ALLEGHENY COUNTY 2020

HAZARD MITIGATION PLAN UPDATE

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1. Introduction

1.1. Background

Across the United States, natural and man-made disasters have led to increasing levels of deaths, injuries, property damage, and interruption of business and government services. The time, money, and effort needed to recover from these disasters exhausts resources, diverting attention from important public programs and private agendas. Since 1955 there have been a combined 62 Presidential Disaster Declarations and Emergency Declarations in Pennsylvania, 18 of which have included Allegheny County. The emergency management community, citizens, elected officials and other stakeholders in Allegheny County, Pennsylvania recognize the impact of disasters on their community and support proactive efforts needed to reduce the impact of natural and human-made hazards.

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

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

2015 Hazard Mitigation Plan Update

The 2015 Plan Update consisted of a review of the 2010 Plan, which was used as a base document. The Plan Update involved the review of data on potential hazards and reprioritization of these hazards in terms of frequency and severity. The Plan Update included a review of mitigation actions, which were revised, deleted, or modified to address the high priority hazards as well as a Plan Maintenance section. The 2015 HMP Update achieved a 99% municipal participation during the planning process.

2020 Hazard Mitigation Plan Update

The Allegheny County Hazard Mitigation Plan Steering Committee (HMPSC) and Hazard Mitigation Planning Team (HMPT), government leaders from Allegheny County, in cooperation with the elected officials of the County and its municipalities, have prepared this Hazard Mitigation Plan (HMP) update. The Plan is the result of work by citizens of the County to develop a pre-disaster multi-hazard mitigation plan that will not only guide the County towards greater disaster resistance but will also respect the character and needs of the community.

The Plan Update involves the review of data on potential hazards and reprioritization of these hazards in terms of frequency and severity. The Plan Update includes a review of mitigation actions, which were revised, deleted, or modified to address the high priority hazards as well as a Plan Maintenance section.

1.2. Scope

The Allegheny County 2020 Hazard Mitigation Plan update has been prepared to meet requirements set forth by the Federal Emergency Management Agency (FEMA) and Pennsylvania Emergency Management Agency (PEMA) in order for the County to be eligible for funding and technical assistance from state and federal hazard mitigation programs. It will be updated and maintained to address both natural and human-made hazards determined to be of significant risk to the County and/or its local municipalities. Updates will take place at a minimum every five years, but they will also take place following significant disaster events.

1.3. Organization of the Plan

The 2020 Hazard Mitigation Plan Update comprises seven chapters. Chapter 1 includes the prerequisites of the Plan including letters of adoption by the County Commission and the individual municipalities. Chapter 2 introduces the plan update process and includes an overview of the socio-economic and demographic characteristics. Chapter 3 discusses the planning process. Chapter 4 comprises the hazard identification and risk assessment and examines vulnerability and the potential losses from the top priority hazards. Chapter 4 also includes a historic profile of hazard types and associated losses, and a vulnerability assessment, which analyzes the potential for future damages due to the hazards identified. Chapter 5 contains a capability assessment including a review of existing plans and ordinances from the counties and municipalities. Chapter 6 discusses the mitigation strategy including updated mitigation goals and objectives, mitigation actions, and the method for prioritization and implementation of mitigation actions. Chapter 7 outlines how Allegheny County and its municipalities will implement the Plan once it is adopted and ways to monitor progress and ensure continued public involvement.

1.4. Purpose

The purpose of this All-Hazard Mitigation Plan Update is:

- To protect life, safety, and property by reducing the potential for future damages and economic losses that result from natural hazards;
- To qualify for additional grant funding, in both the pre-disaster and the post-disaster environment;
- To qualify for additional credit under the Community Ratings System (CRS);
- To speed recovery and redevelopment following future disaster events;
- To demonstrate a firm local commitment to hazard mitigation principles; and
- To comply with both state and federal legislative requirements for local hazard mitigation plans.

1.5. Authority and References

Authority for this plan originates from the following federal sources:

- Robert T. Stafford Disaster Relief and Emergency Assistance Act, 42 U.S.C., Section 322, as amended;
- CFR, Title 44, Parts 201 and 206;

- Disaster Mitigation Act of 2000, Public Law 106-390, as amended; and
- National Flood Insurance Act of 1968, as amended, 42 U.S.C. 4001 *et seq.*

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

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

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

- FEMA 386-1: *Getting Started*. September 2002.
- FEMA 386-2: *Understanding Your Risks: Identifying Hazards and Estimating Losses*. August 2001.
- FEMA 386-3: *Developing the Mitigation Plan*. April 2003.
- FEMA 386-4: *Bringing the Plan to Life*. August 2003.
- FEMA 386-5: *Using Benefit-Cost Review in Mitigation Planning*. May 2007.
- FEMA 386-6: *Integrating Historic Property and Cultural Resource Considerations into Hazard Mitigation Planning*. May 2005.
- FEMA 386-7: *Integrating Manmade Hazards into Mitigation Planning*. September 2003.
- FEMA 386-8: *Multijurisdictional Mitigation Planning*. August 2006.
- FEMA 386-9: *Using the Hazard Mitigation Plan to Prepare Successful Mitigation Projects*. August 2008.
- FEMA: *Local Mitigation Planning Handbook.* March 2013.
- FEMA: *Local Mitigation Plan Review Guide.* October 2011.
- FEMA: *National Fire Incident Reporting System 5.0: Complete Reference Guide*. January 2008.
- FEMA: *Hazard Mitigation Assistance Unified Guidance*. February 2015.
- FEMA: *Integrating Hazard Mitigation into Local Planning: Case Studies and Tools for Community Officials*. March 2013
- FEMA: *Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards.* January 2013.

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

- PEMA: *Hazard Mitigation Planning Made Easy!*
- PEMA Mitigation Ideas: *Potential Mitigation Measures by Hazard Type; A Mitigation Planning Tool for Communities*. March 2009.
- PEMA: *Pennsylvania's Hazard Mitigation Planning Standard Operating Guide*. October 2013.

The following additional guidance document produced by the National Fire Protection Association (NFPA) was used to update this plan:

- NFPA 1600: *Standard on Disaster/Emergency Management and Business Continuity Programs*.2007

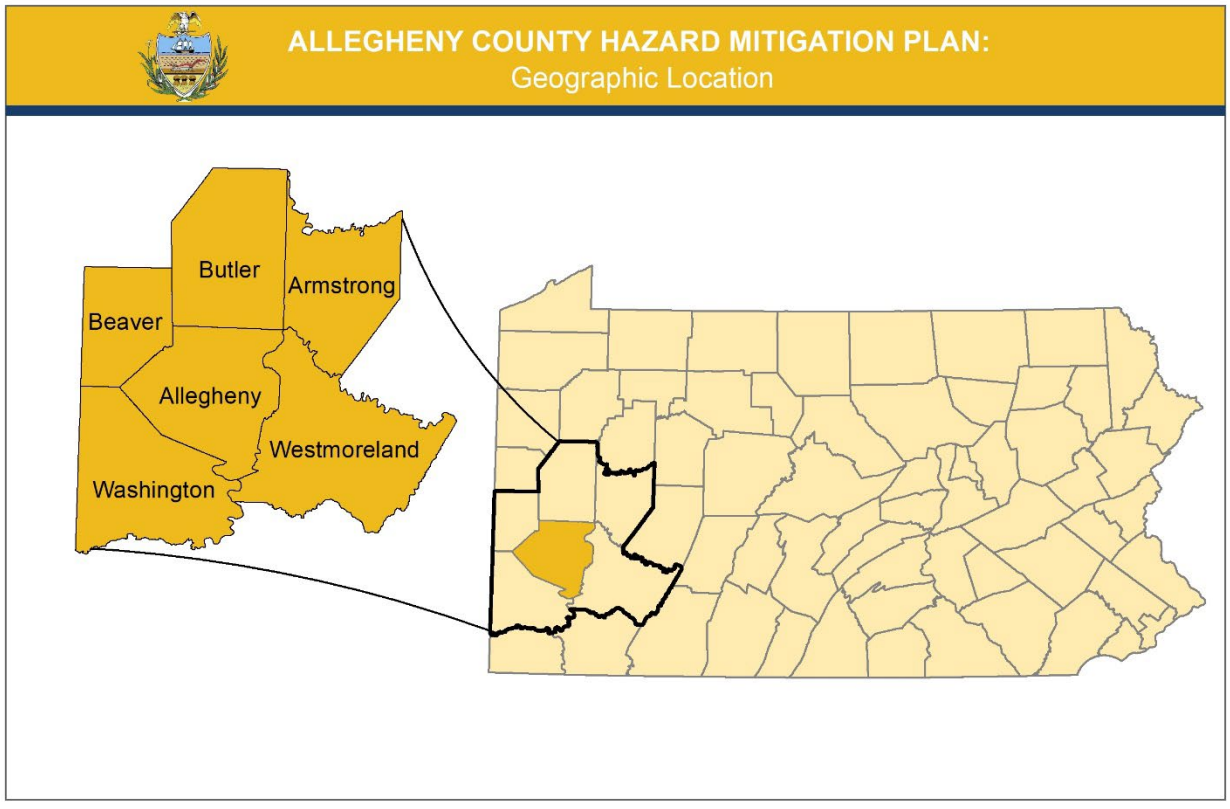
2. Community Profile

2.1. Geography and Environment

Allegheny County, named after the Allegheny River, was officially created on September 24, 1788 from parts of Washington and Westmoreland Counties. The County originally extended all the way north to the shores of Lake Erie, known as the "mother county" for most of what is now northwestern Pennsylvania. By 1800, the County's borders were set. Due to iron and coal deposits and easy access to waterways for barge traffic, the area developed rapidly throughout the 19th century to become the center of steel production in the United States. The City of Pittsburgh was labeled the "Steel Capital of the World." With the decline of the steel industry in the United States, the area shifted to other industries, including medicine, education, and non-steel industry.

Today, Allegheny County is a large, mostly urban county located in southwestern Pennsylvania. As seen in Figure 2.1-1, it is bordered by Butler County to the north, Armstrong County to the northeast, Westmoreland County to the east, Washington County to the southwest and Beaver County to the northwest.

Figure 2.1-1 Geographic Location of Allegheny County and Surrounding Counties



Allegheny County is 745 square miles in size (both land and water) with 130 municipalities, the largest number of municipalities within a county in the Commonwealth. The County has four major rivers - the Allegheny, the Monongahela, and the Ohio Rivers, which meet at the center of the County in the City of Pittsburgh, and the Youghiogheny River. The Youghiogheny River flows into the Monongahela River in the City of McKeesport. Water from these rivers eventually flows into the Gulf of Mexico via the Mississippi River. Water bodies make up approximately 2% of the County's geographic area and have created flat uplands and steep, V-shaped valleys that characterize the County. Unfortunately, the historic choices to locate industrial and other large facilities next to rivers resulted in many important facilities in the floodplain, increasing the County's vulnerability to flooding and other hazards. Although the County's industrial growth caused the clearcutting of forests, a significant woodland remains. Figure 2.1-2 depicts the municipalities, major rivers, and highways network.

Figure 2.1-2 Allegheny County Base Map

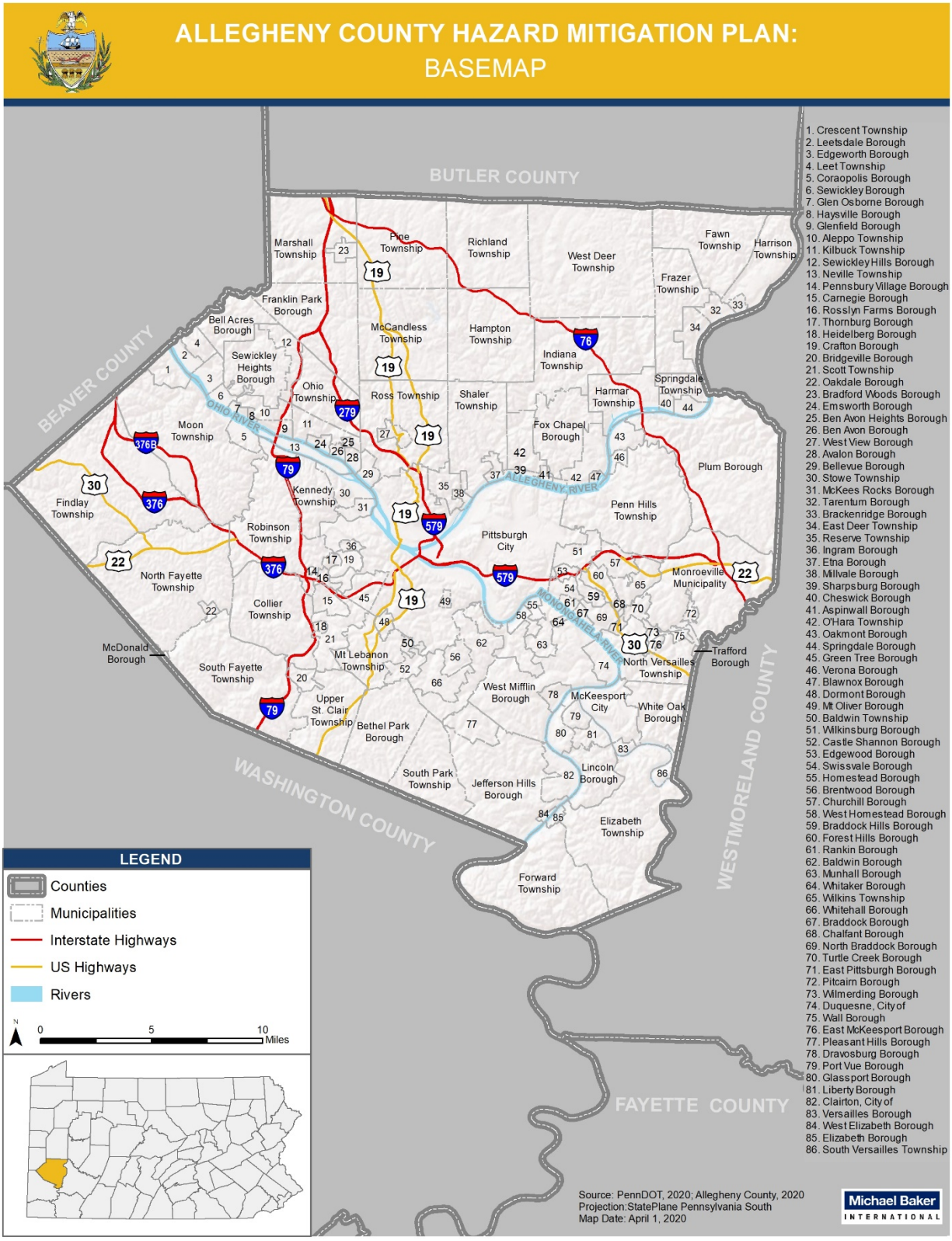
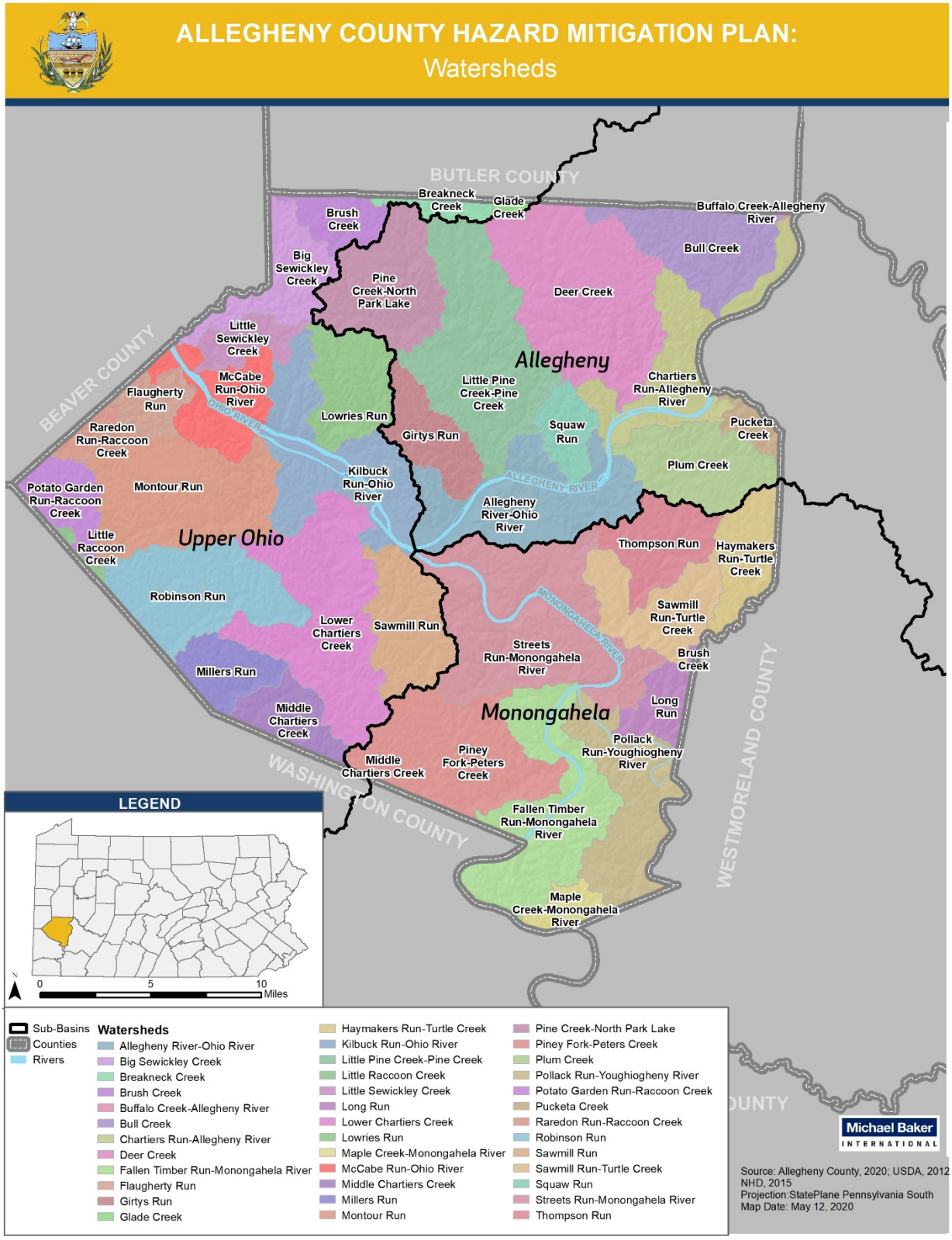


Table 2.1-2 lists the numerous water bodies that make up Allegheny County's 34 watersheds. The location of the County's watersheds are shown in Figure 2.1-3 and will be discussed in more detail in Section 4.3.2 – Flood, Flash Flood, Ice Jam.

