal level. Some municipalities have requirements that new construction hook into existing underground lines, if applicable. Many municipalities are dealing with small cellular antennas in rights of way, which must be above ground, even in underground utility communities. • Lower Swatara Township marked this action as completed. • Royalton Borough marked this action as continuously implemented. • South Hanover Township marked this action as completed. • Upper Paxton Township marked this action as completed.
11. Update and implement a comprehensive water resources management plan that analyzes the County's existing water resources supply and evaluates the County's anticipated water use demand in an effort to identify suspected water supply shortages and potential new water supply sources.	Countywide	In progress	• Include in the updated HMP. • Some watershed implementation plans exist at the individual stream level, but a comprehensive plan considering the anticipated water use of the entire county does not exist. Individual water providers have undertaken planning and protection programs. • East Hanover Township marked this action as completed. • Lower Paxton Township marked this action as continuously implemented. • South Hanover Township marked this action as completed. • Upper Paxton Township marked this action as completed.
12. Revise or re-adopt a municipal floodplain management ordinance/map that is consistent with current FEMA D-FIRMS to ensure municipal compliance with NFIP and PA Act 166 floodplain development regulations, as appropriate.	Countywide	Continuous	• Discontinue. • FIRMs have not been updated since 2009 and are not currently being updated.
13. Continue the partnership with the NWS Mid-Atlantic River Forecast Center to enhance the existing Susquehanna Flood Forecast and Warning System via the Advanced Hydrologic Prediction Services Program.	Countywide	Continuous	• Discontinue • The County maintains this partnership.
14. Coordinate with the USGS, local watershed organizations, and/or the DCCD to increase the number of USGS and Integrated Flood Observing and Warning System (IFLOWS) rain and stream gauges in the County as a potential enhancement to the existing Susquehanna Flood Forecast and Warning System.	Countywide	In progress	• Include in the updated HMP. • Coordination continues.
15. Develop flood forecasting maps for the Swatara Creek Watershed.	Countywide	Complete	• This action was completed by the Pennsylvania Silver Jackets.

Description	Jurisdiction	Status	Review Comments
16. Work with municipalities to evaluate participation in the CRS and facilitate the preparation and submission of CRS applications.	Countywide	In progress	• Include in the updated HMP. • The City of Harrisburg participates in the CRS Program as a Class 7 community. Nine other municipalities applied to enter the CRS Program. • East Hanover Township marked this action to be discontinued. • Royalton Borough marked this action as continuously implemented.
17. Inventory and assess flood prone residential structures on islands throughout Londonderry Township.	Londonderry Township	Complete	• This action has been completed.
18. Encourage the owners/operators of Yeshiva Academy, Downey Elementary School, Circle School, and the Williams Township Wastewater Treatment Plant to develop and implement an emergency response plan to mitigate potential flooding impacts.	Harrisburg City, Swatara Township, Williams Township	No progress	• Updated to include all floodprone critical facilities.
19. Continue to acquire, relocate, or make structural modifications (such as elevation and dry/wet flood proofing) to minimize impact to flood prone structures in accordance with NFIP guidelines.	Countywide	In progress	• Include in the updated HMP. • This is an ongoing effort throughout the County. • Lower Swatara Township purchased two floodplain properties for demolition. • Royalton Borough marked this action as continuously implemented.
20. Develop a technical proficiency at the municipal level for conducting post-disaster damage assessments and continue to regulate through local planning and zoning reconstruction activities to ensure compliance with NFIP substantial damage/ substantial improvement requirements.	Countywide	In progress	• Include in the updated HMP. • Some expertise exists. Outreach and education need to be increased. • East Hanover Township marked this action as continuously implemented. • Lower Paxton Township marked this action as continuously implemented. • Royalton Borough marked this action as continuously implemented.
21. Develop a technical proficiency at the municipal level for assisting local residents and business owners in applying for hazard mitigation and assistance funds and identifying cost beneficial hazard mitigation measures to be incorporated into reconstruction activities.	Countywide	In progress	• Include in the updated HMP. • Some expertise exists. Outreach and education need to be increased. • Londonderry Township marked this as completed. • Royalton Borough marked this action as continuously implemented.
22. Encourage local business and industry owners in known flood hazard areas to develop an emergency response plan as a potential alternative to implementing a physical property protection measure, where otherwise not technically or fiscally appropriate.	Countywide	In progress	• Penbrook Borough reported that urban flash flooding occurs at commercial and residential properties. • Royalton Borough marked this action as continuously implemented.
23. Educate and encourage uninsured property owners to purchase flood insurance through the NFIP who are identified as being located within the flood hazard areas on the 2012 FIRMs.	Countywide	In progress	• Include in the updated HMP. • Londonderry Township marked this as continuously implemented. • Lower Paxton Township marked this action as continuously implemented. • Millersburg Borough marked this action as continuously implemented. • Royalton Borough marked this action as continuously implemented.
24. Encourage private well owners to conduct rigorous sampling and analysis of private drinking water supply sources immediately after an inundating flood event and boil water as needed.	Countywide	Continuous	• Discontinue • The Penn State Cooperative Extension promotes well water testing on a continuous basis.

Description	Jurisdiction	Status	Review Comments
25. Implement flood related repairs and hazard mitigation including the Reservoir, the Glen Park area, the North side of town, and the South side of town along Rattling Creek and the Wiconisco Creek.	Jackson Township, Lykens Borough, Wiconisco Township	No progress	• Discontinue. Issues not identified in the 2021 planning process.
26. Develop a plan for replacing the Derry Street Bridge.	Swatara Township	No progress	• Include in the updated HMP.
27. Investigate the feasibility of constructing a levee/floodwall system along Swatara Creek between East Main Street and the Pennsylvania Turnpike to minimize Middletown Borough's flood hazard potential.	Londonderry Township, Middletown Borough	No progress	• Include in the updated HMP.
28. Investigate the feasibility of installing flood gates and pumps to prevent the backup of flood waters in Highspire Borough.	Highspire Borough	No progress	• Include in the updated HMP.
29. Municipalities should continue to seek solutions to problem areas and obstructions identified in the April 2010 Countywide Act 167 Stormwater Management Plan.	Derry Township, Highspire Borough, Hummelstown Borough, Lower Swatara Township, Middletown Borough, Royalton Borough, Upper Paxton Township	In progress	• Include in the updated HMP. • Royalton Borough marked this action as continuously implemented.
30. Support the recommendations of, and assist in implementing, the Paxton Creek Revitalization Project.	Lower Paxton Township, Susquehanna Township	Continuous	• Discontinue • Lower Paxton Township marked this action as continuously implemented.
31. Develop and implement a community-specific channel maintenance program consisting of routine inspections and subsequent debris removal to ensure maximum hydraulic capacity of all local streams and watercourses.	Countywide	Continuous	• Discontinue • Most municipalities are carrying out this action.
32. Implement the recommendations of the Harrisburg Authority's ongoing combined sewer overflow impact study.	Harrisburg City	No progress	• Include in the updated HMP.
33. Working through the Conservation District, the County should ensure continued contractor compliance with approved Erosion and Sedimentation Pollution Control Plans and should continue to work with local farmers to implement erosion and sedimentation control BMPs.	Countywide	Continuous	• Discontinue • This action is carried out on an ongoing basis.

Description	Jurisdiction	Status	Review Comments
34. Implement the suggested precautionary steps recommended by a registered Professional Geologist (or other acceptable expert) to remedy surface-exposed sinkhole features that pose an identifiable threat to the general public.	Derry Township, Harrisburg City, Hummelstown Borough, South Hanover Township, Steelton Borough, Swatara Township, West Hanover Township	No progress	• Addressed as new action in the 2021 HMP.
35. Capital Region Water will ensure continued implementation of appropriate operations and maintenance procedures (routine inspections and regular maintenance) at the DeHart Dam in an effort to prevent a potential failure.	Harrisburg City, Middle Paxton Township, Rush Township, Steelton Borough, Susquehanna Township	Continuous	• Discontinue • This action is continuously implemented.
36. Enroll in the Pennsylvania Firewise Communities Program through the DCNR Fire Forester for Dauphin County.	Countywide	No progress	• Include in the updated HMP. • No municipalities have enrolled in the program.
37. Work with the DCNR Fire Forester for Dauphin County to encourage property owners in potential wildfire hazard areas to remove all excess brush and shrubby plants from the immediate vicinity (i.e., 50 to 100 feet) of all buildings.	Countywide	No progress	• Include in the updated HMP.
38. Coordinate with the DCNR Fire Forester for Dauphin County on the potential construction of a fire- break at the appropriate location on the south side of Peters Mountain along Route 325 in Rush Township.	Rush Township	No progress	• Include in the updated HMP.
39. Install easily accessible and reliable water supply dry hydrants at various bridge and culvert crossings of local streams and water- courses for emergency firefighting uses through coordination with the PA DCNR and local fire companies.	Countywide	In progress	• Include in the updated HMP. • Municipalities are implementing this action. Pillow Borough has two dry hydrants installed in the Mahantango Creek. South Hanover Township is considering installing dry hydrants. • East Hanover Township marked this action as completed. • Lower Paxton Township marked this action as continuously implemented. • Lykens Borough marked this action as completed. • Millersburg Borough marked this action as completed.
40. Coordinate with Pennsylvania Department of Health on adopting the state Pandemic Plan and develop a Dauphin County Annex.	Countywide	No progress	• Discontinue • The State Pandemic Plan is outdated, having been last updated in 2005. No county-specific annexes exist.

Description	Jurisdiction	Status	Review Comments
41. Encourage homeowners to test for radon and install radon mitigation systems, if needed.	Countywide	In progress	• Include in the updated HMP. • Ongoing education and outreach through the PA DEP and Realtor Association is conducted. Many municipalities have hard copy informational brochures available at their offices or share information via their websites. A few municipalities offer test kits at reduced cost, and in 2017, Susquehanna Township advertised a PA DEP study on radon mitigation systems. • Londonderry Township marked this as completed. • Pillow Borough has sent information on radon and test kits to all residents.
42. Encourage municipalities to adopt the Radon Control Methods Appendix of the current, adopted edition of the International Residential Code to address radon in new construction.	Countywide	In Progress	• Include in the updated HMP. • South Hanover Township marked this action as continuously implemented.
43. Identify structures, including historic structures, at risk from the impacts of natural and human-made hazards and identify funding sources to help mitigate impacts.	Countywide	Complete	• Completed during the HMP update. • Lower Paxton Township marked this action as completed. • Royalton Borough marked this action as continuously implemented.
44. Encourage municipalities to enter into an Intergovernmental Cooperation Agreement and Memorandum of Understanding with the Dauphin County Land Bank Authority as a way to address structures at risk from the impacts of natural and human-made hazards.	Countywide	In progress	• Include in the updated HMP. • There have been more than 10 projects implemented since 2014, in Penbrook Borough, Susquehanna Township, Steelton Borough, and Millersburg Borough. • Millersburg Borough marked this action as completed. • South Hanover Township marked this action as continuously implemented.
45. Identify the need and requirements for emergency generators by agency, municipal, or critical facilities and identify potential funding sources to acquire.	Countywide	In progress	• Include in the updated HMP. • County and municipal staff have identified several facilities that require emergency generators. • East Hanover Township marked this action as completed. • Londonderry Township has a generator for its township building, but needs one at the public works building. • Lower Paxton Township marked this action as continuously implemented. • Pillow Borough has received a gaming grant to purchase generators. • Royalton Borough marked this action as completed. • South Hanover Township marked this action as continuously implemented.
46. Improve coordination with the LEPC and conduct training to prepare for hazardous materials incidents.	Countywide	Continuous	• Discontinue • Hazardous materials training occurs monthly at a minimum. LEPC members are invited to observe/participate in all training sessions. The County Hazardous Materials Response Team (HMRT) provides initial and recurring training to local fire departments. The HMRT regularly trains/meets with hazardous materials transporters and storage facilities.
47. Review the County's evacuation routes to ensure alternate transportation routes are available in the event of major roadway closures.	Countywide	Continuous	• Discontinue • Lower Paxton Township marked this action as continuously implemented. • Royalton Borough marked this action as continuously implemented. • South Hanover Township marked this action as continuously implemented.

Description	Jurisdiction	Status	Review Comments
48. Ensure that a planned, coordinated, and effective public warning dissemination program exists at the local level.	Countywide	Continuous	• Discontinue • A public warning and dissemination program is implemented, and continues to be updated with technology. Capabilities exist for Reverse 911, Wireless Emergency Alerts, texts and emails to citizens who have signed up for alerts, sirens for radiological events, and social and traditional media. 911 supervisors and EOC staff are trained in each listed method.
49. Conduct public outreach to educate Dauphin County citizens about the potential health and safety implications of various natural and human-made hazard events using existing public information materials.	Countywide	In progress	• Include in the updated HMP. • DPS supports requests whenever possible, including initial and recurring community events for National Night Out, Fire Prevention Week, Strawberry Square Public Safety Day, open houses, etc. DPS also provides 911-center tours to citizen and school groups. DPS provides outreach about 911/EMA/HMRT as requested. There are ongoing efforts through social media to amplify partner messages and share curated content from credible organizations with a stake in preparedness. The Dauphin County Conservation District conducts public outreach regarding various subjects – floodplain, stormwater, agriculture, preservation, etc. • Elizabethville Borough marked this as continuously implemented. • Jackson Township marked this as continuously implemented. • Londonderry Township marked this as continuously implemented. • Lower Paxton Township marked this action as continuously implemented. • Reed Township marked this action as continuously implemented. • Royalton Borough marked this action as continuously implemented. • South Hanover Township marked this action as continuously implemented.
50. Encourage citizens, schools, nursing homes, hospitals, etc., to sign up for AlertPA notifications.	Countywide	Continuous	• Discontinue • This is carried out on an ongoing basis.
51. Develop and/or obtain a program for the collection and identification of Special Needs populations for means of notification during an emergency, also so that proper transportation is provided to these populations in the event of an evacuation.	Countywide	Continuous	• Discontinue. • Municipalities are largely responsible for maintaining documentation of people with access and functional needs, and persons who do not speak English, via their municipal Notification & Resource Manuals, which are updated annually at a minimum.
52. Work with PEMA and municipalities to fully integrate resource management and EOC management software throughout the County.	Countywide	Continuous	• Discontinue • This action is implemented on an ongoing basis. The South Central Task Force (SCTF) purchased and implemented EOC management software in Dauphin and the other 8 counties. This software continues to evolve to meet current needs and technology. PEMA utilizes the same software, but a different version of it. Municipalities have implemented the software at varying levels.
53. Increase the number of NOAA Weather Alert radios in public places across the County which currently do not have them (such as personal care homes) above and beyond what is required of the County by the NWS's Storm Ready Program.	Countywide	In progress	• Include in the updated HMP. • DPS undertook an effort to distribute NOAA radios in 2010, and another effort is planned for 2021. • East Hanover Township marked this action as continuously implemented. • South Hanover Township marked this action as continuously implemented.
54. Adopt via resolution and respond to hazards with actions that are consistent with, the County-level EOP.	Countywide	Continuous	• Discontinue • This action is carried out on an ongoing basis.

Description	Jurisdiction	Status	Review Comments
55. Conduct hazard response practice drills and emergency management training exercises on an annual basis.	Countywide	Continuous	• Discontinue • This action is carried out on an ongoing basis.
56. Encourage municipal EOCs (including those outside the TMI EPZ) to participate in more County EOC exercises and evacuation drills to practice and gain efficiency in emergency plan preparedness.	Countywide	Continuous	• Discontinue • This action is carried out on an ongoing basis.
57. Conduct routine inspections, regular maintenance, and annual tests on all emergency communications equipment, public address systems, and hazard alert sirens to ensure unhindered operation during an emergency event.	Countywide	Continuous	• Discontinue • This action is carried out on an ongoing basis.
58. Establish an alternate EOC location in the event the primary EOC must be evacuated. The facility should be selected to support the EOC as well as all of the County Special Teams. This facility should also be located outside of the TMI EPZ and the 1% Annual Chance Flood Zone.	Countywide	In progress	• Include in the updated HMP. • A location has been identified. The County is in the process of implementing a redundant power system at the location, but the site has not been outfitted with equipment yet. • Londonderry Township marked this as completed. • Lower Paxton Township marked this action as completed. • Royalton Borough marked this action as completed. • South Hanover Township marked this action as continuously implemented.
59. Municipalities should continue to store and make available for public inspection, their community's FIRMs and associated Flood Insurance Study. Dauphin County should continue to provide copies of these maps at the courthouse, conservation district office, libraries, and planning commission.	Countywide	Continuous	• Discontinue • This action is carried out on an ongoing basis. Municipalities have and make available their FIRMs and the Dauphin County Flood Insurance Study. Dauphin County's Parcel Viewer can display FIRM information.
60. Maintain natural hazard and human-made hazard risk assessment and mitigation publications/materials at public libraries throughout the County.	Countywide	Continuous	• Discontinue. • This action is carried out on an ongoing basis.
61. Develop and distribute a public summary of this hazard mitigation plan including relevant information on hazard specific "do's" and "don'ts," hazard-prone areas, emergency contact information, and lists of shelters or hotels where evacuees can stay with domestic animals.	Countywide	In progress	• Include in the updated HMP. • Londonderry Township marked this as continuously implemented.
62. Continue to provide links from Dauphin County's homepage to FEMA, PEMA, DCCD, SRBC, and DCED.	Countywide	Complete	• This action has been completed.
63. Store in an easily accessible location and make available for public inspection, the original hazard mitigation plan, the new plan update document, and the FEMA guidance documents which were provided as part of the hazard mitigation planning program. Also make electronic files available for review.	Countywide	Complete	• The 2010 document was available through the DPS website until the update process began. The 2016 plan is available via the DPS website. The HMP is emailed to any citizen or entity upon request, and a point of contact to do so is listed on the DPS website. Municipalities maintain copies of the plan as well.
64. The Dauphin County Department of Information Technology will make natural and human-made hazard data available for municipal use.	Countywide	In progress	• Include in the updated HMP. • Source data was not in a usable format from last HMP update. The Dauphin County GIS Department is attempting to reformat and find other sources, but the County intends to utilize data from this HMP update.

Description	Jurisdiction	Status	Review Comments
65. Develop the county's GIS to include an updated and fully attributed building/structure coverage by use and type.	Countywide	In progress	• Include in the updated HMP. • The action is approximately 50 percent complete. Tax Assessment upgraded the related database, which includes structure ID, year built, and building description. This data was used to populate structure IDs for building outlines.

6.1.3 Additional Past Mitigation Accomplishments

Dauphin County and its municipalities are dedicated to mitigation activities and comprehensive all-hazards planning. To that end, the County has engaged in mitigation activities beyond those identified in its 2016 HMP. Stakeholders throughout the County have demonstrated a proactive approach, commitment to resiliency, and desire to protect both physical assets, environment, and citizens against hazard losses through the following additional accomplishments:

- Berrysburg Borough has completed comprehensive upgrades to the water and wastewater plants.
- Halifax Borough has upgraded culverts along Strawberry Alley, Armstrong Street, and Division Street.
- Halifax Township has restored Deppen Park with stone placed along the banks of Armstrong Creek. The township also upgraded the Konick Road Bridge, and upgraded storm drains on Keiffer Road. The township also improved stormwater management infrastructure on Middle Road.
- The City of Harrisburg acquired 53 properties vulnerable to sinkholes as part of the South 14th Street Buyout Program.
- Highspire Borough replaced the Market Street Bridge and completed another project on the Jury Street Bridge.
- Hummelstown Borough acquired the former 7-11 convenience store, to turn into open space
- Londonderry Township acquired 14 homes and elevated one more. Additionally, the township has acquired over 300 summer cabins on the islands in the Susquehanna River. The township is also restoring part of the Conewago Creek.
- Lower Swatara Township purchased two properties on Bradford Avenue in the Jednota Flats area of the township. Lower Swatara Township also completed work on the Highland Street Bridge and Richardson Road Bridge. The township replaced the Lumber Street culvert.
- Paxtang Borough completed two water basin projects.
- Royalton Borough replaced culverts with ones with higher capacity.
- Susquehanna Township adopted new stormwater management regulations and implemented stormwater fees. The township adopted a land use plan.
- Washington Township purchased a property to demolish the structure and incorporate the land into the adjoining park.

6.2 MITIGATION GOALS AND OBJECTIVES

This section describes the mitigation goals and objectives set forth in the 2021 HMP update.

6.2.1 2021 Mitigation Goals

The Steering Committee reviewed the 2016 HMP goals to determine their continuing applicability to County mitigation needs and decided to update them. The updated goals and objectives were distributed to the Planning Team at the Mitigation Solutions Workshop. The Planning Team reviewed and approved the updated goals for the 2021 HMP. The 2021 County HMP goals are in line with State mitigation goals, embody the overarching needs and concerns of the County and participating municipalities, and address both natural and non-natural hazard risk reduction.

The 2021 County HMP goals are listed below:

1. **Goal 1:** Prevent injury/death, physical damage, and other impacts from hazards in Dauphin County.

2. **Goal 2**: Protect the citizens of Dauphin County as well as public and private property from the impacts of natural and human-caused hazards.
3. **Goal 3**: Protect and restore existing natural resources.
4. **Goal 4**: Educate officials and the public on the potential impacts of natural and non-natural hazards, and actions to reduce those impacts.
5. **Goal 5**: Plan for improved infrastructure to protect citizens and public and private property from natural and human-made hazards.

6.2.2 2021 Mitigation Objectives

The goals listed above were used to develop relevant objectives. The objectives address the results of the vulnerability assessment in more specific terms and reflect the possible effects that can be mitigated for the identified hazards, as well as existing limitations in available data and information. The objectives that were originally identified during the 2016 HMP update process were reviewed by the Steering Committee and updated to reflect changes in County priorities and capabilities since the HMP was written in 2016. Objectives related to each of the goals are listed below, and Table 6-1 summarizes the evaluation of all goals and objectives from the 2016 HMP.

Goal 1: Prevent injury/death, physical damage, and other impacts from hazards in Dauphin County.

Objective 1.1 Support FEMA's efforts to prepare detailed floodplain mapping in the Lower Susquehanna-Penns and Lower Susquehanna-Swatara Watersheds.

Objective 1.2 Enhance regulations for development in hazard-prone areas.

Objective 1.3 Enhance stormwater management planning and regulations.

Objective 1.4 Upgrade infrastructure to reduce the likelihood of hazards and their impacts.

Objective 1.5 Improve problem intersections and transportation corridors to reduce the likelihood of transportation accidents.

Goal 2: Protect the citizens of Dauphin County as well as public and private property from the impacts of natural and human-caused hazards.

Objective 2.1 Protect existing structures, including critical facilities, historic and cultural resources, and infrastructure, from damage that can be caused by hazards.

Objective 2.2 Acquire, relocate, elevate, and/or retrofit existing structures, including repetitive loss properties, located in hazard areas.

Objective 2.3 Improve and maintain stormwater management systems to reduce flooding.

Objective 2.4 Encourage homeowners, renters, and businesses to insure their properties against all hazards, including flood coverage under the National Flood Insurance Program (NFIP).

Objective 2.5 Develop connections and agreements among water systems and operators.

Goal 3: Protect and restore existing natural resources.

Objective 3.1 Restore degraded natural resources and open space to reduce vulnerability to hazards.

Objective 3.2 Provide appropriate safeguards for the preservation of the quality of water resources, stream corridors, watershed areas, and floodplains.

Objective 3.3 Preserve areas where natural hazard potential is high.

Goal 4: Educate officials and the public on the potential impacts of natural and non-natural hazards, and actions to reduce those impacts.

Objective 4.1 Educate local officials regarding their municipalities' risk and the precautions they can take.

Objective 4.2 Educate property owners and residents in hazard-risk areas regarding their risks and the precautions they can take.

Objective 4.3 Encourage local participation in the Community Rating System (CRS) Program.

Objective 4.4 Develop and enforce a requirement for property sellers to disclose hazards that exist on the property to potential buyers.

Objective 4.5 Educate the public about cyber security and how to reduce their vulnerability to cyber crime and attack.

Objective 4.6 Educate the public about invasive species and the precautions and response measures they can take to reduce the impacts of these species.

Objective 4.7 Encourage residents and business owners to install and maintain radon fans in below-grade levels of structures.

Goal 5: Plan for improved infrastructure to protect citizens and public and private property from natural and human-made hazards.

Objective 5.1 Provide residents and businesses with adequate warning of natural and human-made hazard events.

Objective 5.2 Provide adequate shelters during hazard events.

Objective 5.3 Provide adequate communication systems for emergency management agencies and emergency response units.

6.3 IDENTIFICATION AND ANALYSIS OF MITIGATION TECHNIQUES

Concerted efforts were made to ensure that the County and its municipalities developed updated mitigation strategies. Updated strategies included activities and initiatives covering the range of mitigation action types described in recent FEMA planning guidance, "Local Mitigation Planning Handbook" (FEMA 2013). Mitigation action types listed in the FEMA guidance include the following:

1. **Local Plans and Regulations:** These actions include government authorities, policies, or codes that influence the way land and buildings are being developed and built.
2. **Structure and Infrastructure Projects:** These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. These project types could apply to public or private structures as well as critical facilities and infrastructure. This type of action also involves projects to construct manmade structures to reduce the impact of hazards.
3. **Natural Systems Protection:** These are actions that minimize damage and losses and also preserve or restore the functions of natural systems.

4. **Education and Awareness Programs:** These are actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. These actions may also include participation in national programs, such as NFIP and CRS, StormReady (NOAA), and Firewise (National Fire Protection Association [NFPA]) Communities (FEMA 2013).

The participants of the Mitigation Strategy Workshop and the Planning Team identified actions that relate to the techniques listed above. Table 6-3 identifies which mitigation techniques are applicable for the hazards included in the 2021 HMP. In some cases, the mitigation techniques identified for a particular hazard reflect ongoing mitigation capabilities, not specific projects included in the updated HMP.

Table 6-3. Mitigation Technique Matrix

Hazard	Local Plans and Regulations	Structure and Infrastructure Projects	Natural Systems Protection	Education and Awareness Programs
Building or Structure Collapse	✓	✓		✓
Cyber Attack	✓			✓
Dam Failure	✓	✓		✓
Drought	✓	✓		✓
Environmental Hazards: Hazardous Materials Releases	✓	✓		✓
Floods, Flash Floods, and Ice Jams	✓	✓	✓	✓
Hurricane, Tropical Storm, Nor'easter	✓	✓	✓	✓
Invasive Species	✓		✓	✓
Landslide	✓	✓	✓	✓
Opioid Addiction Response				✓
Pandemic and Infectious Disease	✓	✓		✓
Radon Exposure	✓			✓
Subsidence, Sinkholes	✓	✓		✓
Tornado, Windstorm	✓			✓
Transportation Accidents	✓	✓		✓
Utility Interruption	✓	✓		✓
Wildfire	✓	✓	✓	✓
Winter Storm	✓			✓

6.4 MITIGATION ACTION PLAN

Representatives from the County and all participating municipalities selected mitigation strategies and initiatives to pursue until the next plan update. These actions also include some actions identified during the 2016 update that are still relevant or in progress. This section describes 2021 mitigation initiatives, mitigation strategy prioritization and implementation, and prioritization of mitigation actions.

6.4.1 2021 Mitigation Initiatives

Table 6-4 summarizes the updated mitigation strategies identified by the County and all municipalities, including the following information:

- Mitigation actions for individual and multiple hazards
- Mitigation action type
- Department or agency primarily responsible for project initiation and/or implementation
- Estimated cost for the mitigation action and identification of known or potential sources of funding
- Implementation schedule
- Implementation priority

The updated mitigation actions were documented using the Mitigation Action Worksheet distributed at the Mitigation Solution Workshop. Refer to Appendix G for a blank version of the Mitigation Action Worksheet and to Appendix H for completed worksheets. Specific mitigation actions were identified to prevent future losses; however, current funding is not identified for all of these actions at present, but potential funding sources (see Section 5) are indicated to support future implementation. The County and municipalities have limited resources to take on new responsibilities or projects. The implementation of these mitigation actions is dependent on the approval of the local elected governing body and the ability of the jurisdiction to obtain funding from local or outside sources.

The Planning Team prioritized proposed mitigation actions during the Mitigation Action Worksheet documentation process. In general, mitigation actions ranked as highest priorities should be addressed first within each jurisdiction, depending upon funding. However, medium- or low priority mitigation actions will be considered for implementation as funding becomes available. Therefore, the ranking levels should be considered as a preliminary ranking, which will evolve based on prevailing priorities and discretion of local governments, the public, the Pennsylvania Emergency Management Agency (PEMA), and FEMA as the plan update is implemented.

Table 6-4. Hazard Mitigation Strategy

Note: Some of the identified mitigation initiatives in Table 6-4 are dependent upon available funding (grants and local match availability) and may be modified or omitted at any time based on the occurrence of new hazard events and changes in County or municipal priorities. Actions that have been carried over from the 2016 version of the HMP may have been reworded and given a new initiative designation to conform to current needs and procedures. The Countywide actions apply to the County as an entity and participating municipalities. For most Countywide actions, the action applies to all participating municipalities. See Appendix H for action worksheets that specify to which municipalities other County-Wide actions apply.

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
Countywide (Multiple Municipalities)												
DauphinC-01	Provide public outreach about hazards and protective measures people can take to protect themselves (e.g., receiving emergency alerts through South Central Alert) and their property.	Existing	All Hazards	4	DPS	EMCs	Medium	Low	Operating Budget	Short	Medium	EAP
DauphinC-02	Improve telecommunications infrastructure, including accessibility of high-speed Internet connectivity, throughout the county	Existing	Pandemic and Infectious Disease; Utility Interruption	1, 2	DC DCED		High	High	FEMA BRIC; PA DCED; Operating Budget; Gaming grant	Long	High	SIP
DauphinC-03	Simplify and improve the model stormwater management ordinance in an effort to enhance enforcement and effectiveness of stormwater management practices	Both	Floods, Flash Floods, and Ice Jams; Hurricane, Tropical Storm, Nor'easter	1	Dauphin County Conservation District	Municipalities	High	Low	Operating Budget	Short	Medium	LPR
DauphinC-04	Educate the public about resources available to combat the opioid abuse/addiction.	N/A	Opioid Addiction Response	4	Dauphin County Human Services		Medium	Low	Operating Budget; Gaming grant	Short	Medium	EAP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
DauphinC-05	Inform the owners/operators of facilities storing hazardous materials of the risks they face and what they can do to protect their facilities and operations.	Existing	Cyber Attack; Dam Failure; Environmental Hazards: Hazardous Materials Releases; Floods, Flash Floods, and Ice Jams; Hurricane, Tropical Storm, Nor'easter; Landslide; Subsidence, Sinkholes; Tornado, Windstorm; Transportation Accidents; Utility Interruption; Wildfire; Winter Storm	4	DPS	LEPC; SCTF	High	Low	Operating Budget	Short	High	EAP
DauphinC-06	Work with child care facility operators to discuss hazards they face and ensure their emergency plans address those hazards.	Existing	All Hazards	4, 5	DPS	EMCs	High	High	Operating Budget	Short	Medium	EAP
DauphinC-07	Assess the topography around the Lykens Tower Site, Mahantango Tower Site, Peters Mountain Tower Site, and Pillow Tower Site to determine if mitigation measures are necessary, and to implement those measures if they are.	Existing	Landslide	1, 2	Engineer	DPS	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	High	SIP
DauphinC-08	Assess the following properties to determine the risk from wildfires and what vegetation needs to be cleared: Agriculture Building, Blue Mountain Tower Site, Conewago CWT Tower Site, Lower Swatara Tower Site, and Mahantango Tower Site	Existing	Wildfire	2, 3	DPS	All departments	High	Low	Operating Budget	Short	Medium	SIP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
DauphinC-09	Determine options for protecting the following facilities from the possible inundation due to a failure of the Raystown Lake Dam: Admin Building, Bar Association, County Offices – 100 Chestnut Street, Court House, Fort Hunter Park, Harrisburg Tower Site, Lykens Tower Site, Superior Court, Veterans Building Tower Site	Existing	Dam Failure; Floods, Flash Floods, and Ice Jams	2	Engineer		Medium	Medium	Operating Budget	Short	High	SIP
DauphinC-10	Determine options for protecting Dauphin County Bridge No. 23 from the inundation due to a failure of the DeHart Dam	Existing	Dam Failure; Floods, Flash Floods, and Ice Jams	2	Engineer	DPS; PHMC	Medium	Medium	Operating Budget	Short	High	SIP
DauphinC-11	Assess the geology at the following sites and determine if mitigation measures are necessary, and to implement them if they are: 333 Market Street Tower Site, Administration Building, Adult Probation, Assistance Office, Bar Association, Children and Youth, Conewago CWT Tower Site, Coroner's Office, County Offices – 100 Chestnut Street, Court House, Dauphin ECC Tower Site, Department of Public Safety, Harrisburg Tower Site, Judicial Center, Lower Swatara Tower Site, Market Street Tower Site, Prison, Recycling Center, Reservoir Park Tower Site, Superior Court, Veteran's Building Tower Site, and Work Release	Existing	Subsidence and Sinkholes	2	Engineer	DPS	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	Medium	SIP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
DauphinC-12	Identify and provide incentives to recruit and retain volunteer firefighters.	Existing	Building or Structure Collapse; Dam Failure; Drought; Environmental Hazards: Hazardous Materials Releases; Floods, Flash Floods, and Ice Jams; Hurricane, Tropical Storm, Nor'easter; Landslide; Subsidence, Sinkholes; Tornado, Windstorm; Transportation Accidents; Utility Interruption; Wildfire; Winter Storm	4	Municipalities	Fire Departments	High	Medium	Operating Budget	Short	Medium	LPR
DauphinC-13	Provide information to PEMA on the risks faced by each Commonwealth-owned critical facility in Dauphin County, so that PEMA can work with the Department of General Services to protect the facilities.	Existing	Dam Failure; Environmental Hazards: Hazardous Materials Releases; Floods, Flash Floods, and Ice Jams; Hurricane, Tropical Storm, Nor'easter; Subsidence, Sinkholes; Wildfire	2	DPS	PEMA; PA DGS	High	Low	Operating Budget	Short	Medium	SIP
DauphinC-14	Work with PennDOT to improve Interstates -076 (PA Turnpike), -081, -083, and -283 to reduce accidents	Existing	Transportation Accidents	1	Dauphin County Planning Commission	PennDOT	High	High	PennDOT, Operating Budget	Long	Medium	SIP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
DauphinC-15	Conduct a wildlands/forestry survey of forested areas, to identify strategies for mitigating the negative effects of invasive plant and insect species.	Existing	Invasive Species	3	DC Conservation District	DPS; PA DCNR	Medium	Medium	Operating Budget	Short	High	NSP
DauphinC-16	Construct another ingress/egress route for the Dauphin County Department of Public Safety, Schaffner Youth Center, Adult Probation facility, and Work Release Center	Existing	Transportation Accidents	1	Swatara Township	County Engineer	Medium	Low	Operating Budget; Infrastructure Bank	Short	High	SIP
DauphinC-17	Install wet and dry hydrants to provide water supply for fire suppression.	Existing	Drought	1	Municipal EMCs	Fire Departments; Water Utilities	High	Medium	Operating Budget; Gaming grant	Short	Medium	SIP
DauphinC-18	Work with the owners/operators of privately-owned critical facilities in the special flood hazard area to discuss their risk of flooding and protective measures they can take.	Existing	Floods, Flash Floods, and Ice Jams	2, 4	FPA	Engineers; USACE	High	Low	Operating Budget	Short	Low	EAP
DauphinC-19	Work with the owners/operators of privately-owned critical facilities in the area subject to inundation due to a failure of the Raystown Lake Dam to discuss their risk of flooding and protective measures they can take.	Existing	Dam Failure; Floods, Flash Floods, and Ice Jams	4	FPA	Engineers; USACE	High	Low	Operating Budget	Short	Medium	EAP
DauphinC-20	Work with privately-owned critical facilities to assess the geology at their sites to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Municipal EMC		High	Medium	Municipal Budget	Short	Medium	EAP
DauphinC-21	Work with the owners/operators of the privately-owned critical facilities to determine the risk from wildfires and what vegetation needs to be cleared.	Existing	Wildfire	2, 3	Municipalities	DC Conservation District, PA DCNR	Medium	Low	Operating Budget	Short	Medium	EAP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
DauphinC-22	Assess the Dauphin County Bridge No. 23 historic site to determine the risk from wildfires and what vegetation needs to be cleared.	Existing	Wildfire	2, 3	DC Conservation District	PA DCNR; PHMC	Medium	Low	Operating Budget	Short	Medium	SIP
DauphinC-23	Protect the Dauphin County Bridge No. 23 historic site to at least the 0.2 percent chance flood level.	Existing	Floods, Flash Floods, and Ice Jams	2	Engineer	FPA	Medium	Medium	FEMA HMGP, BRIC; PA DCED FMP; PHMC; Gaming grant	Short	Medium	SIP
DauphinC-25	Work with the owners/operators of privately-owned critical facilities on steep slopes to study the topography of the property to determine if mitigation measures are necessary, and to implement those measures.	Existing	Landslide	1, 2	DPS	EMCs	Medium	Low	Operating Budget	Short	Medium	SIP
DauphinC-26	The county will assess their bridges to determine what measures can be taken to protect them to the 0.2 percent annual chance flood level	Existing	Floods, Flash Floods, and Ice Jams	2	Engineer	Municipal FPAs	High	Medium	Operating Budget; Infrastructure Bank	Short	High	SIP
DauphinC-27	Assess the geology at the Area Agency on Aging property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Engineer		Medium	Medium	Operating Budget	Short	High	SIP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
DauphinC-28	Encourage homeowners, renters, and businesses to insure their properties against all hazards, including flood coverage under the National Flood Insurance Program (NFIP)	Existing	Building or Structure Collapse; Cyber Attack; Dam Failure; Drought; Environmental Hazards: Hazardous Materials Releases; Floods, Flash Floods, and Ice Jams; Hurricane, Tropical Storm, Nor'easter; Invasive Species; Landslide; Pandemic and Infectious Disease; Radon Exposure; Subsidence, Sinkholes; Tornado, Windstorm; Transportation Accidents; Utility Interruption; Wildfire; Winter Storm	2, 4	Municipalities	DPS; LEPC	High	Low	Operating Budget	Short	High	EAP
DauphinC-29	Clean debris from pillars at Grubb Street and Canal Street bridges	N/A	Floods, Flash Floods, and Ice Jams	2, 3	Royalton Borough	Middletown Borough; Dauphin County	Medium	Medium	PA DCNR; Operating Budget	Short	High	NSP
DauphinC-30	Install backup preventers in wastewater pipes to prevent basement flooding.	Existing	Floods, Flash Floods, and Ice Jams; Utility Interruption	2	Municipalities		High	High	PA DCED Small Water and Sewer Grant; Operating Budget; Gaming grant	Short	Medium	SIP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
DauphinC-31	Elevate or acquire properties, including repetitive loss and severe repetitive loss properties, in flood prone areas.	Existing	Floods, Flash Floods, and Ice Jams	2, 3	FPA		High	High	FEMA HMGP, BRIC, FMA; PA DCED FMP; Operating Budget	Short	Medium	SIP
DauphinC-32	Floodproof structures in flood prone areas.	Existing	Floods, Flash Floods, and Ice Jams	2	FPA		High	High	FEMA HMGP, BRIC, FMA; PA DCED FMP; Operating Budget	Short	High	SIP
DauphinC-33	Conduct a study for the Susquehanna River to determine the best option to address snakeheads, flathead catfish, and other invasive species	N/A	Invasive Species	3	DC Conservation District	Susquehanna River Basin Commission; PA Fish and Boat Commission	Medium	Medium	Operating Budget	Short	High	NSP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
DauphinC-34	Develop a new Comprehensive Plan or amend an existing Comprehensive Plan to include an assessment and associated mapping of the municipality's vulnerability to location-specific hazards and appropriate recommendations for the use of these hazard areas.	Both	Building or Structure Collapse; Cyber Attack; Dam Failure; Drought; Environmental Hazards: Hazardous Materials Releases; Floods, Flash Floods, and Ice Jams; Hurricane, Tropical Storm, Nor'easter; Invasive Species; Landslide; Pandemic and Infectious Disease; Radon Exposure; Subsidence, Sinkholes; Tornado, Windstorm; Transportation Accidents; Utility Interruption; Wildfire; Winter Storm	1	Municipalities	Tri-County Regional Planning Commission	High	80000	Municipal budget	Short	Medium	LPR

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
DauphinC-35	Develop a new Zoning Ordinance or revise an existing Zoning Ordinance to include separate zones or districts with appropriate development criteria for known hazard areas.	Both	Building or Structure Collapse; Cyber Attack; Dam Failure; Drought; Environmental Hazards: Hazardous Materials Releases; Floods, Flash Floods, and Ice Jams; Hurricane, Tropical Storm, Nor'easter; Invasive Species; Landslide; Pandemic and Infectious Disease; Radon Exposure; Subsidence, Sinkholes; Tornado, Windstorm; Transportation Accidents; Utility Interruption; Wildfire; Winter Storm	1	Municipalities	Tri-County Regional Planning Commission	High	50000	Municipal budget	Short	High	LPR

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
DauphinC-36	Develop a new Subdivision and Land Development Ordinance or revise an existing Subdivision and Land Development Ordinance to include municipal-specific, hazard mitigation-related development criteria and/or provisions for the mandatory use of conservation subdivision design principles in order to regulate the location and construction of buildings and other infrastructure in known hazard areas.	Both	Building or Structure Collapse; Cyber Attack; Dam Failure; Drought; Environmental Hazards: Hazardous Materials Releases; Floods, Flash Floods, and Ice Jams; Hurricane, Tropical Storm, Nor'easter; Invasive Species; Landslide; Pandemic and Infectious Disease; Radon Exposure; Subsidence, Sinkholes; Tornado, Windstorm; Transportation Accidents; Utility Interruption; Wildfire; Winter Storm	1	Municipalities	Tri-County Regional Planning Commission	High	50000	Municipal budget	Short	Medium	LPR
DauphinC-37	Revise existing zoning and/or subdivision and land development ordinances or adopt a separate, standalone ordinance to require the completion of subsurface investigations (i.e., borings, geo-physical surveys, and/or studies by a registered Professional Geologist) for all new subdivision and land development projects in known land subsidence hazard areas.	Both	Subsidence and Sinkholes	1	Municipalities	Tri-County Regional Planning Commission	High	5000	Municipal budget	Short	High	LPR

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
DauphinC-38	Update and implement a comprehensive water resources management plan that analyzes the County's existing water resources supply and evaluates the County's anticipated water use demand in an effort to identify suspected water supply shortages and potential new water supply sources.	Both	Drought; Utility Interruption; Wildfire	1	DCCD	Susquehanna River Basin Commission; PA DEP	Medium	Medium	Municipal budget; Gaming grants	Long	Medium	LPR
DauphinC-39	Coordinate with the USGS, local watershed organizations, and/or the DCCD to increase the number of USGS and Integrated Flood Observing and Warning System (IFLOWS) rain and stream gauges in the County as a potential enhancement to the existing Susquehanna Flood Forecast and Warning System.	New	Floods, Flash Floods, and Ice Jams	1, 5	DPS	Susquehanna River Basin Commission; watershed associations; DC Conservation District; USGS	Medium	Medium	Municipal budget; Gaming grants	Short	High	SIP
DauphinC-40	Work with municipalities to evaluate participation in the CRS and facilitate the preparation and submission of CRS applications.	Both	Dam Failure; Floods, Flash Floods, and Ice Jams	1, 2, 3, 4, 5	DC DCED	DPS; PEMA; FEMA Region III	High	Low	CDBG	Short	High	LPR

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
DauphinC-41	Develop a technical proficiency at the municipal level for conducting post-disaster damage assessments and continue to regulate through local planning and zoning reconstruction activities to ensure compliance with NFIP substantial damage/substantial improvement requirements.	Both	Building or Structure Collapse; Dam Failure; Environmental Hazards: Hazardous Materials Releases; Floods, Flash Floods, and Ice Jams; Hurricane, Tropical Storm, Nor'easter; Landslide; Subsidence, Sinkholes; Tornado, Windstorm; Transportation Accidents; Utility Interruption; Wildfire; Winter Storm	4	DPS	County IT; County Tax Assessment; Municipal EMCs	Medium	Low	Operating Budget; Gaming grant	Short	Medium	EAP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
DauphinC-42	Develop a technical proficiency at the municipal level for assisting local residents and business owners in applying for hazard mitigation and assistance funds and identifying cost beneficial hazard mitigation measures to be incorporated into reconstruction activities.	Both	Building or Structure Collapse; Dam Failure; Environmental Hazards: Hazardous Materials Releases; Floods, Flash Floods, and Ice Jams; Hurricane, Tropical Storm, Nor'easter; Landslide; Subsidence, Sinkholes; Tornado, Windstorm; Transportation Accidents; Utility Interruption; Wildfire; Winter Storm	1, 2, 3, 4	Municipal EMC	DPS	High	Low	Operating Budget; Gaming grant	Short	Medium	EAP
DauphinC-43	Investigate the feasibility of constructing a levee/floodwall system along Swatara Creek between East Main Street and the Pennsylvania Turnpike to minimize Middletown Borough's flood hazard potential.	New	Floods, Flash Floods, and Ice Jams	2	FPA	Engineer; SRBC	High	High	FEMA HMA; USACE	Long	Medium	SIP
DauphinC-44	Municipalities should continue to seek solutions to problem areas and obstructions identified in the April 2010 Countywide Act 167 Stormwater Management Plan.	Existing	Floods, Flash Floods, and Ice jams; Hurricanes, Tropical Storms, and Nor'easters	2	Municipalities	FPA	High	High	FEMA HMA; PA DCED FMP; Gaming grant	Short	Medium	SIP
DauphinC-45	Enroll in the Pennsylvania Firewise Communities Program through the DCNR Fire Forester for Dauphin County.	N/A	Wildfire	3, 4, 5	Municipalities	Fire Departments; PA DCNR	Medium	Low	Operating Budget	Short	Medium	EAP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
DauphinC-46	Encourage homeowners to test for radon and install radon mitigation systems, if needed.	Existing	Radon Exposure	4	Municipalities	PA DEP	Medium	Low	Operating Budget	Short	Medium	EAP
DauphinC-47	Adopt the Radon Control Methods Appendix of the current, adopted edition of the International Residential Code to address radon in new construction.	Both	Radon Exposure	1	Municipalities	PA DEP	Medium	Low	Operating Budget	Short	High	LPR
DauphinC-48	Encourage municipalities to enter into an Intergovernmental Cooperation Agreement and Memorandum of Understanding with the Dauphin County Land Bank Authority as a way to address structures at risk from the impacts of natural and human-made hazards.	Both	Building or Structure Collapse; Dam Failure; Drought; Environmental Hazards: Hazardous Materials Releases; Floods, Flash Floods, and Ice Jams; Hurricane, Tropical Storm, Nor'easter; Invasive Species; Landslide; Radon Exposure; Subsidence, Sinkholes; Tornado, Windstorm; Transportation Accidents; Utility Interruption; Wildfire; Winter Storm	1	DC DCED	DPS	Medium	Low	Operating Budget	Short	High	LPR

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
DauphinC-49	Increase the number of NOAA Weather Alert radios in public places across the County which currently do not have them (such as personal care homes) above and beyond what is required of the County by the NWS's Storm Ready Program.	Both	Dam Failure; Environmental Hazards: Hazardous Materials Releases; Floods, Flash Floods, and Ice Jams; Hurricane, Tropical Storm, Nor'easter; Tornado, Windstorm; Wildfire; Winter Storm	4	DPS		Medium	Low	Operating Budget; EMPG; Gaming grant	Short	Medium	LPR
DauphinC-50	Establish an alternate EOC location in the event the primary EOC must be evacuated. This facility should also be located outside of the Special Flood Hazard Area.	Existing	Building or Structure Collapse; Cyber Attack; Dam Failure; Drought; Environmental Hazards: Hazardous Materials Releases; Floods, Flash Floods, and Ice Jams; Hurricane, Tropical Storm, Nor'easter; Invasive Species; Landslide; Pandemic and Infectious Disease; Radon Exposure; Subsidence, Sinkholes; Tornado, Windstorm; Transportation Accidents; Utility Interruption; Wildfire; Winter Storm	5	DPS	DC Conservation District; Facilities; Engineer	Low	Low	Operating Budget	Short	High	LPR

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
DauphinC-51	The Dauphin County Department of Information Technology will make natural and human-made hazard data available for municipal use.	N/A	Building or Structure Collapse; Cyber Attack; Dam Failure; Drought; Environmental Hazards: Hazardous Materials Releases; Floods, Flash Floods, and Ice Jams; Hurricane, Tropical Storm, Nor'easter; Invasive Species; Landslide; Pandemic and Infectious Disease; Radon Exposure; Subsidence, Sinkholes; Tornado, Windstorm; Transportation Accidents; Utility Interruption; Wildfire; Winter Storm	4	DC IT	DPS	Low	Low	Operating Budget	Short	Medium	LPR
DauphinC-52	Assess the EMS Station 12 property to determine the risk from wildfires and what vegetation needs to be cleared.	Existing	Wildfire	2, 3	Facilities	DPS; Fire Department; PA DCNR	High	Low	Operating Budget	Short	Medium	NSP
Berrysburg Borough												
BerrysburgB-01	Install a backup power generator at the Berrysburg Borough municipal building.	Existing	Utility Interruption	1, 2	Borough		High	High	FEMA HMGP, BRIC; Operating Budget; Gaming grant	Short	Medium	SIP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
BerrysburgB-02	Install a backup power generator at the Berrysburg & Community Fire Company station	Existing	Utility Interruption	1, 2	Borough	Fire Department	High	High	FEMA HMGP, BRIC; Operating Budget; Gaming grant	Short	High	SIP
BerrysburgB-03	Discuss with the owner/operator of critical facilities vulnerable to a hazardous materials release the risk and possible protective measures.	Existing	Environmental Hazards - Hazardous Material Releases	4	EMC	DPS, LEPC	Medium	Low	Operating Budget	Short	Medium	EAP
Conewago Township												
ConewagoT-01	Protect Laurel Drive from the current and future sinkholes.	Existing	Subsidence and Sinkholes	2	Engineer		High	Medium	Municipal Budget	Short	Medium	SIP
ConewagoT-02	Work with PennDOT to improve Deodate Road to mitigate traffic accidents.	Existing	Transportation Accidents	1	Conewago Township	PennDOT	High	High	Operating Budget; Infrastructure Bank	Long	Medium	SIP
ConewagoT-03	Work with PennDOT to improve Colebrook Road to mitigate traffic accidents	Existing	Transportation Accidents	1	Conewago Township	PennDOT	High	High	Operating Budget; Infrastructure Bank	Long	Medium	SIP
Dauphin Borough												
DauphinB-01	Assess conditions at the confluence of Stony Creek and the Susquehanna River to identify potential mitigation actions for nearby structures.	Existing	Floods, Flash Floods, and Ice Jams; Hurricane, Tropical Storm, Nor'easter	2, 3	FPA	Susquehanna River Basin Commission	Medium	Medium	FEMA HMGP, BRIC, FMA; PA DCED FMP; Operating Budget; Gaming grant	Short	Medium	SIP
DauphinB-02	Assess the borough to identify potential mitigation actions to take to ensure access to/from the borough during floods of the Susquehanna River.	Existing	Floods, Flash Floods, and Ice Jams; Hurricane, Tropical Storm, Nor'easter	2	Borough	Susquehanna River Basin Commission	Medium	Medium	FEMA HMGP, BRIC, FMA; PA DCED FMP; Operating Budget	Short	Medium	SIP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
DauphinB-03	Install a generator at the Borough Building	Existing	Utility Interruption	1, 2	Borough		High	High	FEMA HMGP, BRIC; Operating Budget; Gaming grant	Short	Low	SIP
DauphinB-04	Determine what other critical facilities in the borough need generators and purchase/install them.	Existing	Utility Interruption	1, 2	EMC	Public Works	High	High	FEMA HMGP, BRIC; Operating Budget	Short	High	SIP
DauphinB-05	Develop and implement a stream maintenance program to clear debris from Stony Creek.	Existing	Floods, Flash Floods, and Ice Jams	3	Borough	FPA	Medium	Medium	FEMA HMGP, BRIC, FMA; PA DCED FMP; Operating Budget	Short	High	SIP
DauphinB-06	Assess critical facilities in the wildland-urban interface area to determine the risk from wildfires and what vegetation needs to be cleared.	Existing	Wildfire	2, 3	Borough	Fire Department; PA DCNR	Medium	Low	Operating Budget	Short	Medium	SIP
DauphinB-07	Assess Hillside properties to determine the risk from wildfires and what vegetation needs to be cleared	Existing	Wildfire	2, 3	Borough	Fire Department; PA DCNR	High	Low	Operating Budget	Short	High	SIP
DauphinB-08	Work with PennDOT to improve Claster Boulevard to reduce traffic accidents	Existing	Transportation Accidents	1	Dauphin Borough	PennDOT	High	High	Operating Budget; Infrastructure Bank	Long	Medium	SIP
DauphinB-09	Work with PennDOT to improve US-22/322 to mitigate traffic accidents	Existing	Transportation Accidents	1	Dauphin Borough	PennDOT	High	High	Municipal Budget	Long	Medium	SIP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
Derry Township												
DerryT-01	Assess stormwater management infrastructure in the township to determine what improvements need to be made, then implement the improvements.	Existing	Floods, Flash Floods, and Ice Jams; Hurricane, Tropical Storm, Nor'easter	1, 2	Engineer	FPA	High	High	FEMA HMGP, BRIC; PA DCED FMP; Gaming grant	Short	Low	SIP
DerryT-02	Work with PennDOT to assess the bridges over the Swatara Creek on PA-39 and PA-0743 to improve the ability to pass floodwaters under the bridges.	Existing	Floods, Flash Floods, and Ice Jams	2	Engineer	FPA	Medium	Medium	FEMA HMGP, BRIC, FMA; PA DCED FMP; Operating Budget	Long	High	SIP
DerryT-03	Work with PennDOT to upgrade stormwater infrastructure on Hershey Park Drive	Existing	Floods, Flash Floods, and Ice Jams; Hurricane, Tropical Storm, Nor'easter	1, 2	Public Works	PennDOT	High	High	FEMA HMGP, BRIC, FMA; PA DCED FMP; Operating Budget; Gaming grant	Short	High	SIP
DerryT-04	Upgrade stormwater infrastructure on Mae Street	Existing	Floods, Flash Floods, and Ice Jams; Hurricane, Tropical Storm, Nor'easter	1, 2	Public Works		High	High	FEMA HMGP, BRIC, FMA; PA DCED FMP; Operating Budget; Gaming grant	Short	High	SIP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
DerryT-05	Upgrade stormwater infrastructure on Bull Frog Valley Road	Existing	Floods, Flash Floods, and Ice Jams; Hurricane, Tropical Storm, Nor'easter	1, 2	Public Works		High	High	FEMA HMGP, BRIC, FMA; PA DCED FMP; Operating Budget; Gaming grant	Short	Medium	SIP
DerryT-06	Upgrade stormwater infrastructure on Wilsonville Road	Existing	Floods, Flash Floods, and Ice Jams; Hurricane, Tropical Storm, Nor'easter	1, 2	Public Works		High	High	FEMA HMGP, BRIC, FMA; PA DCED FMP; Operating Budget; Gaming grant	Short	High	SIP
DerryT-07	Install a generator at the Derry Township Public Works building	Existing	Utility Interruption	1, 2	Public Works		High	High	FEMA HMGP, BRIC; Operating Budget; Gaming grant	Short	Medium	SIP
DerryT-08	Assess the topography around the following structures to determine if mitigation measures are necessary, and to implement those measures if they are: Quarries of the Hummelstown Brownstone Company historic site and Derry Township LDFL Wastewater facility	Existing	Landslide	1, 2	Engineer		Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	Low	SIP
DerryT-09	Work with PennDOT to protect US-322 near PA-0743 from current and future sinkholes.	N/A	Subsidence and Sinkholes	2	Public Works	EMC; PennDOT	High	Medium	Municipal Budget	Long	Medium	SIP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
DerryT-10	Assess the geology at the Derry Township municipal offices to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Engineer	EMC	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	Medium	SIP
DerryT-11	Work with the Sheetz #351 to determine options for protecting the facility from the possible inundation from dam failure from the Hershey Dam	Existing	Dam Failure; Floods, Flash Floods, and Ice Jams	2	EMC	FPA; Engineer	High	Medium	Operating Budget	Short	Medium	SIP
DerryT-12	Work with PennDOT to improve Elizabethtown Road to mitigate traffic accidents	N/A	Transportation Accidents	1	Derry Township	PennDOT	High	High	Municipal Budget	Long	Medium	SIP
DerryT-13	Work with PennDOT to improve Governor Road to mitigate traffic accidents	N/A	Transportation Accidents	1	Derry Township	PennDOT	High	High	Municipal Budget	Long	Medium	SIP
DerryT-14	Work with PennDOT to improve Middletown Road to mitigate traffic accidents	N/A	Transportation Accidents	1	Derry Township	PennDOT	High	High	Municipal Budget	Long	Medium	SIP
DerryT-15	Work with PennDOT to improve Waltonville Road to mitigate traffic accidents	N/A	Transportation Accidents	1	Derry Township	PennDOT	High	High	Operating Budget; Infrastructure Bank	Long	High	SIP
DerryT-16	Assess the drainage and stormwater management infrastructure in the area of Hersheypark Drive and Walton Avenue to determine appropriate mitigation measures to reduce risk from flooding, and implement them.	Existing	Floods, Flash Floods, and Ice Jams	1, 2	Engineer	PennDOT; TCRPC; FPA	High	Medium	FEMA HMGP, BRIC; Operating Budget	Short	Medium	SIP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
East Hanover Township												
East HanoverT-01	Work with PennDOT to improve drainage to reduce flooding along the 1100 block of Manada Bottom Road	Existing	Floods, Flash Floods, and Ice Jams; Hurricane, Tropical Storm, Nor'easter	1, 2	Public Works	PennDOT	Medium	Medium	FEMA HMGP, BRIC, FMA; PA DCED FMP; Operating Budget; Gaming grant	Short	High	SIP
East HanoverT-02	Work with PennDOT to eliminate highway flooding at intersection of PA-443 and Firehouse Road during heavy rainfalls.	N/A	Floods, Flash Floods, and Ice Jams; Hurricane, Tropical Storm, Nor'easter	1, 2	Township Public Works	PennDOT	High	Medium	PennDOT	Long	Low	SIP
East HanoverT-03	Work with PennDOT to improve Mountain Road to mitigate traffic accidents	N/A	Transportation Accidents	1	East Hanover Township	PennDOT	High	High	Municipal Budget	Long	Medium	SIP
East HanoverT-04	Work with PennDOT to improve Laudermilch Road to mitigate traffic accidents	N/A	Transportation Accidents	1	East Hanover Township	PennDOT	High	High	Municipal Budget	Long	Medium	SIP
East HanoverT-05	Work with PennDOT to improve Sandbeach Road to mitigate traffic accidents	N/A	Transportation Accidents	1	East Hanover Township	PennDOT	High	High	Municipal Budget	Long	Medium	SIP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
East HanoverT-06	Obtain warning system for residents from outside contractor to alert residents to hazardous materials incidents or other hazards	N/A	Environmental Hazards: Hazardous Materials Releases; Floods, Flash Floods, and Ice Jams; Hurricane, Tropical Storm, Nor'easter; Subsidence, Sinkholes; Tornado, Windstorm; Transportation Accidents; Utility Interruption; Wildfire; Winter Storm	5	EMC	Township Manager	Medium	Low	Operating Budget; Gaming grant; SCTF	Short	Medium	EAP
Elizabethville Borough												
ElizabethvilleB-01	Determine the best option to prevent flooding of the borough building	Existing	Floods, Flash Floods, and Ice Jams	2	Engineer	FPA	High	High	FEMA HMGP, BRIC, FMA; PA DCED FMP, Operating Budget	Short	High	SIP
ElizabethvilleB-02	Assess stormwater management infrastructure in the borough to determine what improvements need to be made to control runoff and reduce flooding.	Existing	Floods, Flash Floods, and Ice Jams; Hurricane, Tropical Storm, Nor'easter	1, 2	Engineer	FPA	High	High	FEMA HMGP, BRIC; PA DCED FMP; Gaming grant	Short	Medium	SIP
ElizabethvilleB-03	Work with PennDOT to improve drainage of US-209 at Park Drive.	N/A	Floods, Flash Floods, and Ice Jams; Hurricane, Tropical Storm, Nor'easter	1, 2	Elizabethville Borough		Medium	Medium	FEMA HMGP, BRIC, FMA; PA DCED FMP; Operating Budget	Long	Low	SIP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
ElizabethvilleB-04	Protect the Upper Dauphin County EMS station to the 0.2 percent annual chance flood level.	Existing	Floods, Flash Floods, and Ice Jams	2	Engineer	FPA	High	High	FEMA HMGP, BRIC, FMA; PA DCED FMP; Operating Budget; Gaming grant	Short	High	SIP
ElizabethvilleB-05	Assess the property of the Elizabethville Fire Station to determine the risk from wildfires and what vegetation needs to be cleared.	Existing	Wildfire	2; 3	Borough	Municipal EMC; PA DCNR	Medium	Low	Operating Budget	Short	Medium	SIP
ElizabethvilleB-06	Install a backup power generator at the Elizabethville Borough building.	Existing	Utility Interruption	1, 2	Borough	EMC	High	30,000	FEMA HMGP, BRIC; Operating Budget; Gaming grant	Short	Medium	SIP
Gratz Borough												
GratzB-01	Assess the property of the Gratz Borough Building to determine the risk from wildfires and what vegetation needs to be cleared.	Existing	Wildfire	2, 3	Borough	Fire Department	Medium	Low	Operating Budget	Short	High	SIP
GratzB-02	Assess the Gratz Fire Department station to determine the risk from wildfires and what vegetation needs to be cleared.	Existing	Wildfire	2, 3	Borough	Fire Department	Medium	Low	Operating Budget	Short	Medium	SIP
Halifax Borough												
Halifax B-01	Ensure that the borough has plans in place to continue operations if a hazardous materials release causes an evacuation of the Halifax Borough Office.	Existing	Environmental Hazards - Hazardous Material Releases	4	EMC	DPS, LEPC	High	Low	Operating Budget	Short	Medium	EAP

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Halifax B-02	Discuss with the US Postal Service that the Halifax Post Office is vulnerable to a hazardous materials release and possible protective measures.	Existing	Environmental Hazards - Hazardous Material Releases	4	EMC	DPS, LEPC	Medium	Low	Operating Budget	Short	Medium	EAP
Halifax Township												
Halifax T-01	Protect the Halifax Area Water Authority Well #1 to the 0.2 percent annual chance flood event.	Existing	Floods, Flash Floods, and Ice Jams; Utility Interruption	2	Water Authority		High	High	FEMA HMGP, BRIC; PA DCED H2O, Small Water and Sewer Project Grant; Operating Budget; Gaming grant	Short	Medium	SIP
Halifax T-02	Work with the property owner to protect the Legislative Route 1 Sycamore Allee historic site from flooding	Existing	Floods, Flash Floods, and Ice Jams	2	Engineer	FPA; PHMC	Medium	Medium	FEMA HMGP, BRIC, FMA; PA DCED FMP; PHMC; Operating Budget	Short	Medium	SIP
Halifax T-03	Assess the topography around the Halifax Area Water Authority Well #1 to determine if mitigation measures are necessary, and to implement those measures if they are.	Existing	Landslide	1, 2	Engineer		Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	Medium	SIP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
Halifax T-04	Assess the following properties to determine the risk from wildfires and what vegetation needs to be cleared: Halifax Area Authority Sewer Plant, Halifax Area Water Authority Well #1, Halifax Area Authority Sewer Plant, and Halifax Township Municipal Building.	Existing	Wildfire	2, 3	Township	Fire Department; PA DCNR	High	Low	Operating Budget	Short	High	SIP
Halifax T-05	Work with PennDOT to improve Peters Mountain Road to mitigate traffic accidents	N/A	Transportation Accidents	1	Halifax Township	PennDOT	High	High	Municipal Budget	Long	Medium	SIP
Halifax T-06	Work with PennDOT to improve Powells Valley Road to mitigate traffic accidents	N/A	Transportation Accidents	1	Halifax Township	PennDOT	High	High	Municipal Budget	Long	High	SIP
Halifax T-07	Work with PennDOT to improve South River Road to mitigate traffic accidents	N/A	Transportation Accidents	1	Halifax Township	PennDOT	High	High	Municipal Budget	Long	Medium	SIP
Harrisburg City												
HarrisburgC-01	Renovate or demolish vacant structures that are at risk of collapse.	Existing	Building or Structure Collapse	2	City of Harrisburg	DC DCED	High	Medium	CDBG; Operating Budget	Short	Medium	SIP
HarrisburgC-02	Protect the Downey Elementary School to at least the 0.2 percent chance flood level	Existing	Floods, Flash Floods, and Ice Jams	2	FPA		High	High	FEMA HMGP, BRIC, FMA; PA DCED FMP; Operating Budget; Gaming grant	Short	Medium	SIP
HarrisburgC-03	Protect the Edgewater Psychiatric Center to at least the 0.2 percent chance flood level	Existing	Floods, Flash Floods, and Ice Jams	2	FPA		High	High	FEMA HMGP, BRIC, FMA; PA DCED FMP; Operating Budget; Gaming grant	Short	Medium	SIP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
HarrisburgC-04	Protect the Station 1 EMS facility to at least the 0.2 percent chance flood level	Existing	Floods, Flash Floods, and Ice Jams	2	Engineer	FPA	High	High	FEMA HMGP, BRIC, FMA; PA DCED FMP; Operating Budget; Gaming grant	Short	Low	SIP
HarrisburgC-05	Assess the geology at the Ben Franklin School property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	School District Facilities	City Engineer	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	Medium	SIP
HarrisburgC-06	Assess the geology at the Camp Curtin Fire Station historic site property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Engineer	EMC	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	High	SIP
HarrisburgC-07	Assess the geology at the Camp Curtin Junior High School historic property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Facilities Management	Engineer	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	Medium	SIP
HarrisburgC-08	Assess the geology at the Downey Elementary School historic site property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	District Facilities Management	City Engineer	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	Medium	SIP
HarrisburgC-09	Assess the geology at the Edgewater Psychiatric Center property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Facility Engineer	City Engineer	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	Medium	SIP
HarrisburgC-10	Assess the geology at the Foose Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	District Facilities Management	City Engineer	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	High	SIP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
HarrisburgC-11	Assess the geology at the Hamilton School property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	District Facilities Management	City Engineer	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	High	SIP
HarrisburgC-12	Assess the geology at the Harrisburg City Government Center and Police Department property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Engineer	EMC	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	High	SIP
HarrisburgC-13	Assess the geology at the Harrisburg City Public Works property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Engineer	EMC	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	High	SIP
HarrisburgC-14	Assess the geology at the Harrisburg City Fire Station 1 property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Engineer	EMC	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	Medium	SIP
HarrisburgC-15	Assess the geology at the Harrisburg City Fire Station 2 property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Engineer	EMC	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	High	SIP
HarrisburgC-16	Assess the geology at the Harrisburg City Fire Station 8 property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Engineer	EMC	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	High	SIP
HarrisburgC-17	Assess the geology at the Harrisburg Technical High School property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	School Facilities Management	City Engineer	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	High	SIP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
HarrisburgC-18	Assess the geology at the John Harris High School property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Facilities Management	Engineer	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	High	SIP
HarrisburgC-19	Assess the geology at the Harrisburg School District Administration Building property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Facilities Management	Engineer	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	High	SIP
HarrisburgC-20	Assess the geology at the Marshall School property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	School Facilities Management	City Engineer	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	High	SIP
HarrisburgC-21	Assess the geology at the Melrose School property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	School Facilities Management	City Engineer	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	Low	SIP
HarrisburgC-22	Assess the geology at the Paxton Fire Station historic property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	City Engineer	EMC	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	Medium	SIP
HarrisburgC-24	Assess the geology at the Riverside Fire Station historic property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Engineer	EMC	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	Medium	SIP
HarrisburgC-25	Assess the geology at the Rowland Middle School property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	School Facilities Management	City Engineer	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	High	SIP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
HarrisburgC-26	Assess the geology at the Scott Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	School Facilities Management	City Engineer	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	Medium	SIP
HarrisburgC-28	Determine options for protecting the following facilities from the possible inundation due to a failure of the Raystown Lake Dam: Downey Elementary School, Edgewater Psychiatric Center, Harrisburg City Government Center, Harrisburg City Police Station, Station 1 EMS	Existing	Dam Failure; Floods, Flash Floods, and Ice Jams	2	Engineer		Medium	Low	Operating Budget	Short	High	SIP
HarrisburgC-29	Work with PennDOT to assess and improve the stormwater management infrastructure at Cameron and Maclay Streets, near the Maclay Street entrance to the Farm Show Complex.	Existing	Floods, Flash Floods, and Ice Jams; Hurricane, Tropical Storm, Nor'easter	1, 2	Engineer	Capital Region Water; PennDOT	High	High	FEMA HMGP, BRIC; PA DCED FMP; Gaming grant	Short	High	SIP
HarrisburgC-30	Work with PennDOT to assess and improve the stormwater management infrastructure on the 1800 block of Derry Street.	Existing	Floods, Flash Floods, and Ice Jams; Hurricane, Tropical Storm, Nor'easter	1, 2	Engineer	Capital Region Water; PennDOT	High	High	FEMA HMGP, BRIC; PA DCED FMP; Gaming grant	Short	Medium	SIP
HarrisburgC-31	Work with PennDOT to assess and improve the stormwater management infrastructure along the 1400 block of Market Street.	Existing	Floods, Flash Floods, and Ice Jams; Hurricane, Tropical Storm, Nor'easter	1, 2	Engineer	Capital Region Water; PennDOT	High	High	FEMA HMGP, BRIC; PA DCED FMP; Gaming grant	Short	Medium	SIP
HarrisburgC-32	Assess and improve the stormwater management infrastructure at the intersection of 2nd and Geiger Streets.	Existing	Floods, Flash Floods, and Ice Jams; Hurricane, Tropical Storm, Nor'easter	1, 2	Engineer	Capital Region Water; PennDOT	High	High	FEMA HMGP, BRIC; PA DCED FMP; Gaming grant	Short	High	SIP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
HarrisburgC-33	Assess and improve the stormwater management infrastructure at the intersection of Herr and Plum Streets.	Existing	Floods, Flash Floods, and Ice Jams; Hurricane, Tropical Storm, Nor'easter	1, 2	Engineer	Capital Region Water	High	High	FEMA HMGP, BRIC; PA DCED FMP; Gaming grant	Short	Medium	SIP
HarrisburgC-34	Work with PennDOT to study Cameron Street to identify measures to reduce transportation accidents.	N/A	Transportation Accidents	1	City Engineer	TCRPC; PennDOT	Medium	Medium	Operating Budget; HATS; Infrastructure Bank	Short	Medium	SIP
HarrisburgC-35	Work with PennDOT to study Mulberry Street to identify measures to reduce transportation accidents.	N/A	Transportation Accidents	1	City Engineer	TCRPC; PennDOT	Medium	Medium	Operating Budget; HATS; Infrastructure Bank	Short	High	SIP
HarrisburgC-36	Work with PennDOT to study State Street to identify measures to reduce transportation accidents.	N/A	Transportation Accidents	1	City Engineer	TCRPC; PennDOT	Medium	Medium	Operating Budget; HATS; Infrastructure Bank	Short	Medium	SIP
HarrisburgC-37	Support Capital Region Water's Wastewater Arsenal Boulevard Sewer Improvements - Rehabilitation/replacement of approximately 2,500 LF of sewer collector pipe.	Existing	Utility Interruption	1, 2	City Engineer	Capital Region Water; PennDOT	High	$3 million	PENNVEST	Short	High	SIP
HarrisburgC-38	Support Capital Region Water's Stormwater SW Pond Retrofit – Bellevue Park Design - Employing green stormwater infrastructure (GSI) to manage stormwater runoff and prevent flows from entering the combined sewer system, thereby reducing combined sewer overflow (CSO) activity.	New	Floods, Flash Floods, and Ice Jams; Hurricane, Tropical Storm, Nor'easter	1, 2, 3	City Engineer	Capital Region Water; Jacobs	High	$1,150,000	PA DCED H2O	2021 - 2022	Medium	NSP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
HarrisburgC-39	Support Capital Region Water's Stormwater Camp Curtin YMCA GSI - Develop visible GSI improvements as part of the community center rehabilitation and beautification	New	Floods, Flash Floods, and Ice Jams; Hurricane, Tropical Storm, Nor'easter	1, 2, 3	City Engineer	Capital Region Water; AKRF	High	$1,857,000	PENNVEST	2021 - 2022	Medium	NSP
HarrisburgC-40	Support Capital Region Water's Stormwater COH East-West Multimodal Connector - GSI - Capture and manage stormwater in green stormwater elements designed to also serve as traffic calming elements.	New	Floods, Flash Floods, and Ice Jams; Hurricane, Tropical Storm, Nor'easter; Transportation Accidents	1, 2, 3	City Engineer	Capital Region Water	High	$900,000	PA DCED Multimodal Transportation Funding (MTF) grant; PENNVEST	2021 - 2022	Medium	SIP
HarrisburgC-41	Support Capital Region Water's Wastewater (Combined, Sanitary & Storm) Collection System Rehabilitation - Rehabilitate priority defects to avoid failures using a variety of methods including conventional replacement and "trenchless" structural pipe lining procedures.	Existing	Utility Interruption	1, 2	City Engineer	Capital Region Water; HRG; Rogele & Abel Recon	High	$4,300,000	Municipal Bonds; Operating Budget	Short	Low	SIP
HarrisburgC-42	Support Capital Region Water's Stormwater South Allison Hill GSI - Capture and manage stormwater in green stormwater elements designed to also serve as traffic calming elements.	New	Floods, Flash Floods, and Ice Jams; Hurricane, Tropical Storm, Nor'easter; Transportation Accidents	1, 2, 3	City Engineer	Capital Region Water; PennDOT; Tri-County Community Action; Impact Harrisburg; AKRF	High	$1,700,000	PENNVEST	2020 - 2021	Medium	SIP
HarrisburgC-43	Work with PennDOT to study 19th Street to identify measures to reduce transportation accidents.	N/A	Transportation Accidents	1	Engineer	TCRPC; PennDOT	Medium	Medium	Operating Budget; HATS; Infrastructure Bank	Short	High	SIP