Table 2.1-1 **Allegheny County Watersheds and their Receiving Waters.**

HUC 12 Watershed	Sub-Basin	HUC 12 Watershed	Sub-Basin
Allegheny River-Ohio River	Allegheny River	McCabe Run-Ohio River	Upper Ohio River
Big Sewickley Creek	Upper Ohio River	Middle Chartiers Creek	Upper Ohio River
Breakneck Creek	Upper Ohio River	Millers Run	Upper Ohio River
Buffalo Creek-Allegheny River	Allegheny River	Montour Run	Upper Ohio River
Bull Creek	Allegheny River	Pine Creek-North Park Lake	Allegheny River
Chartiers Run-Allegheny River	Allegheny River	Piney Fork-Peters Creek	Monongahela River
Deer Creek	Allegheny River	Plum Creek	Allegheny River
Fallen Timber Run-Monongahela River	Monongahela River	Pollack Run-Youghiogheny River	Monongahela River
Flaugherty Run	Upper Ohio River	Potato Garden Run-Raccoon Creek	Upper Ohio River
Girty's Run	Allegheny River	Pucketa Creek	Allegheny River
Haymakers Run-Turtle Creek	Monongahela River	Raredon Run-Raccoon Creek	Upper Ohio River
Kilbuck Run-Ohio River	Upper Ohio River	Robinson Run	Upper Ohio River
Little Pine Creek-Pine Creek	Allegheny River	Sawmill Run	Upper Ohio River
Little Sewickley Creek	Upper Ohio River	Sawmill Run-Turtle Creek	Monongahela River
Long Run	Monongahela River	Squaw Run	Allegheny River
Lower Chartiers Creek	Upper Ohio River	Streets Run-Monongahela River	Monongahela River
Maple Creek-Monongahela River	Monongahela River	Thompson Run	Monongahela River

Figure 2.1-3 Allegheny County Watersheds



2.2. Community Facts

There are seven Councils of Government (COGs) in the County, each containing 9 to 20 member municipalities, which are local planning organizations that help the municipalities organize and/or take action on various issues that arise in the County. The seven COGs are: Allegheny Valley North, Char-West, North Hills, Quaker Valley, South Hills Area, Steel Rivers, and Turtle Creek Valley. Steel Rivers was formed through a merger of two COGs, Steel Valley and Twin River, in 2015. The City of Pittsburgh is not in a COG, but in many respects provides similar functions for the many neighborhoods in the City. More information on the capabilities of the eight COGs can be found in Section 5.2.2.

The major thoroughfares within the County are Interstate 79 running north-south, Interstate 376 (The Parkway) west-east, followed by Interstates 279 running northwest-southeast, 579 north-south, and 76 northwest-southeast. Prominent Pennsylvania Routes include Route 19 running north-south and Route 22 and 30 running west-east. Another a major factor of the transportation network are the major railroads bisecting the County from northwest to southeast and northeast to southwest.

As with most communities, Allegheny County has dealt with changes over time in its economic and physical environment. In recent times the region has responded to the decline of the steel industry by developing retraining programs, incubating new industries, and engaging universities in entrepreneurial activities, including the development of a biotech industry. The region is currently home to several large companies, including Alcoa, PPG Industries, Mellon Bank, PNC Bank, US Steel and the Bayer Corporation. Allegheny County also contains world-class universities such as Carnegie Mellon, Duquesne, and the University of Pittsburgh, as well as several major cultural destinations, including the Andy Warhol Museum, the Carnegie Museum of Art, the Carnegie Museum of Natural History, and the Pittsburgh Symphony Orchestra. The County is home to the black and gold Pittsburgh Steelers, Pirates, and Penguins. All facilities (Heinz Field, PNC Park, and Consol Energy Center) are located within the City of Pittsburgh.

Table 2.2-1 breaks down Allegheny County's industry sections by the number of establishments and employees. The largest industries are Healthcare and Social Assistance leading with 132,257 employees, which is 19% of the workforce, and with 4,674 establishments. This is followed by Retail Trade with 4,238 establishments and 72,763 employees (10% of the workforce). Accommodation and Food Services; Professional, Scientific, and Technical Services; and Educational Services are also major employer sectors within the County.

Table 2.2-1 **Allegheny County Industry Sections by Establishments and Employees (2017)**

Industry Sector	Establishments	Employees	Percentage of Workforce
Health care and social assistance	4,674	132,257	18.6%
Retail trade	4,238	72,763	10.2%
Accommodation and food services	3,382	66,269	9.3%
Professional, scientific, and technical services	3,990	60,251	8.5%
Educational services	508	54,649	7.7%
Finance and insurance	2,128	54,117	7.6%
Management of companies and enterprises	413	50,052	7.0%

Table 2.2-1 Allegheny County Industry Sections by Establishments and Employees (2017)			
Industry Sector	**Establishments**	**Employees**	**Percentage of Workforce**
Administrative and support and waste management and remediation services	1,768	38,865	5.5%
Manufacturing	1,033	34,105	4.8%
Construction	2,600	30,630	4.3%
Other services (except public administration)	3,877	29,920	4.2%
Wholesale trade	1,724	24,650	3.5%
Information	725	17,569	2.5%
Transportation and warehousing	605	16,674	2.3%
Arts, entertainment, and recreation	600	13,539	1.9%
Real estate and rental and leasing	1,323	9,718	1.4%
Utilities	69	3,668	0.5%
Mining, quarrying, and oil and gas extraction	73	1,594	0.2%
Industries not classified	23	36	0.01%
Agriculture, forestry, fishing and hunting	9	28	0.00%
Total for all sectors	**33,762**	**711,354**	
Source: U.S. Census Bureau, 2017 County Business Patterns			

2.3. Population and Demographics

Population and demographic data provide baseline information for assessing the potential magnitude of hazards and can be used to identify trends in high-risk populations. This section includes baseline demographic trends for Allegheny County.

According to the 2018 Census Estimate, the population of Allegheny County is approximately 1,225,561. This is an increase of an estimated 2,213 residents since the 2010 Census. However, this is also a decrease of approximately 56,105 residents since the 2000 Census. Allegheny County's population has been steadily decreasing since the 1950s as seen in Table 2.3-1.

Table 2.3-1 Allegheny County Population Trends	
Year	**Population**
1950	1,515,237
1960	1,628,587
1970	1,605,016
1980	1,450,085
1990	1,336,449
2000	1,281,666
2010	1,223,348
2018	1,225,561

Table 2.3-1 Allegheny County Population Trends	
Year	**Population**
Source: U.S. Census Bureau	

Table 2.3-2 shows the distribution of the County population by municipality in the 2010 Census and the 2018 5-Year American Community Survey Estimates. Some of the most populated municipalities are:

- Pittsburgh, City of;
- Penn Hills Township;
- Mount Lebanon Township;
- Bethel Park Borough;
- Ross Township;
- Town of McCandless;
- Shaler Township;
- Monroeville Borough;
- Plum Borough;
- Moon Township; and
- West Mifflin Borough.

Some of the least populated municipalities are:

- Trafford Borough;
- Haysville Borough;
- Glenfield Borough;
- Ben Avon Heights Borough;
- South Versailles Township;
- Rosslyn Farm Borough;
- McDonald Borough;
- Thornburgh Borough;
- West Elizabeth Borough;
- Glen Osbourne Borough; and
- Wall Borough.

The largest increase in percent population change took place in Glen Osborne Borough (64.4%), Trafford Borough (61.6%), West Elizabeth Borough (34.5%), Whitehall Borough (42.9%), and Ohio Township (24.6%). Significant population loss has occurred in Glenfield Borough, and White Oak Borough. The City of Pittsburgh also had a slight decrease in population.

Table 2.3-2 List of Municipalities in Allegheny County with Associated Populations (U.S. Census, 2018).

Municipality	Population 2010	2018 ACS 5-Year Estimate	Population Difference	Percent Change (%)
Aleppo Township	1,916	1,826	-90	-4.9%
Aspinwall Borough	2,801	2,756	-45	-1.6%
Avalon Borough	4,705	4,626	-79	-1.7%
Baldwin Borough	19,767	19,651	-116	-0.6%
Baldwin Township	1,992	2,058	66	3.2%
Bell Acres Borough	1,388	1,434	46	3.2%
Bellevue Borough	8,370	8,196	-174	-2.1%
Ben Avon Borough	1,781	1,865	84	4.5%

Table 2.3-2 **List of Municipalities in Allegheny County with Associated Populations (U.S. Census, 2018).**

Municipality	Population 2010	2018 ACS 5-Year Estimate	Population Difference	Percent Change (%)
Ben Avon Heights Borough	371	343	-28	-8.2%
Bethel Park Borough	32,313	32,185	-128	-0.4%
Blawnox Borough	1,432	1,543	111	7.2%
Brackenridge Borough	3,260	3,203	-57	-1.8%
Braddock Borough	2,159	1,729	-430	-24.9%
Braddock Hills Borough	1,880	1,710	-170	-9.9%
Bradford Woods Borough	1,171	1,201	30	2.5%
Brentwood Borough	9,643	9,453	-190	-2.0%
Bridgeville Borough	5,148	5,066	-82	-1.6%
Carnegie Borough	7,972	7,905	-67	-0.9%
Castle Shannon Borough	8,316	8,229	-87	-1.1%
Chalfant Borough	800	735	-65	-8.8%
Cheswick Borough	1,746	1,715	-31	-1.8%
Churchill Borough	3,011	2,963	-48	-1.6%
Clairton, City of	6,796	6,640	-156	-2.4%
Collier Township	7,080	8,027	947	11.8%
Coraopolis Borough	5,677	5,587	-90	-1.6%
Crafton Borough	5,951	5,839	-112	-1.9%
Crescent Township	2,640	2,593	-47	-1.8%
Dormont Borough	8,593	8,438	-155	-1.8%
Dravosburg Borough	1,792	1,779	-13	-0.7%
Duquesne, City of	5,565	5,544	-21	-0.4%
East Deer Township	1,500	1,409	-91	-6.5%
East McKeesport Borough	2,126	2,106	-20	-1.0%
East Pittsburgh Borough	1,822	1,755	-67	-3.8%
Edgewood Borough	3,118	3,070	-48	-1.6%
Edgeworth Borough	1,680	1,596	-84	-5.3%
Elizabeth Borough	1,493	1,477	-16	-1.1%
Elizabeth Township	13,271	13,134	-137	-1.0%
Emsworth Borough	2,449	2,541	92	3.6%
Etna Borough	3,451	3,388	-63	-1.9%
Fawn Township	2,376	2,281	-95	-4.2%
Findlay Township	5,060	5,619	559	10.0%
Forest Hills Borough	6,518	6,401	-117	-1.8%
Forward Township	3,376	3,321	-55	-1.7%
Fox Chapel Borough	5,388	5,331	-57	-1.1%
Franklin Park Borough	13,470	14,448	978	6.8%

Table 2.3-2 List of Municipalities in Allegheny County with Associated Populations (U.S. Census, 2018).

Municipality	Population 2010	2018 ACS 5-Year Estimate	Population Difference	Percent Change (%)
Frazer Township	1,157	1,070	-87	-8.1%
Glassport Borough	4,483	4,391	-92	-2.1%
Glenfield Borough	205	576	371	64.4%
Glen Osborne Borough	547	209	-338	-161.7%
Green Tree Borough	4,432	4,913	481	9.8%
Hampton Township	18,363	18,365	2	0.01%
Harmar Township	2,921	3,043	122	4.0%
Harrison Township	10,461	10,394	-67	-0.6%
Haysville Borough	70	83	13	15.7%
Heidelberg Borough	1,244	1,285	41	3.2%
Homestead Borough	3,165	3,153	-12	-0.4%
Indiana Township	7,253	7,243	-10	-0.1%
Ingram Borough	3,330	3,271	-59	-1.8%
Jefferson Hills Borough	10,619	11,231	612	5.5%
Kennedy Township	7,672	8,105	433	5.3%
Kilbuck Township	697	696	-1	-0.1%
Leet Township	1,634	1,593	-41	-2.6%
Leetsdale Borough	1,218	1,237	19	1.5%
Liberty Borough	2,551	2,488	-63	-2.5%
Lincoln Borough	1,072	1,057	-15	-1.4%
Marshall Township	6,915	8,634	1,719	19.9%
McCandless, Town of	28,457	28,582	125	0.4%
McDonald Borough	383	447	64	14.3%
McKees Rocks Borough	6,104	5,966	-13,765	-0.2%
McKeesport, City of	19,731	19,365	13,261	-0.2%
Millvale Borough	3,744	3,636	-108	-3.0%
Monroeville Borough	28,386	27,893	-493	-1.8%
Moon Township	24,185	25,464	1,279	5.0%
Mount Lebanon Township	33,137	32,540	-597	-1.8%
Mount Oliver Borough	3,403	3,340	-63	-1.9%
Munhall Borough	11,406	11,229	-177	-1.6%
Neville Township	1,084	1,035	-49	-4.7%
North Braddock Borough	4,857	4,758	-99	-2.1%
North Fayette Township	13,934	14,617	683	4.7%
North Versailles Township	10,229	10,081	-148	-1.5%
O'Hara Township	1,459	1,548	89	5.8%
Oakdale Borough	6,303	6,450	147	2.3%

Table 2.3-2 List of Municipalities in Allegheny County with Associated Populations (U.S. Census, 2018).

Municipality	Population 2010	2018 ACS 5-Year Estimate	Population Difference	Percent Change (%)
Oakmont Borough	8,407	8,768	361	4.12%
Ohio Township	4,757	6,308	1,551	24.6%
Penn Hills Township	42,329	41,519	-810	-2.0%
Pennsbury Village Borough	661	747	86	11.5%
Pine Township	11,497	12,881	1,384	10.7%
Pitcairn Borough	3,294	3,230	-64	-2.0%
Pittsburgh, City of	305,704	303,587	-2,117	-0.7%
Pleasant Hills Borough	8,268	8,184	-84	-1.0%
Plum Borough	27,126	27,304	178	0.7%
Port Vue Borough	3,798	3,724	-74	-2.0%
Rankin Borough	2,122	2,100	-22	-1.1%
Reserve Township	3,333	3,272	-61	-1.9%
Richland Township	11,100	11,477	377	3.3%
Robinson Township	13,354	13,650	296	2.2%
Ross Township	31,105	30,728	-377	-1.2%
Rosslyn Farms Borough	427	436	9	2.1%
Scott Township	17,024	16,720	-304	-1.8%
Sewickley Borough	3,827	3,838	11	0.3%
Sewickley Heights Borough	810	770	-40	-5.2%
Sewickley Hills Borough	639	701	62	8.8%
Shaler Township	28,757	28,324	-433	-1.5%
Sharpsburg Borough	3,446	3,374	-72	-2.1%
South Fayette Township	14,416	15,503	1,087	7.0%
South Park Township	13,416	13,363	-53	-0.4%
South Versailles Township	351	406	55	13.6%
Springdale Borough	3,405	3,353	-52	-1.6%
Springdale Township	1,636	1,567	-69	-4.4%
Stowe Township	6,362	6,260	-102	-1.6%
Swissvale Borough	8,983	8,808	-175	-2.0%
Tarentum Borough	4,530	4,441	-89	-2.0%
Thornburg Borough	455	454	-1	-0.2%
Trafford Borough	61	48	-13	-27.1%
Turtle Creek Borough	5,349	5,244	-105	-2.0%
Upper St. Clair Township	19,229	19,592	363	1.9%
Verona Borough	2,474	2,736	262	9.6%
Versailles Borough	1,515	1,631	116	7.1%
Wall Borough	580	667	87	13.0%

Table 2.3-2 List of Municipalities in Allegheny County with Associated Populations (U.S. Census, 2018).				
Municipality	**Population 2010**	**2018 ACS 5-Year Estimate**	**Population Difference**	**Percent Change (%)**
West Deer Township	11,771	11,929	158	1.3%
West Elizabeth Borough	518	501	-17	-3.4%
West Homestead Borough	1,929	1,778	-151	-8.5%
West Mifflin Borough	20,313	19,946	-367	-1.8%
West View Borough	6,771	6,640	-131	-2.0%
Whitaker Borough	1,271	1,135	-136	-12.0%
White Oak Borough	13,944	7,621	-6,323	-83.0%
Whitehall Borough	7,862	13,759	5,897	42.9%
Wilkins Township	6,357	6,247	-110	-1.8%
Wilkinsburg Borough	15,930	15,637	-293	-1.9%
Wilmerding Borough	2,190	1,949	-241	-12.4%
Total	1,223,348	1,225,561	2,213	0.9%

Recent demographic trends in Allegheny County are summarized in Table 2.3-3 based on the census data available. The population is stable, and the median age decreased slightly.