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HarrisburgC-44	Work with PennDOT to study 25th Street to identify measures to reduce transportation accidents.	N/A	Transportation Accidents	1	Engineer	TCRPC; PennDOT	Medium	Medium	Operating Budget; HATS; Infrastructure Bank	Short	High	SIP
HarrisburgC-45	Work with PennDOT to study the intersection of 2nd and Geiger Streets to identify measures to reduce transportation accidents.	N/A	Transportation Accidents	1	Engineer	TCRPC; PennDOT	Medium	Medium	Operating Budget; HATS; Infrastructure Bank	Short	Medium	SIP
HarrisburgC-46	Work with PennDOT to study the intersection of Front and Forster Streets to identify measures to reduce transportation accidents.	N/A	Transportation Accidents	1	Engineer	TCRPC; PennDOT	Medium	Medium	Operating Budget; HATS; Infrastructure Bank	Short	Medium	SIP
HarrisburgC-47	Work with PennDOT to study the intersection of Susquehanna and Riley Streets to identify measures to reduce transportation accidents.	N/A	Transportation Accidents	1	Engineer	TCRPC; PennDOT	Medium	Medium	Operating Budget; HATS; Infrastructure Bank	Short	Medium	SIP
HarrisburgC-48	Implement the recommendations of the Harrisburg Authority's ongoing combined sewer overflow impact study.	Existing	Utility Interruption	2	Engineer		High	High	Capital Improvement Budget	Long	Medium	SIP
Highspire Borough												
HighspireB-01	Protect the wastewater treatment plant to the 0.2 percent annual chance flood level.	Existing	Floods, Flash Floods, and Ice Jams; Utility Interruption	2	Engineer	FPA	High	High	FEMA HMGP, BRIC; PA DCED H2O, Small Water and Sewer Project Grant; Operating Budget; Gaming grant	Short	Medium	SIP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
HighspireB-02	Protect the Highspire Fire Department station to the 0.2 percent annual chance flood level.	Existing	Floods, Flash Floods, and Ice Jams	2	Engineer	FPA	High	High	FEMA HMGP, BRIC, FMA; PA DCED FMP; Operating Budget; Gaming grant	Short	Medium	SIP
HighspireB-03	Assess the Highspire Fire Department property to determine the risk from wildfires and what vegetation needs to be cleared.	Existing	Wildfire	2, 3	Borough	Fire Department; PA DCNR	Medium	Low	Operating Budget	Short	Medium	SIP
HighspireB-04	Investigate the feasibility of installing flood gates and pumps to prevent the backup of flood waters in Highspire Borough.	New	Floods, Flash Floods, and Ice Jams	2	Engineer	FPA; SRBC	High	High	FEMA HMA; USACE	Short	High	SIP
Hummelstown Borough												
HummelstownB-01	Assess the geology at the Lower Dauphin School District campuses to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	District Facilities Management	Borough Engineer	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	Medium	SIP
HummelstownB-02	Assess the geology at the Hummelstown Borough Office to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Engineer	EMC	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	High	SIP
HummelstownB-03	Assess the geology at the Hummelstown Fire Department property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Engineer	EMC	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	Medium	SIP
HummelstownB-04	Assess the geology at the Nye Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	District Facilities Management	Borough Engineer	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	Medium	SIP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
Jackson Township												
Jackson T-01	Assess the Jackson Township Building property to determine the risk from wildfires and what vegetation needs to be cleared.	Existing	Wildfire	2, 3	Township	Fire Department; PA DCNR	Medium	Low	Operating Budget	Short	Medium	NSP
Jefferson Township												
JeffersonT-01	Assess the Carsonville Fire Department property to determine the risk from wildfires and what vegetation needs to be cleared.	Existing	Wildfire	2, 3	Township	Fire Department; PA DCNR	High	Low	Operating Budget	Short	Medium	NSP
JeffersonT-02	Assess the Jefferson Township Municipal Office property to determine the risk from wildfires and what vegetation needs to be cleared.	Existing	Wildfire	2, 3	Township	Fire Department; PA DCNR	Medium	Low	Operating Budget	Short	Medium	NSP
Londonderry Township												
LondonderryT-01	Assess the Londonderry Fire Department property to determine the risk from wildfires and what vegetation needs to be cleared.	Existing	Wildfire	2, 3	Township	Fire Department	Medium	Low	Operating Budget	Short	High	NSP
LondonderryT-02	Assess the Londonderry Township Building property to determine the risk from wildfires and what vegetation needs to be cleared.	Existing	Wildfire	2, 3	Township	Fire Department	Medium	Low	Operating Budget	Short	High	NSP
LondonderryT-03	Assess the geology at the Derry Township Municipal Authority Southwest property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Municipal Authority	Engineer	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	Low	SIP
LondonderryT-04	Replant Ash Trees that were lost to the Ash Borer and determine the best actions to prevent invasive species in the future	N/A	Invasive Species	3	Londonderry Township		Medium	Medium	Operating budget	Short	High	NSP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
LondonderryT-05	Assess the geology at the Londonderry Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	District Facilities Management	Township Engineer	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	Medium	SIP
LondonderryT-06	Install a backup power generator at the public works building.	Existing	Utility Interruption	1, 2	Township		High	High	FEMA HMGP, BRIC; Operating Budget; Gaming grant	Short	Medium	SIP
LondonderryT-07	Work with PennDOT to study Colebrook Road to identify measures to reduce transportation accidents.	N/A	Transportation Accidents	1	Township	TCRPC; PennDOT	Medium	Medium	Operating Budget; HATS; Infrastructure Bank	Short	Medium	SIP
LondonderryT-08	Work with PennDOT to study Harrisburg Pike to identify measures to reduce transportation accidents.	N/A	Transportation Accidents	1	Township	TCRPC; PennDOT	Medium	Medium	Operating Budget; HATS; Infrastructure Bank	Short	Medium	SIP
LondonderryT-09	Work with PennDOT to study Roundtop Road to identify measures to reduce transportation accidents.	N/A	Transportation Accidents	1	Township	TCRPC; PennDOT	Medium	Medium	Operating Budget; HATS; Infrastructure Bank	Short	High	SIP
LondonderryT-10	Assess the geology at the Londonderry Fire Department property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Engineer	EMC	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	Medium	SIP
LondonderryT-11	Conewago Creek Stream Restoration - restore 1 mile of stream, remove approximately 125,000 cubic yards of sediment, and re-establish the historic floodplain of the creek.	N/A	Floods, Flash Floods, and Ice Jams	2, 3	MS4 Environmental Specialist	TCRPC; SRBC; EMC; Engineer	High	$4,000,000	FEMA HMGP, BRIC; CDBG-DR; PA DCED	Long	Medium	NSP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
Lower Paxton Township												
LowerPaxtonT-01	Assess the Linglestown Middle School property to determine the risk from wildfires and what vegetation needs to be cleared.	Existing	Wildfire	2, 3	Township	Fire Department; School Staff; PA DCNR	Medium	Low	Operating Budget	Short	High	NSP
LowerPaxtonT-02	Assess the geology at the Linglestown Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Facilities Management	Engineer	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	High	SIP
LowerPaxtonT-03	Install a backup power generator at the Central Dauphin School District transportation facility.	Existing	Utility Interruption	1, 2	Facilities Management	EMC	High	High	FEMA HMGP, BRIC; Operating Budget; Gaming grant	Short	Medium	SIP
LowerPaxtonT-04	Work with the owner/operator of the Colonial Park Care Center to upgrade its backup power capabilities.	Existing	Utility Interruption	1, 2	Facilities Management	EMC	Medium	Low	FEMA HMGP, BRIC; Operating Budget; Gaming grant	Short	Medium	SIP
LowerPaxtonT-05	Work with PennDOT to study Colonial Road to identify measures to reduce transportation accidents.	N/A	Transportation Accidents	1	Public Works	TCRPC; PennDOT	Medium	Medium	Operating Budget; HATS; Infrastructure Bank	Short	High	SIP
LowerPaxtonT-06	Work with PennDOT to study Jonestown Road to identify measures to reduce transportation accidents.	N/A	Transportation Accidents	1	Public Works	TCRPC; PennDOT	Medium	Medium	PennDOT	Short	Medium	SIP
LowerPaxtonT-07	Work with PennDOT to study Linglestown Road to identify measures to reduce transportation accidents.	N/A	Transportation Accidents	1	Public Works	TCRPC; PennDOT	Medium	Medium	PennDOT	Short	Medium	SIP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
LowerPaxtonT-08	Work with PennDOT to study Nyes Road to identify measures to reduce transportation accidents.	N/A	Transportation Accidents	1	Public Works	TCRPC; PennDOT	Medium	Medium	Operating Budget; HATS; Infrastructure Bank	Short	Medium	SIP
LowerPaxtonT-09	Work with PennDOT to study Rutherford Road to identify measures to reduce transportation accidents.	N/A	Transportation Accidents	1	Public Works	TCRPC; PennDOT	Medium	Medium	Operating Budget; HATS; Infrastructure Bank	Short	High	SIP
LowerPaxtonT-10	Work with PennDOT to study Union Deposit Road to identify measures to reduce transportation accidents.	N/A	Transportation Accidents	1	Public Works	TCRPC; PennDOT	Medium	Medium	Operating Budget; HATS; Infrastructure Bank	Short	High	SIP
Lower Swatara Township												
LowerSwataraT-01	Assess the geology at the Kunkel Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Facilities Management	Engineer	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	High	SIP
LowerSwataraT-02	Assess the cause(s) of flooding of "The Flats" to identify feasible mitigation actions, and implement them.	Existing	Floods, Flash Floods, and Ice Jams	2	Engineer	Public Works; FPA	High	High	FEMA HMGP, BRIC, FMA; PA DCED FMP; Operating Budget; Gaming grant	Short	High	SIP
LowerSwataraT-03	Assess the geology at the Lower Swatara Township Building property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Engineer	Township Staff	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	High	SIP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
LowerSwataraT-04	Assess the geology at the Lower Swatara Township Fire Department property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Engineer	Township Staff	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	High	SIP
LowerSwataraT-05	Assess the geology at the Middletown Area High School property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	District Facilities Management	Township Engineer	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	Medium	SIP
LowerSwataraT-06	Assess the geology at the Reid Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	District Facilities Management	Township Engineer	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	Medium	SIP
LowerSwataraT-07	Protect the Farr Pump Station to at least the 0.2 percent annual chance flood level.	Existing	Floods, Flash Floods, and Ice Jams; Utility Interruption	2	Public Works	Township Municipal Authority	High	High	FEMA HMGP, BRIC; PA DCED H2O, Small Water and Sewer Project Grant; Operating Budget; Gaming grant	Short	Medium	SIP
LowerSwataraT-08	Install a backup power generator at the Farr Pump Station.	Existing	Utility Interruption	1, 2	Public Works	EMC; Township Municipal Authority	High	High	FEMA HMGP, BRIC; Operating Budget; Gaming grant	Short	Medium	SIP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
LowerSwataraT-09	Install a backup power generator at the Jamesway Pump Station.	Existing	Utility Interruption	1, 2	Public Works	EMC; Township Municipal Authority	High	High	FEMA HMGP, BRIC; Operating Budget; Gaming grant	Short	Medium	SIP
LowerSwataraT-10	Install a backup power generator at the North Union Street Pump Station.	Existing	Utility Interruption	1, 2	Public Works	EMC; Township Municipal Authority	High	High	FEMA HMGP, BRIC; Operating Budget; Gaming grant	Short	Medium	SIP
Lykens Borough												
Lykens B-01	Protect the Lykens Borough Office to at least the 0.2 percent chance flood level	Existing	Floods, Flash Floods, and Ice Jams	2	Engineer	FPA	High	High	FEMA HMGP, BRIC, FMA; PA DCED FMP; Operating Budget; Gaming grant	Short	High	SIP
Lykens B-02	Protect the Lykens Borough Authority WWTP to at least the 0.2 percent chance flood level	Existing	Floods, Flash Floods, and Ice Jams; Utility Interruption	2	Borough Authority		High	High	FEMA HMGP, BRIC; PA DCED H2O, Small Water and Sewer Project Grant; Operating Budget; Gaming grant	Short	Medium	SIP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
Lykens B-03	Assess the Lykens Fire Department property to determine the risk from wildfires and what vegetation needs to be cleared.	Existing	Wildfire	2, 3	Borough	Fire Department; PA DCNR	Medium	Low	Operating Budget	Short	High	NSP
Lykens B-04	Assess the Lykens Borough Office property to determine the risk from wildfires and what vegetation needs to be cleared.	Existing	Wildfire	2, 3	Borough	Fire Department; PA DCNR	Medium	Low	Operating Budget	Short	High	NSP
Lykens B-05	Assess the Lykens Borough Authority WWTP property to determine the risk from wildfires and what vegetation needs to be cleared.	Existing	Wildfire	2, 3	Borough	Fire Department; Borough Authority; PA DCNR	Medium	Low	Operating Budget	Short	High	NSP
Lykens B-06	Identify sections of banks of waterways that need to be stabilized, and design and implement the stabilization.	N/A	Floods, Flash Floods, and Ice Jams; Landslide	3	FPA		Medium	Medium	FEMA HMGP, BRIC; PA DCNR	Short	Medium	NSP
Lykens Township												
Lykens T-01	Assess the Bridge in Lykens Township No. 1 historic site to determine the risk from wildfires and what vegetation needs to be cleared. ***This project is not eligible for FEMA mitigation funding, as the borough did not participate in the planning process.***	Existing	Wildfire	2, 3	Township	Fire Department; PA DCNR	Medium	Low	Operating Budget	Short	High	NSP
Lykens T-02	Work with PennDOT to study North Crossroads Road to identify measures to reduce transportation accidents. ***This project is not eligible for FEMA mitigation funding, as the borough did not participate in the planning process.***	N/A	Transportation Accidents	1	Township	TCRPC; PennDOT	Medium	Medium	Operating Budget; HATS; Infrastructure Bank	Short	Medium	SIP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
Middle Paxton Township												
Middle Paxton T-01	Work with PennDOT to study Peters Mountain Road to identify measures to reduce transportation accidents.	N/A	Transportation Accidents	1	Township	TCRPC; PennDOT	Medium	Medium	Operating Budget; HATS; Infrastructure Bank	Short	Medium	SIP
Middle Paxton T-02	Assess the Dauphin-Middle Paxton Municipal Office property to determine the risk from wildfires and what vegetation needs to be cleared.	Existing	Wildfire	2, 3	Township	Fire Department; PA DCNR	High	Low	Operating Budget	Short	Medium	NSP
Middle Paxton T-03	Assess the Middle Paxton Elementary School property to determine the risk from wildfires and what vegetation needs to be cleared.	Existing	Wildfire	2, 3	Township	Fire Department; School Staff; PA DCNR	Medium	Low	Operating Budget	Short	High	NSP
Middle Paxton T-04	Work with the owners/operators of privately-owned critical facilities in the area subject to inundation due to a failure of the DeHart Dam to discuss their risk of flooding and protective measures they can take.	Existing	Dam Failure; Floods, Flash Floods, and Ice Jams	4	Engineer	FPA; Capital Region Water	High	Low	Operating Budget	Short	Medium	EAP
Middletown Borough												
MiddletownB-01	Install a generator at the Borough Hall building	Existing	Utility Interruption	1, 2	Public Works		High	High	FEMA HMGP, BRIC; Operating Budget; Gaming grant	Short	Medium	SIP
MiddletownB-02	Assess the geology at the Fink Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Facilities Management	Engineer	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	High	SIP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
MiddletownB-03	Work with PennDOT to study Main Street/Harrisburg Pike to identify measures to reduce transportation accidents.	N/A	Transportation Accidents	1	Public Works	TCRPC	Medium	Medium	Operating Budget; HATS; Infrastructure Bank	Short	Medium	SIP
MiddletownB-04	Protect the Mill Street electrical substation to the 0.2 percent annual chance flood level.	Existing	Floods, Flash Floods, and Ice Jams; Utility Interruption	2	Middletown Borough		High	High	FEMA HMGP, BRIC; Operating Budget; Gaming grant	Short	Medium	SIP
MiddletownB-05	Work with Suez to assess the Middletown Wastewater Plant property to determine the risk from wildfires and what vegetation needs to be cleared.	Existing	Wildfire	2, 3	Engineer	Suez; EMC; Fire Department; Public Works; PA DCNR	Medium	Low	Operating Budget	Short	High	NSP
MiddletownB-06	Assess the geology at the Middletown Borough Building property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Engineer	EMC	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	Medium	SIP
MiddletownB-07	Assess the geology at the Middletown Fire Department property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Engineer	EMC	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	High	SIP
MiddletownB-08	Assess the geology at the Middletown Police Department property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Engineer	EMC	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	High	SIP
MiddletownB-09	Work with Suez to assess the geology at the Middletown Wastewater Plant property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Engineer	Suez; Public Works	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	Medium	SIP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
Millersburg Borough												
MillersburgB-01	Identify sections of banks of waterways that need to be stabilized, and design and implement the stabilization.	N/A	Floods, Flash Floods, and Ice Jams; Landslide	3	FPA		Medium	Medium	FEMA HMGP, BRIC; PA DCNR	Short	Medium	NSP
MillersburgB-02	Assess the Millersburg Borough Office property to determine the risk from wildfires and what vegetation needs to be cleared.	Existing	Wildfire	2, 3	Borough	Fire Department; PA DCNR	Medium	Low	Operating Budget	Short	High	NSP
MillersburgB-03	Assess the Millersburg Fire Station property to determine the risk from wildfires and what vegetation needs to be cleared.	Existing	Wildfire	2, 3	Borough	Fire Department; PA DCNR	Medium	Low	Operating Budget	Short	Medium	NSP
MillersburgB-04	Floodproof the Welcome Center along the Susquehanna River	Existing	Floods, Flash Floods, and Ice Jams	2	Borough		High	8500	Capital Improvement Budget; Gaming grant	Short	High	SIP
Paxtang Borough												
Paxtang B-01	Protect the Paxtang Borough Office/Fire Station to at least the 0.2 percent annual chance flood level.	Existing	Floods, Flash Floods, and Ice Jams	2	Engineer	FPA; Fire Department	High	High	FEMA HMGP, BRIC, FMA; PA DCED FMP; Operating Budget; Gaming grant	Short	High	SIP
Paxtang B-02	Assess the geology at the Paxtang Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Facilities Management	Engineer	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	Medium	SIP
Paxtang B-03	Assess the geology at the Paxtang Borough Office property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Engineer	EMC	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	Medium	SIP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
Penbrook Borough												
PenbrookB-01	Assess the geology at the Penbrook Borough Office property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Engineer	EMC	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	High	SIP
PenbrookB-02	Assess the geology at the Penbrook Fire Department property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Engineer	EMC	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	Medium	SIP
PenbrookB-03	Install a backup power generator at the public works building.	Existing	Utility Interruption	1, 2	Engineer	Borough Staff	High	High	FEMA HMGP, BRIC; Operating Budget; Gaming grant	Short	High	SIP
PenbrookB-04	Install a backup power generator at the Citizen's Fire Company #1 station.	Existing	Utility Interruption	1, 2	Borough Engineer	EMC; Borough Staff; Fire Department	High	High	FEMA HMGP, BRIC; Operating Budget; Gaming grant	Short	High	SIP
PenbrookB-05	Assess the stormwater management infrastructure throughout the borough and determine what upgrades need to be made.	Existing	Floods, Flash Floods, and Ice Jams; Hurricane, Tropical Storm, Nor'easter	1, 2	Engineer	Borough Staff	Medium	Medium	FEMA HMGP, BRIC, FMA; PA DCED FMP; Operating Budget	Short	Medium	SIP
Pillow Borough												
PillowB-01	Assess the Pillow Borough Building property to determine the risk from wildfires and what vegetation needs to be cleared.	Existing	Wildfire	2, 3	Borough	Fire Department; PA DCNR	Medium	Low	Operating Budget	Short	Low	NSP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
PillowB-02	Assess the Pillow Fire Department property to determine the risk from wildfires and what vegetation needs to be cleared.	Existing	Wildfire	2, 3	Borough	Fire Department; PA DCNR	Medium	Low	Operating Budget	Short	Medium	NSP
PillowB-03	Install a backup power generator at the Pillow Borough municipal building.	Existing	Utility Interruption	1, 2	Engineer	Borough Staff	High	High	FEMA HMGP, BRIC; Operating Budget; Gaming grant	Short	Medium	SIP
PillowB-04	Install a backup power generator at the Pillow Fire Department station.	Existing	Utility Interruption	1, 2	Engineer	Fire Department; Borough Staff	High	High	FEMA HMGP, BRIC; Operating Budget; Gaming grant	Short	Medium	SIP
PillowB-05	Determine appropriate measures for preventing injuries at blighted properties	Existing	Building or Structure Collapse	2, 4	Mayor		High	High	CDBG	Short	Low	LPR
PillowB-06	Install a backup power generator at Well 5.	Existing	Utility Interruption	1, 2	Water Authority	Borough Staff	High	High	FEMA HMGP, BRIC; Operating Budget; Gaming grant	Short	Medium	SIP
PillowB-07	Install a backup power generator at Well 6.	Existing	Utility Interruption	1, 2	Water Authority	Borough Staff	High	High	FEMA HMGP, BRIC; Operating Budget; Gaming grant	Short	High	SIP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
PillowB-08	Upgrade fire department radios to be interoperable between Dauphin and Northumberland Counties.	N/A	Building or Structure Collapse; Dam Failure; Environmental Hazards: Hazardous Materials Releases; Floods, Flash Floods, and Ice Jams; Hurricane, Tropical Storm, Nor'easter; Landslide; Tornado, Windstorm; Transportation Accidents; Utility Interruption; Wildfire; Winter Storm	5	Fire Department	DPS	Medium	Medium	Operating Budget	Short	Medium	LPR
PillowB-09	Work with the Pillow Historical Society and PPL to determine options to prevent power outages and damage to the water treatment building, and implement the most appropriate one.	Existing	Utility Interruption	1, 2	Engineer	Borough Staff; PPL; Pillow Historical Society	Medium	Medium	CDBG, Gaming grants, PA DCED H2O or Small Water and Sewers Grant	Short	Medium	SIP
PillowB-10	Work with PennDOT to improve drainage on PA-225 to prevent ponding water.	N/A	Floods, Flash Floods, and Ice Jams; Hurricane, Tropical Storm, Nor'easter	1, 2	Borough Staff	PennDOT; TCRPC	High	Medium	PennDOT	Long	Medium	SIP
PillowB-11	Map the borough's water infrastructure.	Existing	Utility Interruption	1, 2	Borough Staff	Engineer; Water Authority	Medium	Low	CDBG, Gaming grants	Short	Medium	LPR
PillowB-12	Analyze the intersection and develop solutions to reduce speeding on PA-225, and implement the most appropriate one.	N/A	Transportation Accidents	1	Engineer	Borough Staff; PennDOT; TCRPC	Medium	Medium	PennDOT	Short	Medium	SIP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
PillowB-13	Develop an evacuation and sheltering plan for Pillow Borough.	N/A	Environmental Hazards: Hazardous Materials Releases; Floods, Flash Floods, and Ice Jams; Hurricane, Tropical Storm, Nor'easter; Landslide; Tornado, Windstorm; Utility Interruption; Wildfire; Winter Storm	5	EMC		Medium	Low	CDBG, Gaming grants	Short	High	LPR
PillowB-14	Installation of new water lines and improve the water infrastructure.	Existing	Utility Interruption	1, 2	Water Authority		High	High	CDBG, Gaming grants, PA DCED H20	Long	Medium	SIP
PillowB-15	Enclose Well 5 infrastructure in a shelter.	Existing	Utility Interruption	2	Water Authority		Medium	Medium	CDBG, Gaming grants, PA DCED Small Water and Sewer Grant	Short	Medium	SIP
Reed Township												
ReedT-01	Protect the Bridge in Reed Township historic site to at least the 0.2 percent annual chance flood level.	Existing	Floods, Flash Floods, and Ice Jams	2	Engineer	FPA	High	High	FEMA HMGP, BRIC; PA DCED FMP; PHMC	Short	Medium	SIP
ReedT-02	Assess the Reed Township Municipal Building property to determine the risk from wildfires and what vegetation needs to be cleared.	Existing	Wildfire	2, 3	Township	Fire Department; PA DCNR	Medium	Low	Operating Budget	Short	Low	NSP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
ReedT-03	Work with PennDOT to study South River Road to identify measures to reduce transportation accidents.	N/A	Transportation Accidents	1	Township	TCRPC; PennDOT	Medium	Medium	Operating Budget; HATS; Infrastructure Bank	Short	Medium	SIP
Royalton Borough												
Royalton B-01	Protect the Edgewater Pump Station to at least the 0.2 percent annual chance flood level.	Existing	Floods, Flash Floods, and Ice Jams; Utility Interruption	2	Royalton Borough Authority	FPA; Engineer	High	High	FEMA HMGP, BRIC; PA DCED H2O, Small Water and Sewer Project Grant; Operating Budget; Gaming grant	Short	High	SIP
Royalton B-02	Develop a plan with emergency services to assist the borough if chemical containers from Univar float down stream	N/A	Environmental Hazards - Hazardous Material Releases; Floods, Flash Floods, and Ice Jams	5	EMC	DPS, LEPC	Medium	Low	Operating Budget	Short	High	LPR
Royalton B-03	Upgrade safety features at the Water Street Pump Station to include raising of mechanical controls and back up power.	Existing	Floods, Flash Floods, and Ice Jams; Utility Interruption	2	Royalton Borough Authority	FPA; Engineer	Medium	Medium	CDBG; FEMA HMGP, BRIC; PA DCED H2O; Gaming grant	Short	High	SIP
Royalton B-04	Provide assistance to remove built up debris from around bridge pillars	Existing	Floods, Flash Floods, and Ice Jams	3	FPA	Public Works	High	Low	Operating Budget	Short	Medium	SIP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
Royalton nB-05	Phase 2 Royalton Canal Improvement Project to mitigate localized flooding.	N/A	Floods, Flash Floods, and Ice Jams	2	Royalton Borough	FPA; Engineer	High	High	FEMA HMGP, BRIC; USACE; CDBG; Dauphin County Regional Stormwater Program; Gaming grant	DOF	High	NSP
Royalton nB-06	Structural assessment and reinforcement of Edgewater Development retaining wall.	Existing	Building or Structure Collapse	2	Engineer	Edgewater Development Homeowner Association, Cameron Woods Development Homeowner Association	High	High	CDBG; Operating Budget	DOF	Low	SIP
Rush Township												
RushT-01	Assess the Rush Township Municipal Office property to determine the risk from wildfires and what vegetation needs to be cleared. ***This project is not eligible for FEMA mitigation funding, as the borough did not participate in the planning process.***	Existing	Wildfire	2, 3	Township	Fire Department; PA DCNR	Medium	Low	Operating Budget	Short	Medium	NSP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
RushT-02	Work with PennDOT to study Gold Mine Road to identify measures to reduce transportation accidents. ***This project is not eligible for FEMA mitigation funding, as the borough did not participate in the planning process.***	N/A	Transportation Accidents	1	Township Staff	TCRPC; PennDOT	Medium	Medium	Operating Budget; HATS; Infrastructure Bank	Short	High	SIP
RushT-03	Coordinate with the DCNR Fire Forester for Dauphin County on the potential construction of a fire-break at the appropriate location on the south side of Peters Mountain along Route 325. ***This project is not eligible for FEMA mitigation funding, as the borough did not participate in the planning process.***	N/A	Wildfire	3	Township	Fire Departments; PA DCNR	Medium	Medium	Operating Budget; PA DCNR	Short	High	NSP
South Hanover Township												
SouthHanover T-01	Work with PennDOT to study Grandview Drive to identify measures to reduce transportation accidents.	N/A	Transportation Accidents	1	Public Works	TCRPC; PennDOT	Medium	Medium	Operating Budget; HATS; Infrastructure Bank	Short	Low	SIP
SouthHanover T-02	Work with PennDOT to study Union Deposit Road to identify measures to reduce transportation accidents.	N/A	Transportation Accidents	1	Public Works	TCRPC; PennDOT	Medium	Medium	Operating Budget; HATS; Infrastructure Bank	Short	Medium	SIP
Steelton Borough												
Steelton B-01	Assess the geology at the Steelton Fire Department property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Engineer	EMC	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	High	SIP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
Steelton B-02	Work with PA American Water to protect the Steelton Water Filtration Plant to at least the 0.2 percent annual chance flood level.	Existing	Floods, Flash Floods, and Ice Jams; Utility Interruption	2	Engineer	Public Works; PA American Water; FPA	High	High	FEMA HMGP, BRIC; PA DCED H2O, Small Water and Sewer Project Grant; Operating Budget; Gaming grant	Short	Medium	SIP
Steelton B-03	Install a backup power generator at the Steelton Highway Garage.	Existing	Utility Interruption	1, 2	Public Works		High	High	FEMA HMGP, BRIC; Operating Budget; Gaming grant	Short	High	SIP
Steelton B-04	Work with PA American Water to install a backup power generator at the sewer pump stations.	Existing	Utility Interruption	1, 2	Engineer	Public Works; PA American Water	High	High	FEMA HMGP, BRIC; Operating Budget; Gaming grant	Short	High	SIP
Steelton B-05	Install a backup power generator at the Steelton Borough Building.	Existing	Utility Interruption	1, 2	Public Works		High	High	FEMA HMGP, BRIC; Operating Budget; Gaming grant	Short	High	SIP
Steelton B-06	Renovate or demolish vacant structures that were damaged by fire and are at risk of collapse.	Existing	Building or Structure Collapse	2	Steelton Borough	DC DCED	High	Medium	CDBG; Operating Budget	Short	Medium	SIP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
Steelton B-07	Assess the flooding problem along South Front Street near the quarry to identify feasible mitigation actions, and implement them.	Existing	Floods, Flash Floods, and Ice Jams	2	Engineer	Borough Staff; FPA	Medium	Medium	FEMA HMGP, BRIC, FMA; PA DCED FMP; Operating Budget; Gaming grant	Short	Medium	SIP
Steelton B-08	Assess the geology at the Steelton Borough office property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Engineer	EMC; Borough Staff	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	Low	SIP
Steelton B-09	Work with PA American Water to assess the geology at the Steelton Water Filtration Plant property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Engineer	PA American Water; Public Works	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	Medium	SIP
Susquehanna Township												
Susque hannaT -01	Assess the Susquehanna Township Administration Building property to determine the risk from wildfires and what vegetation needs to be cleared.	Existing	Wildfire	2, 3	Township	Fire Department; PA DCNR	Medium	Low	Operating Budget	Short	Medium	NSP
Susque hannaT -02	Assess the Thomas Holtzman Elementary School property to determine the risk from wildfires and what vegetation needs to be cleared.	Existing	Wildfire	2, 3	Township	Fire Department; School District; PA DCNR	Medium	Low	Operating Budget	Short	Low	NSP
Susque hannaT -03	Assess the geology at the Susquehanna Township Administration Building property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Engineer	EMC	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	Low	SIP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
SusquehannaT-04	Assess the geology at the Susquehanna Township High School property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Facilities Management	Engineer	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	Medium	SIP
SusquehannaT-05	Assess the geology at the Thomas Holtzman Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Facilities Management	Engineer	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	Medium	SIP
SusquehannaT-06	Work with PennDOT to study Progress Avenue to identify measures to reduce transportation accidents.	N/A	Transportation Accidents	1	Engineer	TCRPC; PennDOT	Medium	Medium	Operating Budget; HATS; Infrastructure Bank	Short	High	SIP
SusquehannaT-07	Assess the flooding problem along the canal bed to identify feasible mitigation actions, and implement them.	Existing	Floods, Flash Floods, and Ice Jams	2	Public Works		Medium	Medium	FEMA HMGP, BRIC, FMA; PA DCED FMP; Operating Budget; Gaming grant	Short	High	SIP
SusquehannaT-08	Work with PennDOT to assess the flooding problem along Front Street to identify feasible mitigation actions, and implement them.	Existing	Floods, Flash Floods, and Ice Jams	2	Engineer	PennDOT	High	High	FEMA HMGP, BRIC, FMA; PA DCED FMP; Operating Budget; Gaming grant	Short	Medium	SIP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
SusquehannaT-09	Work with PennDOT to assess the flooding problem along the 3600 block of Elmerton Avenue to identify feasible mitigation actions, and implement them.	Existing	Floods, Flash Floods, and Ice Jams	2	Engineer	PennDOT	High	High	FEMA HMGP, BRIC, FMA; PA DCED FMP; Operating Budget; Gaming grant	Short	High	SIP
SusquehannaT-10	Work with PennDOT to improve drainage to reduce flooding at Penn Street and Estherton Avenue	Existing	Floods, Flash Floods, and Ice Jams; Hurricane, Tropical Storm, Nor'easter	1, 2	Engineer	FPA; PennDOT	Medium	Medium	FEMA HMGP, BRIC, FMA; PA DCED FMP; Operating Budget; Gaming grant	Short	High	SIP
SusquehannaT-11	Work with PennDOT to assess the flooding problem along Paxton Church Road to identify feasible mitigation actions, and implement them.	Existing	Floods, Flash Floods, and Ice Jams	2	Engineer	FPA; PennDOT	Medium	Medium	FEMA HMGP, BRIC, FMA; PA DCED FMP; Operating Budget; Gaming grant	Short	Medium	SIP
SusquehannaT-12	Assess and improve drainage near the Latshmere Swim Club.	N/A	Floods, Flash Floods, and Ice Jams; Hurricane, Tropical Storm, Nor'easter	1, 2	Engineer	Swim Club Staff	Medium	Medium	FEMA HMGP, BRIC; PA DCED FMP; Gaming grant	Short	Medium	SIP
SusquehannaT-13	Assess and improve drainage off the mountain to reduce flooding on Red Road and Roberts Valley Road.	N/A	Floods, Flash Floods, and Ice Jams; Hurricane, Tropical Storm, Nor'easter	1, 2	Engineer		Medium	Medium	FEMA HMGP, BRIC; PA DCED FMP; Gaming grant	Short	High	SIP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
SusquehannaT-14	Assess the geology at the Londonderry School property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Facilities Management	Engineer	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	Medium	SIP
SusquehannaT-15	Assess the geology at the Progress Fire Department property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Engineer	EMC	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	Medium	SIP
SusquehannaT-16	Separate stormwater and sanitary sewer in Ward 1 (Front Street corridor).	Existing	Floods, Flash Floods, and Ice Jams; Utility Interruption	1, 2	Engineer	Township Authority	High	High	FEMA HMGP, BRIC; PA DCED H2O, Small Water and Sewer Project Grant; Operating Budget; Gaming grant	Short	Medium	SIP
SusquehannaT-17	Work with PennDOT to upgrade stormwater infrastructure on Paxton Church Road and Elmwood Drive	Existing	Floods, Flash Floods, and Ice Jams; Hurricane, Tropical Storm, Nor'easter	1, 2	Engineer	Township Authority; PennDOT	High	High	FEMA HMGP, BRIC, FMA; PA DCED FMP; Operating Budget; Gaming grant	Short	High	SIP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
SusquehannaT-18	Upgrade stormwater infrastructure on Maple Lane	Existing	Floods, Flash Floods, and Ice Jams; Hurricane, Tropical Storm, Nor'easter	1, 2	Engineer	Township Authority	High	High	FEMA HMGP, BRIC, FMA; PA DCED FMP; Operating Budget; Gaming grant	Short	High	SIP
SusquehannaT-19	Upgrade stormwater infrastructure on 36th Street in the area of Morton Drive.	Existing	Floods, Flash Floods, and Ice Jams; Hurricane, Tropical Storm, Nor'easter	1, 2	Engineer	Township Authority	High	High	FEMA HMGP, BRIC, FMA; PA DCED FMP; Operating Budget; Gaming grant	Short	High	SIP
SusquehannaT-20	Work with PennDOT to upgrade stormwater infrastructure along State Farm Road where it meets Carter and Locust.	Existing	Floods, Flash Floods, and Ice Jams; Hurricane, Tropical Storm, Nor'easter	1, 2	Engineer	Township Authority; PennDOT	High	High	FEMA HMGP, BRIC, FMA; PA DCED FMP; Operating Budget; Gaming grant	Short	High	SIP
SusquehannaT-21	Assess the geology at the Sara Lindemuth Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Township Engineer	Facilities Management	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	Medium	SIP
SusquehannaT-22	Assess the geology at the Susquehanna Middle School property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Township Engineer	Facilities Management	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	Low	SIP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
SusquehannaT-23	Assess the geology at the Susquehanna Township EMS station property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Engineer	EMC	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	High	SIP
SusquehannaT-24	Assess the property of the Rescue Fire Department Station 1 to determine the risk from wildfires and what vegetation needs to be cleared.	Existing	Wildfire	2, 3	Township	Fire Department; PA DCNR	Medium	Low	Operating Budget	Short	High	SIP
Swatara Township												
Swatara T-01	Protect the Swatara Township Authority WPCF to at least the 0.2 percent annual chance flood level.	Existing	Floods, Flash Floods, and Ice Jams; Utility Interruption	2	Authority		High	High	FEMA HMGP, BRIC; PA DCED H2O, Small Water and Sewer Project Grant; Operating Budget; Gaming grant	Short	Medium	SIP
Swatara T-02	Assess the geology at the Bressler fire station property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Engineer	EMC	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	Medium	SIP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
Swatara T-03	Work with Capital Region Water to protect the Harrisburg Advanced Wastewater facility to at least the 0.2 percent annual chance flood level.	Existing	Floods, Flash Floods, and Ice Jams; Utility Interruption	2	Engineer	Capital Region Water	High	High	FEMA HMGP, BRIC; PA DCED H2O, Small Water and Sewer Project Grant; Operating Budget; Gaming grant	Short	Medium	SIP
Swatara T-04	Work with PennDOT to study Derry Street to identify measures to reduce transportation accidents.	N/A	Transportation Accidents	1	Public Works	TCRPC; PennDOT	Medium	Medium	Operating Budget; HATS; Infrastructure Bank	Short	High	SIP
Swatara T-05	Work with PennDOT to study Eisenhower Boulevard to identify measures to reduce transportation accidents.	N/A	Transportation Accidents	1	Public Works	TCRPC; PennDOT	Medium	Medium	Operating Budget; HATS; Infrastructure Bank	Short	High	SIP
Swatara T-06	Work with PennDOT to study Harrisburg Street to identify measures to reduce transportation accidents.	N/A	Transportation Accidents	1	Public Works	TCRPC; PennDOT	Medium	Medium	Operating Budget; HATS; Infrastructure Bank	Short	Medium	SIP
Swatara T-07	Work with PennDOT to study Paxton Street to identify measures to reduce transportation accidents.	N/A	Transportation Accidents	1	Public Works	TCRPC; PennDOT	Medium	Medium	Operating Budget; HATS; Infrastructure Bank	Short	Medium	SIP
Swatara T-08	Work with the owner/operator of Paxton Ministries to protect the facility from current and future sinkholes.	Existing	Subsidence and Sinkholes	2	Engineer	EMC	Medium	Low	Operating Budget	Short	Medium	SIP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
Swatara T-09	Work with PennDOT to study the intersection of Paxton Street and Sycamore Street to identify measures to reduce transportation accidents.	N/A	Transportation Accidents	1	Public Works	TCRPC; PennDOT	Medium	Medium	Operating Budget; HATS; Infrastructure Bank	Short	Medium	SIP
Swatara T-10	Assess the geology at the Lawnton fire station property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Engineer	EMC	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	Medium	SIP
Swatara T-11	Assess the geology at the Station 1-2 property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Engineer	EMC	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	High	SIP
Swatara T-12	Assess the geology at the Steelton-Highspire Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Township Engineer	Facilities Management	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	Low	SIP
Swatara T-13	Assess the geology at the Steelton-Highspire High School property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Township Engineer	Facilities Management	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	Medium	SIP
Swatara T-14	Assess the geology at the Swatara Middle School property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Township Engineer	Facilities Management	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	Medium	SIP
Swatara T-15	Work with the owner/operator of the Paxton Place senior living apartments to install a backup power generator.	Existing	Utility Interruption	1, 2	Facilities Management	EMC	Medium	Low	FEMA HMGP, BRIC; Operating Budget; Gaming grant	Short	Medium	SIP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
Swatara T-16	Assess the geology at the Swatara Township Building property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Engineer	EMC	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	Medium	SIP
Swatara T-17	Assess the geology at the Swatara Township Fire Department property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Engineer	EMC	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	Medium	SIP
Swatara T-18	Develop a plan for replacing the Derry Street Bridge over Spring Creek.	Existing	Floods, Flash Floods, and Ice Jams	2	Public Works		High	High	FEMA HMA; PennDOT; Capital Improvement Budget; Infrastructure Bank	Short	Medium	SIP
Upper Paxton Township												
UpperPaxtonT-01	Assess the Lenkerville Elementary School property to determine the risk from wildfires and what vegetation needs to be cleared.	Existing	Wildfire	2, 3	Township	Fire Department; School Staff; PA DCNR	Medium	Low	Operating Budget	Short	Medium	NSP
UpperPaxtonT-02	Assess the Millersburg Area Authority - Water Plant property to determine the risk from wildfires and what vegetation needs to be cleared.	Existing	Wildfire	2, 3	Township	Fire Department; Authority; PA DCNR	Medium	Low	Operating Budget	Short	High	NSP
UpperPaxtonT-03	Assess the Millersburg Area Senior Center property to determine the risk from wildfires and what vegetation needs to be cleared.	Existing	Wildfire	2, 3	Township	Fire Department; PA DCNR	Medium	Low	Operating Budget	Short	Medium	NSP
UpperPaxtonT-04	Assess the Millersburg Borough Water System wastewater facility property to determine the risk from wildfires and what vegetation needs to be cleared.	Existing	Wildfire	2, 3	Township	Fire Department; PA DCNR	Medium	Low	Operating Budget	Short	High	NSP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
UpperPaxtonT-05	Assess the Millersburg Area Ambulance Association property to determine the risk from wildfires and what vegetation needs to be cleared.	Existing	Wildfire	2, 3	Township	Fire Department; PA DCNR	Medium	Low	Operating Budget	Short	High	NSP
UpperPaxtonT-06	Assess the Upper Paxton Township Building property to determine the risk from wildfires and what vegetation needs to be cleared.	Existing	Wildfire	2, 3	Township	Fire Department; PA DCNR	Medium	Low	Operating Budget	Short	High	NSP
UpperPaxtonT-07	Protect the Millersburg Area Authority Well 10 & 11 Potable Water facility to at least the 0.2 percent annual chance flood level.	Existing	Floods, Flash Floods, and Ice Jams; Utility Interruption	2	Authority		High	High	FEMA HMGP, BRIC; PA DCED H2O, Small Water and Sewer Project Grant; Operating Budget; Gaming grant	Short	High	SIP
UpperPaxtonT-08	Upgrade the backup power generator at Lenkerville Elementary School.	Existing	Utility Interruption	1, 2	Facilities Management	Township EMC; Township Staff	High	High	FEMA HMGP, BRIC; Operating Budget; Gaming grant	Short	Medium	SIP
UpperPaxtonT-09	Assess the flooding problem in Lenkerville along the Wiconisco Creek to identify feasible mitigation actions, and implement them.	Existing	Floods, Flash Floods, and Ice Jams	2	Engineer	Township Staff	High	High	FEMA HMGP, BRIC, FMA; PA DCED FMP; Operating Budget; Gaming grant	Short	High	SIP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
UpperPaxtonT-10	Assess the flooding problem on River Street to identify feasible mitigation actions, and implement them.	Existing	Floods, Flash Floods, and Ice Jams	2	Engineer	Township Staff	High	High	FEMA HMGP, BRIC, FMA; PA DCED FMP; Operating Budget; Gaming grant	Short	Medium	SIP
UpperPaxtonT-11	Work with PennDOT to protect PA-147 north of Millersburg Borough from landslides.	N/A	Landslide	1, 2	Township Staff	PennDOT	High	High	FEMA HMGP, BRIC; PennDOT; HATS; Operating Budget	Long	Medium	SIP
Washington Township												
WashingtonT-01	Work with the Dauphin Meadows Landfill to assess the property to determine the risk from wildfires and what vegetation needs to be cleared.	Existing	Wildfire	2, 3	Township	Fire Department	Medium	Low	Operating Budget	Short	Medium	NSP
WashingtonT-02	Assess the Upper Dauphin High School property to determine the risk from wildfires and what vegetation needs to be cleared.	Existing	Wildfire	2, 3	Township	Fire Department; PA DCNR; School Staff	Medium	Low	Operating Budget	Short	High	NSP
WashingtonT-03	Assess the Upper Dauphin Middle School property to determine the risk from wildfires and what vegetation needs to be cleared.	Existing	Wildfire	2, 3	Township	Fire Department; PA DCNR; School Staff	Medium	Low	Operating Budget	Short	Medium	NSP
WashingtonT-04	Assess the Washington Township Building property to determine the risk from wildfires and what vegetation needs to be cleared.	Existing	Wildfire	2, 3	Township	Fire Department; PA DCNR	Medium	Low	Operating Budget	Short	Medium	NSP
Wayne Township												
WayneT-01	Assess the Wayne Township Building property to determine the risk from wildfires and what vegetation needs to be cleared.	Existing	Wildfire	2, 3	Township	Fire Department; PA DCNR	Medium	Low	Operating Budget	Short	High	NSP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
West Hanover Township												
WestHanoverT-01	Assess the West Hanover Township Public Works Building on Walnut Ave property to determine the risk from wildfires and what vegetation needs to be cleared.	Existing	Wildfire	2, 3	Township	Fire Department; PA DCNR	Medium	Low	Operating Budget	Short	Medium	NSP
WestHanoverT-02	Assess the West Hanover Township Fire Department Station 3 property to determine the risk from wildfires and what vegetation needs to be cleared.	Existing	Wildfire	2, 3	Township	Fire Department; PA DCNR	Medium	Low	Operating Budget	Short	Medium	NSP
WestHanoverT-03	Assess the geology at the West Hanover Township Water and Sewer property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Engineer	Public Works	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	Medium	SIP
WestHanoverT-04	Work with PennDOT to study Hershey Road to identify measures to reduce transportation accidents.	N/A	Transportation Accidents	1	Public Works	TCRPC; PennDOT	Medium	Medium	Operating Budget; HATS; Infrastructure Bank	Short	Medium	SIP
WestHanoverT-05	Work with PennDOT to study Linglestown Road to identify measures to reduce transportation accidents.	N/A	Transportation Accidents	1	Township	TCRPC; PennDOT	Medium	Medium	PennDOT	Short	Medium	SIP
Wiconisco Township												
WiconiscoT-01	Assess the geology at the Wiconisco Township Fire Department property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Engineer	EMC	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	Medium	SIP
WiconiscoT-02	Assess the topography around the Wiconisco Township WWTP to determine if mitigation measures are necessary, and to implement those measures if they are.	Existing	Landslide	1, 2	Engineer		Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	Medium	SIP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
WiconiscoT-03	Protect the Wiconisco Township Municipal Office at 305 Walnut Street to at least the 0.2 percent annual chance flood level.	Existing	Floods, Flash Floods, and Ice Jams	2	Engineer	FPA	High	High	FEMA HMGP, BRIC, FMA; PA DCED FMP; Operating Budget; Gaming grant	Short	High	SIP
WiconiscoT-04	Assess the geology at the Wiconisco Township building property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Engineer	EMC	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	Medium	SIP
WiconiscoT-05	Assess the Wiconisco Township Office property on Arch Street to determine the risk from wildfires and what vegetation needs to be cleared.	Existing	Wildfire	2, 3	Township	Fire Department; PA DCNR	Medium	Low	Operating Budget	Short	Medium	NSP
WiconiscoT-06	Assess the Wiconisco Township Fire Department property to determine the risk from wildfires and what vegetation needs to be cleared.	Existing	Wildfire	2, 3	Township	Fire Department; PA DCNR	Medium	Low	Operating Budget	Short	Medium	NSP
WiconiscoT-07	Assess the Wiconisco Township Municipal Building property on Walnut Street to determine the risk from wildfires and what vegetation needs to be cleared.	Existing	Wildfire	2, 3	Township	Fire Department; PA DCNR	Medium	Low	Operating Budget	Short	High	NSP
WiconiscoT-08	Assess the geology at the Wiconisco Township Police Department property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Engineer	EMC	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	Medium	SIP
WiconiscoT-09	Assess the geology at the Wiconisco Township WWTP property to determine if mitigation measures are necessary, and to implement them if they are.	Existing	Subsidence and Sinkholes	2	Engineer	Township Staff	Medium	Medium	FEMA HMGP, BRIC; Operating Budget	Short	High	SIP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
Williams Township												
WilliamsT-01	Assess the Williams Township Office property to determine the risk from wildfires and what vegetation needs to be cleared. ***This project is not eligible for FEMA mitigation funding, as the borough did not participate in the planning process.***	Existing	Wildfire	2, 3	Township	Fire Department; PA DCNR	Medium	Low	Operating Budget	Short	High	NSP
WilliamsT-02	Assess the Williams Valley High School property on Walnut Street to determine the risk from wildfires and what vegetation needs to be cleared. ***This project is not eligible for FEMA mitigation funding, as the borough did not participate in the planning process.***	Existing	Wildfire	2, 3	Township	Fire Department; School Staff; PA DCNR	Medium	Low	Operating Budget	Short	High	NSP
WilliamsT-03	Work with PennDOT to study Market Street to identify measures to reduce transportation accidents. ***This project is not eligible for FEMA mitigation funding, as the borough did not participate in the planning process.***	N/A	Transportation Accidents	1	Township	TCRPC; PennDOT	Medium	Medium	Operating Budget; HATS; Infrastructure Bank	Short	Medium	SIP
Williamstown Borough												
WilliamstownB-01	Assess the Williamstown Fire Department property to determine the risk from wildfires and what vegetation needs to be cleared. ***This project is not eligible for FEMA mitigation funding, as the borough did not participate in the planning process.***	Existing	Wildfire	2, 3	Borough	Fire Department; PA DCNR	Medium	Low	Operating Budget	Short	Medium	NSP

Initiative*	Mitigation Initiative	Applies to New and/or Existing Structures**	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category
WilliamstownB-02	Protect the Williamstown EMS Station to at least the 0.2 percent annual chance flood level. ***This project is not eligible for FEMA mitigation funding, as the borough did not participate in the planning process.***	Existing	Floods, Flash Floods, and Ice Jams	2	Engineer	FPA	High	High	FEMA HMGP, BRIC, FMA; PA DCED FMP; Operating Budget; Gaming grant	Short	Medium	SIP

Notes:

** The letters associated with the initiative number indicate the lead agency (i.e., County or municipality)*
*** Does this mitigation initiative reduce the effects of hazards on new and/or existing buildings and/or infrastructure? Not applicable (N/A) is inserted if this does not apply.*

EMA = Emergency Management Agency
EMS = Emergency Medical Services
FEMA = Federal Emergency Management Agency
FPA = Floodplain Administrator
PA DEP = Pennsylvania Department of Environmental Protection
PDM = Pre-Disaster Mitigation Program
PEMA = Pennsylvania Emergency Management Agency
WWTP = Wastewater Treatment Plant

Costs:
These rough estimates should be used where actual project costs cannot reasonably be established at this time:
Low = < $10,000
Medium = $10,000 to $100,000
High = > $100,000

DOF = Depending on funding
HMGP = Hazard Mitigation Grant Program

Timeline:
Short Term = 1 to 5 years. Long Term = 5 years or greater.

Mitigation Category:

- Education and Awareness Programs (EAP) - Actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. These actions may also include participation in national programs, such as StormReady and Firewise Communities.
- Local Plans and Regulations (LPR) - Actions include government authorities, policies, or codes that influence the way land and buildings are being developed and built.
- Natural Systems Protection (NSP) - Actions that minimize damage and losses, and also preserve or restore the functions of natural systems.
- Structure and Infrastructure Project (SIP) - Actions that involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures as well as critical facilities and infrastructure. This type of action also involves projects to construct manmade structures to reduce the impact of hazards.

6.4.2 Mitigation Strategy Prioritization and Implementation

Section 201.6(c) (3) (iii) of Title 44 Code of Federal Regulations (44 CFR) requires the prioritization of the action plan to emphasize the extent to which benefits are maximized according to a cost-benefit review of the proposed projects and their associated costs. This allows the jurisdictions to select the most cost-effective actions for implementation first, not only to use resources efficiently, but also to make a realistic start toward mitigating risks.

Mitigation benefits are defined as future damages and losses that would be eliminated and/or reduced by implementing the proposed mitigation project, and include physical damage to structures and infrastructure, loss of service or function, and emergency management costs. Particularly for physical ("shovel-in-the-ground") mitigation projects, jurisdictions were encouraged to estimate project costs as well as to identify the anticipated benefits. Where exact project costs and potential benefits were not available, ranges were identified (high, medium, low) for each, allowing a qualitative evaluation of project cost-effectiveness.

PEMA has developed a mitigation actions evaluation and prioritization process to provide a consistent, uniform approach for counties and jurisdictions to use to consider, in a systematic way, the best mitigation strategies for their communities (PEMA 2020). Jurisdictions first evaluate feasibility of mitigation actions by using the following ten evaluation criteria:

- **Life Safety:** The Planning Team assesses to what extent a mitigation action will protect individuals from being injured or killed by a hazard.
- **Property Protection:** The Planning Team assesses to what extent the action will protect property, including homes, businesses, and critical infrastructure.
- **Technical:** It is important to determine whether the proposed action is technically feasible, will help to reduce losses in the long term, and has minimal secondary impacts. Here, the Planning Team determines whether the alternative action is a whole or partial solution, or not a solution at all.
- **Political:** Understanding current opinions of community and state political leadership regarding issues related to the environment, economic development, safety, and emergency management will provide valuable insight into the level of political support offered for mitigation activities and programs. Proposed mitigation objectives sometimes fail because of a lack of political acceptability.
- **Legal:** Without the appropriate legal authority, the action cannot lawfully be undertaken. When considering this criterion, the Planning Team determines whether a jurisdiction has the legal authority at the state, tribal, or local level to implement the action, or whether the jurisdiction must pass new laws or regulations. Each level of government operates under a specific source of delegated authority. As a general rule, most local governments operate under enabling legislation that gives them the power to engage in different activities. Jurisdictions should identify the unit of government undertaking the mitigation action, and include an analysis of the inter-relationships between local, regional, state, and federal governments. Legal authority is likely to have a significant role later in the process when the state, tribe, or community determines the ways in which mitigation activities can best be carried out, and the extent to which mitigation policies and programs can be enforced.
- **Environmental:** Impact on the environment is an important consideration because of public desire for sustainable and environmentally healthy communities. In addition, many statutory considerations, such as the National Environmental Policy Act (NEPA), should be counted when using federal funds. Jurisdictions need to evaluate whether, when implementing mitigation actions, the potential negative consequences to environmental assets such as threatened and endangered species, wetlands, and other protected natural resources.
- **Social:** The public must support the overall implementation strategy and specific mitigation actions. Therefore, the projects have to be evaluated in terms of community acceptance. Likewise, the Planning Team should determine if implementing a mitigation action will have a beneficial or negative effect on a particular segment of the population.

- **Administrative:** Under this part of the evaluation criteria, the Planning Team examines the anticipated staffing, funding, and maintenance requirements for the mitigation action to determine whether the jurisdiction has the personnel and administrative capabilities necessary to implement the action or whether outside help will be necessary.
- **Local Champion:** Having an individual who will lead the implementation of a project, particularly a complex project, is essential for implementing it.
- **Other Community Objectives:** The Planning Team evaluates to what extent implementing the mitigation action supports other community objectives, such as increasing parks and recreation, quality of life, and economic development.

Table 6-5 shows the feasibility evaluation for each identified mitigation action. For each criterion, how feasible or effective the action is in the above criteria was indicated with a "+" (highly effective or feasible), "N" (neutral or not applicable), or a "-" (ineffective or not feasible). All actions were deemed feasible.

Table 6-5. Evaluation of Mitigation Actions

Initiative	Mitigation Action	Life Safety	Property Protection	Technical	Political	Legal	Environmental	Social	Administrative	Local Champion	Other Community Objectives	Total Score
DauphinC-01	Provide public outreach about hazards and protective measures people can take to protect themselves (e.g., receiving emergency alerts through South Central Alert) and their property.	+	+	+	+	+	+	+	N	+	+	9 (+) 1 (N) 0 (-)
DauphinC-02	Improve telecommunications infrastructure, including accessibility of high-speed Internet connectivity, throughout the county	+	+	+	+	+	+	+	N	+	+	9 (+) 1 (N) 0 (-)
DauphinC-03	Simplify and improve the model stormwater management ordinance in an effort to enhance enforcement and effectiveness of stormwater management practices	+	+	+	+	+	+	N	+	N	N	7 (+) 3 (N) 0 (-)
DauphinC-04	Educate the public about resources available to combat the opioid abuse/addiction.	+	+	+	+	+	+	+	N	+	+	9 (+) 1 (N) 0 (-)
DauphinC-05	Inform the owners/operators of facilities storing hazardous materials of the risks they face and what they can do to protect their facilities and operations.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
DauphinC-06	Work with child care facility operators to discuss hazards they face and ensure their emergency plans address those hazards.	+	+	+	+	+	+	+	+	N	N	8 (+) 2 (N) 0 (-)
DauphinC-07	Assess the topography around the Lykens Tower Site, Mahantango Tower Site, Peters Mountain Tower Site, and Pillow Tower Site to determine if mitigation measures are necessary, and to implement those measures if they are.	+	+	+	+	+	N	N	N	N	+	6 (+) 4 (N) 0 (-)
DauphinC-08	Assess the following properties to determine the risk from wildfires and what vegetation needs to be cleared: Agriculture Building, Blue Mountain Tower Site, Conewago CWT Tower Site, Lower Swatara Tower Site, and Mahantango Tower Site	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
DauphinC-09	Determine options for protecting the following facilities from the possible inundation due to a failure of the Raystown Lake Dam: Admin Building, Bar Association, County Offices – 100 Chestnut Street, Court House, Fort Hunter Park, Harrisburg Tower Site, Lykens Tower Site, Superior Court, Veterans Building Tower Site	+	+	+	+	+	N	N	N	N	+	6 (+) 4 (N) 0 (-)
DauphinC-10	Determine options for protecting Dauphin County Bridge No. 23 from the inundation due to a failure of the DeHart Dam	+	+	+	+	+	+	N	N	+	+	8 (+) 2 (N) 0 (-)

Initiative	Mitigation Action	Life Safety	Property Protection	Technical	Political	Legal	Environmental	Social	Administrative	Local Champion	Other Community Objectives	Total Score
DauphinC-11	Assess the geology at the following sites and determine if mitigation measures are necessary, and to implement them if they are: 333 Market Street Tower Site, Administration Building, Adult Probation, Assistance Office, Bar Association, Children and Youth, Conewago CWT Tower Site, Coroner's Office, County Offices – 100 Chestnut Street, Court House, Dauphin ECC Tower Site, Department of Public Safety, Harrisburg Tower Site, Judicial Center, Lower Swatara Tower Site, Market Street Tower Site, Prison, Recycling Center, Reservoir Park Tower Site, Superior Court, Veteran's Building Tower Site, and Work Release	+	+	+	+	+	+	N	N	N	N	6 (+) 4 (N) 0 (-)
DauphinC-12	Identify and provide incentives to recruit and retain volunteer firefighters.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
DauphinC-13	Provide information to PEMA on the risks faced by each Commonwealth-owned critical facility in Dauphin County, so that PEMA can work with the Department of General Services to protect the facilities.	+	+	+	+	+	+	N	+	N	N	7 (+) 3 (N) 0 (-)
DauphinC-14	Work with PennDOT to improve Interstates -076 (PA Turnpike), -081, -083, and -283 to reduce accidents	+	+	+	+	+	+	+	+	N	N	8 (+) 2 (N) 0 (-)
DauphinC-15	Conduct a wildlands/forestry survey of forested areas, to identify strategies for mitigating the negative effects of invasive plant and insect species.	+	+	+	+	+	+	N	+	+	+	9 (+) 1 (N) 0 (-)
DauphinC-16	Construct another ingress/egress route for the Dauphin County Department of Public Safety, Schaffner Youth Center, Adult Probation facility, and Work Release Center	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
DauphinC-17	Install wet and dry hydrants to provide water supply for fire suppression.	+	+	+	+	+	+	+	+	N	N	8 (+) 2 (N) 0 (-)
DauphinC-18	Work with the owners/operators of privately-owned critical facilities in the special flood hazard area to discuss their risk of flooding and protective measures they can take.	N	+	+	+	+	N	+	N	N	+	6 (+) 4 (N) 0 (-)
DauphinC-19	Work with the owners/operators of privately-owned critical facilities in the area subject to inundation due to a failure of the Raystown Lake Dam to discuss their risk of flooding and protective measures they can take.	N	+	+	+	+	N	+	N	N	+	6 (+) 4 (N) 0 (-)
DauphinC-20	Work with privately-owned critical facilities to assess the geology at their sites to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	N	N	N	+	+	7 (+) 3 (N) 0 (-)
DauphinC-21	Work with the owners/operators of the privately-owned critical facilities to determine the risk from wildfires and what vegetation needs to be cleared.	+	+	+	+	+	N	+	N	+	+	8 (+) 2 (N) 0 (-)

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DauphinC-22	Assess the Dauphin County Bridge No. 23 historic site to determine the risk from wildfires and what vegetation needs to be cleared.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
DauphinC-23	Protect the Dauphin County Bridge No. 23 historic site to at least the 0.2 percent chance flood level.	+	+	+	+	+	N	N	N	N	+	6 (+) 4 (N) 0 (-)
DauphinC-25	Work with the owners/operators of privately-owned critical facilities on steep slopes to study the topography of the property to determine if mitigation measures are necessary, and to implement those measures.	+	+	+	+	+	N	+	N	+	+	8 (+) 2 (N) 0 (-)
DauphinC-26	The county will assess their bridges to determine what measures can be taken to protect them to the 0.2 percent annual chance flood level	+	+	+	+	+	N	N	N	N	+	6 (+) 4 (N) 0 (-)
DauphinC-27	Assess the geology at the Area Agency on Aging property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	N	N	N	N	+	6 (+) 4 (N) 0 (-)
DauphinC-28	Encourage homeowners, renters, and businesses to insure their properties against all hazards, including flood coverage under the National Flood Insurance Program (NFIP)	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
DauphinC-29	Clean debris from pillars at Grubb Street and Canal Street bridges	+	+	+	+	+	N	N	N	N	+	6 (+) 4 (N) 0 (-)
DauphinC-30	Install backup preventers in wastewater pipes to prevent basement flooding.	+	+	+	+	+	+	+	+	N	N	8 (+) 2 (N) 0 (-)
DauphinC-31	Elevate or acquire properties, including repetitive loss and severe repetitive loss properties, in flood prone areas.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
DauphinC-32	Floodproof structures in flood prone areas.	+	+	+	+	+	N	N	N	N	+	6 (+) 4 (N) 0 (-)
DauphinC-33	Conduct a study for the Susquehanna River to determine the best option to address snakeheads, flathead catfish, and other invasive species	N	N	+	+	+	+	N	N	+	+	6 (+) 4 (N) 0 (-)
DauphinC-34	Develop a new Comprehensive Plan or amend an existing Comprehensive Plan to include an assessment and associated mapping of the municipality’s vulnerability to location-specific hazards and appropriate recommendations for the use of these hazard areas.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)

Initiative	Mitigation Action	Life Safety	Property Protection	Technical	Political	Legal	Environmental	Social	Administrative	Local Champion	Other Community Objectives	Total Score
DauphinC-35	Develop a new Zoning Ordinance or revise an existing Zoning Ordinance to include separate zones or districts with appropriate development criteria for known hazard areas.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
DauphinC-36	Develop a new Subdivision and Land Development Ordinance or revise an existing Subdivision and Land Development Ordinance to include municipal-specific, hazard mitigation-related development criteria and/or provisions for the mandatory use of conservation subdivision design principles in order to regulate the location and construction of buildings and other infrastructure in known hazard areas.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
DauphinC-37	Revise existing zoning and/or subdivision and land development ordinances or adopt a separate, standalone ordinance to require the completion of subsurface investigations (i.e., borings, geo-physical surveys, and/or studies by a registered Professional Geologist) for all new subdivision and land development projects in known land subsidence hazard areas.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
DauphinC-38	Update and implement a comprehensive water resources management plan that analyzes the County's existing water resources supply and evaluates the County's anticipated water use demand in an effort to identify suspected water supply shortages and potential new water supply sources.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
DauphinC-39	Coordinate with the USGS, local watershed organizations, and/or the DCCD to increase the number of USGS and Integrated Flood Observing and Warning System (IFLOWS) rain and stream gauges in the County as a potential enhancement to the existing Susquehanna Flood Forecast and Warning System.	+	+	+	+	+	+	N	N	N	N	6 (+) 4 (N) 0 (-)
DauphinC-40	Work with municipalities to evaluate participation in the CRS and facilitate the preparation and submission of CRS applications.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
DauphinC-41	Develop a technical proficiency at the municipal level for conducting post-disaster damage assessments and continue to regulate through local planning and zoning reconstruction activities to ensure compliance with NFIP substantial damage/ substantial improvement requirements.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
DauphinC-42	Develop a technical proficiency at the municipal level for assisting local residents and business owners in applying for hazard mitigation and assistance funds and identifying cost beneficial hazard mitigation measures to be incorporated into reconstruction activities.	+	+	+	+	+	+	+	N	+	+	9 (+) 1 (N) 0 (-)
DauphinC-43	Investigate the feasibility of constructing a levee/floodwall system along Swatara Creek between East Main Street and the Pennsylvania Turnpike to minimize Middletown Borough's flood hazard potential.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
DauphinC-44	Municipalities should continue to seek solutions to problem areas and obstructions identified in the April 2010 Countywide Act 167 Stormwater Management Plan.	+	+	+	+	+	+	+	+	N	N	8 (+) 2 (N) 0 (-)
DauphinC-45	Enroll in the Pennsylvania Firewise Communities Program through the DCNR Fire Forester for Dauphin County.	+	+	+	+	+	N	N	N	N	+	6 (+) 4 (N) 0 (-)

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DauphinC-46	Encourage homeowners to test for radon and install radon mitigation systems, if needed.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
DauphinC-47	Adopt the Radon Control Methods Appendix of the current, adopted edition of the International Residential Code to address radon in new construction.	N	+	+	+	+	N	+	N	+	+	7 (+) 3 (N) 0 (-)
DauphinC-48	Encourage municipalities to enter into an Intergovernmental Cooperation Agreement and Memorandum of Understanding with the Dauphin County Land Bank Authority as a way to address structures at risk from the impacts of natural and human-made hazards.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
DauphinC-49	Increase the number of NOAA Weather Alert radios in public places across the County which currently do not have them (such as personal care homes) above and beyond what is required of the County by the NWS's Storm Ready Program.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
DauphinC-50	Establish an alternate EOC location in the event the primary EOC must be evacuated. This facility should also be located outside of the Special Flood Hazard Area.	+	+	+	+	+	N	N	N	N	+	6 (+) 4 (N) 0 (-)
DauphinC-51	The Dauphin County Department of Information Technology will make natural and human-made hazard data available for municipal use.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
DauphinC-52	Assess the EMS Station 12 property to determine the risk from wildfires and what vegetation needs to be cleared.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
BerrysburgB-01	Install a backup power generator at the Berrysburg Borough municipal building.	+	+	+	+	+	+	N	N	N	N	6 (+) 4 (N) 0 (-)
BerrysburgB-02	Install a backup power generator at the Berrysburg & Community Fire Company station	+	+	+	+	+	N	N	N	N	+	6 (+) 4 (N) 0 (-)
BerrysburgB-03	Discuss with the owner/operator of critical facilities vulnerable to a hazardous materials release the risk and possible protective measures.	+	+	+	+	+	N	N	N	N	+	6 (+) 4 (N) 0 (-)
ConewagoT-01	Protect Laurel Drive from the current and future sinkholes.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
ConewagoT-02	Work with PennDOT to improve Deodate Road to mitigate traffic accidents.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)

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ConewagoT-03	Work with PennDOT to improve Colebrook Road to mitigate traffic accidents	+	+	+	+	+	+	+	+	N	N	8 (+) 2 (N) 0 (-)
DauphinB-01	Assess conditions at the confluence of Stony Creek and the Susquehanna River to identify potential mitigation actions for nearby structures.	+	+	+	+	+	+	+	+	N	N	8 (+) 2 (N) 0 (-)
DauphinB-02	Assess the borough to identify potential mitigation actions to take to ensure access to/from the borough during floods of the Susquehanna River.	+	+	+	+	+	+	+	+	N	N	8 (+) 2 (N) 0 (-)
DauphinB-03	Install a generator at the Borough Building	+	+	+	+	+	N	N	N	N	+	6 (+) 4 (N) 0 (-)
DauphinB-04	Determine what other critical facilities in the borough need generators and purchase/install them.	+	+	+	+	+	+	N	N	+	+	8 (+) 2 (N) 0 (-)
DauphinB-05	Develop and implement a stream maintenance program to clear debris from Stony Creek.	+	+	+	+	+	+	+	N	+	+	9 (+) 1 (N) 0 (-)
DauphinB-06	Assess critical facilities in the wildland-urban interface area to determine the risk from wildfires and what vegetation needs to be cleared.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
DauphinB-07	Assess Hillside properties to determine the risk from wildfires and what vegetation needs to be cleared	+	+	+	+	+	+	+	N	+	+	9 (+) 1 (N) 0 (-)
DauphinB-08	Work with PennDOT to improve Claster Boulevard to reduce traffic accidents	+	+	+	+	+	+	+	+	N	N	8 (+) 2 (N) 0 (-)
DauphinB-09	Work with PennDOT to improve US-22/322 to mitigate traffic accidents	N	+	+	+	+	N	+	N	N	+	6 (+) 4 (N) 0 (-)
DerryT-01	Assess stormwater management infrastructure in the township to determine what improvements need to be made, then implement the improvements.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
DerryT-02	Work with PennDOT to assess the bridges over the Swatara Creek on PA-39 and PA-0743 to improve the ability to pass floodwaters under the bridges.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)

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DerryT-03	Work with PennDOT to upgrade stormwater infrastructure on Hershey Park Drive.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
DerryT-04	Upgrade stormwater infrastructure on Mae Street	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
DerryT-05	Upgrade stormwater infrastructure on Bull Frog Valley Road	+	+	+	+	+	+	+	N	+	+	9 (+) 1 (N) 0 (-)
DerryT-06	Upgrade stormwater infrastructure on Wilsonville Road	+	+	+	+	+	+	+	N	+	+	9 (+) 1 (N) 0 (-)
DerryT-07	Install a generator at the Derry Township Public Works building	+	+	+	+	+	N	N	N	N	+	6 (+) 4 (N) 0 (-)
DerryT-08	Assess the topography around the following structures to determine if mitigation measures are necessary, and to implement those measures if they are: Quarries of the Hummelstown Brownstone Company historic site and Derry Township LDFL Wastewater facility	+	+	+	+	+	N	N	N	N	+	6 (+) 4 (N) 0 (-)
DerryT-09	Work with PennDOT to protect US-322 near PA-0743 from current and future sinkholes.	+	+	+	+	+	+	N	+	N	N	7 (+) 3 (N) 0 (-)
DerryT-10	Assess the geology at the Derry Township municipal offices to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	N	N	N	N	+	6 (+) 4 (N) 0 (-)
DerryT-11	Work with the Sheetz #351 to determine options for protecting the facility from the possible inundation from dam failure from the Hershey Dam	+	+	+	+	+	+	N	+	N	N	7 (+) 3 (N) 0 (-)
DerryT-12	Work with PennDOT to improve Elizabethtown Road to mitigate traffic accidents	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
DerryT-13	Work with PennDOT to improve Governor Road to mitigate traffic accidents	+	+	+	+	+	+	+	+	N	N	8 (+) 2 (N) 0 (-)
DerryT-14	Work with PennDOT to improve Middletown Road to mitigate traffic accidents	+	+	+	+	+	+	+	+	N	N	8 (+) 2 (N) 0 (-)

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DerryT-15	Work with PennDOT to improve Waltonville Road to mitigate traffic accidents	+	+	+	+	+	+	+	N	+	+	9 (+) 1 (N) 0 (-)
DerryT-16	Assess the drainage and stormwater management infrastructure in the area of Hersheypark Drive and Walton Avenue to determine appropriate mitigation measures to reduce risk from flooding, and implement them.	+	+	+	+	+	+	+	+	N	+	9 (+) 1 (N) 0 (-)
East HanoverT-01	Work with PennDOT to improve drainage to reduce flooding along the 1100 block of Manada Bottom Road	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
East HanoverT-02	Work with PennDOT to eliminate highway flooding at intersection of PA-443 and Firehouse Road during heavy rainfalls.	N	+	+	+	+	N	+	N	N	+	6 (+) 4 (N) 0 (-)
East HanoverT-03	Work with PennDOT to improve Mountain Road to mitigate traffic accidents	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
East HanoverT-04	Work with PennDOT to improve Laudermilch Road to mitigate traffic accidents	+	+	+	+	+	+	+	+	N	N	8 (+) 2 (N) 0 (-)
East HanoverT-05	Work with PennDOT to improve Sandbeach Road to mitigate traffic accidents	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
East HanoverT-06	Obtain warning system for residents from outside contractor to alert residents to hazardous materials incidents or other hazards	+	+	+	+	+	+	+	+	N	N	8 (+) 2 (N) 0 (-)
ElizabethvilleB-01	Determine the best option to prevent flooding of the borough building	+	+	+	+	+	+	N	N	+	+	8 (+) 2 (N) 0 (-)
ElizabethvilleB-02	Assess stormwater management infrastructure in the borough to determine what improvements need to be made to control runoff and reduce flooding.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
ElizabethvilleB-03	Work with PennDOT to improve drainage of US-209 at Park Drive.	N	+	+	+	+	N	+	N	N	+	6 (+) 4 (N) 0 (-)
ElizabethvilleB-04	Protect the Upper Dauphin County EMS station to the 0.2 percent annual chance flood level.	+	+	+	+	+	+	+	N	+	+	9 (+) 1 (N) 0 (-)

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ElizabethvilleB-05	Assess the property of the Elizabethville Fire Station to determine the risk from wildfires and what vegetation needs to be cleared.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
ElizabethvilleB-06	Install a backup power generator at the Elizabethville Borough building.	+	+	+	+	+	+	N	N	N	N	6 (+) 4 (N) 0 (-)
GratzB-01	Assess the property of the Gratz Borough Building to determine the risk from wildfires and what vegetation needs to be cleared.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
GratzB-02	Assess the Gratz Fire Department station to determine the risk from wildfires and what vegetation needs to be cleared.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
Halifax B-01	Ensure that the borough has plans in place to continue operations if a hazardous materials release causes an evacuation of the Halifax Borough Office.	N	N	+	+	+	+	N	N	N	N	4 (+) 6 (N) 0 (-)
Halifax B-02	Discuss with the US Postal Service that the Halifax Post Office is vulnerable to a hazardous materials release and possible protective measures.	+	+	+	+	+	+	N	+	N	N	7 (+) 3 (N) 0 (-)
Halifax T-01	Protect the Halifax Area Water Authority Well #1 to the 0.2 percent annual chance flood event.	+	+	+	+	+	+	+	+	N	N	8 (+) 2 (N) 0 (-)
Halifax T-02	Work with the property owner to protect the Legislative Route 1 Sycamore Allee historic site from flooding	+	+	+	+	+	+	N	+	N	N	7 (+) 3 (N) 0 (-)
Halifax T-03	Assess the topography around the Halifax Area Water Authority Well #1 to determine if mitigation measures are necessary, and to implement those measures if they are	+	+	+	+	+	+	N	N	+	+	8 (+) 2 (N) 0 (-)
Halifax T-04	Assess the following properties to determine the risk from wildfires and what vegetation needs to be cleared: Halifax Area Authority Sewer Plant, Halifax Area Water Authority Well #1, Halifax Area Authority Sewer Plant, and Halifax Township Municipal Building	+	+	+	+	+	+	+	N	+	+	9 (+) 1 (N) 0 (-)
Halifax T-05	Work with PennDOT to improve Peters Mountain Road to mitigate traffic accidents	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
Halifax T-06	Work with PennDOT to improve Powells Valley Road to mitigate traffic accidents	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)

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Halifax T-07	Work with PennDOT to improve South River Road to mitigate traffic accidents	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
Harrisburg C-01	Renovate or demolish vacant structures that are at risk of collapse.	+	+	+	N	+	+	N	N	+	+	7 (+) 3 (N) 0 (-)
Harrisburg C-02	Protect the Downey Elementary School to at least the 0.2 percent chance flood level	+	+	+	+	+	+	+	+	N	N	8 (+) 2 (N) 0 (-)
Harrisburg C-03	Protect the Edgewater Psychiatric Center to at least the 0.2 percent chance flood level	+	+	+	+	+	+	+	+	N	N	8 (+) 2 (N) 0 (-)
Harrisburg C-04	Protect the Station 1 EMS facility to at least the 0.2 percent chance flood level	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
Harrisburg C-05	Assess the geology at the Ben Franklin School property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	+	N	N	+	+	8 (+) 2 (N) 0 (-)
Harrisburg C-06	Assess the geology at the Camp Curtin Fire Station historic site property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	N	N	N	+	+	7 (+) 3 (N) 0 (-)
Harrisburg C-07	Assess the geology at the Camp Curtin Junior High School historic property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	N	N	N	+	+	7 (+) 3 (N) 0 (-)
Harrisburg C-08	Assess the geology at the Downey Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	N	+	+	+	+	N	N	N	N	+	5 (+) 5 (N) 0 (-)
Harrisburg C-09	Assess the geology at the Edgewater Psychiatric Center property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	+	N	N	+	+	8 (+) 2 (N) 0 (-)
Harrisburg C-10	Assess the geology at the Foose Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	N	N	N	N	+	6 (+) 4 (N) 0 (-)
Harrisburg C-11	Assess the geology at the Hamilton School property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	+	N	N	+	+	8 (+) 2 (N) 0 (-)

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HarrisburgC-12	Assess the geology at the Harrisburg City Government Center and Police Department property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	+	N	N	+	+	8 (+) 2 (N) 0 (-)
HarrisburgC-13	Assess the geology at the Harrisburg City Public Works property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	N	+	+	N	N	+	N	6 (+) 4 (N) 0 (-)
HarrisburgC-14	Assess the geology at the Harrisburg City Fire Station 1 property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	N	N	N	N	+	6 (+) 4 (N) 0 (-)
HarrisburgC-15	Assess the geology at the Harrisburg City Fire Station 2 property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	+	N	N	+	+	8 (+) 2 (N) 0 (-)
HarrisburgC-16	Assess the geology at the Harrisburg City Fire Station 8 property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	+	N	N	N	+	7 (+) 3 (N) 0 (-)
HarrisburgC-17	Assess the geology at the Harrisburg Technical High School property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	N	+	+	N	N	+	N	6 (+) 4 (N) 0 (-)
HarrisburgC-18	Assess the geology at the John Harris High School property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	+	N	+	+	+	9 (+) 1 (N) 0 (-)
HarrisburgC-19	Assess the geology at the Harrisburg School District Administration Building property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	N	+	+	N	N	N	+	6 (+) 4 (N) 0 (-)
HarrisburgC-20	Assess the geology at the Marshall School property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	+	N	N	+	N	7 (+) 3 (N) 0 (-)
HarrisburgC-21	Assess the geology at the Melrose School property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	N	N	N	N	+	6 (+) 4 (N) 0 (-)
HarrisburgC-22	Assess the geology at the Paxton Fire Station historic property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	+	N	N	N	N	6 (+) 4 (N) 0 (-)
HarrisburgC-24	Assess the geology at the Riverside Fire Station historic property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	N	N	N	N	+	6 (+) 4 (N) 0 (-)