Table 2.3-3 Allegheny County Demographic Summary (US Census Bureau, 2018)		
Demographic data point	**2010**	**2018 ACS Estimate**
Total Population	1,223,348	1,225,561
Male/Female	585,650/637,698	591,630/633,931
Median Age (Years)	41.3	40.8
Under 5	63,640	64,316
5 to 19 years	212,674	199,586
20 to 59 years	669,137	652,720
60 years and older	277,897	308,939.0

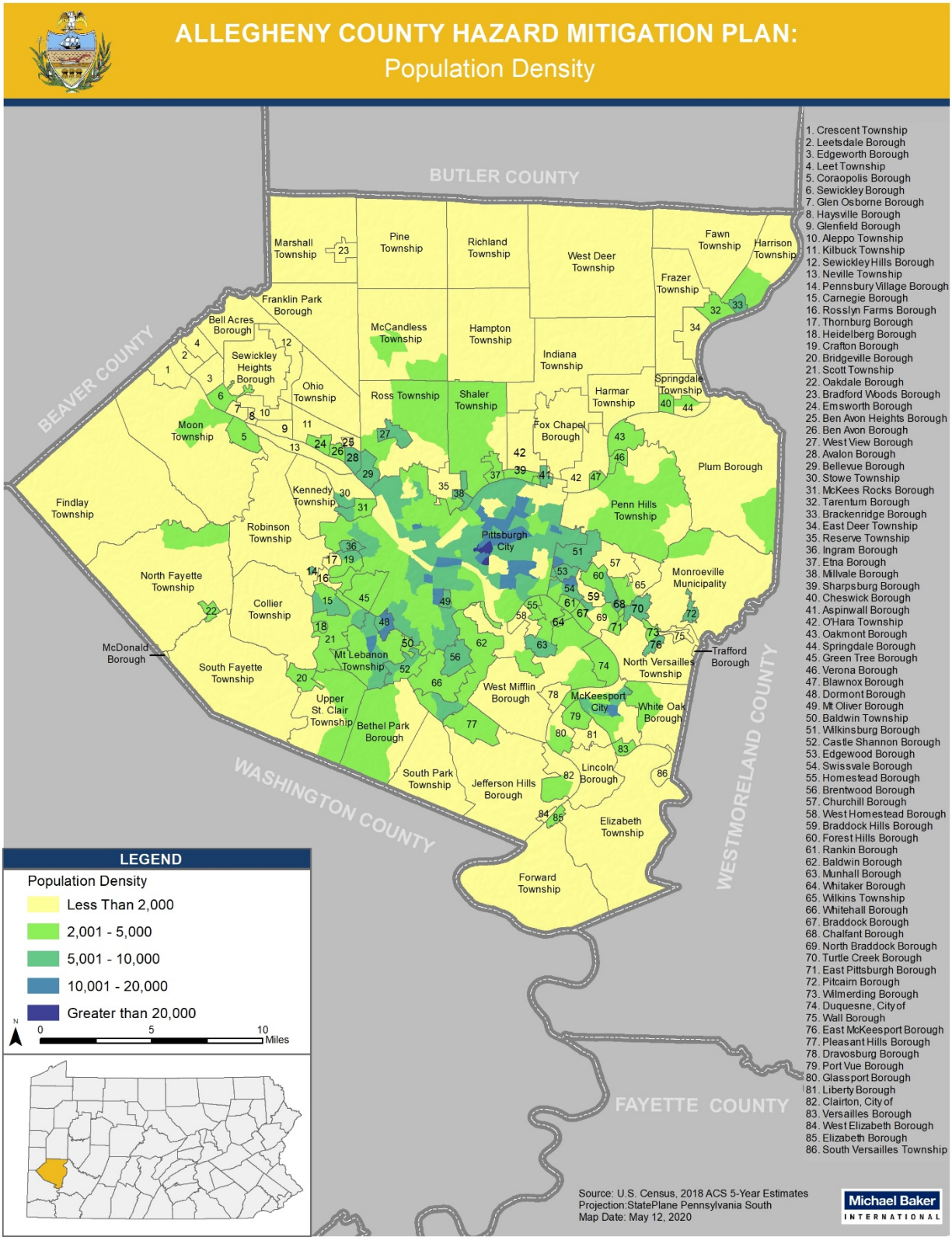
The percentage of the County population under 18 years old is lower than the national average, at 18.7% compared to 22.4%. Conversely, the percentage of the County population 65 years and older is higher than the national average, at 18.9% compared to 16.0%. Due to the large percentage of senior citizens, the County will need to develop hazard mitigation and preparedness strategies that take their needs into account. As senior citizens may not be able to drive, special evacuation plans may be required. Further, hearing or vision impairments could make receiving emergency instructions difficult. Since 2010, there has been a decrease in the number of residents aged five to 19 years old and an increase in those over 60 years.

Figure 2.3-2 describes the population per municipality Allegheny County. As it can be predicted, the center of the county, in and around the City of Pittsburgh, is the densest. In particular the smaller geographical areas listed below have a high population density:

- Braddock Hills;
- Bradford Woods
- Brentwood;
- Bridgeville;
- Castle Shannon;
- Dormont;
- Etna;
- McKees Rocks;
- Oakdale;
- Turtle Cree;
- West View;
- Wilmerding

These areas have a population density of over 20,000 people per square mile. The City of Pittsburgh and the majority of its neighboring communities have a population density of 5,000 to 10,000 people per square mile.

Figure 2.3-1 Allegheny County Population Density



Consideration should also be given to address hazard mitigation actions for citizens with disabilities. According to the U.S. Census, American Community Survey 2018 Estimates, 13.3% (161,343 out of 1,211,450) of Allegheny County residents have a disability. Of this population 7% are under 18, 49% are ages 18 to 64 years old, and 44% are 65 years or over.

From a race and ethnic perspective, Allegheny County citizens are predominantly white, followed by black or African American. As seen in Table 2.3-4, from 2010 to 2018, there has been an increase in people with two or more races and in the Asian population.

Table 2.3-4 **Race and Ethnicity Profile**

Demographic Indicator	2010	2018 Estimate
White	997,295	972,179
Black or African American	161,861	154,042
American Indian and Alaska Native	1,702	1,312
Asian	34,090	44,688
Native Hawaiian and Other Pacific Islander	278	334
Some Other Race	5,523	5,638
Two or More Races	22,599	33,257
Hispanic or Latino of any Race	19,070	24,647
Source: U.S. Census Bureau		

Median household income and median family income in Allegheny County are $58,383 and $70,380 respectively. The median household income is slightly less than Pennsylvania's, but the median family income is $6,250 higher. Per capita income is also slightly higher than the state.

Table 2.3-5 **Income Levels and Wage Statistics**

Income (2018 dollars)	Allegheny County (2018)	Pennsylvania (2018)
Median Household Income	$58,383	$59,445
Median Family Income	$81,730	$75,477
Per Capita Income	$36,907	$32,889
Source: U.S. Census Bureau, American Community Survey 2018 5-Year Estimates		

According to the U.S. Census 2018 Estimate, 65% of the population 16 years of age and older are in the civilian labor force (35% are not in the labor force). This translates to an unemployment rate of 5.3%, which is about the same as the Pennsylvania's unemployment rate.

As seen in Table 2.3-6, U.S. Census data shows an increase in the number of housing units in Allegheny County between 2010 and 2018, and a corresponding increase in vacant properties. Vacant buildings are particularly vulnerable to arson and criminal activity. Since vacant properties are often not maintained, many may be structurally deficient. Citizens renting homes are typically more transient than homeowners, therefore communicating with citizens who are renters may be more difficult than communicating with

homeowners. Communication strategies should be developed to make certain that citizens who rent housing units are given proper notification relate to hazard mitigation actions.

According to the 2018 Estimate, of the 598,424 housing units, 175,377 units (29%) were built in 1939 or earlier, and 80% of the housing stock was built prior to 1970. The age of the housing stock should be considered when planning for hazard mitigation, especially urban fire and explosion.

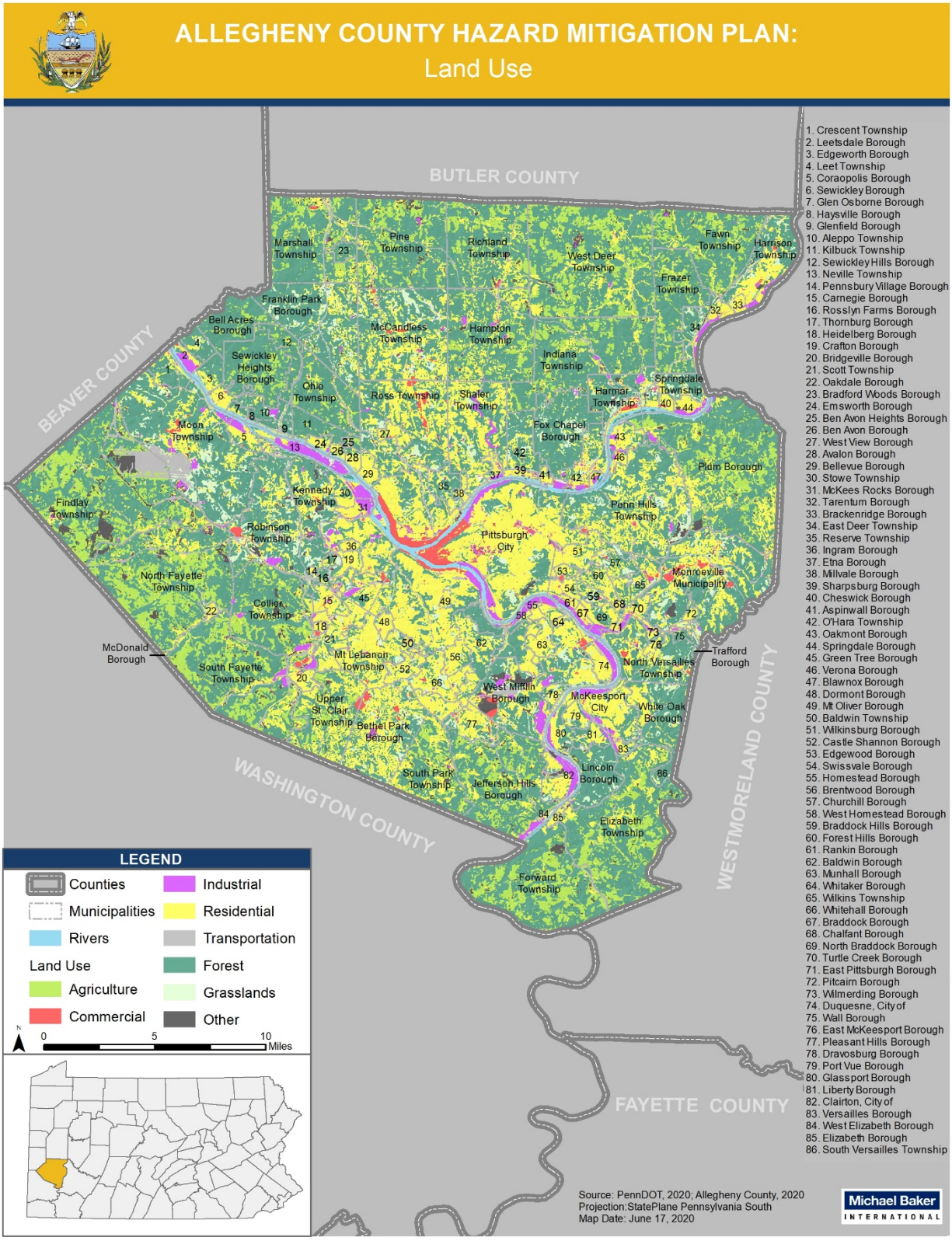
Table 2.3-6 **Housing Characteristics**

Housing characteristic	2010	2018 Estimate
Total Housing Units	589,201	598,424
Occupied Housing Units	533,960	537,960
Vacant Housing Units	55,241	60,464
Owner-Occupied Housing Units	345,393	348,200
Renter-Occupied Housing Units	188,567	189,760
Median Home Value	N/A	$147,700
Source: U.S. Census Bureau, American Community Survey, 2018 Estimates		

2.4. Land Use and Development

Nearly half of the County's total land area is considered developed. The remaining undeveloped land consists of forested, open space, or agricultural land. Despite population losses, the number of acres of developed land continues to increase rapidly, and sprawl strains the fiscal and environmental conditions in the County. The Allegheny Land Trust, funded in part by the County, has preserved over 2,500 acres of land in Allegheny and Washington Counties. The County Conservation District employs state funds to preserve land for agriculture. Figure 2.4-1 shows current land use for Allegheny County.

Figure 2.4-1 2020 Land Use for A2020 Land Use for Allegheny County



The 2017 Census of Agriculture by the United States Department of Agriculture indicated that there were 389 farms in 2017 with an average size of 74 acres, down from 534 farms in 2007. In 2017, the total market value of agricultural products sold was $13.7 million, up from $11.2 million a decade earlier. Ninety percent of the total products come from crop sales. Allegheny County is ranked 56th for agricultural production within Pennsylvania.

There have also been many efforts in recent years, specifically with the Urban Redevelopment Authority (URA) of Pittsburgh, to rehabilitate brownfield sites and to create mixed-use developments within the City of Pittsburgh and the bordering municipalities. Examples include Duquesne, City of Center, Carrie Furnace, Leetsdale Industrial Park, Somerset at Frick Park, the South Side Works, Pittsburgh Technology Center, Morningside Crossing, Krause Commons and Lawrenceville Community Land Trust.

Regional shopping centers, industrial parks, and business districts are mostly located along the County's major roadways. Allegheny County has an extensive transportation network of air, water, highway, railroad, and transit systems. The Port Authority of Allegheny County operates one of the nation's largest public transportation service networks. There are 5,844.74 total miles of highway in Allegheny County. Of the total miles of highway in the County, 79% are local/municipal and 21% are PennDOT and other State and Federal highways. Within the Commonwealth, Allegheny County ranks number one with the most miles of local roads and streets and number two in the number of miles of state highways.

The Future Land Use Plan of the Allegheny County Comprehensive Plan, Allegheny Places, is a guide for development and redevelopment through the year 2025. It is based on the projected growth population of approximately 1.3 million people, including a net gain of 32,000 housing units and 190,000 new jobs. The term "Places" used throughout the Plan references eight different types of Places, each with a unique identity. These include:

1. Airport-Industry
2. The Core
3. Corridors
4. Urban Neighborhoods
5. Community Downtowns
6. Villages
7. Rural Places
8. Transit-Oriented Developments (TODs)

The Plan hopes to provide an efficient and economical way to allow for both new growth and revitalization, meet a diversity of needs, support transit, reduce consumption of open space, and protect environmentally sensitive areas. Key challenges identified within the Plan include sprawl in the northern and western portions of the County, a declining population in the core area particularly, disinvestment in older communities, brownfields, a large number of local governments (the most in Pennsylvania), and poor condition of housing stock in older areas.

The Plan not only includes a Future Land Use Plan but also:

- Agricultural Resource Plan consisting of conservation easements and regulations;
- Transportation Plan outlining future projects and objectives;
- Utilities Plan touching on water supply, public water, pubic sewer systems, wastewater collection systems, stormwater management, and electric, natural gas, and telecommunication systems; and
- Environmental Resource Plan focusing on improving air and water quality.

Further discussion of how future land development patterns impact vulnerability to hazards is included in Section 4.4.4.

2.5. Data Sources and Limitations

The Allegheny County address point and parcel databases were used as an inventory of properties throughout the County. The address points included just the point locations of addresses countywide, and did not include additional attributes. The addresses did not have a value assigned to them. In order to evaluate the type of structures vulnerable to individual hazards, the consultant team used a spatial join to assign land use type to each address using the County's parcel database. The land use categories are unaltered from the County's assigned categories of agricultural, commercial, government, industrial, other, residential, utilities, and unknown. Since a spatial join was used to derive land use, if a parcel had more than one structure on it, both would be given the same underlying land use. As a result, the structure types used throughout this HMP should be considered estimates. The actual structure and land use may differ than information contained in the database. The list of critical facilities provided in Appendix E was developed based on information provided by the Allegheny County GIS Department, Allegheny County Emergency Services, PEMA, FEMA, the Pennsylvania Department of Health, and the National Atlas; selection of categories was led by the Allegheny County HMPSC leadership.

Flood hazard data used in this plan is Allegheny County's effective DFIRM database from 2014, which is a digital representation of features of Flood Insurance Rate Maps (FIRMs). In addition, this plan makes use of the non-regulatory Risk MAP products produced for Allegheny County, namely the 1-percent annual chance depth grid. Allegheny County GIS provided other GIS datasets including transportation infrastructure, boundaries, public buildings, and natural features like steep slopes and landslide prone areas. Additional data for the base map was provided by the Pennsylvania Department of Transportation,

Pennsylvania Game Commission, Pennsylvania Department of Environmental Protection and the Pennsylvania Department of Conservation and Natural Resources.