Initiative	Mitigation Action	Life Safety	Property Protection	Technical	Political	Legal	Environmental	Social	Administrative	Local Champion	Other Community Objectives	Total Score
Harrisburg C-25	Assess the geology at the Rowland Middle School property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	N	N	N	N	+	6 (+) 4 (N) 0 (-)
Harrisburg C-26	Assess the geology at the Scott Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	N	N	N	N	+	6 (+) 4 (N) 0 (-)
Harrisburg C-28	Determine options for protecting the following facilities from the possible inundation due to a failure of the Raystown Lake Dam: Downey Elementary School, Edgewater Psychiatric Center, Harrisburg City Government Center, Harrisburg City Police Station, Station 1 EMS.	+	+	+	+	+	+	N	N	+	+	8 (+) 2 (N) 0 (-)
Harrisburg C-29	Work with PennDOT to assess and improve the stormwater management infrastructure at Cameron and Maclay Streets, near the Maclay Street entrance to the Farm Show Complex.	+	N	+	+	+	N	+	N	+	+	7 (+) 3 (N) 0 (-)
Harrisburg C-30	Work with PennDOT to assess and improve the stormwater management infrastructure on the 1800 block of Derry Street.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
Harrisburg C-31	Work with PennDOT to assess and improve the stormwater management infrastructure along the 1400 block of Market Street.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
Harrisburg C-32	Assess and improve the stormwater management infrastructure at the intersection of 2nd and Geiger Streets.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
Harrisburg C-33	Assess and improve the stormwater management infrastructure at the intersection of Herr and Plum Streets.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
Harrisburg C-34	Work with PennDOT to study Cameron Street to identify measures to reduce transportation accidents.	+	+	+	+	+	+	+	+	N	N	8 (+) 2 (N) 0 (-)
Harrisburg C-35	Work with PennDOT to study Mulberry Street to identify measures to reduce transportation accidents.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
Harrisburg C-36	Work with PennDOT to study State Street to identify measures to reduce transportation accidents.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
Harrisburg C-37	Support Capital Region Water's Wastewater Arsenal Boulevard Sewer Improvements - Rehabilitation/replacement of approximately 2,500 LF of sewer collector pipe.	+	+	+	+	+	+	+	N	+	+	9 (+) 1 (N) 0 (-)

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HarrisburgC-38	Support Capital Region Water’s Stormwater SW Pond Retrofit – Bellevue Park Design - Employing green stormwater infrastructure (GSI) to manage stormwater runoff and prevent flows from entering the combined sewer system, thereby reducing combined sewer overflow (CSO) activity.	+	+	+	+	+	+	N	N	N	N	6 (+) 4 (N) 0 (-)
HarrisburgC-39	Support Capital Region Water’s Stormwater Camp Curtin YMCA GSI - Develop visible GSI improvements as part of the community center rehabilitation and beautification	+	+	+	+	+	+	N	+	N	N	7 (+) 3 (N) 0 (-)
HarrisburgC-40	Support Capital Region Water’s Stormwater COH East-West Multimodal Connector - GSI - Capture and manage stormwater in green stormwater elements designed to also serve as traffic calming elements.	+	+	+	+	+	+	N	+	N	N	7 (+) 3 (N) 0 (-)
HarrisburgC-41	Support Capital Region Water’s Wastewater (Combined, Sanitary & Storm) Collection System Rehabilitation - Rehabilitate priority defects to avoid failures using a variety of methods including conventional replacement and “trenchless” structural pipe lining procedures.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
HarrisburgC-42	Support Capital Region Water’s Stormwater South Allison Hill GSI - Capture and manage stormwater in green stormwater elements designed to also serve as traffic calming elements.	+	+	+	+	+	+	N	N	N	N	6 (+) 4 (N) 0 (-)
HarrisburgC-43	Work with PennDOT to study 19th Street to identify measures to reduce transportation accidents.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
HarrisburgC-4	Work with PennDOT to study 25th Street to identify measures to reduce transportation accidents.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
HarrisburgC-45	Work with PennDOT to study the intersection of 2nd and Geiger Streets to identify measures to reduce transportation accidents.	+	+	+	+	+	+	+	+	N	N	8 (+) 2 (N) 0 (-)
HarrisburgC-46	Work with PennDOT to study the intersection of Front and Forster Streets to identify measures to reduce transportation accidents.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
HarrisburgC-47	Work with PennDOT to study the intersection of Susquehanna and Riley Streets to identify measures to reduce transportation accidents.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
HarrisburgC-48	Implement the recommendations of the Harrisburg Authority’s ongoing combined sewer overflow impact study.	+	+	+	+	+	+	+	+	N	N	8 (+) 2 (N) 0 (-)
HighspireB-01	Protect the wastewater treatment plant to the 0.2 percent annual chance flood level.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)

Initiative	Mitigation Action	Life Safety	Property Protection	Technical	Political	Legal	Environmental	Social	Administrative	Local Champion	Other Community Objectives	Total Score
HighspireB-02	Protect the Highspire Fire Department station to the 0.2 percent annual chance flood level.	+	+	+	+	+	N	+	N	+	+	8 (+) 2 (N) 0 (-)
HighspireB-03	Assess the Highspire Fire Department property to determine the risk from wildfires and what vegetation needs to be cleared.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
HighspireB-04	Investigate the feasibility of installing flood gates and pumps to prevent the backup of flood waters in Highspire Borough.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
HummelstownB-01	Assess the geology at the Lower Dauphin School District campuses to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	N	+	N	N	N	N	+	5 (+) 5 (N) 0 (-)
HummelstownB-02	Assess the geology at the Hummelstown Borough Office to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	+	N	+	+	+	9 (+) 1 (N) 0 (-)
HummelstownB-03	Assess the geology at the Hummelstown Fire Department property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	+	N	N	N	+	7 (+) 3 (N) 0 (-)
HummelstownB-04	Assess the geology at the Nye Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	+	N	+	N	N	7 (+) 3 (N) 0 (-)
JacksonT-01	Assess the Jackson Township Building property to determine the risk from wildfires and what vegetation needs to be cleared.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
JeffersonT-01	Assess the Carsonville Fire Department property to determine the risk from wildfires and what vegetation needs to be cleared.	+	+	+	+	+	N	+	N	+	+	8 (+) 2 (N) 0 (-)
JeffersonT-02	Assess the Jefferson Township Municipal Office property to determine the risk from wildfires and what vegetation needs to be cleared.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
LondonderryT-01	Assess the Londonderry Fire Department property to determine the risk from wildfires and what vegetation needs to be cleared.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
LondonderryT-02	Assess the Londonderry Township Building property to determine the risk from wildfires and what vegetation needs to be cleared.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)

Initiative	Mitigation Action	Life Safety	Property Protection	Technical	Political	Legal	Environmental	Social	Administrative	Local Champion	Other Community Objectives	Total Score
LondonderryT-03	Assess the geology at the Derry Township Municipal Authority Southwest property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	+	N	N	N	N	6 (+) 4 (N) 0 (-)
LondonderryT-04	Replant Ash Trees that were lost to the Ash Borer and determine the best actions to prevent invasive species in the future	+	+	+	+	+	N	N	N	N	+	6 (+) 4 (N) 0 (-)
LondonderryT-05	Assess the geology at the Londonderry Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	+	N	N	+	N	7 (+) 3 (N) 0 (-)
LondonderryT-06	Install a backup power generator at the public works building.	+	+	+	+	+	+	N	N	N	N	6 (+) 4 (N) 0 (-)
LondonderryT-07	Work with PennDOT to study Colebrook Road to identify measures to reduce transportation accidents.	+	+	+	+	+	+	+	+	N	N	8 (+) 2 (N) 0 (-)
LondonderryT-08	Work with PennDOT to study Harrisburg Pike to identify measures to reduce transportation accidents.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
LondonderryT-09	Work with PennDOT to study Roundtop Road to identify measures to reduce transportation accidents.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
LondonderryT-10	Assess the geology at the Londonderry Fire Department property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	+	N	N	+	+	8 (+) 2 (N) 0 (-)
LondonderryT-11	Conewago Creek Stream Restoration - restore 1 mile of stream, remove approximately 125,000 cubic yards of sediment, and re-establish the historic floodplain of the creek.	N	+	+	+	+	+	+	N	+	+	8 (+) 2 (N) 0 (-)
LowerPaxtonT-01	Assess the Linglestown Middle School property to determine the risk from wildfires and what vegetation needs to be cleared.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
LowerPaxtonT-02	Assess the geology at the Linglestown Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	N	+	+	N	N	N	+	6 (+) 4 (N) 0 (-)
LowerPaxtonT-03	Install a backup power generator at the Central Dauphin School District transportation facility.	+	+	+	+	+	+	N	N	N	N	6 (+) 4 (N) 0 (-)

Initiative	Mitigation Action	Life Safety	Property Protection	Technical	Political	Legal	Environmental	Social	Administrative	Local Champion	Other Community Objectives	Total Score
LowerPaxtonT-04	Work with the owner/operator of the Colonial Park Care Center to upgrade its backup power capabilities.	+	+	+	+	+	N	+	N	+	+	8 (+) 2 (N) 0 (-)
LowerPaxtonT-05	Work with PennDOT to study Colonial Road to identify measures to reduce transportation accidents.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
LowerPaxtonT-06	Work with PennDOT to study Jonestown Road to identify measures to reduce transportation accidents.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
LowerPaxtonT-07	Work with PennDOT to study Linglestown Road to identify measures to reduce transportation accidents.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
LowerPaxtonT-08	Work with PennDOT to study Nyes Road to identify measures to reduce transportation accidents.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
LowerPaxtonT-09	Work with PennDOT to study Rutherford Road to identify measures to reduce transportation accidents.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
LowerPaxtonT-10	Work with PennDOT to study Union Deposit Road to identify measures to reduce transportation accidents.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
LowerSwataraT-01	Assess the geology at the Kunkel Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	+	N	N	+	+	8 (+) 2 (N) 0 (-)
LowerSwataraT-02	Assess the cause(s) of flooding of "The Flats" to identify feasible mitigation actions, and implement them.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
LowerSwataraT-03	Assess the geology at the Lower Swatara Township Building property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	N	N	+	+	+	8 (+) 2 (N) 0 (-)
LowerSwataraT-04	Assess the geology at the Lower Swatara Township Fire Department property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	+	N	+	+	+	9 (+) 1 (N) 0 (-)
LowerSwataraT-05	Assess the geology at the Middletown Area High School property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	+	N	N	N	N	6 (+) 4 (N) 0 (-)

Initiative	Mitigation Action	Life Safety	Property Protection	Technical	Political	Legal	Environmental	Social	Administrative	Local Champion	Other Community Objectives	Total Score
LowerSwataraT-06	Assess the geology at the Reid Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	N	+	+	+	+	N	N	N	N	+	5 (+) 5 (N) 0 (-)
LowerSwataraT-07	Protect the Farr Pump Station to at least the 0.2 percent annual chance flood level.	+	+	+	+	+	+	+	+	N	N	8 (+) 2 (N) 0 (-)
LowerSwataraT-08	Install a backup power generator at the Farr Pump Station.	+	+	+	+	+	N	N	N	N	+	6 (+) 4 (N) 0 (-)
LowerSwataraT-09	Install a backup power generator at the Jamesway Pump Station.	+	+	+	+	+	+	N	+	N	N	7 (+) 3 (N) 0 (-)
LowerSwataraT-10	Install a backup power generator at the North Union Street Pump Station.	+	+	+	+	+	+	N	N	N	N	6 (+) 4 (N) 0 (-)
Lykens B-01	Protect the Lykens Borough Office to at least the 0.2 percent chance flood level	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
Lykens B-02	Protect the Lykens Borough Authority WWTP to at least the 0.2 percent chance flood level	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
Lykens B-03	Assess the Lykens Fire Department property to determine the risk from wildfires and what vegetation needs to be cleared.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
Lykens B-04	Assess the Lykens Borough Office property to determine the risk from wildfires and what vegetation needs to be cleared.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
Lykens B-05	Assess the Lykens Borough Authority WWTP property to determine the risk from wildfires and what vegetation needs to be cleared.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
Lykens B-06	Identify sections of banks of waterways that need to be stabilized, and design and implement the stabilization .	+	+	+	+	+	+	+	+	N	N	8 (+) 2 (N) 0 (-)
Lykens T-01*	Assess the Bridge in Lykens Township No. 1 historic site to determine the risk from wildfires and what vegetation needs to be cleared.	+	N	+	+	+	N	+	N	+	+	7 (+) 3 (N) 0 (-)

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Lykens T-02*	Work with PennDOT to study North Crossroads Road to identify measures to reduce transportation accidents.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
Middle Paxton T-01	Work with PennDOT to study Peters Mountain Road to identify measures to reduce transportation accidents.	+	+	+	+	+	N	+	N	+	+	8 (+) 2 (N) 0 (-)
Middle Paxton T-02	Assess the Dauphin-Middle Paxton Municipal Office property to determine the risk from wildfires and what vegetation needs to be cleared.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
Middle Paxton T-03	Assess the Middle Paxton Elementary School property to determine the risk from wildfires and what vegetation needs to be cleared.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
Middle Paxton T-04	Work with the owners/operators of privately-owned critical facilities in the area subject to inundation due to a failure of the DeHart Dam to discuss their risk of flooding and protective measures they can take.	+	+	+	+	+	N	+	N	+	+	8 (+) 2 (N) 0 (-)
Middletown B-01	Install a generator at the Borough Hall building	+	+	+	+	+	N	N	N	N	+	6 (+) 4 (N) 0 (-)
Middletown B-02	Assess the geology at the Fink Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	N	N	N	N	+	6 (+) 4 (N) 0 (-)
Middletown B-03	Work with PennDOT to study Main Street/Harrisburg Pike to identify measures to reduce transportation accidents.	+	+	+	+	+	+	+	+	N	N	8 (+) 2 (N) 0 (-)
Middletown B-04	Protect the Mill Street electrical substation to the 0.2 percent annual chance flood level.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
Middletown B-05	Work with Suez to assess the Middletown Wastewater Plant property to determine the risk from wildfires and what vegetation needs to be cleared.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
Middletown B-06	Assess the geology at the Middletown Borough Building property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	+	N	N	N	N	6 (+) 4 (N) 0 (-)
Middletown B-07	Assess the geology at the Middletown Fire Department property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	N	N	N	N	+	6 (+) 4 (N) 0 (-)

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MiddletownB-08	Assess the geology at the Middletown Police Department property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	N	N	N	N	+	6 (+) 4 (N) 0 (-)
MiddletownB-09	Work with Suez to assess the geology at the Middletown Wastewater Plant property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	+	N	N	N	N	6 (+) 4 (N) 0 (-)
MillersburgB-01	Identify sections of banks of waterways that need to be stabilized, and design and implement the stabilization.	+	+	+	+	+	+	+	+	N	N	8 (+) 2 (N) 0 (-)
MillersburgB-02	Assess the Millersburg Borough Office property to determine the risk from wildfires and what vegetation needs to be cleared.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
MillersburgB-03	Assess the Millersburg Fire Station property to determine the risk from wildfires and what vegetation needs to be cleared.	+	+	+	+	+	+	+	+	N	N	8 (+) 2 (N) 0 (-)
MillersburgB-04	Floodproof the Welcome Center along the Susquehanna River	+	N	+	+	+	N	N	N	N	+	5 (+) 5 (N) 0 (-)
PaxtangB-01	Protect the Paxtang Borough Office/Fire Station to at least the 0.2 percent annual chance flood level.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
PaxtangB-02	Assess the geology at the Paxtang Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	N	N	N	+	+	7 (+) 3 (N) 0 (-)
PaxtangB-03	Assess the geology at the Paxtang Borough Office property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	+	N	+	N	N	7 (+) 3 (N) 0 (-)
PenbrookB-01	Assess the geology at the Penbrook Borough Office property to determine if mitigation measures are necessary, and to implement them if they are.	N	N	+	+	+	+	N	N	+	+	6 (+) 4 (N) 0 (-)
PenbrookB-02	Assess the geology at the Penbrook Fire Department property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	N	N	N	N	+	6 (+) 4 (N) 0 (-)
PenbrookB-03	Install a backup power generator at the public works building.	+	+	+	+	+	N	N	N	+	+	7 (+) 3 (N) 0 (-)

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PenbrookB-04	Install a backup power generator at the Citizen's Fire Company #1 station.	+	+	+	+	+	N	N	N	+	+	7 (+) 3 (N) 0 (-)
PenbrookB-05	Assess the stormwater management infrastructure throughout the borough and determine what upgrades need to be made.	+	+	+	+	+	N	N	N	N	+	6 (+) 4 (N) 0 (-)
PillowB-01	Assess the Pillow Borough Building property to determine the risk from wildfires and what vegetation needs to be cleared.	N	+	+	+	+	N	+	N	N	+	6 (+) 4 (N) 0 (-)
PillowB-02	Assess the Pillow Fire Department property to determine the risk from wildfires and what vegetation needs to be cleared.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
PillowB-03	Install a backup power generator at the Pillow Borough municipal building.	+	+	+	+	+	N	N	N	N	+	6 (+) 4 (N) 0 (-)
PillowB-04	Install a backup power generator at the Pillow Fire Department station.	+	+	+	+	+	N	N	N	N	+	6 (+) 4 (N) 0 (-)
PillowB-05	Determine appropriate measures for preventing injuries at blighted properties	+	+	+	+	+	N	N	N	N	+	6 (+) 4 (N) 0 (-)
PillowB-06	Install a backup power generator at Well 5.	+	N	+	+	+	N	N	N	N	+	5 (+) 5 (N) 0 (-)
PillowB-07	Install a backup power generator at Well 6.	+	+	+	+	+	+	N	N	N	+	7 (+) 3 (N) 0 (-)
PillowB-08	Upgrade fire department radios to be interoperable between Dauphin and Northumberland Counties.	+	+	+	+	+	N	N	N	N	+	6 (+) 4 (N) 0 (-)
PillowB-09	Work with the Pillow Historical Society and PPL to determine options to prevent power outages and damage to the water treatment building, and implement the most appropriate one.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
PillowB-10	Work with PennDOT to improve drainage on PA-225 to prevent ponding water.	+	+	+	+	+	N	+	N	+	+	8 (+) 2 (N) 0 (-)

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PillowB -11	Map the borough's water infrastructure.	+	+	+	+	+	+	N	+	N	N	7 (+) 3 (N) 0 (-)
PillowB -12	Analyze the intersection and develop solutions to reduce speeding on PA-225, and implement the most appropriate one.	+	+	+	+	+	+	+	+	N	N	8 (+) 2 (N) 0 (-)
PillowB -13	Develop an evacuation and sheltering plan for Pillow Borough.	+	+	+	+	+	N	N	N	N	+	6 (+) 4 (N) 0 (-)
PillowB -14	Installation of new water lines and improve the water infrastructure.	+	+	+	+	+	+	N	+	N	N	7 (+) 3 (N) 0 (-)
PillowB -15	Enclose Well 5 infrastructure in a shelter.	+	+	+	+	+	N	N	N	N	+	6 (+) 4 (N) 0 (-)
ReedT-01	Protect the Bridge in Reed Township historic site to at least the 0.2 percent annual chance flood level.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
ReedT-02	Assess the Reed Township Municipal Building property to determine the risk from wildfires and what vegetation needs to be cleared.	N	+	+	+	+	N	+	N	N	+	6 (+) 4 (N) 0 (-)
ReedT-03	Work with PennDOT to study South River Road to identify measures to reduce transportation accidents.	+	+	+	+	+	+	+	+	N	N	8 (+) 2 (N) 0 (-)
RoyaltonB-01	Protect the Edgewater Pump Station to at least the 0.2 percent annual chance flood level.	+	+	+	+	+	+	+	N	+	+	9 (+) 1 (N) 0 (-)
RoyaltonB-02	Develop a plan with emergency services to assist the borough if chemical containers from Univar float down stream	+	+	+	+	+	N	N	N	N	+	6 (+) 4 (N) 0 (-)
RoyaltonB-03	Upgrade safety features at the Water Street Pump Station to include raising of mechanical controls and back up power.	+	+	+	+	+	+	N	N	N	N	6 (+) 4 (N) 0 (-)
RoyaltonB-04	Provide assistance to remove built up debris from around bridge pillars	+	+	+	+	+	+	N	N	+	+	8 (+) 2 (N) 0 (-)

Initiative	Mitigation Action	Life Safety	Property Protection	Technical	Political	Legal	Environmental	Social	Administrative	Local Champion	Other Community Objectives	Total Score
RoyaltonB-05	Phase 2 Royalton Canal Improvement Project to mitigate localized flooding.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
RoyaltonB-06	Structural assessment and reinforcement of Edgewater Development retaining wall.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
RushT-01*	Assess the Rush Township Municipal Office property to determine the risk from wildfires and what vegetation needs to be cleared.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
RushT-02*	Work with PennDOT to study Gold Mine Road to identify measures to reduce transportation accidents.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
RushT-03*	Coordinate with the DCNR Fire Forester for Dauphin County on the potential construction of a fire- break at the appropriate location on the south side of Peters Mountain along Route 325.	+	+	+	+	+	+	N	N	N	N	6 (+) 4 (N) 0 (-)
SouthHanoverT-01	Work with PennDOT to study Grandview Drive to identify measures to reduce transportation accidents.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
SouthHanoverT-02	Work with PennDOT to study Union Deposit Road to identify measures to reduce transportation accidents.	+	+	+	+	+	+	+	N	+	+	9 (+) 1 (N) 0 (-)
SteeltonB-01	Assess the geology at the Steelton Fire Department property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	N	N	N	N	+	6 (+) 4 (N) 0 (-)
SteeltonB-02	Work with PA American Water to protect the Steelton Water Filtration Plant to at least the 0.2 percent annual chance flood level.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
SteeltonB-03	Install a backup power generator at the Steelton Highway Garage.	+	N	+	+	+	N	N	N	N	+	5 (+) 5 (N) 0 (-)
SteeltonB-04	Work with PA American Water to install a backup power generator at the sewer pump stations.	+	+	+	+	+	N	N	N	N	+	6 (+) 4 (N) 0 (-)
SteeltonB-05	Install a backup power generator at the Steelton Borough Building.	+	+	+	+	+	N	N	N	N	+	6 (+) 4 (N) 0 (-)

Initiative	Mitigation Action	Life Safety	Property Protection	Technical	Political	Legal	Environmental	Social	Administrative	Local Champion	Other Community Objectives	Total Score
Steelton B-06	Renovate or demolish vacant structures that were damaged by fire and are at risk of collapse.	+	+	+	+	+	N	N	N	N	+	6 (+) 4 (N) 0 (-)
Steelton B-07	Assess the flooding problem along South Front Street near the quarry to identify feasible mitigation actions, and implement them.	+	+	+	+	+	N	+	N	+	+	8 (+) 2 (N) 0 (-)
Steelton B-08	Assess the geology at the Steelton Borough office property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	N	N	N	N	+	6 (+) 4 (N) 0 (-)
Steelton B-09	Work with PA American Water to assess the geology at the Steelton Water Filtration Plant property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	+	N	+	N	N	7 (+) 3 (N) 0 (-)
SusquehannaT-01	Assess the Susquehanna Township Administration Building property to determine the risk from wildfires and what vegetation needs to be cleared.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
SusquehannaT-02	Assess the Thomas Holtzman Elementary School property to determine the risk from wildfires and what vegetation needs to be cleared.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
SusquehannaT-03	Assess the geology at the Susquehanna Township Administration Building property to determine if mitigation measures are necessary, and to implement them if they are.	N	+	+	+	+	N	N	N	N	+	5 (+) 5 (N) 0 (-)
SusquehannaT-04	Assess the geology at the Susquehanna Township High School property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	+	N	+	N	N	7 (+) 3 (N) 0 (-)
SusquehannaT-05	Assess the geology at the Thomas Holtzman Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	+	N	N	N	N	6 (+) 4 (N) 0 (-)
SusquehannaT-06	Work with PennDOT to study Progress Avenue to identify measures to reduce transportation accidents.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
SusquehannaT-07	Assess the flooding problem along the canal bed to identify feasible mitigation actions, and implement them.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
SusquehannaT-08	Work with PennDOT to assess the flooding problem along Front Street to identify feasible mitigation actions, and implement them.	+	+	+	+	+	+	+	+	N	N	8 (+) 2 (N) 0 (-)

Initiative	Mitigation Action	Life Safety	Property Protection	Technical	Political	Legal	Environmental	Social	Administrative	Local Champion	Other Community Objectives	Total Score
SusquehannaT-09	Work with PennDOT to assess the flooding problem along the 3600 block of Elmerton Avenue to identify feasible mitigation actions, and implement them.	+	+	+	+	+	+	+	N	+	+	9 (+) 1 (N) 0 (-)
SusquehannaT-10	Work with PennDOT to improve drainage to reduce flooding at Penn Street and Estherton Avenue	+	+	+	+	+	N	+	N	+	+	8 (+) 2 (N) 0 (-)
SusquehannaT-11	Work with PennDOT to assess the flooding problem along Paxton Church Road to identify feasible mitigation actions, and implement them.	+	+	+	+	+	N	+	N	+	+	8 (+) 2 (N) 0 (-)
SusquehannaT-12	Assess and improve drainage near the Latshmere Swim Club.	+	+	+	+	+	+	+	+	N	N	8 (+) 2 (N) 0 (-)
SusquehannaT-13	Assess and improve drainage off the mountain to reduce flooding on Red Road and Roberts Valley Road.	+	+	+	+	+	+	+	N	+	+	9 (+) 1 (N) 0 (-)
SusquehannaT-14	Assess the geology at the Londonderry School property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	+	N	N	+	+	8 (+) 2 (N) 0 (-)
SusquehannaT-15	Assess the geology at the Progress Fire Department property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	N	N	N	N	+	6 (+) 4 (N) 0 (-)
SusquehannaT-16	Separate stormwater and sanitary sewer in Ward 1 (Front Street corridor).	+	+	+	+	+	+	+	+	N	N	8 (+) 2 (N) 0 (-)
SusquehannaT-17	Work with PennDOT to upgrade stormwater infrastructure on Paxton Church Road and Elmwood Drive	+	+	+	+	+	+	+	N	+	+	9 (+) 1 (N) 0 (-)
SusquehannaT-18	Upgrade stormwater infrastructure on Maple Lane	+	+	+	+	+	+	+	N	+	+	9 (+) 1 (N) 0 (-)
SusquehannaT-19	Upgrade stormwater infrastructure on 36th Street in the area of Morton Drive.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
SusquehannaT-20	Work with PennDOT to upgrade stormwater infrastructure along State Farm Road where it meets Carter and Locust.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)

Initiative	Mitigation Action	Life Safety	Property Protection	Technical	Political	Legal	Environmental	Social	Administrative	Local Champion	Other Community Objectives	Total Score
SusquehannaT-21	Assess the geology at the Sara Lindemuth Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	N	N	N	+	+	7 (+) 3 (N) 0 (-)
SusquehannaT-22	Assess the geology at the Susquehanna Middle School property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	N	N	N	N	+	6 (+) 4 (N) 0 (-)
SusquehannaT-23	Assess the geology at the Susquehanna Township EMS station property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	N	N	N	N	+	6 (+) 4 (N) 0 (-)
SusquehannaT-24	Assess the property of the Rescue Fire Department Station 1 to determine the risk from wildfires and what vegetation needs to be cleared.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
Swatara T-01	Protect the Swatara Township Authority WPCF to at least the 0.2 percent annual chance flood level.	+	+	+	+	+	+	+	+	N	N	8 (+) 2 (N) 0 (-)
Swatara T-02	Assess the geology at the Bressler fire station property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	N	N	N	N	+	6 (+) 4 (N) 0 (-)
Swatara T-03	Work with Capital Region Water to protect the Harrisburg Advanced Wastewater facility to at least the 0.2 percent annual chance flood level.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
Swatara T-04	Work with PennDOT to study Derry Street to identify measures to reduce transportation accidents.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
Swatara T-05	Work with PennDOT to study Eisenhower Boulevard to identify measures to reduce transportation accidents.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
Swatara T-06	Work with PennDOT to study Harrisburg Street to identify measures to reduce transportation accidents.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
Swatara T-07	Work with PennDOT to study Paxton Street to identify measures to reduce transportation accidents.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
Swatara T-08	Work with the owner/operator of Paxton Ministries to protect the facility from current and future sinkholes.	N	+	+	+	+	N	+	N	N	+	6 (+) 4 (N) 0 (-)

Initiative	Mitigation Action	Life Safety	Property Protection	Technical	Political	Legal	Environmental	Social	Administrative	Local Champion	Other Community Objectives	Total Score
Swatara T-09	Work with PennDOT to study the intersection of Paxton Street and Sycamore Street to identify measures to reduce transportation accidents.	+	+	+	+	+	+	+	N	+	+	9 (+) 1 (N) 0 (-)
Swatara T-10	Assess the geology at the Lawnton fire station property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	+	N	N	+	+	8 (+) 2 (N) 0 (-)
Swatara T-11	Assess the geology at the Station 1-2 property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	N	N	N	N	+	6 (+) 4 (N) 0 (-)
Swatara T-12	Assess the geology at the Steelton-Highspire Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	N	N	N	N	+	6 (+) 4 (N) 0 (-)
Swatara T-13	Assess the geology at the Steelton-Highspire High School property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	+	N	+	N	N	7 (+) 3 (N) 0 (-)
Swatara T-14	Assess the geology at the Swatara Middle School property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	+	N	+	N	N	7 (+) 3 (N) 0 (-)
Swatara T-15	Work with the owner/operator of the Paxton Place senior living apartments to install a backup power generator.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
Swatara T-16	Assess the geology at the Swatara Township Building property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	N	N	N	N	+	6 (+) 4 (N) 0 (-)
Swatara T-17	Assess the geology at the Swatara Township Fire Department property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	+	N	+	N	N	7 (+) 3 (N) 0 (-)
Swatara T-18	Develop a plan for replacing the Derry Street Bridge over Spring Creek.	+	+	+	+	+	+	N	+	N	N	7 (+) 3 (N) 0 (-)
UpperPaxtonT-01	Assess the Lenkerville Elementary School property to determine the risk from wildfires and what vegetation needs to be cleared.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
UpperPaxtonT-02	Assess the Millersburg Area Authority - Water Plant property to determine the risk from wildfires and what vegetation needs to be cleared.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)

Initiative	Mitigation Action	Life Safety	Property Protection	Technical	Political	Legal	Environmental	Social	Administrative	Local Champion	Other Community Objectives	Total Score
UpperPaxtonT-03	Assess the Millersburg Area Senior Center property to determine the risk from wildfires and what vegetation needs to be cleared.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
UpperPaxtonT-04	Assess the Millersburg Borough Water System wastewater facility property to determine the risk from wildfires and what vegetation needs to be cleared.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
UpperPaxtonT-05	Assess the Millersburg Area Ambulance Association property to determine the risk from wildfires and what vegetation needs to be cleared.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
UpperPaxtonT-06	Assess the Upper Paxton Township Building property to determine the risk from wildfires and what vegetation needs to be cleared.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
UpperPaxtonT-07	Protect the Millersburg Area Authority Well 10 & 11 Potable Water facility to at least the 0.2 percent annual chance flood level.	+	+	+	+	+	+	+	N	+	+	9 (+) 1 (N) 0 (-)
UpperPaxtonT-08	Upgrade the backup power generator at Lenkerville Elementary School.	+	+	+	+	+	N	N	N	N	+	6 (+) 4 (N) 0 (-)
UpperPaxtonT-09	Assess the flooding problem in Lenkerville along the Wiconisco Creek to identify feasible mitigation actions, and implement them.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
UpperPaxtonT-10	Assess the flooding problem on River Street to identify feasible mitigation actions, and implement them.	+	+	+	+	+	+	+	+	N	N	8 (+) 2 (N) 0 (-)
UpperPaxtonT-11	Work with PennDOT to protect PA-147 north of Millersburg Borough from landslides.	+	+	+	+	+	+	+	+	N	N	8 (+) 2 (N) 0 (-)
WashingtonT-01	Work with the Dauphin Meadows Landfill to assess the property to determine the risk from wildfires and what vegetation needs to be cleared.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
WashingtonT-02	Assess the Upper Dauphin High School property to determine the risk from wildfires and what vegetation needs to be cleared.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
WashingtonT-03	Assess the Upper Dauphin Middle School property to determine the risk from wildfires and what vegetation needs to be cleared.	+	+	+	+	+	N	+	N	+	N	7 (+) 3 (N) 0 (-)

Initiative	Mitigation Action	Life Safety	Property Protection	Technical	Political	Legal	Environmental	Social	Administrative	Local Champion	Other Community Objectives	Total Score
WashingtonT-04	Assess the Washington Township Building property to determine the risk from wildfires and what vegetation needs to be cleared.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
Wayne T-01	Assess the Wayne Township Building property to determine the risk from wildfires and what vegetation needs to be cleared.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
WestHanoverT-01	Assess the West Hanover Township Public Works Building on Walnut Ave property to determine the risk from wildfires and what vegetation needs to be cleared.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
WestHanoverT-02	Assess the West Hanover Township Fire Department Station 3 property to determine the risk from wildfires and what vegetation needs to be cleared.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
WestHanoverT-03	Assess the geology at the West Hanover Township Water and Sewer property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	N	N	N	N	+	6 (+) 4 (N) 0 (-)
WestHanoverT-04	Work with PennDOT to study Hershey Road to identify measures to reduce transportation accidents.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)
WestHanoverT-05	Work with PennDOT to study Linglestown Road to identify measures to reduce transportation accidents.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
WiconiscoT-01	Assess the geology at the Wiconisco Township Fire Department property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	N	N	N	+	+	7 (+) 3 (N) 0 (-)
WiconiscoT-02	Assess the topography around the Wiconisco Township WWTP to determine if mitigation measures are necessary, and to implement those measures if they are.	+	+	+	+	+	+	N	N	N	N	6 (+) 4 (N) 0 (-)
WiconiscoT-03	Protect the Wiconisco Township Municipal Office at 305 Walnut Street to at least the 0.2 percent annual chance flood level.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
WiconiscoT-04	Assess the geology at the Wiconisco Township building property to determine if mitigation measures are necessary, and to implement them if they are.	+	N	+	+	+	+	N	N	+	+	7 (+) 3 (N) 0 (-)
WiconiscoT-05	Assess the Wiconisco Township Office property on Arch Street to determine the risk from wildfires and what vegetation needs to be cleared.	+	+	+	+	+	+	+	N	N	N	7 (+) 3 (N) 0 (-)

Initiative	Mitigation Action	Life Safety	Property Protection	Technical	Political	Legal	Environmental	Social	Administrative	Local Champion	Other Community Objectives	Total Score
WiconiscoT-06	Assess the Wiconisco Township Fire Department property to determine the risk from wildfires and what vegetation needs to be cleared.	N	+	+	+	+	N	+	N	+	+	7 (+) 3 (N) 0 (-)
WiconiscoT-07	Assess the Wiconisco Township Municipal Building property on Walnut Street to determine the risk from wildfires and what vegetation needs to be cleared.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
WiconiscoT-08	Assess the geology at the Wiconisco Township Police Department property to determine if mitigation measures are necessary, and to implement them if they are.	N	+	+	+	+	N	N	N	N	+	5 (+) 5 (N) 0 (-)
WiconiscoT-09	Assess the geology at the Wiconisco Township WWTP property to determine if mitigation measures are necessary, and to implement them if they are.	+	+	+	+	+	+	N	N	N	N	6 (+) 4 (N) 0 (-)
WilliamsT-01*	Assess the Williams Township Office property to determine the risk from wildfires and what vegetation needs to be cleared.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
WilliamsT-02*	Assess the Williams Valley High School property on Walnut Street to determine the risk from wildfires and what vegetation needs to be cleared.	+	+	+	N	N	+	+	N	N	+	6 (+) 4 (N) 0 (-)
WilliamsT-03*	Work with PennDOT to study Market Street to identify measures to reduce transportation accidents.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)
WilliamstownB-01*	Assess the Williamstown Fire Department property to determine the risk from wildfires and what vegetation needs to be cleared.	+	+	+	+	+	+	+	+	N	N	8 (+) 2 (N) 0 (-)
WilliamstownB-02*	Protect the Williamstown EMS Station to at least the 0.2 percent annual chance flood level.	+	+	+	+	+	N	+	N	N	+	7 (+) 3 (N) 0 (-)

* Project is currently not eligible for FEMA mitigation funding. The municipality did not participate in the planning process.

6.4.3 Prioritization of Mitigation Actions

Actions that are deemed feasible (i.e., receive a positive evaluation score) were then compared and prioritized using another set of criteria (PEMA 2020):

- Effectiveness (20% of score) – The extent to which an action reduces the vulnerability of people and property.
- Efficiency (30% of score) – The extent to which time, effort, and cost is well used as a means of reducing vulnerability. This criterion assesses the benefits of an action versus the cost of the action's implementation.
- Multi-Hazard Mitigation (20% of score) – The action reduces vulnerability for more than one hazard.
- Addresses High-Risk Hazard (15% of score) – The action reduces vulnerability for people and property from a hazard(s) identified as high-risk.
- Addresses Critical Communications/Critical Infrastructure (15% of score) – The action pertains to the maintenance of critical functions and structures such as transportation, supply chain management, data circuits, etc.

Scores in each criterion range from 0 to 3. The action's priority is determined by using a formula based on the criteria values and weights. Priority values range from 0 to 3 as well. An action's priority is then determined using the following scale (PEMA 2020):

- Low priority = 0 – 1.8
- Medium priority = 1.9 – 2.4
- High priority = 2.5 – 3

Table 6-6 shows the prioritization scores for the identified, feasible mitigation actions. Municipal officials reviewed and updated the prioritization values based on local needs.

Table 6-6. Prioritization Scoring of Mitigation Actions

Initiative	Mitigation Action	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High-Risk Hazard	Addresses Critical Communications/ Critical Infrastructure	Priority
DauphinC-01	Provide public outreach about hazards and protective measures people can take to protect themselves (e.g., receiving emergency alerts through South Central Alert) and their property.	2	2	3	2	1	Med.
DauphinC-02	Improve telecommunications infrastructure, including accessibility of high-speed Internet connectivity, throughout the county	2	3	2	3	3	High
DauphinC-03	Simplify and improve the model stormwater management ordinance in an effort to enhance enforcement and effectiveness of stormwater management practices	2	3	1	3	2	Med.
DauphinC-04	Educate the public about resources available to combat the opioid abuse/addiction.	2	2	2	3	3	Med.
DauphinC-05	Inform the owners/operators of facilities storing hazardous materials of the risks they face and what they can do to protect their facilities and operations.	3	3	1	3	3	High
DauphinC-06	Work with child care facility operators to discuss hazards they face and ensure their emergency plans address those hazards.	2	3	1	3	2	Med.
DauphinC-07	Assess the topography around the Lykens Tower Site, Mahantango Tower Site, Peters Mountain Tower Site, and Pillow Tower Site to determine if mitigation measures are necessary, and to implement those measures if they are.	3	3	1	3	3	High
DauphinC-08	Assess the following properties to determine the risk from wildfires and what vegetation needs to be cleared: Agriculture Building, Blue Mountain Tower Site, Conewago CWT Tower Site, Lower Swatara Tower Site, and Mahantango Tower Site	2	2	1	2	3	Med.
DauphinC-09	Determine options for protecting the following facilities from the possible inundation due to a failure of the Raystown Lake Dam: Admin Building, Bar Association, County Offices – 100 Chestnut Street, Court House, Fort Hunter Park, Harrisburg Tower Site, Lykens Tower Site, Superior Court, Veterans Building Tower Site	3	3	1	3	3	High
DauphinC-10	Determine options for protecting Dauphin County Bridge No. 23 from the inundation due to a failure of the DeHart Dam	2	3	2	3	3	High
DauphinC-11	Assess the geology at the following sites and determine if mitigation measures are necessary, and to implement them if they are: 333 Market Street Tower Site, Administration Building, Adult Probation, Assistance Office, Bar Association, Children and Youth, Conewago CWT Tower Site, Coroner's Office, County Offices – 100 Chestnut Street, Court House, Dauphin ECC Tower Site, Department of Public Safety, Harrisburg Tower Site, Judicial Center, Lower Swatara Tower Site, Market Street Tower Site, Prison, Recycling Center, Reservoir Park Tower Site, Superior Court, Veteran's Building Tower Site, and Work Release	2	2	1	3	3	Med.
DauphinC-12	Identify and provide incentives to recruit and retain volunteer firefighters.	3	2	1	3	1	Med.
DauphinC-13	Provide information to PEMA on the risks faced by each Commonwealth-owned critical facility in Dauphin County, so that PEMA can work with the Department of General Services to protect the facilities.	2	3	1	3	2	Med.
DauphinC-14	Work with PennDOT to improve Interstates -076 (PA Turnpike), -081, -083, and -283 to reduce accidents	2	3	1	3	2	Med.
DauphinC-15	Conduct a wildlands/forestry survey of forested areas, to identify strategies for mitigating the negative effects of invasive plant and insect species.	2	3	3	3	3	High

Initiative	Mitigation Action	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High-Risk Hazard	Addresses Critical Communications/ Critical Infrastructure	Priority
DauphinC-16	Construct another ingress/egress route for the Dauphin County Department of Public Safety, Schaffner Youth Center, Adult Probation facility, and Work Release Center	3	3	1	3	3	High
DauphinC-17	Install wet and dry hydrants to provide water supply for fire suppression.	2	3	1	3	3	Med.
DauphinC-18	Work with the owners/operators of privately-owned critical facilities in the special flood hazard area to discuss their risk of flooding and protective measures they can take.	2	2	1	3	1	Low
DauphinC-19	Work with the owners/operators of privately-owned critical facilities in the area subject to inundation due to a failure of the Raystown Lake Dam to discuss their risk of flooding and protective measures they can take.	2	2	2	3	1	Med.
DauphinC-20	Work with privately-owned critical facilities to assess the geology at their sites to determine if mitigation measures are necessary, and to implement them if they are.	3	3	1	3	1	Med.
DauphinC-21	Work with the owners/operators of the privately-owned critical facilities to determine the risk from wildfires and what vegetation needs to be cleared.	3	3	1	3	1	Med.
DauphinC-22	Assess the Dauphin County Bridge No. 23 historic site to determine the risk from wildfires and what vegetation needs to be cleared.	3	3	1	3	1	Med.
DauphinC-23	Protect the Dauphin County Bridge No. 23 historic site to at least the 0.2 percent chance flood level.	3	3	1	3	1	Med.
DauphinC-25	Work with the owners/operators of privately-owned critical facilities on steep slopes to study the topography of the property to determine if mitigation measures are necessary, and to implement those measures.	3	3	1	3	1	Med.
DauphinC-26	The county will assess their bridges to determine what measures can be taken to protect them to the 0.2 percent annual chance flood level	3	3	1	3	3	High
DauphinC-27	Assess the geology at the Area Agency on Aging property to determine if mitigation measures are necessary, and to implement them if they are.	3	3	1	3	3	High
DauphinC-28	Encourage homeowners, renters, and businesses to insure their properties against all hazards, including flood coverage under the National Flood Insurance Program (NFIP)	3	3	1	3	3	High
DauphinC-29	Clean debris from pillars at Grubb Street and Canal Street bridges	3	3	1	3	3	High
DauphinC-30	Install backup preventers in wastewater pipes to prevent basement flooding.	2	3	1	3	2	Med.
DauphinC-31	Elevate or acquire properties, including repetitive loss and severe repetitive loss properties, in flood prone areas.	3	3	1	3	1	Med.
DauphinC-32	Floodproof structures in flood prone areas.	3	3	1	3	3	High
DauphinC-33	Conduct a study for the Susquehanna River to determine the best option to address snakeheads, flathead catfish, and other invasive species	2	3	2	3	3	High
DauphinC-34	Develop a new Comprehensive Plan or amend an existing Comprehensive Plan to include an assessment and associated mapping of the municipality’s vulnerability to location-specific hazards and appropriate recommendations for the use of these hazard areas.	2	2	1	3	3	Med.

Initiative	Mitigation Action	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High-Risk Hazard	Addresses Critical Communications/ Critical Infrastructure	Priority
DauphinC-35	Develop a new Zoning Ordinance or revise an existing Zoning Ordinance to include separate zones or districts with appropriate development criteria for known hazard areas.	3	3	1	3	3	High
DauphinC-36	Develop a new Subdivision and Land Development Ordinance or revise an existing Subdivision and Land Development Ordinance to include municipal-specific, hazard mitigation-related development criteria and/or provisions for the mandatory use of conservation subdivision design principles in order to regulate the location and construction of buildings and other infrastructure in known hazard areas.	2	2	1	3	3	Med.
DauphinC-37	Revise existing zoning and/or subdivision and land development ordinances or adopt a separate, standalone ordinance to require the completion of subsurface investigations (i.e., borings, geo- physical surveys, and/or studies by a registered Professional Geologist) for all new subdivision and land development projects in known land subsidence hazard areas.	3	3	1	3	3	High
DauphinC-38	Update and implement a comprehensive water resources management plan that analyzes the County's existing water resources supply and evaluates the County's anticipated water use demand in an effort to identify suspected water supply shortages and potential new water supply sources.	2	2	1	3	3	Med.
DauphinC-39	Coordinate with the USGS, local watershed organizations, and/or the DCCD to increase the number of USGS and Integrated Flood Observing and Warning System (IFLOWS) rain and stream gauges in the County as a potential enhancement to the existing Susquehanna Flood Forecast and Warning System.	3	3	1	3	3	High
DauphinC-40	Work with municipalities to evaluate participation in the CRS and facilitate the preparation and submission of CRS applications.	3	3	1	3	3	High
DauphinC-41	Develop a technical proficiency at the municipal level for conducting post-disaster damage assessments and continue to regulate through local planning and zoning reconstruction activities to ensure compliance with NFIP substantial damage/ substantial improvement requirements.	2	2	1	3	3	Med.
DauphinC-42	Develop a technical proficiency at the municipal level for assisting local residents and business owners in applying for hazard mitigation and assistance funds and identifying cost beneficial hazard mitigation measures to be incorporated into reconstruction activities.	2	2	1	3	3	Med.
DauphinC-43	Investigate the feasibility of constructing a levee/floodwall system along Swatara Creek between East Main Street and the Pennsylvania Turnpike to minimize Middletown Borough's flood hazard potential.	3	2	1	3	1	Med.
DauphinC-44	Municipalities should continue to seek solutions to problem areas and obstructions identified in the April 2010 Countywide Act 167 Stormwater Management Plan.	2	3	1	3	2	Med.
DauphinC-45	Enroll in the Pennsylvania Firewise Communities Program through the DCNR Fire Forester for Dauphin County.	2	3	1	3	3	Med.
DauphinC-46	Encourage homeowners to test for radon and install radon mitigation systems, if needed.	3	3	1	3	1	Med.
DauphinC-47	Adopt the Radon Control Methods Appendix of the current, adopted edition of the International Residential Code to address radon in new construction.	3	3	1	3	3	High
DauphinC-48	Encourage municipalities to enter into an Intergovernmental Cooperation Agreement and Memorandum of Understanding with the Dauphin County Land Bank Authority as a way to address structures at risk from the impacts of natural and human-made hazards.	3	3	1	3	3	High
DauphinC-49	Increase the number of NOAA Weather Alert radios in public places across the County which currently do not have them (such as personal care homes) above and beyond what is required of the County by the NWS's Storm Ready Program.	2	2	1	3	3	Med.

Initiative	Mitigation Action	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High-Risk Hazard	Addresses Critical Communications/ Critical Infrastructure	Priority
DauphinC-50	Establish an alternate EOC location in the event the primary EOC must be evacuated. This facility should also be located outside of the Special Flood Hazard Area.	3	3	1	3	3	High
DauphinC-51	The Dauphin County Department of Information Technology will make natural and human-made hazard data available for municipal use.	2	2	1	3	3	Med.
DauphinC-52	Assess the EMS Station 12 property to determine the risk from wildfires and what vegetation needs to be cleared.						Med.
Berrysburg B-01	Install a backup power generator at the Berrysburg Borough municipal building.	2	2	1	3	3	Med.
Berrysburg B-02	Install a backup power generator at the Berrysburg & Community Fire Company station	3	3	1	3	3	High
Berrysburg B-03	Discuss with the owner/operator of critical facilities vulnerable to a hazardous materials release the risk and possible protective measures.	2	2	1	3	3	Med.
Conewago T-01	Protect Laurel Drive from the current and future sinkholes.	3	3	1	3	1	Med.
Conewago T-02	Work with PennDOT to improve Deodate Road to mitigate traffic accidents.	2	3	1	3	3	Med.
Conewago T-03	Work with PennDOT to improve Colebrook Road to mitigate traffic accidents	2	3	1	3	3	Med.
DauphinB-01	Assess conditions at the confluence of Stony Creek and the Susquehanna River to identify potential mitigation actions for nearby structures.	2	3	1	3	3	Med.
DauphinB-02	Assess the borough to identify potential mitigation actions to take to ensure access to/from the borough during floods of the Susquehanna River.	2	3	1	3	2	Med.
DauphinB-03	Install a generator at the Borough Building	2	2	1	3	1	Low
DauphinB-04	Determine what other critical facilities in the borough need generators and purchase/install them.	2	3	2	3	3	High
DauphinB-05	Develop and implement a stream maintenance program to clear debris from Stony Creek.	2	3	2	3	3	High
DauphinB-06	Assess critical facilities in the wildland-urban interface area to determine the risk from wildfires and what vegetation needs to be cleared.	3	3	1	3	1	Med.
DauphinB-07	Assess Hillside properties to determine the risk from wildfires and what vegetation needs to be cleared	3	3	2	3	3	High
DauphinB-08	Work with PennDOT to improve Claster Boulevard to reduce traffic accidents	2	3	1	3	3	Med.
DauphinB-09	Work with PennDOT to improve US-22/322 to mitigate traffic accidents	2	2	2	3	1	Med.
DerryT-01	Assess stormwater management infrastructure in the township to determine what improvements need to be made, then implement the improvements.	2	2	1	3	1	Low

Initiative	Mitigation Action	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High-Risk Hazard	Addresses Critical Communications/ Critical Infrastructure	Priority
DerryT-02	Work with PennDOT to assess the bridges over the Swatara Creek on PA-39 and PA-0743 to improve the ability to pass floodwaters under the bridges.	3	3	1	3	3	High
DerryT-03	Work with PennDOT to upgrade stormwater infrastructure on Hershey Park Drive.	3	3	2	3	3	High
DerryT-04	Upgrade stormwater infrastructure on Mae Street	3	3	2	3	3	High
DerryT-05	Upgrade stormwater infrastructure on Bull Frog Valley Road	2	2	2	3	3	Med.
DerryT-06	Upgrade stormwater infrastructure on Wilsonville Road	3	3	2	3	3	High
DerryT-07	Install a generator at the Derry Township Public Works building	2	2	1	3	3	Med.
DerryT-08	Assess the topography around the following structures to determine if mitigation measures are necessary, and to implement those measures if they are: Quarries of the Hummelstown Brownstone Company historic site and Derry Township LDFL Wastewater facility	1	1	1	3	1	Low
DerryT-09	Work with PennDOT to protect US-322 near PA-0743 from current and future sinkholes.	2	3	1	3	3	Med.
DerryT-10	Assess the geology at the Derry Township municipal offices to determine if mitigation measures are necessary, and to implement them if they are.	3	3	1	3	1	Med.
DerryT-11	Work with the Sheetz #351 to determine options for protecting the facility from the possible inundation from dam failure from the Hershey Dam	2	3	1	3	2	Med.
DerryT-12	Work with PennDOT to improve Elizabethtown Road to mitigate traffic accidents	2	2	1	3	3	Med.
DerryT-13	Work with PennDOT to improve Governor Road to mitigate traffic accidents	2	3	1	3	3	Med.
DerryT-14	Work with PennDOT to improve Middletown Road to mitigate traffic accidents	2	3	1	3	2	Med.
DerryT-15	Work with PennDOT to improve Waltonville Road to mitigate traffic accidents	2	3	2	3	3	High
DerryT-16	Assess the drainage and stormwater management infrastructure in the area of Hersheypark Drive and Walton Avenue to determine appropriate mitigation measures to reduce risk from flooding, and implement them.	2	2	2	3	2	Med.
East HanoverT-01	Work with PennDOT to improve drainage to reduce flooding along the 1100 block of Manada Bottom Road	3	3	1	3	3	High
East HanoverT-02	Work with PennDOT to eliminate highway flooding at intersection of PA-443 and Firehouse Road during heavy rainfalls.	2	2	1	3	1	Low
East HanoverT-03	Work with PennDOT to improve Mountain Road to mitigate traffic accidents	3	3	1	3	1	Med.
East HanoverT-04	Work with PennDOT to improve Laudermilch Road to mitigate traffic accidents	2	3	1	3	2	Med.
East HanoverT-05	Work with PennDOT to improve Sandbeach Road to mitigate traffic accidents	3	3	1	3	1	Med.

Initiative	Mitigation Action	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High-Risk Hazard	Addresses Critical Communications/ Critical Infrastructure	Priority
East HanoverT-06	Obtain warning system for residents from outside contractor to alert residents to hazardous materials incidents or other hazards	2	3	1	3	1	Med.
ElizabethvilleB-01	Determine the best option to prevent flooding of the borough building	2	3	2	3	3	High
ElizabethvilleB-02	Assess stormwater management infrastructure in the borough to determine what improvements need to be made to control runoff and reduce flooding.	2	2	1	3	3	Med.
ElizabethvilleB-03	Work with PennDOT to improve drainage of US-209 at Park Drive.	2	2	1	3	1	Low
ElizabethvilleB-04	Protect the Upper Dauphin County EMS station to the 0.2 percent annual chance flood level.	3	3	2	3	3	High
ElizabethvilleB-05	Assess the property of the Elizabethville Fire Station to determine the risk from wildfires and what vegetation needs to be cleared.	3	3	1	3	1	Med.
ElizabethvilleB-06	Install a backup power generator at the Elizabethville Borough building.	2	2	1	3	3	Med.
GratzB-01	Assess the property of the Gratz Borough Building to determine the risk from wildfires and what vegetation needs to be cleared.	3	3	1	3	3	High
GratzB-02	Assess the Gratz Fire Department station to determine the risk from wildfires and what vegetation needs to be cleared.	2	2	1	3	3	Med.
HalifaxB-01	Ensure that the borough has plans in place to continue operations if a hazardous materials release causes an evacuation of the Halifax Borough Office.	2	2	1	3	3	Med.
HalifaxB-02	Discuss with the US Postal Service that the Halifax Post Office is vulnerable to a hazardous materials release and possible protective measures.	2	3	1	3	1	Med.
HalifaxT-01	Protect the Halifax Area Water Authority Well #1 to the 0.2 percent annual chance flood event.	2	3	1	3	2	Med.
HalifaxT-02	Work with the property owner to protect the Legislative Route 1 Sycamore Allee historic site from flooding	2	3	1	3	3	Med.
HalifaxT-03	Assess the topography around the Halifax Area Water Authority Well #1 to determine if mitigation measures are necessary, and to implement those measures if they are	2	2	1	3	3	Med.
HalifaxT-04	Assess the following properties to determine the risk from wildfires and what vegetation needs to be cleared: Halifax Area Authority Sewer Plant, Halifax Area Water Authority Well #1, Halifax Area Authority Sewer Plant, and Halifax Township Municipal Building	3	3	2	3	2	High
HalifaxT-05	Work with PennDOT to improve Peters Mountain Road to mitigate traffic accidents	3	3	1	3	1	Med.
HalifaxT-06	Work with PennDOT to improve Powells Valley Road to mitigate traffic accidents	3	3	1	3	3	High
HalifaxT-07	Work with PennDOT to improve South River Road to mitigate traffic accidents	3	3	1	3	1	Med.

Initiative	Mitigation Action	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High-Risk Hazard	Addresses Critical Communications/ Critical Infrastructure	Priority
Harrisburg C-01	Renovate or demolish vacant structures that are at risk of collapse.	3	3	2	2	1	Med.
Harrisburg C-02	Protect the Downey Elementary School to at least the 0.2 percent chance flood level	2	3	1	3	3	Med.
Harrisburg C-03	Protect the Edgewater Psychiatric Center to at least the 0.2 percent chance flood level	2	3	1	3	3	Med.
Harrisburg C-04	Protect the Station 1 EMS facility to at least the 0.2 percent chance flood level	2	2	1	3	1	Low
Harrisburg C-05	Assess the geology at the Ben Franklin School property to determine if mitigation measures are necessary, and to implement them if they are.	2	2	2	3	3	Med.
Harrisburg C-06	Assess the geology at the Camp Curtin Fire Station historic site property to determine if mitigation measures are necessary, and to implement them if they are.	2	2	3	3	3	High
Harrisburg C-07	Assess the geology at the Camp Curtin Junior High School historic property to determine if mitigation measures are necessary, and to implement them if they are.	2	2	2	3	3	Med.
Harrisburg C-08	Assess the geology at the Downey Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	3	3	1	3	1	Med.
Harrisburg C-09	Assess the geology at the Edgewater Psychiatric Center property to determine if mitigation measures are necessary, and to implement them if they are.	2	2	2	3	3	Med.
Harrisburg C-10	Assess the geology at the Foose Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	3	3	1	3	3	High
Harrisburg C-11	Assess the geology at the Hamilton School property to determine if mitigation measures are necessary, and to implement them if they are.	3	3	2	3	3	High
Harrisburg C-12	Assess the geology at the Harrisburg City Government Center and Police Department property to determine if mitigation measures are necessary, and to implement them if they are.	3	3	2	3	3	High
Harrisburg C-13	Assess the geology at the Harrisburg City Public Works property to determine if mitigation measures are necessary, and to implement them if they are.	3	3	3	3	2	High
Harrisburg C-14	Assess the geology at the Harrisburg City Fire Station 1 property to determine if mitigation measures are necessary, and to implement them if they are.	3	3	1	3	1	Med.
Harrisburg C-15	Assess the geology at the Harrisburg City Fire Station 2 property to determine if mitigation measures are necessary, and to implement them if they are.	3	3	2	3	3	High
Harrisburg C-16	Assess the geology at the Harrisburg City Fire Station 8 property to determine if mitigation measures are necessary, and to implement them if they are.	3	3	1	3	3	High
Harrisburg C-17	Assess the geology at the Harrisburg Technical High School property to determine if mitigation measures are necessary, and to implement them if they are.	3	3	3	3	2	High
Harrisburg C-18	Assess the geology at the John Harris High School property to determine if mitigation measures are necessary, and to implement them if they are.	3	3	2	3	2	High
Harrisburg C-19	Assess the geology at the Harrisburg School District Administration Building property to determine if mitigation measures are necessary, and to implement them if they are.	2	3	3	3	3	High

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Harrisburg C-20	Assess the geology at the Marshall School property to determine if mitigation measures are necessary, and to implement them if they are.	2	3	3	3	2	High
Harrisburg C-21	Assess the geology at the Melrose School property to determine if mitigation measures are necessary, and to implement them if they are.	2	2	1	3	1	Low
Harrisburg C-22	Assess the geology at the Paxton Fire Station historic property to determine if mitigation measures are necessary, and to implement them if they are.	2	2	1	3	3	Med.
Harrisburg C-24	Assess the geology at the Riverside Fire Station historic property to determine if mitigation measures are necessary, and to implement them if they are.	3	3	1	3	1	Med.
Harrisburg C-25	Assess the geology at the Rowland Middle School property to determine if mitigation measures are necessary, and to implement them if they are.	3	3	1	3	3	High
Harrisburg C-26	Assess the geology at the Scott Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	3	3	1	3	1	Med.
Harrisburg C-28	Determine options for protecting the following facilities from the possible inundation due to a failure of the Raystown Lake Dam: Downey Elementary School, Edgewater Psychiatric Center, Harrisburg City Government Center, Harrisburg City Police Station, Station 1 EMS.	2	3	2	3	3	High
Harrisburg C-29	Work with PennDOT to assess and improve the stormwater management infrastructure at Cameron and Maclay Streets, near the Maclay Street entrance to the Farm Show Complex.	3	3	2	3	3	High
Harrisburg C-30	Work with PennDOT to assess and improve the stormwater management infrastructure on the 1800 block of Derry Street.	2	2	3	3	1	Med.
Harrisburg C-31	Work with PennDOT to assess and improve the stormwater management infrastructure along the 1400 block of Market Street.	3	3	1	3	1	Med.
Harrisburg C-32	Assess and improve the stormwater management infrastructure at the intersection of 2nd and Geiger Streets.	3	3	1	3	3	High
Harrisburg C-33	Assess and improve the stormwater management infrastructure at the intersection of Herr and Plum Streets.	2	2	2	3	1	Med.
Harrisburg C-34	Work with PennDOT to study Cameron Street to identify measures to reduce transportation accidents.	2	3	1	3	2	Med.
Harrisburg C-35	Work with PennDOT to study Mulberry Street to identify measures to reduce transportation accidents.	3	3	1	3	3	High
Harrisburg C-36	Work with PennDOT to study State Street to identify measures to reduce transportation accidents.	2	2	1	3	3	Med.
Harrisburg C-37	Support Capital Region Water's Wastewater Arsenal Boulevard Sewer Improvements - Rehabilitation/replacement of approximately 2,500 LF of sewer collector pipe.	3	3	2	3	1	High
Harrisburg C-38	Support Capital Region Water's Stormwater SW Pond Retrofit – Bellevue Park Design - Employing green stormwater infrastructure (GSI) to manage stormwater runoff and prevent flows from entering the combined sewer system, thereby reducing combined sewer overflow (CSO) activity.	2	2	1	3	3	Med.
Harrisburg C-39	Support Capital Region Water's Stormwater Camp Curtin YMCA GSI - Develop visible GSI improvements as part of the community center rehabilitation and beautification	2	3	1	3	2	Med.

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Harrisburg C-40	Support Capital Region Water's Stormwater COH East-West Multimodal Connector - GSI - Capture and manage stormwater in green stormwater elements designed to also serve as traffic calming elements.	2	3	1	3	2	Med.
Harrisburg C-41	Support Capital Region Water's Wastewater (Combined, Sanitary & Storm) Collection System Rehabilitation - Rehabilitate priority defects to avoid failures using a variety of methods including conventional replacement and "trenchless" structural pipe lining procedures.	2	2	1	3	1	Low
Harrisburg C-42	Support Capital Region Water's Stormwater South Allison Hill GSI - Capture and manage stormwater in green stormwater elements designed to also serve as traffic calming elements.	2	2	1	3	3	Med.
Harrisburg C-43	Work with PennDOT to study 19th Street to identify measures to reduce transportation accidents.	3	3	1	3	3	High
Harrisburg C-4	Work with PennDOT to study 25th Street to identify measures to reduce transportation accidents.	3	3	1	3	3	High
Harrisburg C-45	Work with PennDOT to study the intersection of 2nd and Geiger Streets to identify measures to reduce transportation accidents.	2	3	1	3	1	Med.
Harrisburg C-46	Work with PennDOT to study the intersection of Front and Forster Streets to identify measures to reduce transportation accidents.	3	3	1	3	1	Med.
Harrisburg C-47	Work with PennDOT to study the intersection of Susquehanna and Riley Streets to identify measures to reduce transportation accidents.	3	3	1	3	1	Med.
Harrisburg C-48	Implement the recommendations of the Harrisburg Authority's ongoing combined sewer overflow impact study.	2	3	1	3	2	Med.
HighspireB -01	Protect the wastewater treatment plant to the 0.2 percent annual chance flood level.	2	2	1	3	3	Med.
HighspireB -02	Protect the Highspire Fire Department station to the 0.2 percent annual chance flood level.	2	2	2	3	3	Med.
HighspireB -03	Assess the Highspire Fire Department property to determine the risk from wildfires and what vegetation needs to be cleared.	2	2	1	3	3	Med.
HighspireB -04	Investigate the feasibility of installing flood gates and pumps to prevent the backup of flood waters in Highspire Borough.	3	3	1	3	3	High
HummelstownB-01	Assess the geology at the Lower Dauphin School District campuses to determine if mitigation measures are necessary, and to implement them if they are.	2	3	2	2	1	Med.
HummelstownB-02	Assess the geology at the Hummelstown Borough Office to determine if mitigation measures are necessary, and to implement them if they are.	3	3	2	3	1	High
HummelstownB-03	Assess the geology at the Hummelstown Fire Department property to determine if mitigation measures are necessary, and to implement them if they are.	2	2	2	3	1	Med.
HummelstownB-04	Assess the geology at the Nye Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	2	3	1	3	3	Med.
JacksonT-01	Assess the Jackson Township Building property to determine the risk from wildfires and what vegetation needs to be cleared.	2	2	1	3	3	Med.

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JeffersonT-01	Assess the Carsonville Fire Department property to determine the risk from wildfires and what vegetation needs to be cleared.	2	2	2	3	3	Med.
JeffersonT-02	Assess the Jefferson Township Municipal Office property to determine the risk from wildfires and what vegetation needs to be cleared.	2	2	1	3	3	Med.
LondonderryT-01	Assess the Londonderry Fire Department property to determine the risk from wildfires and what vegetation needs to be cleared.	3	3	1	3	3	High
LondonderryT-02	Assess the Londonderry Township Building property to determine the risk from wildfires and what vegetation needs to be cleared.	3	3	1	3	3	High
LondonderryT-03	Assess the geology at the Derry Township Municipal Authority Southwest property to determine if mitigation measures are necessary, and to implement them if they are.	2	2	1	3	1	Low
LondonderryT-04	Replant Ash Trees that were lost to the Ash Borer and determine the best actions to prevent invasive species in the future	3	3	1	3	3	High
LondonderryT-05	Assess the geology at the Londonderry Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	2	3	2	2	1	Med.
LondonderryT-06	Install a backup power generator at the public works building.	2	2	1	3	3	Med.
LondonderryT-07	Work with PennDOT to study Colebrook Road to identify measures to reduce transportation accidents.	2	3	1	3	2	Med.
LondonderryT-08	Work with PennDOT to study Harrisburg Pike to identify measures to reduce transportation accidents.	2	2	1	3	3	Med.
LondonderryT-09	Work with PennDOT to study Roundtop Road to identify measures to reduce transportation accidents.	3	3	1	3	3	High
LondonderryT-10	Assess the geology at the Londonderry Fire Department property to determine if mitigation measures are necessary, and to implement them if they are.	3	3	2	2	1	Med.
LondonderryT-11	Conewago Creek Stream Restoration - restore 1 mile of stream, remove approximately 125,000 cubic yards of sediment, and re-establish the historic floodplain of the creek.	3	2	1	3	1	Med.
LowerPaxtonT-01	Assess the Linglestown Middle School property to determine the risk from wildfires and what vegetation needs to be cleared.	3	3	1	3	3	High
LowerPaxtonT-02	Assess the geology at the Linglestown Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	2	3	2	3	3	High
LowerPaxtonT-03	Install a backup power generator at the Central Dauphin School District transportation facility.	2	2	1	3	3	Med.
LowerPaxtonT-04	Work with the owner/operator of the Colonial Park Care Center to upgrade its backup power capabilities.	3	3	1	3	1	Med.
LowerPaxtonT-05	Work with PennDOT to study Colonial Road to identify measures to reduce transportation accidents.	3	3	1	3	3	High
LowerPaxtonT-06	Work with PennDOT to study Jonestown Road to identify measures to reduce transportation accidents.	2	2	1	3	3	Med.

Initiative	Mitigation Action	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High-Risk Hazard	Addresses Critical Communications/ Critical Infrastructure	Priority
LowerPaxtonT-07	Work with PennDOT to study Linglestown Road to identify measures to reduce transportation accidents.	2	2	1	3	3	Med.
LowerPaxtonT-08	Work with PennDOT to study Nyes Road to identify measures to reduce transportation accidents.	2	2	1	3	3	Med.
LowerPaxtonT-09	Work with PennDOT to study Rutherford Road to identify measures to reduce transportation accidents.	3	3	3	3	3	High
LowerPaxtonT-10	Work with PennDOT to study Union Deposit Road to identify measures to reduce transportation accidents.	3	3	1	3	3	High
LowerSwataraT-01	Assess the geology at the Kunkel Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	2	3	3	3	1	High
LowerSwataraT-02	Assess the cause(s) of flooding of "The Flats" to identify feasible mitigation actions, and implement them.	3	3	1	3	3	High
LowerSwataraT-03	Assess the geology at the Lower Swatara Township Building property to determine if mitigation measures are necessary, and to implement them if they are.	3	3	3	3	3	High
LowerSwataraT-04	Assess the geology at the Lower Swatara Township Fire Department property to determine if mitigation measures are necessary, and to implement them if they are.	2	3	3	3	3	High
LowerSwataraT-05	Assess the geology at the Middletown Area High School property to determine if mitigation measures are necessary, and to implement them if they are.	2	2	1	2	3	Med.
LowerSwataraT-06	Assess the geology at the Reid Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	2	2	1	2	3	Med.
LowerSwataraT-07	Protect the Farr Pump Station to at least the 0.2 percent annual chance flood level.	2	3	1	3	3	Med.
LowerSwataraT-08	Install a backup power generator at the Farr Pump Station.	3	3	1	3	1	Med.
LowerSwataraT-09	Install a backup power generator at the Jamesway Pump Station.	2	3	1	3	2	Med.
LowerSwataraT-10	Install a backup power generator at the North Union Street Pump Station.	2	2	1	3	3	Med.
LykensB-01	Protect the Lykens Borough Office to at least the 0.2 percent chance flood level	3	3	1	3	3	High
LykensB-02	Protect the Lykens Borough Authority WWTP to at least the 0.2 percent chance flood level	2	2	1	2	3	Med.
LykensB-03	Assess the Lykens Fire Department property to determine the risk from wildfires and what vegetation needs to be cleared.	3	3	1	3	3	High
LykensB-04	Assess the Lykens Borough Office property to determine the risk from wildfires and what vegetation needs to be cleared.	3	3	1	3	3	High
LykensB-05	Assess the Lykens Borough Authority WWTP property to determine the risk from wildfires and what vegetation needs to be cleared.	3	3	1	3	3	High

Initiative	Mitigation Action	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High-Risk Hazard	Addresses Critical Communications/ Critical Infrastructure	Priority
LykensB-06	Identify sections of banks of waterways that need to be stabilized, and design and implement the stabilization .						Med.
LykensT-01*	Assess the Bridge in Lykens Township No. 1 historic site to determine the risk from wildfires and what vegetation needs to be cleared.	3	3	1	3	3	High
LykensT-02*	Work with PennDOT to study North Crossroads Road to identify measures to reduce transportation accidents.	2	2	1	2	3	Med.
MiddlePaxtonT-01	Work with PennDOT to study Peters Mountain Road to identify measures to reduce transportation accidents.	3	3	1	3	1	Med.
MiddlePaxtonT-02	Assess the Dauphin-Middle Paxton Municipal Office property to determine the risk from wildfires and what vegetation needs to be cleared.	3	3	1	3	1	Med.
MiddlePaxtonT-03	Assess the Middle Paxton Elementary School property to determine the risk from wildfires and what vegetation needs to be cleared.	3	3	1	3	3	High
MiddlePaxtonT-04	Work with the owners/operators of privately-owned critical facilities in the area subject to inundation due to a failure of the DeHart Dam to discuss their risk of flooding and protective measures they can take.	3	3	1	3	1	Med.
MiddletownB-01	Install a generator at the Borough Hall building	3	3	1	3	1	Med.
MiddletownB-02	Assess the geology at the Fink Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	3	3	1	3	3	High
MiddletownB-03	Work with PennDOT to study Main Street/Harrisburg Pike to identify measures to reduce transportation accidents.	2	3	1	3	2	Med.
MiddletownB-04	Protect the Mill Street electrical substation to the 0.2 percent annual chance flood level.	2	2	1	3	3	Med.
MiddletownB-05	Work with Suez to assess the Middletown Wastewater Plant property to determine the risk from wildfires and what vegetation needs to be cleared.	3	3	1	3	3	High
MiddletownB-06	Assess the geology at the Middletown Borough Building property to determine if mitigation measures are necessary, and to implement them if they are.	2	2	1	2	3	Med.
MiddletownB-07	Assess the geology at the Middletown Fire Department property to determine if mitigation measures are necessary, and to implement them if they are.	3	3	1	3	3	High
MiddletownB-08	Assess the geology at the Middletown Police Department property to determine if mitigation measures are necessary, and to implement them if they are.	3	3	1	3	3	High
MiddletownB-09	Work with Suez to assess the geology at the Middletown Wastewater Plant property to determine if mitigation measures are necessary, and to implement them if they are.	2	2	1	2	3	Med.
MillersburgB-01	Identify sections of banks of waterways that need to be stabilized, and design and implement the stabilization.	2	3	1	3	3	Med.
MillersburgB-02	Assess the Millersburg Borough Office property to determine the risk from wildfires and what vegetation needs to be cleared.	3	3	1	3	3	High
MillersburgB-03	Assess the Millersburg Fire Station property to determine the risk from wildfires and what vegetation needs to be cleared.	2	3	1	3	2	Med.

Initiative	Mitigation Action	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High-Risk Hazard	Addresses Critical Communications/ Critical Infrastructure	Priority
Millersburg B-04	Floodproof the Welcome Center along the Susquehanna River	3	3	1	3	3	High
PaxtangB-01	Protect the Paxtang Borough Office/Fire Station to at least the 0.2 percent annual chance flood level.	3	3	1	3	3	High
PaxtangB-02	Assess the geology at the Paxtang Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	2	2	2	3	3	Med.
PaxtangB-03	Assess the geology at the Paxtang Borough Office property to determine if mitigation measures are necessary, and to implement them if they are.	2	3	1	3	3	Med.
PenbrookB-01	Assess the geology at the Penbrook Borough Office property to determine if mitigation measures are necessary, and to implement them if they are.	2	3	2	3	3	High
PenbrookB-02	Assess the geology at the Penbrook Fire Department property to determine if mitigation measures are necessary, and to implement them if they are.	3	3	1	3	1	Med.
PenbrookB-03	Install a backup power generator at the public works building.	3	3	2	3	3	High
PenbrookB-04	Install a backup power generator at the Citizen's Fire Company #1 station.	3	2	2	3	3	High
PenbrookB-05	Assess the stormwater management infrastructure throughout the borough and determine what upgrades need to be made.	2	2	2	3	2	Med.
PillowB-01	Assess the Pillow Borough Building property to determine the risk from wildfires and what vegetation needs to be cleared.	2	2	1	3	1	Low
PillowB-02	Assess the Pillow Fire Department property to determine the risk from wildfires and what vegetation needs to be cleared.	3	3	1	3	1	Med.
PillowB-03	Install a backup power generator at the Pillow Borough municipal building.	3	3	1	3	1	Med.
PillowB-04	Install a backup power generator at the Pillow Fire Department station.	3	3	1	3	1	Med.
PillowB-05	Determine appropriate measures for preventing injuries at blighted properties	2	2	1	3	1	Low
PillowB-06	Install a backup power generator at Well 5.	3	3	1	3	1	Med.
PillowB-07	Install a backup power generator at Well 6.	3	3	1	3	3	High
PillowB-08	Upgrade fire department radios to be interoperable between Dauphin and Northumberland Counties.	3	3	1	3	1	Med.
PillowB-09	Work with the Pillow Historical Society and PPL to determine options to prevent power outages and damage to the water treatment building, and implement the most appropriate one.	3	3	1	3	1	Med.
PillowB-10	Work with PennDOT to improve drainage on PA-225 to prevent ponding water.	2	2	2	3	3	Med.
PillowB-11	Map the borough's water infrastructure.	2	3	1	3	2	Med.
PillowB-12	Analyze the intersection and develop solutions to reduce speeding on PA-225, and implement the most appropriate one.	2	3	1	3	3	Med.
PillowB-13	Develop an evacuation and sheltering plan for Pillow Borough.	3	3	1	3	3	High
PillowB-14	Installation of new water lines and improve the water infrastructure.	2	3	1	3	2	Med.
PillowB-15	Enclose Well 5 infrastructure in a shelter.	3	3	1	3	1	Med.
ReedT-01	Protect the Bridge in Reed Township historic site to at least the 0.2 percent annual chance flood level.	3	3	1	3	1	Med.