Additional information used to complete the risk assessment for this plan was taken from various government agency and non-government agency sources. Those sources are cited where appropriate throughout the plan and on each map with full references listed in Appendix A – Bibliography. It should be noted that numerous GIS datasets were obtained from the Pennsylvania Spatial Data Access (PASDA) website (http://www.pasda.psu.edu/). PASDA is the official public access geospatial information clearinghouse for the Commonwealth of Pennsylvania. PASDA was developed by the Pennsylvania State University as a service to the citizens, governments, and businesses of the Commonwealth. PASDA is a cooperative project of the Governor's Office of Administration, Office for Information Technology, Geospatial Technologies Office and the Penn State Institutes of Energy and the Environment of the Pennsylvania State University.

In order to assess the vulnerability of different jurisdictions to the hazards, data on past occurrences of damaging hazard events was gathered. For a number of historic natural-hazard events, the National Climatic Data Center (NCDC) database was utilized. NCDC is a division of the US Department of Commerce's National Oceanic and Atmospheric Administration (NOAA). Information on hazard events is compiled by NCDC from data gathered by the National Weather Service (NWS), another division of NOAA. NCDC then presents it on their website in various formats. The data used for this plan came the US Storm Events database, which "documents the occurrence of storms and other significant weather phenomena having sufficient intensity to cause loss of life, injuries, significant property damage, and/or disruption to commerce" (NOAA, 2006).

When applicable, PEIRS incident data spanning 1/1/2002 through 6/1/2009 was used in the 2015 plan update and kept in the 2020 update. However, the Commonwealth of Pennsylvania ceased using PEIRS as its incident reporting system in 2009 and was unable to provide more recent comprehensive incident reports. Although PEIRS data proved valuable, primarily in the human-made hazards section where few records of past occurrences exist, data limitations exist in that the reporting system is not mandatory. As a result, while PEIRS reports provide important information on the frequency of past events, because it is a voluntary reporting system, the number and frequency of events may be under-reported. PEIRS information was used in the following hazard profile sections: Urban Fire/Explosion, Transportation Accidents, and Civil Disturbance.

HAZUS-MH is a powerful risk assessment methodology for analyzing potential losses from floods, hurricane winds and earthquakes. In HAZUS-MH, current scientific and engineering knowledge is coupled with the latest GIS technology to produce estimates of hazard-related damage before, or after, a disaster occurs. HAZUS version 4.0 was used to estimate losses for floods in Allegheny County; this plan incorporates an enhanced analysis. County-specific essential facilities data was incorporated into the model to make it more precise. For more information on the enhanced analysis methodology used for this plan's flood model, please see Appendix F.

This HMP evaluates the vulnerability of the County's critical facilities. For the purposes of this plan, critical facilities are those entities that are essential to the health and welfare of the community. Table 2.5-1 summarizes the critical facilities in Allegheny County by type and by municipality. For a complete listing of critical facilities and their vulnerability to individual hazards, please see Appendix E.

Table 2.5-1 **Critical Facilities by Municipality and Type**

Municipality	Airport and Heliport	Colleges/Universities	Communication Towers	County Jail	Day Care Centers	EMS	EOCs	Fire Departments	Hospitals	Municipal Building	Nursing Homes	Other Public Buildings	Personal Care Homes	Police Departments	Public Works	SARA Facilities	School	Sewer Authorities	Water Authorities	WWTPs/STPs	Grand Total
Aleppo Township	0	0	1	0	0	0	0	1	0	1	1	0	1	0	0	0	0	0	0	2	7
Aspinwall Borough	0	0	0	0	0	0	0	2	0	1	0	1	0	1	0	0	1	0	0	0	6
Avalon Borough	0	0	1	0	1	0	0	1	0	1	0	0	1	1	0	1	1	0	0	0	8
Baldwin Borough	0	0	1	0	2	1	0	3	0	1	1	0	3	1	0	1	4	0	0	0	18
Baldwin Township	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	3
Bell Acres Borough	0	0	1	0	0	0	0	1	0	1	0	0	0	1	0	1	0	0	0	3	8
Bellevue Borough	0	0	0	0	1	1	0	1	1	1	1	0	3	1	0	1	4	0	0	0	15
Ben Avon Borough	0	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	3
Ben Avon Heights Borough	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
Bethel Park Municipality	0	0	3	0	3	1	0	3	0	1	2	0	2	1	1	6	11	0	0	0	34
Blawnox Borough	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0	1	1	1	7
Brackenridge Borough	0	0	0	0	0	0	0	1	0	1	1	0	1	1	0	2	1	0	1	0	9
Braddock Borough	0	0	0	0	0	0	0	1	0	1	0	0	1	1	0	3	0	1	1	0	9
Braddock Hills Borough	0	0	2	0	0	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	5
Bradford Woods Borough	0	0	0	0	1	0	0	1	0	1	0	0	0	0	0	0	1	0	0	0	4
Brentwood Borough	0	0	1	0	0	1	0	1	0	1	0	0	1	1	0	2	5	1	0	0	14
Bridgeville Borough	0	0	0	0	0	0	0	1	0	1	0	0	1	1	0	1	1	0	0	0	6
Carnegie Borough	0	0	1	0	0	1	0	1	0	1	0	0	0	1	1	5	1	0	0	1	13
Castle Shannon Borough	0	0	0	0	0	0	0	1	0	1	0	0	1	1	0	1	2	0	0	1	8

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Chalfant Borough	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	2
Cheswick Borough	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	0	1	1	1	0	6
Churchill Borough	0	0	1	0	0	0	0	1	0	1	0	0	0	1	0	0	2	0	0	0	6
Clairton	0	0	0	0	1	1	0	1	0	1	0	0	1	1	0	4	2	1	0	2	15
Collier Township	1	0	2	0	0	2	0	3	0	1	0	0	2	1	0	6	3	1	0	1	23
Coraopolis Borough	0	0	1	0	0	0	0	1	0	1	0	0	2	1	0	3	1	1	1	1	13
Crafton Borough	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	2	0	0	0	6
Crescent Township	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	1	3
Dormont Borough	0	0	0	0	1	0	0	1	0	1	0	0	0	1	0	2	1	0	0	0	7
Dravosburg Borough	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1	0	0	0	2	5
Duquesne	0	0	0	0	1	1	0	1	0	1	0	0	2	1	0	3	2	0	0	2	14
East Deer Township	0	0	0	0	0	1	0	1	0	1	0	0	1	1	0	4	0	0	1	1	11
East McKeesport Borough	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0	0	0	0	4
East Pittsburgh Borough	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	0	0	0	0	1	4
Edgewood Borough	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	0	2	0	0	0	5
Edgeworth Borough	0	0	0	0	1	0	0	0	0	1	0	0	0	1	0	0	2	0	1	0	6
Elizabeth Borough	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0	0	0	2	6
Elizabeth Township	0	0	4	0	0	1	0	5	0	1	0	0	1	1	1	6	5	0	0	4	29
Emsworth Borough	0	0	0	0	4	0	0	1	0	1	0	0	0	0	0	1	1	0	0	0	8

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Etna Borough	0	0	2	0	0	0	0	1	0	1	0	0	0	1	0	1	0	0	1	1	8
Fawn Township	1	0	1	0	0	0	0	2	0	1	0	0	0	1	0	3	2	0	1	1	13
Findlay Township	1	0	4	0	0	0	0	4	0	1	0	0	0	1	0	15	1	0	0	0	27
Forest Hills Borough	0	0	0	0	1	1	0	1	0	2	0	0	1	1	0	0	2	0	0	0	9
Forward Township	0	0	3	0	0	1	0	3	0	1	0	0	0	1	0	3	1	0	0	4	17
Fox Chapel Borough	0	0	1	0	1	1	0	2	0	2	0	0	1	1	0	2	3	0	0	0	14
Franklin Park Borough	0	0	2	0	1	1	0	2	0	2	0	0	1	1	0	0	4	0	0	0	14
Frazer Township	0	0	2	0	0	0	0	2	0	1	0	0	0	1	0	7	0	0	0	1	14
Glassport Borough	0	0	2	0	0	0	0	1	0	1	0	0	1	1	0	4	0	0	0	2	12
Glen Osborne Borough	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	1	3
Glenfield Borough	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Green Tree Borough	0	0	0	0	1	1	0	1	0	1	0	0	0	1	0	1	1	0	0	0	7
Hampton Township	0	0	6	0	2	1	0	3	0	1	0	1	3	2	1	5	9	1	1	3	39
Harmar Township	0	0	1	0	0	1	0	1	1	1	1	0	1	1	0	11	1	2	1	1	24
Harrison Township	2	0	0	0	1	2	0	3	1	1	0	0	0	1	0	2	4	0	1	0	18
Haysville Borough	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
Heidelberg Borough	0	0	0	0	0	1	0	1	0	1	0	0	0	1	0	0	0	1	0	0	5
Homestead Borough	0	0	0	0	2	1	0	1	0	2	0	0	0	1	0	1	2	0	0	0	10
Indiana Township	2	0	3	0	1	1	0	3	0	1	1	0	2	1	0	11	5	0	0	0	31

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Ingram Borough	0	0	0	0	1	1	0	0	0	1	0	0	0	1	0	0	1	0	0	0	5
Jefferson Hills Borough	1	0	5	0	0	1	0	3	1	1	2	0	1	1	0	8	4	1	0	1	30
Kennedy Township	0	0	5	0	0	0	0	1	1	0	1	0	1	1	0	4	5	0	0	1	20
Kilbuck Township	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
Leet Township	0	0	0	0	0	0	0	1	1	1	0	0	0	1	0	0	1	0	0	0	5
Leetsdale Borough	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	7	1	1	0	1	13
Liberty Borough	0	0	0	0	0	1	0	1	0	1	0	0	1	1	0	0	2	0	0	0	7
Lincoln Borough	0	0	0	0	0	1	0	1	0	1	0	0	0	1	0	0	0	0	0	0	4
Marshall Township	0	0	3	0	3	0	0	2	0	1	0	0	0	0	0	5	3	0	0	3	20
McCandless Township	2	1	1	0	3	1	0	5	1	1	2	2	4	1	0	3	9	1	0	1	38
McDonald Borough	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
McKees Rocks Borough	0	0	1	0	0	0	0	1	0	1	0	0	1	1	0	2	0	0	0	0	7
McKeesport	0	1	1	0	6	1	0	2	1	2	3	3	10	1	0	5	8	1	0	2	47
Millvale Borough	0	0	2	0	1	0	0	1	0	1	0	0	1	1	0	1	1	0	0	0	9
Monroeville, Municipality of	4	0	2	0	1	6	0	5	3	2	5	0	5	1	0	17	17	0	2	1	71
Moon Township	0	1	10	0	4	1	0	5	0	1	1	0	2	2	0	8	10	1	1	6	53
Mount Lebanon	1	0	1	0	6	1	0	1	1	1	4	0	7	1	0	0	17	1	0	0	42
Mount Oliver Borough	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0	0	0	0	4

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Munhall Borough	0	0	1	0	2	1	0	4	0	1	1	0	1	1	0	1	6	0	0	1	20
Neville Township	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	19	0	0	0	1	22
North Braddock Borough	0	0	1	0	0	1	0	2	0	2	0	0	0	1	0	3	0	0	0	0	10
North Fayette Township	0	0	2	0	0	2	0	2	0	3	0	0	1	1	0	6	5	1	0	5	28
North Versailles Township	0	0	2	0	1	1	0	4	0	1	0	0	0	1	0	2	3	0	0	0	15
O Hara Township	1	0	3	0	0	2	0	2	0	0	0	0	1	1	0	14	3	0	0	0	27
Oakdale Borough	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	1	0	0	0	0	3
Oakmont Borough	0	0	0	0	0	1	0	1	0	1	2	0	2	1	0	3	3	1	1	2	18
Ohio Township	0	0	3	0	0	0	0	1	0	1	0	0	1	1	0	4	5	0	0	1	17
Penn Hills Municipality	0	0	14	0	4	1	0	6	0	1	1	2	2	1	1	8	7	0	0	4	53
Pennsbury Village Borough	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	1	0	1	4
Pine Township	0	0	2	0	2	0	0	3	0	1	1	0	1	1	0	2	9	0	0	1	23
Pitcairn Borough	0	0	0	0	0	1	0	2	0	1	0	0	0	1	0	0	1	0	0	0	6
Pittsburgh	11	11	34	2	60	19	3	29	9	3	16	77	21	8	19	99	112	1	1	4	539
Pleasant Hills Borough	0	0	0	0	0	0	0	1	0	1	1	0	1	1	0	1	1	1	0	0	8
Plum Borough	1	0	10	0	2	1	0	4	0	1	1	0	2	1	0	14	7	2	0	5	51
Port Vue Borough	0	0	0	0	0	1	0	1	0	0	0	0	0	1	0	1	1	0	0	0	5

Table 2.5-1 **Critical Facilities by Municipality and Type**

Municipality	Airport and Heliport	Colleges/Universities	Communication Towers	County Jail	Day Care Centers	EMS	EOCs	Fire Departments	Hospitals	Municipal Building	Nursing Homes	Other Public Buildings	Personal Care Homes	Police Departments	Public Works	SARA Facilities	School	Sewer Authorities	Water Authorities	WWTPs/STPs	Grand Total
Rankin Borough	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	1	0	0	0	0	4
Reserve Township	0	0	0	0	0	1	0	1	0	1	0	0	0	1	0	0	1	1	1	0	7
Richland Township	0	0	4	0	2	1	0	3	0	1	1	0	2	0	0	1	3	1	0	0	19
Robinson Township	0	0	6	0	0	1	0	3	0	2	0	0	1	1	0	11	5	0	0	3	33
Ross Township	0	0	8	0	2	2	0	9	0	0	2	1	4	1	0	4	11	0	0	1	45
Rosslyn Farms Borough	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	0	0	3
Scott Township	0	0	1	0	2	1	0	3	0	1	3	2	2	1	0	1	4	0	0	0	21
Sewickley Borough	0	0	1	0	3	0	0	1	1	2	0	0	0	1	0	4	2	0	0	1	16
Sewickley Heights Borough	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1	3
Sewickley Hills Borough	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
Shaler Township	0	0	3	0	0	1	0	6	0	1	0	0	0	1	0	5	11	0	1	0	29
Sharpsburg Borough	0	0	0	0	0	1	0	1	0	1	0	0	2	1	0	1	2	0	0	0	9
South Fayette Township	0	0	4	0	1	1	0	4	0	1	1	0	3	1	0	7	5	0	0	1	29
South Park Township	0	0	2	0	1	0	0	2	0	1	0	0	1	1	0	1	3	1	0	2	15
South Versailles Township	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	2
Springdale Borough	0	0	0	0	1	0	0	1	0	1	0	0	0	1	0	7	2	0	1	0	14
Springdale Township	0	0	1	0	0	0	0	1	0	1	0	0	0	1	0	1	0	1	1	0	7
Stowe Township	0	0	2	0	0	1	0	2	0	1	0	0	0	1	0	5	1	0	0	0	13
Swissvale Borough	0	0	0	0	1	0	0	1	0	1	0	0	0	1	0	1	2	1	0	0	8

Table 2.5-1 **Critical Facilities by Municipality and Type**

Municipality	Airport and Heliport	Colleges/Universities	Communication Towers	County Jail	Day Care Centers	EMS	EOCs	Fire Departments	Hospitals	Municipal Building	Nursing Homes	Other Public Buildings	Personal Care Homes	Police Departments	Public Works	SARA Facilities	School	Sewer Authorities	Water Authorities	WWTPs/STPs	Grand Total
Tarentum Borough	0	0	3	0	0	1	0	3	0	1	0	0	1	1	0	6	1	1	1	0	19
Thornburg Borough	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	3
Trafford Borough	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
Turtle Creek Borough	0	0	0	0	0	1	0	1	0	1	1	1	1	1	0	3	2	0	0	1	13
Upper St. Clair Municipality	1	0	5	0	4	0	0	2	1	1	1	0	2	1	0	2	8	0	0	0	28
Verona Borough	0	0	0	0	1	0	0	1	0	1	0	0	0	1	0	1	2	0	0	0	7
Versailles Borough	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	0	0	0	0	0	3
Wall Borough	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	2
West Deer Township	2	0	4	0	0	1	0	3	0	1	1	0	2	1	0	4	3	1	0	1	24
West Elizabeth Borough	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	3	0	1	0	1	7
West Homestead Borough	0	0	0	0	0	1	0	1	0	1	0	0	0	1	0	2	0	0	0	0	6
West Mifflin Borough	1	0	6	0	1	2	0	4	0	1	0	0	2	1	1	21	8	1	0	5	54
West View Borough	0	0	0	0	0	0	0	3	0	2	0	0	1	1	0	1	1	2	1	0	12
Whitaker Borough	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	2
White Oak Borough	0	0	2	0	0	1	0	2	0	2	0	0	0	1	0	1	3	0	0	0	12
Whitehall Borough	0	0	2	0	0	1	0	2	0	1	1	0	1	1	0	3	7	0	0	0	19
Wilkins Township	0	0	0	0	0	1	0	3	0	1	0	1	0	1	0	3	1	0	0	0	11
Wilkinsburg Borough	0	0	2	0	5	0	0	1	0	1	1	2	4	1	0	2	6	1	2	0	28

Table 2.5-1 **Critical Facilities by Municipality and Type**

Municipality	Airport and Heliport	Colleges/Universities	Communication Towers	County Jail	Day Care Centers	EMS	EOCs	Fire Departments	Hospitals	Municipal Building	Nursing Homes	Other Public Buildings	Personal Care Homes	Police Departments	Public Works	SARA Facilities	School	Sewer Authorities	Water Authorities	WWTPs/STPs	Grand Total
Wilmerding Borough	0	0	0	0	1	0	0	1	0	1	0	0	1	0	0	1	1	0	0	0	6
Grand Total	**32**	**14**	**205**	**2**	**150**	**88**	**3**	**244**	**23**	**132**	**61**	**93**	**130**	**116**	**25**	**468**	**431**	**37**	**25**	**101**	**2,381**

3. Planning Process

3.1. Update Process and Participation Summary

Michael Baker International was responsible for preparing the County's 2015 HMP, which was adopted on Month Day, 2015. The 2015 HMP was an update to the County's 2011 HMP update spearheaded by the Allegheny County Hazard Mitigation Planning Steering Committee. To facilitate the update of the 2020 HMP, PEMA contracted Michael Baker International once again.