Initiative	Mitigation Action	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High-Risk Hazard	Addresses Critical Communications/ Critical Infrastructure	Priority
ReedT-02	Assess the Reed Township Municipal Building property to determine the risk from wildfires and what vegetation needs to be cleared.	2	2	1	3	1	Low
ReedT-03	Work with PennDOT to study South River Road to identify measures to reduce transportation accidents.	2	3	1	3	3	Med.
RoyaltonB-01	Protect the Edgewater Pump Station to at least the 0.2 percent annual chance flood level.	3	3	2	3	3	High
RoyaltonB-02	Develop a plan with emergency services to assist the borough if chemical containers from Univar float down stream	3	3	1	3	2	High
RoyaltonB-03	Upgrade safety features at the Water Street Pump Station to include raising of mechanical controls and back up power.	3	3	1	3	3	High
RoyaltonB-04	Provide assistance to remove built up debris from around bridge pillars	2	2	2	3	2	Med.
RoyaltonB-05	Phase 2 Royalton Canal Improvement Project to mitigate localized flooding.	3	3	1	3	3	High
RoyaltonB-06	Structural assessment and reinforcement of Edgewater Development retaining wall.	2	2	1	3	1	Low
RushT-01*	Assess the Rush Township Municipal Office property to determine the risk from wildfires and what vegetation needs to be cleared.	2	2	1	3	3	Med.
RushT-02*	Work with PennDOT to study Gold Mine Road to identify measures to reduce transportation accidents.	3	3	1	3	3	High
RushT-03*	Coordinate with the DCNR Fire Forester for Dauphin County on the potential construction of a fire- break at the appropriate location on the south side of Peters Mountain along Route 325.	3	3	1	3	3	High
SouthHanoverT-01	Work with PennDOT to study Grandview Drive to identify measures to reduce transportation accidents.	2	2	1	3	1	Low
SouthHanoverT-02	Work with PennDOT to study Union Deposit Road to identify measures to reduce transportation accidents.	2	2	2	3	3	Med.
SteeltonB-01	Assess the geology at the Steelton Fire Department property to determine if mitigation measures are necessary, and to implement them if they are.	3	3	1	3	3	High
SteeltonB-02	Work with PA American Water to protect the Steelton Water Filtration Plant to at least the 0.2 percent annual chance flood level.	2	2	1	3	3	Med.
SteeltonB-03	Install a backup power generator at the Steelton Highway Garage.	3	3	1	3	3	High
SteeltonB-04	Work with PA American Water to install a backup power generator at the sewer pump stations.	3	3	1	3	3	High
SteeltonB-05	Install a backup power generator at the Steelton Borough Building.	3	3	2	3	1	High
SteeltonB-06	Renovate or demolish vacant structures that were damaged by fire and are at risk of collapse.	2	2	3	2	1	Med.
SteeltonB-07	Assess the flooding problem along South Front Street near the quarry to identify feasible mitigation actions, and implement them.	2	3	1	3	1	Med.

Initiative	Mitigation Action	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High-Risk Hazard	Addresses Critical Communications/ Critical Infrastructure	Priority
SteeltonB-08	Assess the geology at the Steelton Borough office property to determine if mitigation measures are necessary, and to implement them if they are.	2	2	1	3	1	Low
SteeltonB-09	Work with PA American Water to assess the geology at the Steelton Water Filtration Plant property to determine if mitigation measures are necessary, and to implement them if they are.	2	3	1	3	3	Med.
SusquehannaT-01	Assess the Susquehanna Township Administration Building property to determine the risk from wildfires and what vegetation needs to be cleared.	2	2	1	3	3	Med.
SusquehannaT-02	Assess the Thomas Holtzman Elementary School property to determine the risk from wildfires and what vegetation needs to be cleared.	2	2	1	3	1	Low
SusquehannaT-03	Assess the geology at the Susquehanna Township Administration Building property to determine if mitigation measures are necessary, and to implement them if they are.	2	2	1	3	1	Low
SusquehannaT-04	Assess the geology at the Susquehanna Township High School property to determine if mitigation measures are necessary, and to implement them if they are.	3	3	1	3	1	Med.
SusquehannaT-05	Assess the geology at the Thomas Holtzman Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	2	2	1	3	3	Med.
SusquehannaT-06	Work with PennDOT to study Progress Avenue to identify measures to reduce transportation accidents.	3	3	1	3	3	High
SusquehannaT-07	Assess the flooding problem along the canal bed to identify feasible mitigation actions, and implement them.	3	3	1	3	3	High
SusquehannaT-08	Work with PennDOT to assess the flooding problem along Front Street to identify feasible mitigation actions, and implement them.	2	3	1	3	2	Med.
SusquehannaT-09	Work with PennDOT to assess the flooding problem along the 3600 block of Elmerton Avenue to identify feasible mitigation actions, and implement them.	3	3	2	3	3	High
SusquehannaT-10	Work with PennDOT to improve drainage to reduce flooding at Penn Street and Estherton Avenue	2	3	2	3	3	High
SusquehannaT-11	Work with PennDOT to assess the flooding problem along Paxton Church Road to identify feasible mitigation actions, and implement them.	2	2	3	3	1	Med.
SusquehannaT-12	Assess and improve drainage near the Latshmere Swim Club.	2	3	1	3	1	Med.
SusquehannaT-13	Assess and improve drainage off the mountain to reduce flooding on Red Road and Roberts Valley Road.	3	3	2	3	3	High
SusquehannaT-14	Assess the geology at the Londonderry School property to determine if mitigation measures are necessary, and to implement them if they are.	3	3	2	2	1	Med.
SusquehannaT-15	Assess the geology at the Progress Fire Department property to determine if mitigation measures are necessary, and to implement them if they are.	3	3	1	3	1	Med.
SusquehannaT-16	Separate stormwater and sanitary sewer in Ward 1 (Front Street corridor).	2	3	1	3	2	Med.
SusquehannaT-17	Work with PennDOT to upgrade stormwater infrastructure on Paxton Church Road and Elmwood Drive	2	3	2	3	3	High

Initiative	Mitigation Action	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High-Risk Hazard	Addresses Critical Communications/ Critical Infrastructure	Priority
SusquehannaT-18	Upgrade stormwater infrastructure on Maple Lane	3	3	2	3	3	High
SusquehannaT-19	Upgrade stormwater infrastructure on 36th Street in the area of Morton Drive.	3	2	2	3	3	High
SusquehannaT-20	Work with PennDOT to upgrade stormwater infrastructure along State Farm Road where it meets Carter and Locust.	3	3	1	3	3	High
SusquehannaT-21	Assess the geology at the Sara Lindemuth Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	2	2	2	3	3	Med.
SusquehannaT-22	Assess the geology at the Susquehanna Middle School property to determine if mitigation measures are necessary, and to implement them if they are.	1	1	1	3	1	Low
SusquehannaT-23	Assess the geology at the Susquehanna Township EMS station property to determine if mitigation measures are necessary, and to implement them if they are.	3	3	1	3	3	High
SusquehannaT-24	Assess the property of the Rescue Fire Department Station 1 to determine the risk from wildfires and what vegetation needs to be cleared.	3	3	1	3	3	High
SwataraT-01	Protect the Swatara Township Authority WPCF to at least the 0.2 percent annual chance flood level.	2	3	1	3	3	Med.
SwataraT-02	Assess the geology at the Bressler fire station property to determine if mitigation measures are necessary, and to implement them if they are.	3	3	1	3	1	Med.
SwataraT-03	Work with Capital Region Water to protect the Harrisburg Advanced Wastewater facility to at least the 0.2 percent annual chance flood level.	2	2	1	3	3	Med.
SwataraT-04	Work with PennDOT to study Derry Street to identify measures to reduce transportation accidents.	3	3	2	3	3	High
SwataraT-05	Work with PennDOT to study Eisenhower Boulevard to identify measures to reduce transportation accidents.	3	3	1	3	3	High
SwataraT-06	Work with PennDOT to study Harrisburg Street to identify measures to reduce transportation accidents.	3	3	1	3	1	Med.
SwataraT-07	Work with PennDOT to study Paxton Street to identify measures to reduce transportation accidents.	2	2	1	3	3	Med.
SwataraT-08	Work with the owner/operator of Paxton Ministries to protect the facility from current and future sinkholes.	2	2	2	3	1	Med.
SwataraT-09	Work with PennDOT to study the intersection of Paxton Street and Sycamore Street to identify measures to reduce transportation accidents.	2	2	3	2	1	Med.
SwataraT-10	Assess the geology at the Lawnton fire station property to determine if mitigation measures are necessary, and to implement them if they are.	2	2	2	3	1	Med.
SwataraT-11	Assess the geology at the Station 1-2 property to determine if mitigation measures are necessary, and to implement them if they are.	3	3	1	3	2	High
SwataraT-12	Assess the geology at the Steelton-Highspire Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	1	1	1	3	1	Low

Initiative	Mitigation Action	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High-Risk Hazard	Addresses Critical Communications/ Critical Infrastructure	Priority
SwataraT-13	Assess the geology at the Steelton-Highspire High School property to determine if mitigation measures are necessary, and to implement them if they are.	2	3	1	3	3	Med.
SwataraT-14	Assess the geology at the Swatara Middle School property to determine if mitigation measures are necessary, and to implement them if they are.	2	3	1	3	3	Med.
SwataraT-15	Work with the owner/operator of the Paxton Place senior living apartments to install a backup power generator.	3	3	1	3	1	Med.
SwataraT-16	Assess the geology at the Swatara Township Building property to determine if mitigation measures are necessary, and to implement them if they are.	3	3	1	3	1	Med.
SwataraT-17	Assess the geology at the Swatara Township Fire Department property to determine if mitigation measures are necessary, and to implement them if they are.	2	3	1	3	2	Med.
SwataraT-18	Develop a plan for replacing the Derry Street Bridge over Spring Creek.	2	3	1	3	3	Med.
UpperPaxtonT-01	Assess the Lenkerville Elementary School property to determine the risk from wildfires and what vegetation needs to be cleared.	2	2	1	3	3	Med.
UpperPaxtonT-02	Assess the Millersburg Area Authority - Water Plant property to determine the risk from wildfires and what vegetation needs to be cleared.	3	3	1	3	3	High
UpperPaxtonT-03	Assess the Millersburg Area Senior Center property to determine the risk from wildfires and what vegetation needs to be cleared.	2	2	1	3	3	Med.
UpperPaxtonT-04	Assess the Millersburg Borough Water System wastewater facility property to determine the risk from wildfires and what vegetation needs to be cleared.	3	3	1	3	3	High
UpperPaxtonT-05	Assess the Millersburg Area Ambulance Association property to determine the risk from wildfires and what vegetation needs to be cleared.	3	3	1	3	3	High
UpperPaxtonT-06	Assess the Upper Paxton Township Building property to determine the risk from wildfires and what vegetation needs to be cleared.	3	3	1	3	3	High
UpperPaxtonT-07	Protect the Millersburg Area Authority Well 10 & 11 Potable Water facility to at least the 0.2 percent annual chance flood level.	3	3	2	3	3	High
UpperPaxtonT-08	Upgrade the backup power generator at Lenkerville Elementary School.	3	3	1	3	1	Med.
UpperPaxtonT-09	Assess the flooding problem in Lenkerville along the Wiconisco Creek to identify feasible mitigation actions, and implement them.	3	3	1	3	3	High
UpperPaxtonT-10	Assess the flooding problem on River Street to identify feasible mitigation actions, and implement them.	2	3	1	3	2	Med.
UpperPaxtonT-11	Work with PennDOT to protect PA-147 north of Millersburg Borough from landslides.	2	3	1	3	3	Med.
WashingtonT-01	Work with the Dauphin Meadows Landfill to assess the property to determine the risk from wildfires and what vegetation needs to be cleared.	3	3	1	3	1	Med.
WashingtonT-02	Assess the Upper Dauphin High School property to determine the risk from wildfires and what vegetation needs to be cleared.	3	3	1	3	3	High

Initiative	Mitigation Action	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High-Risk Hazard	Addresses Critical Communications/ Critical Infrastructure	Priority
WashingtonT-03	Assess the Upper Dauphin Middle School property to determine the risk from wildfires and what vegetation needs to be cleared.	2	2	2	3	1	Med.
WashingtonT-04	Assess the Washington Township Building property to determine the risk from wildfires and what vegetation needs to be cleared.	3	3	1	3	1	Med.
WayneT-01	Assess the Wayne Township Building property to determine the risk from wildfires and what vegetation needs to be cleared.	3	3	1	3	3	High
WestHanoverT-01	Assess the West Hanover Township Public Works Building on Walnut Ave property to determine the risk from wildfires and what vegetation needs to be cleared.	3	3	1	3	1	Med.
WestHanoverT-02	Assess the West Hanover Township Fire Department Station 3 property to determine the risk from wildfires and what vegetation needs to be cleared.	3	3	1	3	1	Med.
WestHanoverT-03	Assess the geology at the West Hanover Township Water and Sewer property to determine if mitigation measures are necessary, and to implement them if they are.	3	3	1	3	1	Med.
WestHanoverT-04	Work with PennDOT to study Hershey Road to identify measures to reduce transportation accidents.	2	2	1	3	3	Med.
WestHanoverT-05	Work with PennDOT to study Linglestown Road to identify measures to reduce transportation accidents.	3	3	1	3	1	Med.
WiconiscoT-01	Assess the geology at the Wiconisco Township Fire Department property to determine if mitigation measures are necessary, and to implement them if they are.	2	2	2	3	3	Med.
WiconiscoT-02	Assess the topography around the Wiconisco Township WWTP to determine if mitigation measures are necessary, and to implement those measures if they are.	2	2	1	3	3	Med.
WiconiscoT-03	Protect the Wiconisco Township Municipal Office at 305 Walnut Street to at least the 0.2 percent annual chance flood level.	3	3	1	3	3	High
WiconiscoT-04	Assess the geology at the Wiconisco Township building property to determine if mitigation measures are necessary, and to implement them if they are.	2	2	2	3	3	Med.
WiconiscoT-05	Assess the Wiconisco Township Office property on Arch Street to determine the risk from wildfires and what vegetation needs to be cleared.	2	2	1	3	3	Med.
WiconiscoT-06	Assess the Wiconisco Township Fire Department property to determine the risk from wildfires and what vegetation needs to be cleared.	2	2	1	3	3	Med.
WiconiscoT-07	Assess the Wiconisco Township Municipal Building property on Walnut Street to determine the risk from wildfires and what vegetation needs to be cleared.	3	3	1	3	3	High
WiconiscoT-08	Assess the geology at the Wiconisco Township Police Department property to determine if mitigation measures are necessary, and to implement them if they are.	2	2	2	3	1	Med.
WiconiscoT-09	Assess the geology at the Wiconisco Township WWTP property to determine if mitigation measures are necessary, and to implement them if they are.	3	3	1	3	3	High
WilliamsT-01*	Assess the Williams Township Office property to determine the risk from wildfires and what vegetation needs to be cleared.	3	3	1	3	3	High
WilliamsT-02*	Assess the Williams Valley High School property on Walnut Street to determine the risk from wildfires and what vegetation needs to be cleared.	3	2	2	3	3	High

Initiative	Mitigation Action	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High-Risk Hazard	Addresses Critical Communications/ Critical Infrastructure	Priority
WilliamsT-03*	Work with PennDOT to study Market Street to identify measures to reduce transportation accidents.	3	3	1	3	1	Med.
WilliamstownB-01*	Assess the Williamstown Fire Department property to determine the risk from wildfires and what vegetation needs to be cleared.	2	3	1	3	2	Med.
WilliamstownB-02*	Protect the Williamstown EMS Station to at least the 0.2 percent annual chance flood level.	3	3	1	3	1	Med.

Med. = Medium
* Project is currently not eligible for FEMA mitigation funding. The municipality did not participate in the planning process.

The actions in Table 6-7 are listed in order of priority, with the high priority actions first. This list of actions is the result of the planning effort led by the Planning Team and represents what the County and municipalities consider most important. Any actions, including projects, to be implemented will have benefits outweighing their associated costs (i.e., the benefit-cost ratio would be greater than 1).

A blank Mitigation Action Worksheet template is included in Appendix G. The set of completed action worksheets and a table summarizing the worksheets by jurisdiction are presented in Appendix H.

Table 6-7. Prioritized Mitigation Actions

Mitigation Action		Priority
High Priority		
DauphinC-02	Improve telecommunications infrastructure, including accessibility of high-speed Internet connectivity, throughout the county	High
DauphinC-05	Inform the owners/operators of facilities storing hazardous materials of the risks they face and what they can do to protect their facilities and operations.	High
DauphinC-07	Assess the topography around the Lykens Tower Site, Mahantango Tower Site, Peters Mountain Tower Site, and Pillow Tower Site to determine if mitigation measures are necessary, and to implement those measures if they are.	High
DauphinC-09	Determine options for protecting the following facilities from the possible inundation due to a failure of the Raystown Lake Dam: Admin Building, Bar Association, County Offices – 100 Chestnut Street, Court House, Fort Hunter Park, Harrisburg Tower Site, Lykens Tower Site, Superior Court, Veterans Building Tower Site	High
DauphinC-10	Determine options for protecting Dauphin County Bridge No. 23 from the inundation due to a failure of the DeHart Dam	High
DauphinC-15	Conduct a wildlands/forestry survey of forested areas, to identify strategies for mitigating the negative effects of invasive plant and insect species.	High
DauphinC-16	Construct another ingress/egress route for the Dauphin County Department of Public Safety, Schaffner Youth Center, Adult Probation facility, and Work Release Center	High
DauphinC-26	The county will assess their bridges to determine what measures can be taken to protect them to the 0.2 percent annual chance flood level	High
DauphinC-27	Assess the geology at the Area Agency on Aging property to determine if mitigation measures are necessary, and to implement them if they are.	High
DauphinC-28	Encourage homeowners, renters, and businesses to insure their properties against all hazards, including flood coverage under the National Flood Insurance Program (NFIP)	High
DauphinC-29	Clean debris from pillars at Grubb Street and Canal Street bridges	High
DauphinC-32	Floodproof structures in flood prone areas.	High
DauphinC-33	Conduct a study for the Susquehanna River to determine the best option to address snakeheads, flathead catfish, and other invasive species	High
DauphinC-35	Develop a new Zoning Ordinance or revise an existing Zoning Ordinance to include separate zones or districts with appropriate development criteria for known hazard areas.	High
DauphinC-37	Revise existing zoning and/or subdivision and land development ordinances or adopt a separate, standalone ordinance to require the completion of subsurface investigations (i.e., borings, geo- physical surveys, and/or studies by a registered Professional Geologist) for all new subdivision and land development projects in known land subsidence hazard areas.	High
DauphinC-39	Coordinate with the USGS, local watershed organizations, and/or the DCCD to increase the number of USGS and Integrated Flood Observing and Warning System (IFLOWS) rain and stream gauges in the County as a potential enhancement to the existing Susquehanna Flood Forecast and Warning System.	High
DauphinC-40	Work with municipalities to evaluate participation in the CRS and facilitate the preparation and submission of CRS applications.	High
DauphinC-47	Adopt the Radon Control Methods Appendix of the current, adopted edition of the International Residential Code to address radon in new construction.	High
DauphinC-48	Encourage municipalities to enter into an Intergovernmental Cooperation Agreement and Memorandum of Understanding with the Dauphin County Land Bank Authority as a way to address structures at risk from the impacts of natural and human-made hazards.	High
DauphinC-50	Establish an alternate EOC location in the event the primary EOC must be evacuated. This facility should also be located outside of the Special Flood Hazard Area.	High
BerrysburgB-02	Install a backup power generator at the Berrysburg & Community Fire Company station	High

	Mitigation Action	Priority
DauphinB-04	Determine what other critical facilities in the borough need generators and purchase/install them.	High
DauphinB-05	Develop and implement a stream maintenance program to clear debris from Stony Creek.	High
DauphinB-07	Assess Hillside properties to determine the risk from wildfires and what vegetation needs to be cleared	High
DerryT-02	Work with PennDOT to assess the bridges over the Swatara Creek on PA-39 and PA-0743 to improve the ability to pass floodwaters under the bridges.	High
DerryT-03	Work with PennDOT to upgrade stormwater infrastructure on Hershey Park Drive.	High
DerryT-04	Upgrade stormwater infrastructure on Mae Street	High
DerryT-06	Upgrade stormwater infrastructure on Wilsonville Road	High
DerryT-15	Work with PennDOT to improve Waltonville Road to mitigate traffic accidents	High
East HanoverT-01	Work with PennDOT to improve drainage to reduce flooding along the 1100 block of Manada Bottom Road	High
ElizabethvilleB-01	Determine the best option to prevent flooding of the borough building	High
ElizabethvilleB-04	Protect the Upper Dauphin County EMS station to the 0.2 percent annual chance flood level.	High
GratzB-01	Assess the property of the Gratz Borough Building to determine the risk from wildfires and what vegetation needs to be cleared.	High
HalifaxT-04	Assess the following properties to determine the risk from wildfires and what vegetation needs to be cleared: Halifax Area Authority Sewer Plant, Halifax Area Water Authority Well #1, Halifax Area Authority Sewer Plant, and Halifax Township Municipal Building.	High
HalifaxT-06	Work with PennDOT to improve Powells Valley Road to mitigate traffic accidents	High
HarrisburgC-06	Assess the geology at the Camp Curtin Fire Station historic site property to determine if mitigation measures are necessary, and to implement them if they are.	High
HarrisburgC-10	Assess the geology at the Foose Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	High
HarrisburgC-11	Assess the geology at the Hamilton School property to determine if mitigation measures are necessary, and to implement them if they are.	High
HarrisburgC-12	Assess the geology at the Harrisburg City Government Center and Police Department property to determine if mitigation measures are necessary, and to implement them if they are.	High
HarrisburgC-13	Assess the geology at the Harrisburg City Public Works property to determine if mitigation measures are necessary, and to implement them if they are.	High
HarrisburgC-15	Assess the geology at the Harrisburg City Fire Station 2 property to determine if mitigation measures are necessary, and to implement them if they are.	High
HarrisburgC-16	Assess the geology at the Harrisburg City Fire Station 8 property to determine if mitigation measures are necessary, and to implement them if they are.	High
HarrisburgC-17	Assess the geology at the Harrisburg Technical High School property to determine if mitigation measures are necessary, and to implement them if they are.	High
HarrisburgC-18	Assess the geology at the John Harris High School property to determine if mitigation measures are necessary, and to implement them if they are.	High
HarrisburgC-19	Assess the geology at the Harrisburg School District Administration Building property to determine if mitigation measures are necessary, and to implement them if they are.	High
HarrisburgC-20	Assess the geology at the Marshall School property to determine if mitigation measures are necessary, and to implement them if they are.	High
HarrisburgC-25	Assess the geology at the Rowland Middle School property to determine if mitigation measures are necessary, and to implement them if they are.	High
HarrisburgC-28	Determine options for protecting the following facilities from the possible inundation due to a failure of the Raystown Lake Dam: Downey Elementary School, Edgewater Psychiatric Center, Harrisburg City Government Center, Harrisburg City Police Station, Station 1 EMS	High
HarrisburgC-29	Work with PennDOT to assess and improve the stormwater management infrastructure at Cameron and Maclay Streets, near the Maclay Street entrance to the Farm Show Complex.	High
HarrisburgC-32	Assess and improve the stormwater management infrastructure at the intersection of 2nd and Geiger Streets.	High
HarrisburgC-35	Work with PennDOT to study Mulberry Street to identify measures to reduce transportation accidents.	High

	Mitigation Action	Priority
HarrisburgC-37	Support Capital Region Water's Wastewater Arsenal Boulevard Sewer Improvements - Rehabilitation/replacement of approximately 2,500 LF of sewer collector pipe.	High
HarrisburgC-43	Work with PennDOT to study 19th Street to identify measures to reduce transportation accidents.	High
HarrisburgC-44	Work with PennDOT to study 25th Street to identify measures to reduce transportation accidents.	High
HighspireB-04	Investigate the feasibility of installing flood gates and pumps to prevent the backup of flood waters in Highspire Borough.	High
HummelstownB-02	Assess the geology at the Hummelstown Borough Office to determine if mitigation measures are necessary, and to implement them if they are.	High
LondonderryT-01	Assess the Londonderry Fire Department property to determine the risk from wildfires and what vegetation needs to be cleared.	High
LondonderryT-02	Assess the Londonderry Township Building property to determine the risk from wildfires and what vegetation needs to be cleared.	High
LondonderryT-04	Replant Ash Trees that were lost to the Ash Borer and determine the best actions to prevent invasive species in the future	High
LondonderryT-09	Work with PennDOT to study Roundtop Road to identify measures to reduce transportation accidents.	High
LowerPaxtonT-01	Assess the Linglestown Middle School property to determine the risk from wildfires and what vegetation needs to be cleared.	High
LowerPaxtonT-02	Assess the geology at the Linglestown Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	High
LowerPaxtonT-05	Work with PennDOT to study Colonial Road to identify measures to reduce transportation accidents.	High
LowerPaxtonT-09	Work with PennDOT to study Rutherford Road to identify measures to reduce transportation accidents.	High
LowerPaxtonT-10	Work with PennDOT to study Union Deposit Road to identify measures to reduce transportation accidents.	High
LowerSwataraT-01	Assess the geology at the Kunkel Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	High
LowerSwataraT-02	Assess the cause(s) of flooding of "The Flats" to identify feasible mitigation actions, and implement them.	High
LowerSwataraT-03	Assess the geology at the Lower Swatara Township Building property to determine if mitigation measures are necessary, and to implement them if they are.	High
LowerSwataraT-04	Assess the geology at the Lower Swatara Township Fire Department property to determine if mitigation measures are necessary, and to implement them if they are.	High
LykensB-01	Protect the Lykens Borough Office to at least the 0.2 percent chance flood level	High
LykensB-03	Assess the Lykens Fire Department property to determine the risk from wildfires and what vegetation needs to be cleared.	High
LykensB-04	Assess the Lykens Borough Office property to determine the risk from wildfires and what vegetation needs to be cleared.	High
LykensB-05	Assess the Lykens Borough Authority WWTP property to determine the risk from wildfires and what vegetation needs to be cleared.	High
LykensT-01*	Assess the Bridge in Lykens Township No. 1 historic site to determine the risk from wildfires and what vegetation needs to be cleared.	High
MiddlePaxtonT-03	Assess the Middle Paxton Elementary School property to determine the risk from wildfires and what vegetation needs to be cleared.	High
MiddletownB-02	Assess the geology at the Fink Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	High
MiddletownB-05	Work with Suez to assess the Middletown Wastewater Plant property to determine the risk from wildfires and what vegetation needs to be cleared.	High
MiddletownB-07	Assess the geology at the Middletown Fire Department property to determine if mitigation measures are necessary, and to implement them if they are.	High
MiddletownB-08	Assess the geology at the Middletown Police Department property to determine if mitigation measures are necessary, and to implement them if they are.	High
MillersburgB-02	Assess the Millersburg Borough Office property to determine the risk from wildfires and what vegetation needs to be cleared.	High
MillersburgB-04	Floodproof the Welcome Center along the Susquehanna River	High

	Mitigation Action	Priority
PaxtangB-01	Protect the Paxtang Borough Office/Fire Station to at least the 0.2 percent annual chance flood level.	High
PenbrookB-01	Assess the geology at the Penbrook Borough Office property to determine if mitigation measures are necessary, and to implement them if they are.	High
PenbrookB-03	Install a backup power generator at the public works building.	High
PenbrookB-04	Install a backup power generator at the Citizen's Fire Company #1 station.	High
PillowB-07	Install a backup power generator at Well 6.	High
PillowB-13	Develop an evacuation and sheltering plan for Pillow Borough.	High
RoyaltonB-01	Protect the Edgewater Pump Station to at least the 0.2 percent annual chance flood level.	High
RoyaltonB-02	Develop a plan with emergency services to assist the borough if chemical containers from Univar float down stream	High
RoyaltonB-03	Upgrade safety features at the Water Street Pump Station to include raising of mechanical controls and back up power.	High
RoyaltonB-05	Phase 2 Royalton Canal Improvement Project to mitigate localized flooding.	High
RushT-02*	Work with PennDOT to study Gold Mine Road to identify measures to reduce transportation accidents.	High
RushT-03*	Coordinate with the DCNR Fire Forester for Dauphin County on the potential construction of a fire- break at the appropriate location on the south side of Peters Mountain along Route 325.	High
SteeltonB-01	Assess the geology at the Steelton Fire Department property to determine if mitigation measures are necessary, and to implement them if they are.	High
SteeltonB-03	Install a backup power generator at the Steelton Highway Garage.	High
SteeltonB-04	Work with PA American Water to install a backup power generator at the sewer pump stations.	High
SteeltonB-05	Install a backup power generator at the Steelton Borough Building.	High
SusquehannaT-06	Work with PennDOT to study Progress Avenue to identify measures to reduce transportation accidents.	High
SusquehannaT-07	Assess the flooding problem along the canal bed to identify feasible mitigation actions, and implement them.	High
SusquehannaT-09	Work with PennDOT to assess the flooding problem along the 3600 block of Elmerton Avenue to identify feasible mitigation actions, and implement them.	High
SusquehannaT-10	Work with PennDOT to improve drainage to reduce flooding at Penn Street and Estherton Avenue	High
SusquehannaT-13	Assess and improve drainage off the mountain to reduce flooding on Red Road and Roberts Valley Road.	High
SusquehannaT-17	Work with PennDOT to upgrade stormwater infrastructure on Paxton Church Road and Elmwood Drive	High
SusquehannaT-18	Upgrade stormwater infrastructure on Maple Lane	High
SusquehannaT-19	Upgrade stormwater infrastructure on 36th Street in the area of Morton Drive.	High
SusquehannaT-20	Work with PennDOT to upgrade stormwater infrastructure along State Farm Road where it meets Carter and Locust.	High
SusquehannaT-23	Assess the geology at the Susquehanna Township EMS station property to determine if mitigation measures are necessary, and to implement them if they are.	High
SusquehannaT-24	Assess the property of the Rescue Fire Department Station 1 to determine the risk from wildfires and what vegetation needs to be cleared.	High
SwataraT-04	Work with PennDOT to study Derry Street to identify measures to reduce transportation accidents.	High
SwataraT-05	Work with PennDOT to study Eisenhower Boulevard to identify measures to reduce transportation accidents.	High
SwataraT-11	Assess the geology at the Station 1-2 property to determine if mitigation measures are necessary, and to implement them if they are.	High
UpperPaxtonT-02	Assess the Millersburg Area Authority - Water Plant property to determine the risk from wildfires and what vegetation needs to be cleared.	High
UpperPaxtonT-04	Assess the Millersburg Borough Water System wastewater facility property to determine the risk from wildfires and what vegetation needs to be cleared.	High

Mitigation Action		Priority
UpperPaxtonT-05	Assess the Millersburg Area Ambulance Association property to determine the risk from wildfires and what vegetation needs to be cleared.	High
UpperPaxtonT-06	Assess the Upper Paxton Township Building property to determine the risk from wildfires and what vegetation needs to be cleared.	High
UpperPaxtonT-07	Protect the Millersburg Area Authority Well 10 & 11 Potable Water facility to at least the 0.2 percent annual chance flood level.	High
UpperPaxtonT-09	Assess the flooding problem in Lenkerville along the Wiconisco Creek to identify feasible mitigation actions, and implement them.	High
WashingtonT-02	Assess the Upper Dauphin High School property to determine the risk from wildfires and what vegetation needs to be cleared.	High
WayneT-01	Assess the Wayne Township Building property to determine the risk from wildfires and what vegetation needs to be cleared.	High
WiconiscoT-03	Protect the Wiconisco Township Municipal Office at 305 Walnut Street to at least the 0.2 percent annual chance flood level.	High
WiconiscoT-07	Assess the Wiconisco Township Municipal Building property on Walnut Street to determine the risk from wildfires and what vegetation needs to be cleared.	High
WiconiscoT-09	Assess the geology at the Wiconisco Township WWTP property to determine if mitigation measures are necessary, and to implement them if they are.	High
WilliamsT-01*	Assess the Williams Township Office property to determine the risk from wildfires and what vegetation needs to be cleared.	High
WilliamsT-02*	Assess the Williams Valley High School property on Walnut Street to determine the risk from wildfires and what vegetation needs to be cleared.	High
Medium Priority		
DauphinC-01	Provide public outreach about hazards and protective measures people can take to protect themselves (e.g., receiving emergency alerts through South Central Alert) and their property.	Medium
DauphinC-03	Simplify and improve the model stormwater management ordinance in an effort to enhance enforcement and effectiveness of stormwater management practices	Medium
DauphinC-04	Educate the public about resources available to combat the opioid abuse/addiction.	Medium
DauphinC-06	Work with child care facility operators to discuss hazards they face and ensure their emergency plans address those hazards.	Medium
DauphinC-08	Assess the following properties to determine the risk from wildfires and what vegetation needs to be cleared: Agriculture Building, Blue Mountain Tower Site, Conewago CWT Tower Site, Lower Swatara Tower Site, and Mahantango Tower Site	Medium
DauphinC-11	Assess the geology at the following sites and determine if mitigation measures are necessary, and to implement them if they are: 333 Market Street Tower Site, Administration Building, Adult Probation, Assistance Office, Bar Association, Children and Youth, Conewago CWT Tower Site, Coroner's Office, County Offices – 100 Chestnut Street, Court House, Dauphin ECC Tower Site, Department of Public Safety, Harrisburg Tower Site, Judicial Center, Lower Swatara Tower Site, Market Street Tower Site, Prison, Recycling Center, Reservoir Park Tower Site, Superior Court, Veteran's Building Tower Site, and Work Release	Medium
DauphinC-12	Identify and provide incentives to recruit and retain volunteer firefighters.	Medium
DauphinC-13	Provide information to PEMA on the risks faced by each Commonwealth-owned critical facility in Dauphin County, so that PEMA can work with the Department of General Services to protect the facilities.	Medium
DauphinC-14	Work with PennDOT to improve Interstates -076 (PA Turnpike), -081, -083, and -283 to reduce accidents	Medium
DauphinC-17	Install wet and dry hydrants to provide water supply for fire suppression.	Medium
DauphinC-19	Work with the owners/operators of privately-owned critical facilities in the area subject to inundation due to a failure of the Raystown Lake Dam to discuss their risk of flooding and protective measures they can take.	Medium
DauphinC-20	Work with privately-owned critical facilities to assess the geology at their sites to determine if mitigation measures are necessary, and to implement them if they are.	Medium
DauphinC-21	Work with the owners/operators of the privately-owned critical facilities to determine the risk from wildfires and what vegetation needs to be cleared.	Medium
DauphinC-22	Assess the Dauphin County Bridge No. 23 historic site to determine the risk from wildfires and what vegetation needs to be cleared.	Medium

	Mitigation Action	Priority
DauphinC-23	Protect the Dauphin County Bridge No. 23 historic site to at least the 0.2 percent chance flood level.	Medium
DauphinC-25	Work with the owners/operators of privately-owned critical facilities on steep slopes to study the topography of the property to determine if mitigation measures are necessary, and to implement those measures.	Medium
DauphinC-30	Install backup preventers in wastewater pipes to prevent basement flooding.	Medium
DauphinC-31	Elevate or acquire properties, including repetitive loss and severe repetitive loss properties, in flood prone areas.	Medium
DauphinC-34	Develop a new Comprehensive Plan or amend an existing Comprehensive Plan to include an assessment and associated mapping of the municipality's vulnerability to location-specific hazards and appropriate recommendations for the use of these hazard areas.	Medium
DauphinC-36	Develop a new Subdivision and Land Development Ordinance or revise an existing Subdivision and Land Development Ordinance to include municipal-specific, hazard mitigation-related development criteria and/or provisions for the mandatory use of conservation subdivision design principles in order to regulate the location and construction of buildings and other infrastructure in known hazard areas.	Medium
DauphinC-38	Update and implement a comprehensive water resources management plan that analyzes the County's existing water resources supply and evaluates the County's anticipated water use demand in an effort to identify suspected water supply shortages and potential new water supply sources	Medium
DauphinC-41	Develop a technical proficiency at the municipal level for conducting post-disaster damage assessments and continue to regulate through local planning and zoning reconstruction activities to ensure compliance with NFIP substantial damage/ substantial improvement requirements.	Medium
DauphinC-42	Develop a technical proficiency at the municipal level for assisting local residents and business owners in applying for hazard mitigation and assistance funds and identifying cost beneficial hazard mitigation measures to be incorporated into reconstruction activities.	Medium
DauphinC-43	Investigate the feasibility of constructing a levee/floodwall system along Swatara Creek between East Main Street and the Pennsylvania Turnpike to minimize Middletown Borough's flood hazard potential.	Medium
DauphinC-44	Municipalities should continue to seek solutions to problem areas and obstructions identified in the April 2010 Countywide Act 167 Stormwater Management Plan.	Medium
DauphinC-45	Enroll in the Pennsylvania Firewise Communities Program through the DCNR Fire Forester for Dauphin County.	Medium
DauphinC-46	Encourage homeowners to test for radon and install radon mitigation systems, if needed.	Medium
DauphinC-49	Increase the number of NOAA Weather Alert radios in public places across the County which currently do not have them (such as personal care homes) above and beyond what is required of the County by the NWS's Storm Ready Program.	Medium
DauphinC-51	The Dauphin County Department of Information Technology will make natural and human-made hazard data available for municipal use.	Medium
DauphinC-52	Assess the EMS Station 12 property to determine the risk from wildfires and what vegetation needs to be cleared.	Medium
BerrysburgB-01	Install a backup power generator at the Berrysburg Borough municipal building.	Medium
BerrysburgB-03	Discuss with the owner/operator of critical facilities vulnerable to a hazardous materials release the risk and possible protective measures.	Medium
ConewagoT-01	Protect Laurel Drive from the current and future sinkholes.	Medium
ConewagoT-02	Work with PennDOT to improve Deodate Road to mitigate traffic accidents.	Medium
ConewagoT-03	Work with PennDOT to improve Colebrook Road to mitigate traffic accidents	Medium
DauphinB-01	Assess conditions at the confluence of Stony Creek and the Susquehanna River to identify potential mitigation actions for nearby structures.	Medium
DauphinB-02	Assess the borough to identify potential mitigation actions to take to ensure access to/from the borough during floods of the Susquehanna River.	Medium
DauphinB-06	Assess critical facilities in the wildland-urban interface area to determine the risk from wildfires and what vegetation needs to be cleared.	Medium
DauphinB-08	Work with PennDOT to improve Claster Boulevard to reduce traffic accidents	Medium
DauphinB-09	Work with PennDOT to improve US-22/322 to mitigate traffic accidents	Medium