The 2020 effort was led by the Allegheny County Department of Emergency Services with Allegheny County Economic Development and the Allegheny County municipalities. Allegheny County has in total 130 municipalities, but two municipalities are only partially located in Allegheny County. Trafford Borough is a borough both Allegheny and Westmoreland Counties and McDonald Borough is a borough of both Allegheny and Washington Counties. While these two communities did not participate in the previous plan update, they did participate in this one.

The first meeting of the Allegheny County Hazard Mitigation Plan Team (HMPSC) to discuss the 2020 HMP Update was held as an Internal County Kick-off teleconference on January 23, 2020. At this meeting an overview of the Hazard Mitigation Planning process was provided.

In addition to Allegheny County local municipalities, the HMPSC identified additional stakeholders to be included in the HMP process. Detailed information pertaining to stakeholders and stakeholder outreach is included in Section 3.4 – Public & Stakeholder Participation.

The HMPSC and the Planning Team of local municipalities and stakeholders completed an Evaluation of Identified Hazards and Risk Worksheet as part of the Planning Team Kick-Off meeting on February 12, 2020. This survey, included in Appendix C – Meeting and Other Participation Documentation, listed hazards profiled in the 2015 HMP and prompted the team to identify the frequency of occurrence, magnitude of impact, and/or the geographic extent of each hazard as increased, decreased, or did not change since the 2015 HMP preparation. This survey also provided the opportunity to assess hazards not profiled in the HMP to determine if those hazards should be included as part of the HMP Update. In total, 21 hazards were identified to be profiled as part of the HMP Update, including 11 natural hazards and 10 human-made hazards.

The HMPSC conducted a detailed review of draft Goals, Objectives, and Actions for the 2020 HMP Update and developed the final hazard mitigation strategy. A Mitigation Action Plan developed by the HMPSC is included in Section 6.4 – Mitigation Action Plan.

Allegheny County's municipalities actively participated as part of the Planning Team. Municipal involvement in developing the 2020 HMP Update is detailed in Section 3.5 – Multi-Jurisdictional Planning. One hundred twenty-nine (128) of the 130 municipalities met the participation requirements. With this level of participation, over 90% of Allegheny County's population will be covered by this HMP.

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

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

The report format is structured in accordance with the most current planning guidance from FEMA, Local Mitigation Handbook (2013), and PEMA, Standard Operating Guide (October 2013). The overall format between the 2020 HMP Update and the 2015 HMP Update has not changed. Specific process updates pertaining to each section of the HMP Update are included in Sections 4.1, 5.1, 6.1, and 7.1.

3.2. The Planning Team

The Planning Team assembled for the 2020 HMP Update included representatives from Allegheny County Emergency Management Services, the Southwestern Pennsylvania Planning Commission (SPC), Allegheny County Housing Authority, Allegheny County Local Emergency Planning Committees (LEPC), Bureau of Forestry, the Negley Run Watershed Taskforce and Allegheny County's local municipalities. A subset of the Planning Team, the HMPSC, was assembled to guide the overall direction of the HMP Update and make day-to-day decisions pertaining to its completion in conjunction with the consultant Baker Team.

The HMPSC assembled for the 2020 HMP Update included essentially the same organizations as the HMPSC assembled for the 2015 HMP Update with the exclusion of a representative from the Allegheny County Economic Development-Planning Division. HMPSC members for the 2020 HMP Update are listed in Table 3.2-1.

Table 3.2-1 **Allegheny County HMP Steering Committee (HMPSC) Members**

Name	Organization
Steven Wilharm	Allegheny County EMS
Robert Gerlach	Allegheny County EMS
Madeleine Fincham	Michael Baker International, Consultant Point of Contact (POC)

In order to represent the diverse stakeholders in the County, the HMPSC developed a list of Planning Team members, discussed in more detail in Section 3.4. The HMPSC worked throughout the process to plan and hold meetings, collect information, and conduct public outreach.

The stakeholders listed in Table 3.2-2 served on the Planning Team, demonstrating their commitment to actively participate in the planning process by attending meetings, completing assessments, surveys, and worksheets, and/or submitting comments. The Planning Team consisted of County and local officials including municipal Supervisors and Council Members, Emergency Management Coordinators, and other identified stakeholders.

Table 3.2-2 Participants in the 2020 Allegheny HMP Update	
Municipality	**Participant (s)**
Aleppo Township	Gwen Patterson, Manager
Aspinwall Borough	Bob Zischkau, Engineer; Melissa Lang O'Malley, Manager & Secretary
Avalon Borough	Lorraine Makatura, Borough Manager
Baldwin Borough	Robert Firek, Manager
Baldwin Township	Robert Firek, Manager and Municipal Services Manager
Bell Acres Borough	William Bender, EMC
Bellevue Borough	Michael Bookser, EMC
Ben Avon Borough	Michael Bookser, EMC
Ben Avon Heights Borough	Sgt. Adam Beck, Police
Bethel Park, Municipality of	Susan Dolinar, Director of Public Works; John Kachma, EMC
Blawnox Borough	Jeff Stephens, EMC
Brackenridge Borough	Dino Lopreiato, Councilman
Braddock Borough	Bob Zischkau, Engineer
Braddock Hills Borough	Cheryl Sorrentino, Manager; Jack Brown, Mayor, Deputy EMC
Bradford Woods Borough	Natalie Thiess, Manager
Brentwood Borough	John Balkovec, EMC
Bridgeville Borough	Lori Collins, Manager
Carnegie Borough	Regina Popichak, Steve Beuter, Stacie Riley
Castle Shannon Borough	Paul Vietmeier, Zoning & Code Official; Brian McKeown, Police Lieutenant; Robert Ausman, Public Works; William Reffner, EMC
Chalfant Borough	Bob Zischkau, Engineer
Cheswick Borough	Lorraine Zebrine, Secretary; Bruno Moretti, EMA
Churchill Borough	Scott Henderson, Scott Stonebraker
Clairton, City of	Richard Lattanzi, Mayor
Collier Township	Kyle Thauvette, Manager; Dan Stide, EMC
Coraopolis Borough	Ray McCutcheen, Manager; Robb J Cardimen, Council President; John H May, Super of Public Works
Crafton Borough	Mark Sumter, EMC; Russ McKibber, Manager
Crescent Township	Jerry L Keller, Commissioner
Dormont Borough	Mat Davis, EMC; Jeff Stakich, EMC
Dravosburg Borough	Martin Bell, EMC; Redmac McKelvey, Manager
Duquesne, City of	Tammy Pratt, EMC; Doug Sample, Manager
East Deer Township	Paul F. Duffer, EMC
East McKeesport Borough	Stacy Mays, EMC
East Pittsburgh Borough	Seth Abrams, DEMC/Manager
Edgewood Borough	Rick Susalla, EMC
Edgeworth Borough	John Schwend, EMC/Manager
Elizabeth Borough	Charles Smith Jr. , EMA
Elizabeth Township	Paul, Public Works; John Sneison, Code Enforcement

Table 3.2-2 Participants in the 2020 Allegheny HMP Update	
Municipality	**Participant (s)**
Emsworth Borough	Paul F Gutz, Council member
Etna Borough	Mary Ellen Ramage, Manager, Pete Ramage, EMA/Manager
Fawn Township	Pam Ponsart, Secretary
Findlay Township	Tom Garrett, Assistance Manger
Forest Hills Borough	Keith Morse, EMC
Forward Township	Karen Stetor, Secretary
Fox Chapel Borough	David Laux, Chief of Police
Franklin Park Borough	Tom Stew, SMC; John Parks, Council President
Frazer Township	Lori
Glassport Borough	Jonathan Petrick, EMC
Glen Osborne Borough	William Monski, Tom Huddleston, John Omdorff
Glenfield Borough	Curtis Reiner, Connie Klauck
Green Tree Borough	Dave Montz, Manager; Mark Sampogna, Council President
Hampton Township	Thomas Vulikovich, Chief of Police; Michael Peters, Council Pres.; Chris Loshner, Manager
Harmar Township	Ian Fitzgerald, Manager; Bruno Moretti, EMA
Harrison Township	Rich Hill, Township Manager; Mike Krzeminski, EMC
Haysville Borough	Amanda Muzichuck & Catherine Paff
Heidelberg Borough	Janice Adamski, Manager/EMC; Ken LaSota, Mayor
Homestead Borough	Dan Hankis, Core Officer; Lauren Zang, EMC
Indiana Township	Al Koltan, Jeff Curti, Steve Colvcer
Ingram Borough	John S. Doherty, Chief
Jefferson Hills Borough	John Stinner, Manager
Kennedy Township	Justin Gutt, EMC
Kilbuck Township	Sgt. Adam Beck, Police
Leet Township	David Volk, EMC; Donna Adipietro, Commissioner
Leetsdale Borough	Osman K Awap, Council; Tom Beleastico, Council; Amos P Cameron, EMC
Liberty Borough	Jill Pack, Secretary
Lincoln Borough	Chris Evans, EMC
Marshall Township	Nicole Hanson, Planning Director
McCandless Township	Dan Stack, EMC; Jim Venture, Engineer
McDonald Borough	Dave Cooper, Mayor
McKees Rocks Borough	Paul Krisby, President; John, Mayor; Nick Radoycis, Fire Chief; Rick Dellman, Chief of Police
McKeesport, City of	William Miller, EMC
Millvale Borough	Eddie Figas, Manager
Monroeville, Municipality of	Paul Whealdon, Zoning Officer; Jason Sonaht, Building Inspector
Moon Township	Jim Hewkewey, DEMC; Frank Starko, EMC

Table 3.2-2 Participants in the 2020 Allegheny HMP Update	
Municipality	**Participant (s)**
Mount Lebanon, Municipality of	Lossy Celender, Lieutenant/EMC; Lee McCarthy, Lieutenant/EMC; Sean Daniels, Assistant Chief
Mount Oliver Borough	Steve Williams, EMC
Munhall Borough	Darryl Hunt, EMC; Joe Varhola, Manager
Neville Township	Jeanne Creese
North Braddock Borough	Bob Zischkau, Engineer
North Fayette Township	Chad Slovick, EMC; Lonnie Lamb, EMC
North Versailles Township	James Hill, EMC; Melvin Gooden Sr., EMC
Oakdale Borough	William Hartman, EMC
Oakmont Borough	Bill Albright, EMC; Scot Fodi, Manager
O'Hara Township	Scott Slagel, Police Chief; Tom Heilmann, EMT Coordinator
Ohio Township	Joe Jackson, Code Compliance Officer; Thomas Larhin, EMC
Penn Hills, Municipality of	Charles J Miller, EMC/Fire Marshall
Pennsbury Village Borough	Lucy Harper, Mayor; Steve Stecko, Council President
Pine Township	Tom Flaherty, Fire Marshal; Mike Denheny, Supervisor
Pitcairn Borough	Annette Dietz, Manager
Pittsburgh, City of	Dan Smith, Emergency Planner
Pleasant Hills Borough	Jamie Smith, EMC
Plum Borough	Joe Fischetter, EMC
Port Vue Borough	Shawn Chapman, DEMC
Rankin Borough	Bob Zischkau, Engineer; Jean Warren, Secretary
Reserve Township	Mark S. Mikulan, EMC
Richland Township	Joe Pillart, EMC
Robinson Township	Frank Piccolino, Manager; Ken Kisow, Commissioner; Gary Bayue, EMC
Ross Township	John A Reubi, EMC; John Spencer, EMC
Rosslyn Farms Borough	Dorothy Falk, Secretary
Scott Township	Denise Fitzgerald, Manager, Jim Mykita, EMC
Sewickley Borough	Marla Marcinko, Secretary
Sewickley Heights Borough	Katie Stringent, Manager; Nathan Briggs, Dr. Public Works
Sewickley Hills Borough	Sgt. Adam Beck, Police
Shaler Township	John Rihn, EMC; Matt Sebastian, Engineer; Robert C Uita, Code Enforcement Officer
Sharpsburg Borough	Dennis Lane
South Fayette Township	Keith Dernosek, Commission S.F.; John Barrett, Manager
South Park Township	Karen Fosvaugh, Manager; Dennis McDougal, EMC
South Versailles Township	Larry Robertson, EMC; Bella Kulasa, Secretary
Springdale Borough	Kimberly McAfouse, Manager
Springdale Township	Bruno Moretti, EMA
Stowe Township	Nick Martini, Manager

Table 3.2-2 Participants in the 2020 Allegheny HMP Update	
Municipality	**Participant (s)**
Swissvale Borough	Clyde Wilhelm, Michael Volpe, Greg Bachy
Tarentum Borough	Anthony Bruni, Code Official
Thornburg Borough	Tan Mack, Mayor
Trafford Borough	Ashley Stack, Borough Manager
Turtle Creek Borough	Louis Lantzy, EMC
Upper Saint Clair Township	Adan Benigni, Dir if Comm Dev; Christina Phlegar, Planning Asst.
Verona Borough	Mark Stanton, EMC; Matthew Pitsch, Engineer
Versailles Borough	Lisa Fleckenstein
Wall Borough	Valentina Lachimia, Secretary
West Deer Township	Jonathan Lape, EMC/Police Chief; William Payne, Building Inspector
West Elizabeth Borough	Larry Ball, EMC
West Homestead Borough	Cindy Bahn, Manager
West Mifflin Borough	Sean J Lear, DEMC; Craig McDivett, Coordinator
West View Borough	Mark Schellerm Public Works; Rich Rapp, Public Works
Whitaker Borough	Bob Zischkau, Engineer; Jean Warren, Secretary
White Oak Borough	Joshua M Gelman, Paul Falauolijo, Mark Jones John Palyo
Whitehall Borough	Jason Gagorik, Chief of Police
Wilkins Township	Leonard Hill, EMC
Wilkinsburg Borough	Eric Parrish, Director of Code
Wilmerding Borough	Robert Zischkau, Engineer
Other Stakeholders	
Negley Run Watershed Taskforce	John Stephen
Southwestern Pennsylvania Planning Commission (SPC)	Ryan Gordon
Bureau of Forestry	Brian Vinsky
Allegheny County Housing Authority	Ed Mogus
Allegheny County Local Emergency Planning Committees (LEPC)	Carol Adams

3.3. Meetings and Documentation

The following meetings, both in person and teleconference, were held as part of the planning process. Meeting documentation in the form of invitations (letter and e-mail), agendas, sign-in sheets, handouts, presentations, flyers, and minutes are included in Appendix C – Meetings and Other Participation Documentation.

January 23, 2020: The Steering Committee Kick-Off Meeting was conducted as a conference call on Tuesday, January 23, 2020. The meeting included discussion of the following: review of the updated

planning process and project schedule, review of the Risk Assessment Hazard Descriptions, identification of stakeholders, methods for stakeholder outreach, and collection of relevant data and documents.

February 12, 2020: A Hazard Mitigation Planning Team (HMPT) Meeting was held with local municipalities and stakeholders identified by the HMPSC during the Steering Committee Kick-Off Meeting. The workshop was held at the Allegheny County Emergency Services Center from 10:00 AM – 12:00 PM, 1:00 PM – 3:00 PM, and 6:30 PM – 8:30 PM on Wednesday February 12, 2020. Having a variety of meeting times throughout the day ensured maximum participation and flexibility for the municipalities. The workshop provided an opportunity for participants to review the hazard mitigation process; discuss capabilities; offer risk assessment input on hazards identified by the HMPSC; suggest the inclusion of additional hazards; review and provide input on existing Goals, Objectives, and Actions.

As part of the workshop, municipalities and stakeholders were asked to complete a Hazard Risk Evaluation Worksheet (Hazards in Your Community). The form included the hazards profiled in the 2015 HMP and requested attendees to rank hazards' relative spatial extent, probable impact, possibility of future events, and overall significance. Results of the Hazard Risk Evaluation were used to prepare the Risk Factor (RF) ranking. This form was asked to be completed by the end of the workshop.

The HMP Workshop also provided the opportunity for municipalities to ask questions and complete the Capability Assessment Survey. Responses from Capability Assessment Surveys completed by each municipality for the 2015 HMP Update were pre-populated in the 2020 Capability Assessment Survey template, and each municipality was asked to review previous responses, update responses, and complete new fields. In order to receive as much information as possible, stakeholders were asked to return the form no later than the next workshop. This allowed participants to return to their municipality to collect information from other knowledgeable staff members.

One hundred and five (105) of Allegheny County's 130 municipalities were represented at the workshop. Six stakeholder organizations representing Allegheny County Emergency Management Services, the Southwestern Pennsylvania Planning Commission (SPC), Allegheny County Housing Authority, Allegheny County LEPC, Pennsylvania Bureau of Forestry, the Negley Run Watershed Taskforce attended the meeting.