	Mitigation Action	Priority
DerryT-05	Upgrade stormwater infrastructure on Bull Frog Valley Road	Medium
DerryT-07	Install a generator at the Derry Township Public Works building	Medium
DerryT-09	Work with PennDOT to protect US-322 near PA-0743 from current and future sinkholes.	Medium
DerryT-10	Assess the geology at the Derry Township municipal offices to determine if mitigation measures are necessary, and to implement them if they are.	Medium
DerryT-11	Work with the Sheetz #351 to determine options for protecting the facility from the possible inundation from dam failure from the Hershey Dam	Medium
DerryT-12	Work with PennDOT to improve Elizabethtown Road to mitigate traffic accidents	Medium
DerryT-13	Work with PennDOT to improve Governor Road to mitigate traffic accidents	Medium
DerryT-14	Work with PennDOT to improve Middletown Road to mitigate traffic accidents	Medium
DerryT-16	Assess the drainage and stormwater management infrastructure in the area of Hersheypark Drive and Walton Avenue to determine appropriate mitigation measures to reduce risk from flooding, and implement them.	Medium
East HanoverT-03	Work with PennDOT to improve Mountain Road to mitigate traffic accidents	Medium
East HanoverT-04	Work with PennDOT to improve Laudermilch Road to mitigate traffic accidents	Medium
East HanoverT-05	Work with PennDOT to improve Sandbeach Road to mitigate traffic accidents	Medium
East HanoverT-06	Obtain warning system for residents from outside contractor to alert residents to hazardous materials incidents or other hazards	Medium
ElizabethvilleB-02	Assess stormwater management infrastructure in the borough to determine what improvements need to be made to control runoff and reduce flooding.	Medium
ElizabethvilleB-05	Assess the property of the Elizabethville Fire Station to determine the risk from wildfires and what vegetation needs to be cleared.	Medium
ElizabethvilleB-06	Install a backup power generator at the Elizabethville Borough building.	Medium
GratzB-02	Assess the Gratz Fire Department station to determine the risk from wildfires and what vegetation needs to be cleared.	Medium
HalifaxB-01	Ensure that the borough has plans in place to continue operations if a hazardous materials release causes an evacuation of the Halifax Borough Office.	Medium
HalifaxB-02	Discuss with the US Postal Service that the Halifax Post Office is vulnerable to a hazardous materials release and possible protective measures.	Medium
HalifaxT-01	Protect the Halifax Area Water Authority Well #1 to the 0.2 percent annual chance flood event.	Medium
HalifaxT-02	Work with the property owner to protect the Legislative Route 1 Sycamore Allee historic site from flooding	Medium
HalifaxT-03	Assess the topography around the Halifax Area Water Authority Well #1 to determine if mitigation measures are necessary, and to implement those measures if they are	Medium
HalifaxT-05	Work with PennDOT to improve Peters Mountain Road to mitigate traffic accidents	Medium
HalifaxT-07	Work with PennDOT to improve South River Road to mitigate traffic accidents	Medium
HarrisburgC-01	Renovate or demolish vacant structures that are at risk of collapse.	Medium
HarrisburgC-02	Protect the Downey Elementary School to at least the 0.2 percent chance flood level	Medium
HarrisburgC-03	Protect the Edgewater Psychiatric Center to at least the 0.2 percent chance flood level	Medium
HarrisburgC-05	Assess the geology at the Ben Franklin School property to determine if mitigation measures are necessary, and to implement them if they are.	Medium
HarrisburgC-07	Assess the geology at the Camp Curtin Junior High School historic property to determine if mitigation measures are necessary, and to implement them if they are.	Medium
HarrisburgC-08	Assess the geology at the Downey Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	Medium
HarrisburgC-09	Assess the geology at the Edgewater Psychiatric Center property to determine if mitigation measures are necessary, and to implement them if they are.	Medium
HarrisburgC-14	Assess the geology at the Harrisburg City Fire Station 1 property to determine if mitigation measures are necessary, and to implement them if they are.	Medium
HarrisburgC-22	Assess the geology at the Paxton Fire Station historic property to determine if mitigation measures are necessary, and to implement them if they are.	Medium

Mitigation Action		Priority
HarrisburgC-24	Assess the geology at the Riverside Fire Station historic property to determine if mitigation measures are necessary, and to implement them if they are.	Medium
HarrisburgC-26	Assess the geology at the Scott Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	Medium
HarrisburgC-30	Work with PennDOT to assess and improve the stormwater management infrastructure on the 1800 block of Derry Street.	Medium
HarrisburgC-31	Work with PennDOT to assess and improve the stormwater management infrastructure along the 1400 block of Market Street.	Medium
HarrisburgC-33	Assess and improve the stormwater management infrastructure at the intersection of Herr and Plum Streets.	Medium
HarrisburgC-34	Work with PennDOT to study Cameron Street to identify measures to reduce transportation accidents.	Medium
HarrisburgC-36	Work with PennDOT to study State Street to identify measures to reduce transportation accidents.	Medium
HarrisburgC-38	Support Capital Region Water's Stormwater SW Pond Retrofit – Bellevue Park Design - Employing green stormwater infrastructure (GSI) to manage stormwater runoff and prevent flows from entering the combined sewer system, thereby reducing combined sewer overflow (CSO) activity.	Medium
HarrisburgC-39	Support Capital Region Water's Stormwater Camp Curtin YMCA GSI - Develop visible GSI improvements as part of the community center rehabilitation and beautification	Medium
HarrisburgC-40	Support Capital Region Water's Stormwater COH East-West Multimodal Connector - GSI - Capture and manage stormwater in green stormwater elements designed to also serve as traffic calming elements.	Medium
HarrisburgC-42	Support Capital Region Water's Stormwater South Allison Hill GSI - Capture and manage stormwater in green stormwater elements designed to also serve as traffic calming elements.	Medium
HarrisburgC-45	Work with PennDOT to study the intersection of 2nd and Geiger Streets to identify measures to reduce transportation accidents.	Medium
HarrisburgC-46	Work with PennDOT to study the intersection of Front and Forster Streets to identify measures to reduce transportation accidents.	Medium
HarrisburgC-47	Work with PennDOT to study the intersection of Susquehanna and Riley Streets to identify measures to reduce transportation accidents.	Medium
HarrisburgC-48	Implement the recommendations of the Harrisburg Authority's ongoing combined sewer overflow impact study.	Medium
HighspireB-01	Protect the wastewater treatment plant to the 0.2 percent annual chance flood level.	Medium
HighspireB-02	Protect the Highspire Fire Department station to the 0.2 percent annual chance flood level.	Medium
HighspireB-03	Assess the Highspire Fire Department property to determine the risk from wildfires and what vegetation needs to be cleared.	Medium
HummelstownB-01	Assess the geology at the Lower Dauphin School District campuses to determine if mitigation measures are necessary, and to implement them if they are.	Medium
HummelstownB-03	Assess the geology at the Hummelstown Fire Department property to determine if mitigation measures are necessary, and to implement them if they are.	Medium
HummelstownB-04	Assess the geology at the Nye Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	Medium
JacksonT-01	Assess the Jackson Township Building property to determine the risk from wildfires and what vegetation needs to be cleared.	Medium
JeffersonT-01	Assess the Carsonville Fire Department property to determine the risk from wildfires and what vegetation needs to be cleared.	Medium
JeffersonT-02	Assess the Jefferson Township Municipal Office property to determine the risk from wildfires and what vegetation needs to be cleared.	Medium
LondonderryT-05	Assess the geology at the Londonderry Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	Medium
LondonderryT-06	Install a backup power generator at the public works building.	Medium
LondonderryT-07	Work with PennDOT to study Colebrook Road to identify measures to reduce transportation accidents.	Medium
LondonderryT-08	Work with PennDOT to study Harrisburg Pike to identify measures to reduce transportation accidents.	Medium
LondonderryT-10	Assess the geology at the Londonderry Fire Department property to determine if mitigation measures are necessary, and to implement them if they are.	Medium
LondonderryT-11	Conewago Creek Stream Restoration - restore 1 mile of stream, remove approximately 125,000 cubic yards of sediment, and re-establish the historic floodplain of the creek.	Medium

	Mitigation Action	Priority
LowerPaxtonT-03	Install a backup power generator at the Central Dauphin School District transportation facility.	Medium
LowerPaxtonT-04	Work with the owner/operator of the Colonial Park Care Center to upgrade its backup power capabilities.	Medium
LowerPaxtonT-06	Work with PennDOT to study Jonestown Road to identify measures to reduce transportation accidents.	Medium
LowerPaxtonT-07	Work with PennDOT to study Linglestown Road to identify measures to reduce transportation accidents.	Medium
LowerPaxtonT-08	Work with PennDOT to study Nyes Road to identify measures to reduce transportation accidents.	Medium
LowerSwataraT-05	Assess the geology at the Middletown Area High School property to determine if mitigation measures are necessary, and to implement them if they are.	Medium
LowerSwataraT-06	Assess the geology at the Reid Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	Medium
LowerSwataraT-07	Protect the Farr Pump Station to at least the 0.2 percent annual chance flood level.	Medium
LowerSwataraT-08	Install a backup power generator at the Farr Pump Station.	Medium
LowerSwataraT-09	Install a backup power generator at the Jamesway Pump Station.	Medium
LowerSwataraT-10	Install a backup power generator at the North Union Street Pump Station.	Medium
LykensB-02	Protect the Lykens Borough Authority WWTP to at least the 0.2 percent chance flood level	Medium
LykensB-06	Identify sections of banks of waterways that need to be stabilized, and design and implement the stabilization.	Medium
LykensT-02*	Work with PennDOT to study North Crossroads Road to identify measures to reduce transportation accidents.	Medium
MiddlePaxtonT-01	Work with PennDOT to study Peters Mountain Road to identify measures to reduce transportation accidents.	Medium
MiddlePaxtonT-02	Assess the Dauphin-Middle Paxton Municipal Office property to determine the risk from wildfires and what vegetation needs to be cleared.	Medium
MiddlePaxtonT-04	Work with the owners/operators of privately-owned critical facilities in the area subject to inundation due to a failure of the DeHart Dam to discuss their risk of flooding and protective measures they can take.	Medium
MiddletownB-01	Install a generator at the Borough Hall building	Medium
MiddletownB-03	Work with PennDOT to study Main Street/Harrisburg Pike to identify measures to reduce transportation accidents.	Medium
MiddletownB-04	Protect the Mill Street electrical substation to the 0.2 percent annual chance flood level.	Medium
MiddletownB-06	Assess the geology at the Middletown Borough Building property to determine if mitigation measures are necessary, and to implement them if they are.	Medium
MiddletownB-09	Work with Suez to assess the geology at the Middletown Wastewater Plant property to determine if mitigation measures are necessary, and to implement them if they are.	Medium
MillersburgB-01	Identify sections of banks of waterways that need to be stabilized, and design and implement the stabilization.	Medium
MillersburgB-03	Assess the Millersburg Fire Station property to determine the risk from wildfires and what vegetation needs to be cleared.	Medium
PaxtangB-02	Assess the geology at the Paxtang Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	Medium
PaxtangB-03	Assess the geology at the Paxtang Borough Office property to determine if mitigation measures are necessary, and to implement them if they are.	Medium
PenbrookB-02	Assess the geology at the Penbrook Fire Department property to determine if mitigation measures are necessary, and to implement them if they are.	Medium
PenbrookB-05	Assess the stormwater management infrastructure throughout the borough and determine what upgrades need to be made.	Medium
PillowB-02	Assess the Pillow Fire Department property to determine the risk from wildfires and what vegetation needs to be cleared.	Medium
PillowB-03	Install a backup power generator at the Pillow Borough municipal building.	Medium
PillowB-04	Install a backup power generator at the Pillow Fire Department station.	Medium
PillowB-06	Install a backup power generator at Well 5.	Medium

	Mitigation Action	Priority
PillowB-08	Upgrade fire department radios to be interoperable between Dauphin and Northumberland Counties.	Medium
PillowB-09	Work with the Pillow Historical Society and PPL to determine options to prevent power outages and damage to the water treatment building, and implement the most appropriate one.	Medium
PillowB-10	Work with PennDOT to improve drainage on PA-225 to prevent ponding water.	Medium
PillowB-11	Map the borough's water infrastructure.	Medium
PillowB-12	Analyze the intersection and develop solutions to reduce speeding on PA-225, and implement the most appropriate one.	Medium
PillowB-14	Installation of new water lines and improve the water infrastructure.	Medium
PillowB-15	Enclose Well 5 infrastructure in a shelter.	Medium
ReedT-01	Protect the Bridge in Reed Township historic site to at least the 0.2 percent annual chance flood level.	Medium
ReedT-03	Work with PennDOT to study South River Road to identify measures to reduce transportation accidents.	Medium
RoyaltonB-04	Provide assistance to remove built up debris from around bridge pillars	Medium
RushT-01*	Assess the Rush Township Municipal Office property to determine the risk from wildfires and what vegetation needs to be cleared.	Medium
SouthHanoverT-02	Work with PennDOT to study Union Deposit Road to identify measures to reduce transportation accidents.	Medium
SteeltonB-02	Work with PA American Water to protect the Steelton Water Filtration Plant to at least the 0.2 percent annual chance flood level.	Medium
SteeltonB-06	Renovate or demolish vacant structures that were damaged by fire and are at risk of collapse.	Medium
SteeltonB-07	Assess the flooding problem along South Front Street near the quarry to identify feasible mitigation actions, and implement them.	Medium
SteeltonB-09	Work with PA American Water to assess the geology at the Steelton Water Filtration Plant property to determine if mitigation measures are necessary, and to implement them if they are.	Medium
SusquehannaT-01	Assess the Susquehanna Township Administration Building property to determine the risk from wildfires and what vegetation needs to be cleared.	Medium
SusquehannaT-04	Assess the geology at the Susquehanna Township High School property to determine if mitigation measures are necessary, and to implement them if they are.	Medium
SusquehannaT-05	Assess the geology at the Thomas Holtzman Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	Medium
SusquehannaT-08	Work with PennDOT to assess the flooding problem along Front Street to identify feasible mitigation actions, and implement them.	Medium
SusquehannaT-11	Work with PennDOT to assess the flooding problem along Paxton Church Road to identify feasible mitigation actions, and implement them.	Medium
SusquehannaT-12	Assess and improve drainage near the Latshmere Swim Club.	Medium
SusquehannaT-14	Assess the geology at the Londonderry School property to determine if mitigation measures are necessary, and to implement them if they are.	Medium
SusquehannaT-15	Assess the geology at the Progress Fire Department property to determine if mitigation measures are necessary, and to implement them if they are.	Medium
SusquehannaT-16	Separate stormwater and sanitary sewer in Ward 1 (Front Street corridor).	Medium
SusquehannaT-21	Assess the geology at the Sara Lindemuth Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	Medium
SwataraT-01	Protect the Swatara Township Authority WPCF to at least the 0.2 percent annual chance flood level.	Medium
SwataraT-02	Assess the geology at the Bressler fire station property to determine if mitigation measures are necessary, and to implement them if they are.	Medium
SwataraT-03	Work with Capital Region Water to protect the Harrisburg Advanced Wastewater facility to at least the 0.2 percent annual chance flood level.	Medium
SwataraT-06	Work with PennDOT to study Harrisburg Street to identify measures to reduce transportation accidents.	Medium

Mitigation Action		Priority
SwataraT-07	Work with PennDOT to study Paxton Street to identify measures to reduce transportation accidents.	Medium
SwataraT-08	Work with the owner/operator of Paxton Ministries to protect the facility from current and future sinkholes.	Medium
SwataraT-09	Work with PennDOT to study the intersection of Paxton Street and Sycamore Street to identify measures to reduce transportation accidents.	Medium
SwataraT-10	Assess the geology at the Lawnton fire station property to determine if mitigation measures are necessary, and to implement them if they are.	Medium
SwataraT-13	Assess the geology at the Steelton-Highspire High School property to determine if mitigation measures are necessary, and to implement them if they are.	Medium
SwataraT-14	Assess the geology at the Swatara Middle School property to determine if mitigation measures are necessary, and to implement them if they are.	Medium
SwataraT-15	Work with the owner/operator of the Paxton Place senior living apartments to install a backup power generator.	Medium
SwataraT-16	Assess the geology at the Swatara Township Building property to determine if mitigation measures are necessary, and to implement them if they are.	Medium
SwataraT-17	Assess the geology at the Swatara Township Fire Department property to determine if mitigation measures are necessary, and to implement them if they are.	Medium
SwataraT-18	Develop a plan for replacing the Derry Street Bridge over Spring Creek.	Medium
UpperPaxtonT-01	Assess the Lenkerville Elementary School property to determine the risk from wildfires and what vegetation needs to be cleared.	Medium
UpperPaxtonT-03	Assess the Millersburg Area Senior Center property to determine the risk from wildfires and what vegetation needs to be cleared.	Medium
UpperPaxtonT-08	Upgrade the backup power generator at Lenkerville Elementary School.	Medium
UpperPaxtonT-10	Assess the flooding problem on River Street to identify feasible mitigation actions, and implement them.	Medium
UpperPaxtonT-11	Work with PennDOT to protect PA-147 north of Millersburg Borough from landslides.	Medium
WashingtonT-01	Work with the Dauphin Meadows Landfill to assess the property to determine the risk from wildfires and what vegetation needs to be cleared.	Medium
WashingtonT-03	Assess the Upper Dauphin Middle School property to determine the risk from wildfires and what vegetation needs to be cleared.	Medium
WashingtonT-04	Assess the Washington Township Building property to determine the risk from wildfires and what vegetation needs to be cleared.	Medium
WestHanoverT-01	Assess the West Hanover Township Public Works Building on Walnut Ave property to determine the risk from wildfires and what vegetation needs to be cleared.	Medium
WestHanoverT-02	Assess the West Hanover Township Fire Department Station 3 property to determine the risk from wildfires and what vegetation needs to be cleared.	Medium
WestHanoverT-03	Assess the geology at the West Hanover Township Water and Sewer property to determine if mitigation measures are necessary, and to implement them if they are.	Medium
WestHanoverT-04	Work with PennDOT to study Hershey Road to identify measures to reduce transportation accidents.	Medium
WestHanoverT-05	Work with PennDOT to study Linglestown Road to identify measures to reduce transportation accidents.	Medium
WiconiscoT-01	Assess the geology at the Wiconisco Township Fire Department property to determine if mitigation measures are necessary, and to implement them if they are.	Medium
WiconiscoT-02	Assess the topography around the Wiconisco Township WWTP to determine if mitigation measures are necessary, and to implement those measures if they are.	Medium
WiconiscoT-04	Assess the geology at the Wiconisco Township building property to determine if mitigation measures are necessary, and to implement them if they are.	Medium
WiconiscoT-05	Assess the Wiconisco Township Office property on Arch Street to determine the risk from wildfires and what vegetation needs to be cleared.	Medium
WiconiscoT-06	Assess the Wiconisco Township Fire Department property to determine the risk from wildfires and what vegetation needs to be cleared.	Medium
WiconiscoT-08	Assess the geology at the Wiconisco Township Police Department property to determine if mitigation measures are necessary, and to implement them if they are.	Medium
WilliamsT-03*	Work with PennDOT to study Market Street to identify measures to reduce transportation accidents.	Medium

	Mitigation Action	Priority
WilliamstownB-01*	Assess the Williamstown Fire Department property to determine the risk from wildfires and what vegetation needs to be cleared.	Medium
WilliamstownB-02*	Protect the Williamstown EMS Station to at least the 0.2 percent annual chance flood level.	Medium
Low Priority		
DauphinC-18	Work with the owners/operators of privately-owned critical facilities in the special flood hazard area to discuss their risk of flooding and protective measures they can take.	Low
DauphinB-03	Install a generator at the Borough Building	Low
DerryT-01	Assess stormwater management infrastructure in the township to determine what improvements need to be made, then implement the improvements.	Low
DerryT-08	Assess the topography around the following structures to determine if mitigation measures are necessary, and to implement those measures if they are: Quarries of the Hummelstown Brownstone Company historic site and Derry Township LDFL Wastewater facility	Low
East HanoverT-02	Work with PennDOT to eliminate highway flooding at intersection of PA-443 and Firehouse Road during heavy rainfalls.	Low
ElizabethvilleB-03	Work with PennDOT to improve drainage of US-209 at Park Drive.	Low
HarrisburgC-04	Protect the Station 1 EMS facility to at least the 0.2 percent chance flood level	Low
HarrisburgC-21	Assess the geology at the Melrose School property to determine if mitigation measures are necessary, and to implement them if they are.	Low
HarrisburgC-41	Support Capital Region Water's Wastewater (Combined, Sanitary & Storm) Collection System Rehabilitation - Rehabilitate priority defects to avoid failures using a variety of methods including conventional replacement and "trenchless" structural pipe lining procedures.	Low
LondonderryT-03	Assess the geology at the Derry Township Municipal Authority Southwest property to determine if mitigation measures are necessary, and to implement them if they are.	Low
PillowB-01	Assess the Pillow Borough Building property to determine the risk from wildfires and what vegetation needs to be cleared.	Low
PillowB-05	Determine appropriate measures for preventing injuries at blighted properties	Low
ReedT-02	Assess the Reed Township Municipal Building property to determine the risk from wildfires and what vegetation needs to be cleared.	Low
RoyaltonB-06	Structural assessment and reinforcement of Edgewater Development retaining wall.	Low
SouthHanoverT-01	Work with PennDOT to study Grandview Drive to identify measures to reduce transportation accidents.	Low
SteeltonB-08	Assess the geology at the Steelton Borough office property to determine if mitigation measures are necessary, and to implement them if they are.	Low
SusquehannaT-02	Assess the Thomas Holtzman Elementary School property to determine the risk from wildfires and what vegetation needs to be cleared.	Low
SusquehannaT-03	Assess the geology at the Susquehanna Township Administration Building property to determine if mitigation measures are necessary, and to implement them if they are.	Low
SusquehannaT-22	Assess the geology at the Susquehanna Middle School property to determine if mitigation measures are necessary, and to implement them if they are.	Low
SwataraT-12	Assess the geology at the Steelton-Highspire Elementary School property to determine if mitigation measures are necessary, and to implement them if they are.	Low

Notes: * *Project is currently not eligible for FEMA mitigation funding. The municipality did not participate in the planning process.*
\+ *Though the formulaic evaluation of this action does not match the listed priority, municipal officials updated the priority based on their mitigation needs.*

SECTION 7 PLAN MAINTENANCE PROCEDURES

This section describes how the Dauphin County Hazard Mitigation Plan (HMP) was updated since 2015 (Section 7.1); the system that Dauphin County and all participating jurisdictions have established to monitor, evaluate, and update the HMP (Section 7.2); and the strategy to continue public involvement for plan maintenance (Section 7.3).

7.1 UPDATE PROCESS SUMMARY

The process of monitoring, evaluating, and updating the HMP is critical to maintaining its value and supporting the success of Dauphin County's hazard mitigation efforts. Ensuring effective implementation of mitigation activities paves the way for continued momentum in the planning process and supports future resiliency.

The Steering Committee reviewed the 2015 plan maintenance procedures and carried them forward to the current HMP update, as described in the sections below. Going forward, the plan will continue to be available on the Dauphin County Department of Public Safety's (DPS) HMP website. The 2021 plan maintenance procedures also describe the ways in which this plan may be integrated into other planning mechanisms in the county.

7.2 MONITORING, EVALUATING, AND UPDATING THE PLAN

The Dauphin County HMP Planning Team intends to remain intact as the organization responsible for monitoring, evaluating, and updating this plan. The Office of Emergency Management's Planning Specialist will serve as HMP Coordinator for the Planning Team. Each participating jurisdiction is expected to retain a municipal hazard mitigation representative to support the jurisdiction's input to monitor, evaluate, and update the responsibilities identified in this section. Members of the Planning Team are listed in Section 3.

Understanding that individual commitments change over time, each jurisdiction and its representatives will be responsible for informing the Dauphin County HMP Coordinator of any changes in representation by formal letter. The HMP Coordinator will strive to keep the Planning Team makeup as a representation of planning partners and stakeholders within the county. The HMP Coordinator will maintain the current membership of the Planning Team on the Dauphin County HMP website (shown below) or in publicly accessible county records https://www.dauphincounty.org/government/departments/public_safety/emergency_management.php. .

Several of Dauphin County's municipalities did not participate in the 2020-2021 HMP update process and are therefore not currently eligible for federal mitigation funding to implement their projects. Each of these municipalities can elect to join the 2021 HMP by working with the Dauphin County HMP Coordinator to complete the following steps:

1. *Provide information on the hazards and risks that can affect its operations, residents, businesses, property, and environment*
2. *Provide information on its capabilities*
3. *Provide an update on the status of its mitigation actions from the 2015 version of the HMP*
4. *Identify mitigation actions to include in the current HMP*
5. *Adopt the current HMP by resolution (see Section 8)*

Information in Steps 1-3 above can be accomplished by completing the information gathering worksheets that were used during the planning process. Municipalities that have adopted the 2021 HMP will not have to re-adopt the 2021 HMP if another municipality's information is gathered and added to the HMP.

The following sections describe the monitoring, evaluating, and updating processes and protocols for the Dauphin County HMP.

7.2.1 Monitoring

The Planning Team will be responsible for monitoring implementation and evaluating the effectiveness of the HMP and documenting this information in a progress report. Prior to Planning Team progress meetings (detailed below), Planning Team representatives may collect information from departments, agencies, and organizations involved with the mitigation activities identified in Section 6 of this plan. The representatives will make phone calls and conduct meetings with persons responsible for initiating and/or overseeing the mitigation projects to obtain progress information. Copies of any grant applications filed on behalf of any of the participating jurisdictions will be provided to the Planning Team. The Dauphin County HMP Coordinator will work with municipal representatives to provide additional opportunities for members of the public to learn about the hazards they face, and to provide information to be incorporated into the HMP. FEMA's National Flood Hazard Layer interactive tools can be used to facilitate this process. Further, the representatives will obtain from their municipal supervisor, mayor, or councilperson any public comments made on the plan, and provide them to the Planning Team for inclusion in the progress report.

The Planning Team representatives will be expected to document the following, as needed and as appropriate:

- Additional stakeholders (such as planning agencies and business representatives) who should be invited to participate in the planning process
- Additional local assets (such as major employers, local points of interest, residential areas, etc.) to consider in the risk assessment and mitigation strategy to ensure that items considered vital by each municipality can be included in the HMP
- Hazard events and losses occurring in their jurisdiction, including their nature and extent, and the effects that hazard mitigation actions have had on impacts and losses
- Progress on the implementation of mitigation actions, including efforts to obtain outside funding for mitigation actions
- Any obstacles or impediments to the implementation of actions
- Additional mitigation actions believed to be appropriate and feasible
- How floodplain management, in accordance with the National Flood Insurance Program (NFIP), is carried out in the municipality (through completion of the NFIP Survey worksheet)
- Public and stakeholder input and comments on the plan

Local Planning Team representatives may use the progress reporting forms (Worksheets #1 and #3 in the Federal Emergency Management Agency [FEMA] 386-4 guidance document) to facilitate collection of progress data and information on specific mitigation actions.

7.2.2 Evaluating

The evaluation of the HMP is an assessment of whether (1) the planning process and actions have been effective, (2) the plan's goals are being reached, and (3) changes are needed. The plan will be evaluated on an annual basis to determine the effectiveness of the programs, and to reflect changes that may affect mitigation priorities or available funding.

After information on the status of the HMP is gathered, as described in Section 7.2.1, the information will be discussed and documented at an annual plan review meeting of the Hazard Mitigation Planning Team. At least 1 month before the progress plan review meeting, the Dauphin County HMP Coordinator will advise Planning Team members of the meeting date, agenda, and expectations of the members. The Dauphin County HMP Coordinator may also distribute additional flood mitigation surveys and mitigation project opportunity forms for jurisdictions that may have new information or did not participate in the update process.

The Dauphin County HMP Coordinator will be responsible for calling and coordinating the progress plan review meeting and assessing progress toward achieving plan goals and objectives. These evaluations will assess whether:

- Goals and objectives address current and expected conditions
- The nature or magnitude of the risks has changed
- The HMP has been implemented into land-use processes on the county and municipal levels
- Current resources are appropriate for implementing the HMP and if different or additional resources are now available
- Actions are cost effective
- Schedules and budgets are feasible
- Implementation problems exist—such as technical, political, legal, or coordination issues with other agencies
- Outcomes have occurred as expected
- Changes in county or municipal resources have impacted plan implementation (for example, funding, personnel, and equipment)
- New agencies, departments, or staff should be included, including other local governments, as defined under 44 *Code of Federal Regulations* (CFR), Section 201.6
- Documentation has been completed for any hazards that occurred during the last year

Specifically, the Planning Team will review the mitigation goals, objectives, activities, and projects using the following performance-based indicators:

- New agencies or departments created that have authority to implement mitigation actions or are required to meet goals, objectives, and actions
- Project evaluation based on current needs of the mitigation plan
- Project completion regarding progress of proposed or ongoing actions
- Under or over spending regarding proposed mitigation action budgets
- Achievement of the goals and objectives
- Resource allocation to note whether resources are required to implement mitigation activities
- Timeframe comments on whether proposed schedules are sufficient to address actions
- Budget notes (in other words, if budget basis should be changed or is sufficient)
- Lead or support agency commitment notes (if there is a lack of commitment on the part of lead or support agencies)
- Resource comments regarding whether resources are available to implement actions
- Feasibility comments regarding whether certain goals, objectives, or actions prove to be unfeasible

Finally, the Planning Team will evaluate the ways other programs and policies have conflicted or augmented planned or implemented measures, and will identify policies, programs, practices, and procedures that could be modified to accommodate hazard mitigation actions (described further in Section 5.2.6). These other programs and policies can include those that address the following:

- Economic development
- Environmental preservation and permitting
- Historic preservation
- Redevelopment
- Health and/or safety

- Recreation
- Land use and zoning
- Public education and outreach
- Transportation

The Planning Team may refer to the evaluation forms (Worksheets #2 and #4 in the FEMA 386-4 guidance document) to assist in the evaluation process.

The Dauphin County HMP Coordinator will be responsible for preparing an annual HMP progress report based on the annual local progress reports provided by each jurisdiction, information presented at the Planning Team meeting, and other information as appropriate and relevant. These HMP annual county progress reports will provide data for the 5-year update of this HMP and will assist in pinpointing implementation challenges. By monitoring the implementation of the plan, the Planning Team will assess which projects are completed, are no longer feasible, or may require additional funding.

The annual HMP progress report will apply to all planning partners who have provided input, and as such, will be developed according to an agreed-upon format and with adequate allowance for input and comment of each planning partner prior to completion and submission to the State Hazard Mitigation Officer. Each planning partner will be responsible for providing this report to its governing body for their review.

During the Planning Team meeting, the planning partners will establish a schedule for the development, review, comment, amendment, and submission of the annual HMP progress report to the State Hazard Mitigation Officer. The HMP Coordinator will ensure that the reports are submitted to the State Hazard Mitigation Officer and FEMA Region III.

The plan will also be evaluated and revised following any major disasters to determine whether the recommended actions remain relevant and appropriate. The risk assessment will also be revisited to determine whether any changes are necessary based on the pattern of disaster damage or if data listed in Section 4.3 (Hazard Profiles) of this plan have been collected to facilitate the risk assessment. Revisiting the risk assessment is an opportunity to increase the community's disaster resistance and build a better and stronger community.

7.2.3 Updating

Section 44 CFR 201.6.d.3 requires that local hazard mitigation plans be reviewed, revised (as appropriate), and resubmitted for approval to remain eligible for benefits awarded under the Disaster Mitigation Act of 2000 (DMA 2000). The Dauphin County Hazard Mitigation Planning Team will update this plan on a 5-year cycle from the date of plan adoption.

To facilitate the update process, the Dauphin County HMP Coordinator (with support from the Planning Team) will hold a meeting 3 years from the date of plan approval to develop and commence with the implementation of a detailed plan update program. The Dauphin County HMP Coordinator will invite representatives from the Pennsylvania Emergency Management Agency (PEMA) to this meeting to provide guidance on plan update procedures. This program will, at a minimum, establish (1) the parties responsible for managing and completing the plan update effort, (2) features needed to be included in the updated plan, and (3) a detailed timeline with milestones to ensure that the update is completed according to regulatory requirements.

At this meeting, the Planning Team will determine the resources needed to complete the update. The Dauphin County HMP Coordinator will be responsible for ensuring that needed resources are secured.

The Dauphin County HMP Coordinator will be responsible for coordinating the plan evaluation portion of the meeting, soliciting feedback, collecting and reviewing the comments, and ensuring their incorporation in the 5-year plan update, as appropriate. Additional meetings may also be held as deemed necessary by the Planning Team. These meetings will provide an opportunity for the public to express concerns, opinions, and ideas about the HMP.

7.3 CONTINUED PUBLIC INVOLVEMENT

Dauphin County and participating jurisdictions are committed to the continued involvement of the public in the hazard mitigation process. Therefore, the plan will be posted on the DPS HMP website https://www.dauphincounty.org/government/departments/public_safety/emergency_management.php, and copies of the plan will be made available for review during normal business hours at DPS's main office. Dauphin County will make electronic copies of the plan available for local municipalies to provide to the public..

Following each 5-year update of the HMP, the updated plan will be distributed for public comment. After all comments are addressed, the HMP will be revised and distributed to all Planning Team members and the Pennsylvania State Hazard Mitigation Officer.

The Dauphin County HMP Coordinator will be responsible for receiving, tracking, and filing public comments regarding the HMP. The public will have an opportunity to comment on the plan at the review meeting for the HMP and during the 5-year plan update. Dauphin County will maintain an active link on the DPS HMP website to collect public comments.

The Planning Team representatives will be responsible for ensuring the following:

- Public comment and input on the HMP (and hazard mitigation in general) are recorded and addressed, as appropriate. An opportunity to comment on the plan will be provided directly on the DPS HMP website, and provisions will be made for public comments submitted in writing. All public comments should be addressed to:

  Alexis "Lexi" Passaro, Planning Specialist
  Dauphin County Department of Public Safety
  Office of Emergency Management
  911 Gibson Boulevard
  Steelton, PA 17113
- Copies of the latest approved version of the plan will be available for review at the municipal buildings along with instructions to facilitate public input and comment on the plan.
- Appropriate links to the Dauphin County HMP website (https://www.dauphincounty.org/government/departments/public_safety/emergency_management.php), will be maintained. The website will be monitored throughout the course of the HMP update process, and a draft copy of the plan will be posted for public comment. Upon conclusion of the update, appropriate links to the County HMP will be maintained on the DPS website (https://www.dauphincounty.org/government/departments/public_safety/emergency_management.php).
- Public notices will be made, as appropriate, to inform the public of the availability of the plan, particularly during plan update cycles.

The Dauphin County HMP Coordinator will ensure the following:

- Public comment and input on the HMP (and hazard mitigation in general) will be recorded and addressed, as appropriate.
- The DPS HMP website will be maintained and updated, as appropriate.
- All public and stakeholder comments received will be documented and maintained.
- Copies of the latest approved plan will be available for review at DPS, along with instructions to facilitate public input and comment on the plan.
- Public notices, including media releases, will be developed (as appropriate) to inform the public of the availability of the plan, particularly during plan update cycles.

SECTION 8 PLAN ADOPTION

By adopting the Dauphin County Hazard Mitigation Plan (HMP), local governing bodies demonstrate their commitment to fulfill the mitigation goals and objectives outlined in the plan. Adoption of the HMP by Dauphin County and each participating jurisdiction legitimizes the HMP and authorizes responsible agencies to execute their responsibilities.

Each participating jurisdiction in Dauphin County will continue with formal adoption proceedings upon conditional approval of this HMP from the Federal Emergency Management Agency (FEMA), known as "Approval Pending Adoption (APA)." Each participating jurisdiction understands that conditional approval of the HMP will be provided for those municipalities that meet the planning requirements with the exception of the adoption requirement, as stated above.

Following adoption or formal action on the HMP, each participating jurisdiction must submit a copy of the resolution or other legal instrument showing formal adoption (acceptance) of the HMP to the Dauphin County Hazard Mitigation Coordinator. Dauphin County will forward the executed resolutions to the Pennsylvania Emergency Management Agency (PEMA), which will subsequently forward the resolutions to FEMA. Each participating jurisdiction understands that FEMA will transmit acknowledgement of verification of formal HMP adoption and the official approval of the HMP to the Hazard Mitigation Coordinator. Resolutions reflecting the formal adoption of this HMP by the county and participating jurisdictions are included in Appendix F of this HMP. A sample resolution to be used by the county and its jurisdictions is provided on the following pages in Section 8.

Dauphin County Hazard Mitigation Plan

County Adoption Resolution

Resolution No. __________________

Dauphin County, Pennsylvania

WHEREAS, the municipalities of Dauphin 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, Dauphin County 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 Dauphin County Hazard Mitigation Plan has been developed by the Dauphin County Department of Public Safety in cooperation with other county departments, local municipal officials, and the citizens of Dauphin County, and

WHEREAS, a public involvement process consistent with the requirements of DMA 2000 was conducted to develop the Dauphin County Hazard Mitigation Plan, and

WHEREAS, the Dauphin 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 and its municipal governments.

NOW THEREFORE BE IT RESOLVED by the governing body for the County of Dauphin that:

- The 2021 Dauphin County Hazard Mitigation Plan is hereby adopted as the official Hazard Mitigation Plan of the county, and
- The respective officials and agencies of Dauphin County identified in the implementation strategy of the 2021 Dauphin County Hazard Mitigation Plan are hereby directed to execute the recommended activities assigned to them.

ADOPTED, this _________ day of ________________, 2021

ATTEST:

____

DAUPHIN COUNTY COMMISSIONERS

By _______________________________

By _______________________________

By _______________________________

Dauphin County Hazard Mitigation Plan

Municipal Adoption Resolution

Resolution No. ___________________

< *Municipality Name*>*,* Dauphin County, Pennsylvania

WHEREAS, the <*Municipality Name*>, Dauphin 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 <*Municipality 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 Dauphin County Hazard Mitigation Plan has been developed by the Dauphin County Department of Public Safety in cooperation with other county departments, and officials and citizens of <*Municipality Name*>, and

WHEREAS, a public involvement process consistent with the requirements of DMA 2000 was conducted to develop the Dauphin County Hazard Mitigation Plan, and

WHEREAS, the Dauphin 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 and its municipal governments.

NOW THEREFORE BE IT RESOLVED by the governing body for the <*Municipality Name*>:

- The 2021 Dauphin County Hazard Mitigation Plan is hereby adopted as the official Hazard Mitigation Plan of the <*Municipality Name*>, and
- The respective officials and agencies identified in the implementation strategy of the 2021 Dauphin County Hazard Mitigation Plan are hereby directed to execute the recommended activities assigned to them.

ADOPTED, this _________ day of ________________, 2021

ATTEST:

____

< *MUNICIPALITY NAME*> REPRESENTATIVES

By _______________________________

By _______________________________

By _______________________________