May 6, 2020: A Risk Assessment/Mitigation Solutions Meeting was held via teleconference with local municipalities and stakeholders on Wednesday May 6, 2020 from 1:00 PM to 2:30 PM and from 6:00 PM to 7:30 PM. As with the previous meeting, having a variety of meeting times throughout the day ensured maximum participation and flexibility for the 130 municipalities. The workshop provided an opportunity for participants to review the hazard mitigation process; review the profiled hazards for the 2020 HMP Update; review the 2020 Goals, Objectives, and Actions; and begin the selection of each municipality's Actions.

The meeting started with a discussion of the basic outline of the Hazard Mitigation Plan, as well as the requirements for participations by each municipality. The results from the Hazard Risk Evaluation were presented, revealing the 21 hazards to be profiled in the 2020 HMP Update. A discussion of each hazard was conducted through the presentation of maps representing different hazards to provide some context

of how each municipality may be at risk to different hazards. As a part of this discussion the Hazard Ranking and Risk Factor worksheet was introduced to meeting participants to collect information from municipalities as to which hazard(s) may have a major impact on their community. The HMPSC provided an overview of the worksheet, and participants were asked to fill it out and return it after the meeting.

Then the team presented an overview of the County's capabilities using the information gathered from the Capability Assessments completed at the previous meeting. At the time of the meeting about 35% of municipalities had completed and returned their Capability Assessment.

The team also encouraged municipalities to fill out the NFIP Survey. This survey was used to help collect information on each community's participation in and continued compliance with the NFIP. It also has each community identify areas for improvement that could be potential mitigation actions. As of March 2021, 22 municipalities have completed this form. Some key findings include that many municipalities including Harrison Township, Mount Lebanon Township and North Fayette Township limit the type of construction allowable within a known flood zone. Also, many communities work to educate their community members on the availability and value of flood insurance through their website including Baldwin Borough, Fox Chapel Borough, Mount Lebanon Township, and North Fayette Township. Some communities have also adopted higher standards including Etna Borough. These municipalities are documented in table 3.5-1 and the entire forms are included in Appendix C.

The Mitigation Strategy was the last element to review and discuss with participants. What constitutes Goals, Objectives, and Actions were first went over with participants. After this, the Goals selected with the HMPSC for the 2020 HMP Update were briefed, as well as prominent Objectives. When discussing Actions, the appropriate mitigation techniques were reviewed. Mitigation Strategy Evaluations were distributed to all municipality representatives. Pre-populated Mitigation Strategy Evaluations were given to municipalities who had records of selected actions from the 2015 HMP Update. They were asked to decide whether to continue, cancel, or defer each action, as well as report on any progress. All other communities were presented with existing municipality Actions. Municipalities could also create new Actions that were not in the current Strategy. This allowed an opportunity for participants to discuss their needs and Goals with the rest of the municipality staff. A total of 40 communities returned either the mitigation strategy form or submitted a new mitigation action form.

Ninety-three (93) of Allegheny County's 130 municipalities were represented at the workshop. No stakeholders were recorded as attending the workshop.

June 11, 2020: A Teleconference was held to accommodate schedules for those municipalities unable to attend the Hazard Mitigation Planning Workshops and Meetings. Consultant Point of Contact Madeleine Fincham held teleconferences on Thursday June 11, 2020 from 1:00 PM to 2:00 PM.

For these municipalities unable to attend the Workshops, the purpose of the teleconference was to discuss information presented throughout the planning process; complete the Capability Assessment Survey; review and comment on the Goals, Objectives, and Actions using the Mitigation Strategy Evaluation Form; as well as to discuss and develop new mitigation actions.

June 30, 2020: A status update of the HMP 2020 update status was presented during the Local Emergency Management Coordination Quarterly Training session. There were a total of 64 participants. The meeting was held via Microsoft Teams, including a tutorial for the local EMCs to familiar themselves with the platform as this would be the platform moving forward due to social distancing governance. Chief Matthew Brown gave his overview of recent Emergency Operations Center (EOC) virtual meetings, activated in March 2020, with the County Health Department regarding COVID-19. Many of the trending numbers in cases at the time were a result of travel and large gatherings in restaurants and bars. Although no cure or vaccine had been introduced, the County Health Department had found ways to treat the symptoms.

EMA Staff reports from Steve Wilharm, Rick Colella (HazMat Coordinator), Michael Spur (Homeland Security Coordinator), and Bob Gerlach were also briefed to the group. Briefs were followed by the revised 2020 Training schedule and EMA updates for PEMA certifications. Guest speakers included Madeleine Fincham, MBI, presenting the HMP status, and Aaron Skrbin, Director of Safety and Security for the Allegheny County Intermediate Unit. The presentation detailed the bridge of communication between emergency managers and schools. Over the last several years, that need has become more prominent and resulted in requiring an administrator at a school to have the role as an emergency coordinator. The HMP presentation included background, the process thus far, and the upcoming schedules. The only question was submitted asked the different between the County HMP and municipal Emergency Operations Plan (EOP). Specifically, the EOP updates being due by August 2020

September 30, 2020: Two sessions of a Draft Plan Municipal Meeting was held via teleconference with local municipalities on September 30, 2020 from 10:00 AM to 11:00 AM and 6:00 PM to 7:00 PM. These meetings provided an opportunity for participants to review the hazard mitigation process; review the profiled hazards for the 2020 HMP Update; review the 2020 Goals, Objectives, and Actions; fulfill participation requirements; and receive a final update on the upcoming schedule.

Each of the sections within the draft HMP were briefed to the municipalities, as well as the high-ranked hazards profiled. A summary of the resources common among the municipalities was provided based on the Capability Assessment Surveys. Specific actions that were continued from the 2015 HMP or created for the 2020 HMP Update were shared with municipalities.

The upcoming submittal schedule was shared with municipalities. This included a Public Comment Period from October 9, 2020 to October 31, 2020, Delivery to PEMA/FEMA on November 10, 2020, and Distribution to Municipalities for Adoption in December 2020.

Sixty-nine (69) communities attended the Draft Plan Municipal Meeting.

3.4. Public and Other Stakeholder Participation

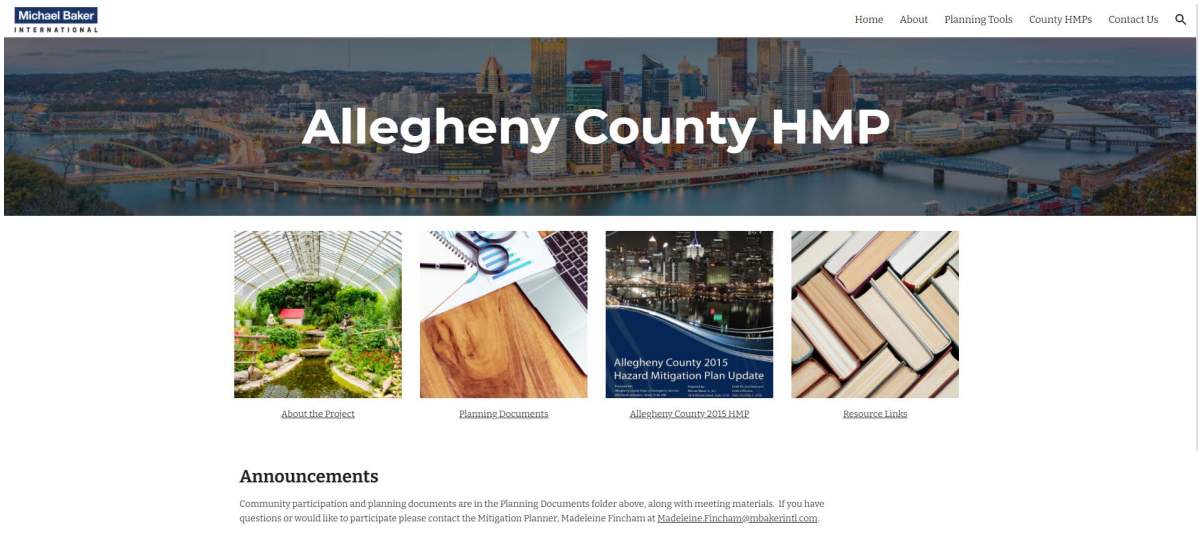
The HMPSC identified at the January 23 Steering Committee Kick-Off Meeting, stakeholders to engage in order to obtain comprehensive input about hazards impacting, or with the potential to impact, Allegheny County. The following table lists stakeholders who participated in meetings and/or provided data to assist in the HMP Update. A list of stakeholders identified and invited to the HMP Update process can be found in Appendix C.

Table 3.4-1 **Allegheny County HMP Update Stakeholders**	
Allegheny County Emergency Management Services (EMS)	Allegheny County Housing Authority
Bureau of Forestry	Pennsylvania Emergency Management Agency (PEMA)
Southwestern Pennsylvania Planning Commission (SPC)	Allegheny County Local Emergency Planning Committees (LEPC)
Allegheny County Housing Authority	Negley Run Watershed Task Force

The stakeholders represent a diverse mix of local governments; and county, state, and federal agencies operating programs in Allegheny County.

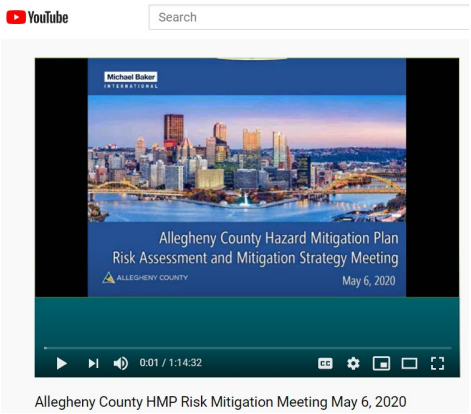
Stakeholders were invited to the workshops held February 12, 2020, as well as May 6, 2020. As part of the workshops, stakeholders were asked to complete a Hazard Risk Evaluation Form which listed hazards to be profiled for the 2020 HMP Update. Stakeholders were asked to rank each hazard from the perspective of their organization. Stakeholders were also encouraged to provide additional information pertaining to the listed hazards, as well as list additional hazards not identified on the hazard risk evaluation form, but ones which could impact their organization. Results of the Hazard Risk Evaluation Worksheet were reviewed as part of the preparation of the 2020 Risk Factor ranking.

A few stakeholders did not attend meetings but were contacted for their knowledge in completing portions of the HMP Update. For example, the US Army Corps of Engineers the Department of Public Works was contacted for landslide information.



Throughout the planning process there were three touchpoints made with the public, which allowed for public participation.

The first form of public outreach was conducted through making the website publicly available. The Allegheny County HMP Website located at https://www.pennsylvaniahmp.com/allegheny-hmp was made public. This link was given to municipal officials who were encouraged to share the link publicly. Throughout the planning process many materials were posted on the website including meeting materials, planning resources and plan update announcements. Throughout the course of the plan update the website received over 750 views.



Allegheny County HMP Risk Mitigation Meeting May 6, 2020

Another was that the HMPSC worked to reach out to the public was through posting a video recording of the RAMS meeting and was shared on both YouTube and the project website for the public to view. To date the recording has had 42 views.

The third way that outreach was conducted to the public was through the Allegheny County HMP: Community Hazard Mitigation Survey, which asks questions about risk perception and individual preparedness. In order to gain public input through this survey, the survey link was posted to the project website and was provided to municipal officials to share with their communities following the RAMS Meeting and was available until the plan was approved. Survey results showed that 80 people from over 45 different communities responded to the survey. A majority of survey respondents were homeowners. Almost 35% of respondents were somewhat informed about local risks, while about 30% were very informed. About 28% responded that there is probably not a lot

that they are aware of. Also a majority of respondents would potentially be interested in attending public education training related to risk and the best way to contact respondents is via email or newsletter.

Stakeholder outreach documentation including meeting invitations, e-mails, sign-in sheets, and completed surveys and forms are included in Appendix C – Meeting and Other Participation Documentation.

In 2020 the Pine Creek Water Quality Improvement Plan was drafted to help prioritize specific subwatersheds in which to target best management practices that address causes and sources of water quality impairments, with the goal of improving these impaired segments to meet water quality standards. In this plan priority areas for flood management were chosen in the Pine Creek Watershed, which encompasses part of Allegheny County, based on past flooding and stream channel issues. Table 4.3.3-6 outlines the areas of the watershed that have experienced flood issues in the past, and Figure 4.3.3-6 illustrates where these problem areas have been identified by stakeholders. In the Pine Creek Watershed streams that have experienced past flood events include Little Pine Creek East, Little Pine Creek West, Pine 1 &2 and Pine 5.

A specific opportunity for plan integration includes addressing consistency between the HMP and stormwater management planning. By ensuring integration and consistency between the 2020 HMP update, the Allegheny County Stormwater Management Plan, and the Pine Creek Watershed Implementation Plan, the existing planning documents can be aligned to mitigate flood impacts and improve water quality, improving overall community health and safety.

The Pine Creek Watershed Implementation Plan (WIP) was developed in 2009 and is currently being updated. The Pine Creek Watershed includes 14 of 19 North Hill COG member municipalities. The watershed is part of a larger watershed draining into the Allegheny River.

PA DEP received technical assistance from US EPA to support the Nonpoint Source Program and the Pine Creek watershed was selected as one of three watersheds to receive technical support. The implementation plan provided the opportunity to combine resources with flood hazard mitigation efforts. The update to the WIP is required to meet US EPA requirements for funding through Section 319 of the Federal Clean Water Act and provide a current update on the watershed.

EPA's section 319 Nonpoint Source Clean Water Act grant guidelines identify 9 minimum elements of successful watershed projects. These elements are required for watershed-based plans developed and implemented with section 319 funds.[1] The following table identifies each of these elements and how the 2009 Pine Creek WIP has met each of these elements.

Major needs for the 2020 Pine Creek WIP were identified by the Tetra Tech consultant team and include the following:

- The plan is over 10 years old, requiring updates to information needed.

[1] US EPA. Accessed 8/27/20 at: https://cfpub.epa.gov/watertrain/moduleFrame.cfm?parent_object_id=2868&object_id=2873#2873.

- More specificity of critical area selection (2 to 3 targeted subwatersheds)
- Clear connection between impairment, proposed best management practice, load reduction, and water quality standards
- Interim water quality targets in addition to implementation schedule
- Expanded monitoring plan
- Expanded civic engagement plan

As the major needs (or gaps) for the 2020 Pine Creek WIP have already been identified, these gaps were used as the basis to evaluate how Allegheny County's Act 167 stormwater management plan and 2020 HMP update could be used to support update of the Pine Creek WIP and vice versa. Each plan contains technical information mutually beneficial to the other documents; therefore, ensuring data is made available to share between documents will maximize opportunities for plan integration.

3.5. Multi-Jurisdictional Planning

This HMP update was developed using a multi-jurisdictional approach. With funding support from PEMA, the County had resources such as technical expertise and data, which local jurisdictions lacked, but involvement from local municipalities has been critical to the collection of local knowledge relating to hazard events and mitigation activities. Local municipalities also have the legal authority to enforce compliance with land use planning and development issues. The County undertook an intensive effort to involve all jurisdictions in the planning process. In the end, 128 municipalities participated- many attended multiple meetings and submitted comments, questions, and forms. Rosslyn Farms Borough and Springdale Township attended meetings but did not meet the participation requirement with forms. These communities were contacted separately by the consultant and Allegheny County Emergency Services. A phone call and email were sent to each municipality after holding the comment review with Allegheny County Emergency Services, PEMA, and FEMA. An email notifying the municipality that the participation requirements were not met and the municipality would be ineligible to receive some mitigation grant funding was sent one week prior to resubmitting the HMP to FEMA for APA. An example is shown below:

From: Fincham, Madeleine
Sent: Monday, March 1, 2021 4:37 PM
To: [redacted]
Cc: Wilharm, Steve <Steve.Wilharm@AlleghenyCounty.US>; Gerlach, Robert <Robert.Gerlach@AlleghenyCounty.US>; Delvecchio, Devon <Devon.Delvecchio@mbakerintl.com>
Subject: Allegheny County Hazard Mitigation Plan

Hello, [redacted]

Hope you both have been well! We have received comments from FEMA regarding the County HMP Update and will be resubmitting the revisions in two weeks. One of the comments is regarding [redacted] participation. I have you marked down for attending the Kickoff Meeting and LEMC Quarterly Training in June, but we did not receive any paperwork. **To meet FEMA's participation requirements the municipality must complete at least one form.**

Could you please complete/review the information in one or both of the attached forms at your earliest convenience? If you have any questions feel free to give me a call directly. We'd prefer if you could complete the mitigation action review, but the capability assessment is fine as well. We'd like to receive the update NLT end of week so we can turn the revised HMP back to FEMA quickly.

Thank you again!
Madeleine

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madeleine.fincham@mbakerintl.com | www.mbakerintl.com

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Each municipality was part of the Planning Team, crucial in the development of the 2020 HMP Update, and were invited to participate in several meetings held at the Allegheny County Emergency Services Center and via teleconference due to the impacts of COVID-19. Dates of sent invitations, follow-up e-mails, and calls can be found in Appendix C – Meeting and Other Participation Documentation.

Table 3.1-1 documents jurisdictional presence at the meetings described in Section 3.3 and other involvement from each jurisdiction throughout the planning process. Each municipality was emailed invitations to all meetings and received email reminders prior to each session. Multi-jurisdictional participation is summarized in Table 3.5-1.

Table 3.5-1 **Allegheny County HMP Update Stakeholders**

Municipality	Attendance					Forms			
	Kick-Off Meeting	Risk Assessment-Mitigation Solutions Workshop	Local EMC Quarterly Training	Interim Participation Webinar	Draft Plan Review Meeting	Hazard-Risk Form	Capability Assessment Form	NFIP Survey	Mitigation Action Form
Aleppo Township	Y	Y			Y	Y	Y		
Aspinwall Borough	Y	Y	Y		Y	Y			Y
Avalon Borough				Y		Y	Y	Y	Y
Baldwin Borough	Y	Y	Y		Y	Y	Y	Y	Y
Baldwin Township		Y			Y	Y	Y		Y
Bell Acres Borough	Y					Y	Y		
Bellevue Borough	Y	Y	Y		Y	Y	Y		
Ben Avon Borough	Y	Y	Y		Y	Y	Y		Y
Ben Avon Heights Borough			Y		Y	Y			
Bethel Park, Municipality of	Y	Y	Y		Y	Y	Y		
Blawnox Borough	Y		Y			Y			
Brackenridge Borough	Y					Y			
Braddock Borough	Y	Y				Y	Y		Y
Braddock Hills Borough	Y				Y		Y		
Bradford Woods Borough	Y	Y			Y	Y	Y	Y	Y
Brentwood Borough	Y	Y	Y		Y	Y		Y	
Bridgeville Borough	Y	Y	Y		Y	Y	Y		Y
Carnegie Borough	Y	Y	Y		Y	Y	Y		Y

Table 3.5-1 **Allegheny County HMP Update Stakeholders**

Municipality	Attendance					Forms			
	Kick-Off Meeting	Risk Assessment-Mitigation Solutions Workshop	Local EMC Quarterly Training	Interim Participation Webinar	Draft Plan Review Meeting	Hazard-Risk Form	Capability Assessment Form	NFIP Survey	Mitigation Action Form
Castle Shannon Borough	Y	Y	Y		Y	Y		Y	Y
Chalfant Borough	Y	Y					Y		Y
Cheswick Borough	Y	Y			Y				
Churchill Borough	Y	Y	Y		Y	Y			Y
Clairton, City of		Y	Y		Y		Y		Y
Collier Township	Y	Y				Y			
Coraopolis Borough	Y		Y			Y			
Crafton Borough	Y	Y	Y		Y	Y	Y		Y
Crescent Township	Y	Y			Y				Y
Dormont Borough	Y	Y	Y			Y	Y		Y
Dravosburg Borough	Y				Y	Y			
Duquesne, City of	Y	Y				Y	Y		
East Deer Township		Y			Y				Y
East McKeesport Borough		Y	Y			Y			
East Pittsburgh Borough	Y	Y	Y		Y	Y	Y	Y	Y
Edgewood Borough			Y	Y					Y
Edgeworth Borough	Y	Y			Y	Y	Y		
Elizabeth Borough			Y	Y					
Elizabeth Township	Y	Y		Y	Y	Y		Y	
Emsworth Borough	Y	Y				Y	Y		
Etna Borough	Y	Y		Y	Y	Y	Y	Y	Y
Fawn Township							Y		Y
Findlay Township	Y	Y		Y			Y		
Forest Hills Borough	Y	Y		Y					
Forward Township					Y		Y		Y

Table 3.5-1 **Allegheny County HMP Update Stakeholders**

Municipality	Attendance					Forms			
	Kick-Off Meeting	Risk Assessment-Mitigation Solutions Workshop	Local EMC Quarterly Training	Interim Participation Webinar	Draft Plan Review Meeting	Hazard-Risk Form	Capability Assessment Form	NFIP Survey	Mitigation Action Form
Fox Chapel Borough	Y	Y			Y	Y	Y	Y	Y
Franklin Park Borough	Y	Y				Y	Y		Y
Frazer Township	Y	Y				Y	Y		Y
Glassport Borough	Y	Y			Y	Y			
Glen Osborne Borough	Y	Y		Y		Y	Y		Y
Glenfield Borough					Y		Y		Y
Green Tree Borough	Y	Y			Y	Y			
Hampton Township	Y	Y			Y	Y	Y		
Harmar Township	Y				Y				Y
Harrison Township				Y	Y			Y	Y
Haysville Borough				Y		Y	Y		Y
Heidelberg Borough	Y	Y		Y	Y	Y	Y		Y
Homestead Borough	Y	Y		Y		Y			
Indiana Township	Y	Y		Y		Y			
Ingram Borough	Y	Y				Y			Y
Jefferson Hills Borough	Y	Y		Y		Y			
Kennedy Township	Y					Y			
Kilbuck Township					Y	Y			
Leet Township	Y	Y		Y		Y			
Leetsdale Borough	Y	Y		Y	Y	Y	Y		Y
Liberty Borough					Y		Y		Y
Lincoln Borough	Y				Y				
Marshall Township	Y	Y			Y	Y	Y		Y
McCandless Township	Y	Y		Y	Y	Y	Y		

Table 3.5-1 **Allegheny County HMP Update Stakeholders**

Municipality	Attendance					Forms			
	Kick-Off Meeting	Risk Assessment-Mitigation Solutions Workshop	Local EMC Quarterly Training	Interim Participation Webinar	Draft Plan Review Meeting	Hazard-Risk Form	Capability Assessment Form	NFIP Survey	Mitigation Action Form
McDonald Borough					Y				Y
McKees Rocks Borough	Y			Y		Y	Y		
McKeesport, City of	Y	Y		Y		Y			
Millvale Borough	Y	Y		Y	Y	Y	Y	Y	Y
Monroeville, Municipality of	Y	Y		Y	Y	Y		Y	
Moon Township	Y	Y				Y	Y		Y
Mount Lebanon, Municipality of	Y	Y		Y	Y	Y	Y	Y	Y
Mount Oliver Borough	Y	Y		Y	Y	Y	Y		
Munhall Borough	Y	Y				Y	Y		
Neville Township	Y			Y		Y	Y		
North Braddock Borough	Y	Y					Y		Y
North Fayette Township	Y	Y		Y	Y	Y	Y	Y	Y
North Versailles Township	Y					Y			
Oakdale Borough	Y	Y					Y		Y
Oakmont Borough	Y	Y		Y	Y	Y	Y	Y	Y
O'Hara Township	Y	Y				Y			
Ohio Township	Y	Y				Y			
Penn Hills, Municipality of	Y	Y				Y			Y
Pennsbury Village Borough	Y	Y				Y	Y		
Pine Township	Y	Y		Y	Y	Y	Y	Y	Y
Pitcairn Borough	Y	Y			Y		Y	Y	
Pittsburgh, City of	Y	Y		Y			Y		Y
Pleasant Hills Borough	Y	Y		Y	Y	Y	Y	Y	Y
Plum Borough	Y	Y		Y		Y			Y
Port Vue Borough	Y	Y		Y	Y	Y	Y	Y	Y

Table 3.5-1 **Allegheny County HMP Update Stakeholders**

Municipality	Attendance					Forms			
	Kick-Off Meeting	Risk Assessment-Mitigation Solutions Workshop	Local EMC Quarterly Training	Interim Participation Webinar	Draft Plan Review Meeting	Hazard-Risk Form	Capability Assessment Form	NFIP Survey	Mitigation Action Form
Rankin Borough	Y	Y					Y		Y
Reserve Township				Y	Y				Y
Richland Township	Y	Y		Y	Y	Y	Y		Y
Robinson Township	Y	Y		Y	Y	Y	Y		Y
Ross Township	Y	Y		Y		Y	Y		Y
Rosslyn Farms Borough					Y				
Scott Township	Y	Y		Y		Y	Y		Y
Sewickley Borough							Y		Y
Sewickley Heights Borough	Y	Y		Y	Y	Y			Y
Sewickley Hills Borough	Y				Y	Y			
Shaler Township	Y	Y		Y		Y	Y		
Sharpsburg Borough				Y	Y		Y		Y
South Fayette Township	Y	Y				Y			
South Park Township	Y	Y		Y		Y			
South Versailles Township					Y	Y	Y	Y	Y
Springdale Borough	Y	Y			Y	Y	Y		
Springdale Township	Y			Y					
Stowe Township	Y	Y		Y		Y			Y
Swissvale Borough	Y	Y		Y		Y	Y		
Tarentum Borough	Y					Y	Y		Y
Thornburg Borough	Y	Y			Y	Y			
Trafford Borough				Y			Y		
Turtle Creek Borough	Y	Y			Y	Y	Y		Y

Table 3.5-1 **Allegheny County HMP Update Stakeholders**

Municipality	Attendance					Forms			
	Kick-Off Meeting	Risk Assessment-Mitigation Solutions Workshop	Local EMC Quarterly Training	Interim Participation Webinar	Draft Plan Review Meeting	Hazard-Risk Form	Capability Assessment Form	NFIP Survey	Mitigation Action Form
Upper Saint Clair Township	Y	Y			Y	Y	Y		Y
Verona Borough	Y	Y				Y	Y		
Versailles Borough					Y		Y		Y
Wall Borough		Y		Y	Y		Y		Y
West Deer Township	Y	Y			Y	Y	Y	Y	Y
West Elizabeth Borough	Y					Y			
West Homestead Borough	Y	Y		Y	Y	Y	Y	Y	Y
West Mifflin Borough	Y			Y		Y			
West View Borough	Y	Y				Y			
Whitaker Borough	Y	Y				Y	Y		Y
White Oak Borough	Y	Y		Y	Y	Y			
Whitehall Borough	Y	Y			Y	Y	Y	Y	
Wilkins Township	Y	Y			Y	Y	Y		Y
Wilkinsburg Borough	Y	Y			Y	Y	Y		
Wilmerding Borough							Y		Y

4. Risk Assessment

4.1. Update Process Summary

The risk assessment provides a factual basis for activities proposed by the County in their mitigation strategy. Hazards that may affect Allegheny County are identified and defined in terms of their location and extent, magnitude of impacts, previous events, and probability of future events. Wherever data could be validated, information from the previous plan has been incorporated and/or updated in the 2020 HMP. In addition, new data sources and analysis has been incorporated throughout the Risk Assessment.

Hazard profiles in the 2020 HMP include the following Natural and Human-Made Hazards:

- Drought
- Earthquake
- Flood
- Hurricane
- Landslide
- Pandemic
- Radon Exposure
- Subsidence, Sinkhole
- Tornado, Windstorm
- Wildfire
- Winter Storm
- Civil Disturbance
- Dam and Lock Failure
- Environmental Hazards
- Levee Failure
- Nuclear Incidents
- Opioid Addiction
- Terrorism
- Transportation Accidents
- Urban Fire and Explosion
- Utility Interruption

The 2005 Allegheny County Hazard Mitigation Plan included a list of five natural and one human-made hazard affecting the County. In the 2011 HMP, the HMPT added eleven hazards: earthquake; tornado and windstorms; hurricane, tropical storm, nor'easter; dam failure; nuclear incidents; pandemic; urban fire and explosion; transportation accidents; civil disturbance; and levee failure. In addition, the 2011 HMP re-arranged hazard profiles to be compliant with the Commonwealth of Pennsylvania's Standard Operating Guide.

For the 2015 HMP, the HMPSC decided to include 2 new hazards: Radon and Exposure to Terrorism. In addition, the HMPSC decided to expand its definition of Dam Failure to also include failures of the lock and dam systems on the Allegheny, Monongahela, and Ohio Rivers as the 2013 SSAHMP does. Finally, the discussion of hazardous material releases in transit was moved from the Environmental Hazards profile to Transportation Accidents.

For the 2020 plan the HMPSC decided to include 1 new hazard: Opioid Addiction. Also, integration of the County's Stormwater Management Plan was emphasized in this update.

Hazard profiles were then developed in order to define the characteristics of each hazard as they apply to Allegheny County. In addition, participating municipalities and stakeholders evaluated the impact of the profiled hazards on their jurisdiction using the Hazards in Your Community form (see Appendix C). These evaluations, together with discussion at community meetings and research and analysis, allow the HMP to evaluate where municipal risk may deviate from the overall countywide risk.

Following hazard identification and profiling, a vulnerability assessment was conducted for each hazard to identify the impact of both natural and human-made hazard events on people, buildings, infrastructure, and the community, as appropriate. Each hazard is discussed in terms of its potential impact on individual communities, including the types of structures that may be at risk.

This assessment allows the County and its municipalities to focus on and prioritize local mitigation efforts on areas that are most likely to be damaged or require early response to a hazard event. A vulnerability analysis was performed which identifies structures, critical facilities, and/or populations that may be impacted during hazard events and describes what events can do to physical, social, and economic assets.

4.2. Hazard Identification

Pennsylvania's disaster history provides direction on the identification of hazards that may be of concern to Allegheny County and other parts of the commonwealth. An analysis of past declared disasters is the first step toward predicting the future susceptibility to that hazard. This section outlines the past disaster declarations as well as defines the hazards being profiled in the 2020 HMP.

4.2.1. Table of Presidential Disaster Declarations

Under the Stafford Act, there are two forms of presidential action that authorize federal disaster assistance dollars. Presidential Emergency Declarations are intended to spur activities that will protect property and strengthen public safety to lessen impacts or avoid a catastrophic event. Presidential Disaster Declarations are made as a result of a disaster event and provide supplemental coordination and financial assistance beyond the ability of state and local governments (McCarthy, 2011). Because of the difference in these declarations, a single event may qualify for both kinds of declarations.

There is no financial threshold for an Emergency Declaration, but there are two thresholds for Presidential Disaster Declarations established under the Stafford Act: a state and a county threshold. These thresholds are based on a formula that uses the population of the jurisdiction (as recorded in the decennial Census) times a set per capita indicator. As of federal fiscal year, 2020, these thresholds are $3.84 per capita for counties and $1.53 per capita for the state. With a population of over 1.2 million, the Allegheny County threshold is over $4.6 million. State and county thresholds must be simultaneously attained for a Presidential Disaster Declaration to be issued.

Table 4.2-1 displays the Presidential Disaster and Emergency Declarations for Allegheny County from most to least recent.

Table 4.2-1 **Presidential Disaster and Emergency Declarations Affecting Allegheny County.**

Declaration Number	Date	Event
4506*	March 30, 2020	COVID-19 Pandemic
3441*	March 13, 2020	COVID-19
4149	October 2013	Severe Storms, Tornadoes, and Flooding
3356*	October 2012	Hurricane Sandy Response and Recovery
1898	April 2010	Severe Winter Storms and Snowstorms
3235*	September 2005	Hurricane Katrina Evacuation
1557	September 2004	Tropical Depression Ivan
1555	September 2004	Severe Storms and Flooding Associated with Tropical Depression Frances
1219	June 1998	Flooding, Severe Storms, and Tornadoes
1093	January 1996	Flooding

Table 4.2-1 Presidential Disaster and Emergency Declarations Affecting Allegheny County.		
Declaration Number	**Date**	**Event**
1085	January 1996	Blizzard
1015	March 1994	Winter Storm, Severe Storm
3105*	March 1993	Severe Snowfall and Winter Storm
766	June 1986	Severe Storms, Flooding
754	November 1985	Severe Storms, Flooding
721	August 1984	Severe Storms, Flooding
3081*	June 1980	Severe Storms and Tornadoes
340	June 1972	Tropical Storm Agnes
**Presidential Emergency Declaration*		

4.2.2. Summary of Hazards

The HMPT was provided the Pennsylvania Standard List of Hazards to be considered for evaluation in the 2020 HMP. Following a review of the hazards considered in the 2015 HMP and the Standard List of Hazards, the Steering Committee along with input from the municipalities decided that the 2020 plan should identify, profile, and analyze twenty one hazards. These twenty one hazards include all hazards profiled in the 2015 plan and the addition of opioid addiction as a hazard of concern.

Table 4.2-2 contains a complete list of the twenty one hazards that have the potential to impact Allegheny County as identified through previous risk assessments, the County Hazards Vulnerability Analysis, and input from those that participated in the 2020 HMP update. Hazard profiles are included in Section 4.3 for each of these hazards.

Table 4.2-2 List of Hazards Profiled in the Allegheny County HMP Update with Associated Descriptions.	
Profiled Hazards	**Description**
Natural	
Drought	Drought is defined as a deficiency of precipitation experienced over an extended period of time, usually a season or more. Droughts increase the risk of other hazards, like wildfires, flash floods, and landslides or debris flows. This hazard is of particular concern in Pennsylvania due to the prevalence of farms and other water-dependent industries, water-dependent recreation uses, and residents who depend on wells for drinking water.
Earthquake	An earthquake is the motion or trembling of the ground produced by sudden displacement of rock usually within the upper 10-20 miles of the Earth's crust. Earthquakes result from crustal strain, volcanism, landslides, or the collapse of underground caverns. Earthquakes can affect hundreds of thousands of square miles, cause damage to property measured in the tens of billions of dollars, result in loss of life and injury to hundreds of thousands of persons, and disrupt the social and economic functioning of the affected area.

Table 4.2-2	List of Hazards Profiled in the Allegheny County HMP Update with Associated Descriptions.
Profiled Hazards	**Description**
Flood, Flash Flood, Ice Jam	Flooding is the temporary condition of partial or complete inundation of normally dry land, and it is the most frequent and costly of all natural hazards in Pennsylvania. Flash flooding is usually a result of heavy localized precipitation falling in a short time period over a given location, often along mountain streams and in urban areas where much of the ground is covered by impervious surfaces. Winter flooding can include ice jams which occur when warm temperatures and heavy rain cause snow to melt rapidly. Snow melt combined with heavy rains can cause frozen rivers to swell, which breaks the ice layer on top of a river. The ice layer often breaks into large chunks, which float downstream, piling up in narrow passages and near other obstructions such as bridges and dams.
Hurricane, Tropical Storm, Nor'easter	Hurricanes, tropical storms, and nor'easters are classified as cyclones and are any closed circulation developing around a low-pressure center in which the winds rotate counterclockwise (in the Northern Hemisphere) and whose diameter averages 10-30 miles across. Potential threats from hurricanes include powerful winds, heavy rainfall, storm surges, coastal and inland flooding, rip currents, tornadoes, and landslides. The Atlantic hurricane season runs from June 1 to November 30.
Landslide	In a landslide, masses of rock, earth or debris move down a slope. Landslides can be caused by a variety of factors, including earthquakes, storms, fire, and human modification of land. Areas that are prone to landslide hazards include previous landslide areas, areas on or at the base of slopes, areas in or at the base of drainage hollows, developed hillsides with leach field septic systems, and areas recently burned by forest or brush fires.
Pandemic and Infectious Disease	A pandemic is a global outbreak of disease that occurs when a new virus emerges in the human population, spreading easily in a sustained manner, and causing serious illness. An epidemic describes a smaller-scale infectious outbreak, within a region or population, that emerges at a disproportional rate. Infectious disease outbreaks may be widely dispersed geographically, impact large numbers of the population, and could arrive in waves lasting several months at a time.
Radon	Radon is a radioactive gas produced by the breakdown of uranium in soil and rock that can lead to lung cancer in people exposed over a long period of time. Most exposure comes from breathing in radon gas that enters homes and buildings through foundation cracks and other openings. According to the DEP, approximately 40% of Pennsylvania homes have elevated radon levels.

Table 4.2-2	List of Hazards Profiled in the Allegheny County HMP Update with Associated Descriptions.
Profiled Hazards	**Description**
Subsidence, Sinkhole	Land subsidence is a gradual settling or sudden sinking of the ground surface due to the movement of subsurface materials. A sinkhole is a subsidence feature resulting from the sinking of surficial material into a pre-existing subsurface void. Subsidence and sinkholes are geologic hazards that can impact roadways and buildings and disrupt utility services. Subsidence and sinkholes are most common in areas underlain by limestone and can be exacerbated by human activities such as water, natural gas, and oil extraction.
Tornado, Windstorm	A tornado is a narrow, violently rotating column of air that extends from the base of a thunderstorm to the ground. About 1,250 tornadoes hit the U.S. each year, with about 16 hitting Pennsylvania. Damaging winds exceeding 50-60 miles per hour can occur during tornadoes, severe thunderstorms, winter storms, or coastal storms. These winds can have severe impacts on buildings, pulling off the roof covering, roof deck, or wall siding and pushing or pulling off the windows.
Wildfire	A wildfire is an unplanned fire that burns in a natural area. Wildfires can cause injuries or death and can ruin homes in their path. Wildfires can be caused by humans or lightning, and can happen anytime, though the risk increases in period of little rain. In Pennsylvania, 98% of wildfires are caused by people.
Winter Storm	A winter storm is a storm in which the main types of precipitation are snow, sleet, or freezing rain. A winter storm can range from a moderate snowfall or ice event over a period of a few hours to blizzard conditions with wind-driven snow that lasts for several days. Most deaths from winter storms are not directly related to the storm itself, but result from traffic accidents on icy roads, medical emergencies while shoveling snow, or hypothermia from prolonged exposure to cold.
Human-Made	
Civil Disturbance	A civil disturbance is defined by FEMA as a civil unrest activity (such as a demonstration, riot, or strike) that disrupts a community and requires intervention to maintain public safety.
Dam and Lock Failure	Dam failure is the uncontrolled release of water (and any associated wastes) from a dam. This hazard often results from a combination of natural and human causes, and can follow other hazards such as hurricanes, earthquakes, and landslides. The consequences of dam failures can include property and environmental damage and loss of life.

Table 4.2-2	List of Hazards Profiled in the Allegheny County HMP Update with Associated Descriptions.
Profiled Hazards	**Description**
Environmental Hazards	Environmental hazards are hazards that pose threats to the natural environment, the built environment, and public safety through the diffusion of harmful substances, materials, or products. Environmental hazards include the following: Coal Mining - Major impacts from coal mining include subsidence, landscape changes, and the chemical degradation of surface and subsurface waters. In addition, active and abandoned mines can result in injury and loss of human life. In active mines, workers can be injured or killed by mine collapse, entrapment, poisonous gases, inundation, explosions, fires, equipment malfunction, or improper ventilation. In abandoned mines, causes of injury or death include falling and drowning. Conventional Oil and Gas Wells - Many of the hazards associated with conventional oil and gas extraction relate to the contamination of surface and subsurface waters. Abandoned oil and gas wells that are not properly plugged can contaminate groundwater and pollute domestic drinking water wells. In addition, surface waters and soil can be contaminated by brine, a salty wastewater product of oil and gas well drilling, or by oil spills. This pollution can degrade public drinking water supplies and disrupt aquatic ecosystems. Hazardous Materials Releases - Hazardous material releases can contaminate air, water, and soils and have the potential to cause injury or death. Dispersion can take place rapidly when transported by water and wind. While often accidental, releases can occur as a result of human carelessness, intentional acts, or natural hazards. When caused by natural hazards, these incidents are known as secondary events. Unconventional Oil and Gas Wells - In addition to the hazards associated with conventional oil and gas extraction, potential hazards from Marcellus Shale gas wells include surface water depletion affecting drinking water supplies and aquatic ecosystems; contaminated surface and groundwater resulting from hydraulic fracturing and the recovery of contaminated hydraulic fracturing fluid; and mishandling of solid toxic waste.
Levee Failure	A levee is a human-made structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control, or divert the flow of water to provide protection from temporary flooding (FEMA, 2016). A levee failure or breach occurs when a levee fails to prevent flooding on the landside of the levee. The consequences of a sudden levee failure can be catastrophic, with the resulting flooding causing loss of life, emergency evacuations, and significant property damage.

Table 4.2-2	List of Hazards Profiled in the Allegheny County HMP Update with Associated Descriptions.
Profiled Hazards	**Description**
Nuclear Incident	Nuclear explosions can cause significant damage and casualties from blast, heat, and radiation. The primary concern following a nuclear accident or nuclear attack is the extent of radiation, inhalation, and ingestion of radioactive isotopes which can cause acute health effects (e.g. death, burns, severe impairment), chronic health effects (e.g. cancer), and psychological effects.
Opioid Addiction	Opioid addiction occurs when an individual becomes physically dependent on opioids, which include opiates and narcotics. Opioids are a synthetic substance found in certain prescription pain medications: morphine, codeine, methadone, oxycodone, hydrocodone, fentanyl, and hydromorphone, and street drugs like heroine. Opioids block the body's ability to feel pain and can create a sense of euphoria. Individuals often build a tolerance to opioid drugs, which leads them to take more of the medication than originally prescribed.
Terrorism	Terrorism is use of force or violence against persons or property with the intent to intimidate or coerce. Acts of terrorism include threats of terrorism; assassinations; kidnappings; hijackings; bomb scares and bombings; cyber-attacks (computer-based); and the use of chemical, biological, nuclear and radiological weapons. Cyber-attacks have become an increasingly pressing concern.
Transportation Accident	Transportation accidents are technological hazards involving the nation's system of land, sea, and air transportation infrastructure. A flaw or breakdown in any component of this system can and often does result in a major disaster involving loss of life, injuries, property and environmental damage, and economic consequences.
Urban Fire and Explosion	Urban fire and explosion hazards include vehicle and building/structure fires as well as overpressure rupture, overheat, or other explosions that do not ignite. This hazard occurs in denser, more urbanized areas statewide and most often occurs in residential structures. Nationally, fires cause over 3,000 deaths and approximately 16,000 injuries each year.
Utility Interruption	Utility interruption hazards are hazards that impair the functioning of important utilities in the energy, telecommunications, public works, and information network sectors. Utility interruption hazards include the following: • Geomagnetic Storms • Fuel or Resource Shortage • Electromagnetic Pulse • Information Technology Failure • Ancillary Support Equipment • Public Works Failure • Telecommunications System Failure • Transmission Facility or Linear Utility Accident • Major Energy, Power, Utility Failure

4.3. Hazard Profiles and Vulnerability Analysis

Natural Hazards

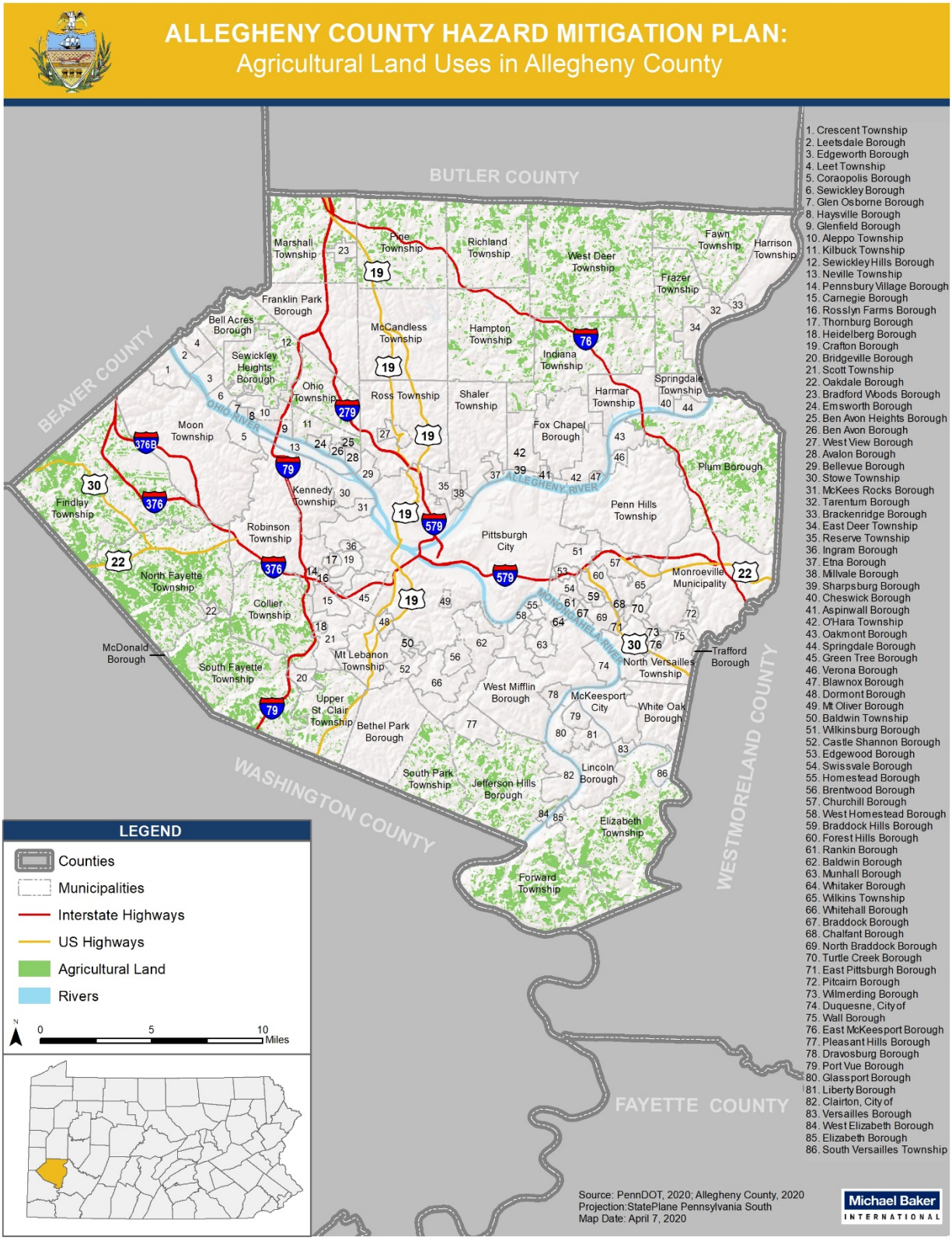
4.3.1. Drought

4.3.1.1. Location and Extent

Droughts are a normal part of the climate in the Mid-Atlantic; they are a consequence of a natural reduction in the amount of precipitation experienced over a long period of time. High temperatures, prolonged winds, and low relative humidity can exacerbate the severity of a drought.

Droughts are regional climatic events, so when these events occur in Allegheny County, impacts are felt across the County as well as in areas outside the County boundaries. The spatial extent for areas of impact can range from localized areas in Pennsylvania to the entire Mid-Atlantic region. Areas with extensive agricultural (farmland) land uses are most vulnerable to drought. About 11% of Allegheny County's landcover is agricultural use. As shown in Figure 4.3.1-1, these uses are scattered near the edges of the County and the north side of the Ohio River. Additionally, areas that heavily forested can also be negatively impacted by drought.

Figure 4.3.1-1 Agricultural Land Uses in Allegheny County



4.3.1.2. Range of Magnitude

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

Hydrologic drought events result in a reduction of stream flows, reduction of lake/reservoir storage, and a lowering of groundwater levels. These events have adverse impacts on public water supplies for human consumption, rural water supplies for livestock consumption and agricultural operations, water quality, natural soil water or irrigation water for agriculture, soil moisture, conditions conducive to wildfire events, and water for navigation and recreation.

The Commonwealth uses five parameters to assess drought conditions:

1. Stream flows (compared to benchmark records)
2. Precipitation (measured as the departure from normal, 30 year average precipitation)
3. Reservoir storage levels in a variety of locations (especially three New York City reservoirs in upper Delaware River Basin)
4. Groundwater elevations in a number of counties (comparing to past month, past year and historic record)
5. The Palmer Drought Severity Index – a soil moisture algorithm calibrated for relatively homogeneous regions which measures dryness based on recent precipitation and temperature (see Table 4.3.1-1).

Table 4.3.1-1 **Palmer Drought Severity Index (PSDI) Classifications (NDMC, 2009)**

Severity Category	PSDI Value
Extremely wet	4.0 or more
Very wet	3.0 to 3.99
Moderately wet	2.0 to 2.99
Slightly wet	1.0 to 1.99
Incipient wet spell	0.5 to 0.99
Near normal	0.49 to -0.49
Incipient dry spell	-0.5 to -0.99
Mild drought	-1.0 to -1.99
Moderate drought	-2.0 to -2.99
Severe drought	-3.0 to -3.99
Extreme drought	-4.0 or less

In Pennsylvania, PEMA has primary responsibility for managing droughts with direct support from the Department of Environmental Protection (DEP). According to USGS, PEMA and DEP use the following three stages to describe and manage droughts. They are listed in order of increasing severity:

- Drought Watch: Intended to alert government agencies, public water suppliers, water users and the public regarding the onset of conditions indicating the potential for future drought-related problems. The focus during this stage is on increased monitoring, awareness and preparation for response if conditions become worse. A request for voluntary water conservation is made. The objective of voluntary water conservation measures during a drought watch is to reduce water uses by 5% in the affected areas. Because of varying conditions, individual water suppliers or municipalities may be asking for more stringent conservation actions.
- Drought Warning: Implements coordinated response to imminent drought conditions and potential water supply shortages and initiates concerted voluntary conservation measures to avoid or reduce shortages, relieve stressed sources and forestall the need to impose mandatory water use restrictions. Development of alternate sources is initiated where and as appropriate. The objective of voluntary water conservation measures during a drought warning is to reduce overall water uses by 10-15% in the affected areas. Because of varying conditions, individual water suppliers or municipalities may be asking for more stringent conservation actions.

  Drought Emergency: A concentrated management phase designed to marshal all available resources to respond to actual emergency conditions, to avoid depletion of water sources, to assure at least minimum water supplies to protect public health and safety, to support essential and high priority water uses and to avoid unnecessary economic dislocations. During this phase, mandatory restrictions are imposed on nonessential water uses as provided for in 4 PA Code Chapter 119. The objective of water use restrictions and other conservation measures during this phase is to reduce consumptive water use in the affected area by at least 15 percent, and to reduce total use to the extent necessary to preserve public water system supplies, to avoid or mitigate local or area shortages, and to assure equitable sharing of limited supplies. During a drought emergency, public water suppliers are authorized to institute water rationing, if mandatory restrictions prove insufficient to protect supplies and if approved by the Commonwealth Drought Coordinator.

In addition, communities may opt to ask for local water rationing:

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

The worst historical drought event for Allegheny County occurred in the summer of 1930, when no rain fell from June 15 through the end of October. According to USGS, during this drought, precipitation was 68% of the mean in Pennsylvania while there were 20 days with a high temperature of over 100 degrees and a maximum temperature of 108. Crop yields were only 88% of the normal yield (USGS, 1930). In Allegheny County, many park construction projects were delayed, and golf

courses were closed due to water shortages. In addition, records from the Carnegie Library in Pittsburgh state that Pine Creek ran dry in North Park that year (Gangewere, 1986).

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; 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
- Damage to plant communities – loss of biodiversity; loss of trees from urban landscapes and wooded conservation areas
- Increased number and severity of fires
- Reduced soil quality
- Air quality effects – dust and pollutants
- Loss of quality in landscape
- Loss of water for navigation and recreation
- Increase in nitrate levels which can have health impacts on pregnant women and children.

4.3.1.3. Past Occurrence

Between 1930 and 1994, the Commonwealth of Pennsylvania experienced five significant droughts: 1930-1934, 1939-1942, 1953-1955, 1961-1967, and 1991-1992. In addition, PA DEP maintains Pennsylvania's history of declared droughts back to 1980. This drought history is presented in Table 4.3.1-2 below. While there have been significant droughts since 1980, DEP's records indicate that there has only been one drought emergency in Allegheny County since 1980, in the summer of 1999.

Table 4.3.1-2 **Summary of Declared Drought Status from 1980 to 2020 for Allegheny County (PA DEP, 2020)**

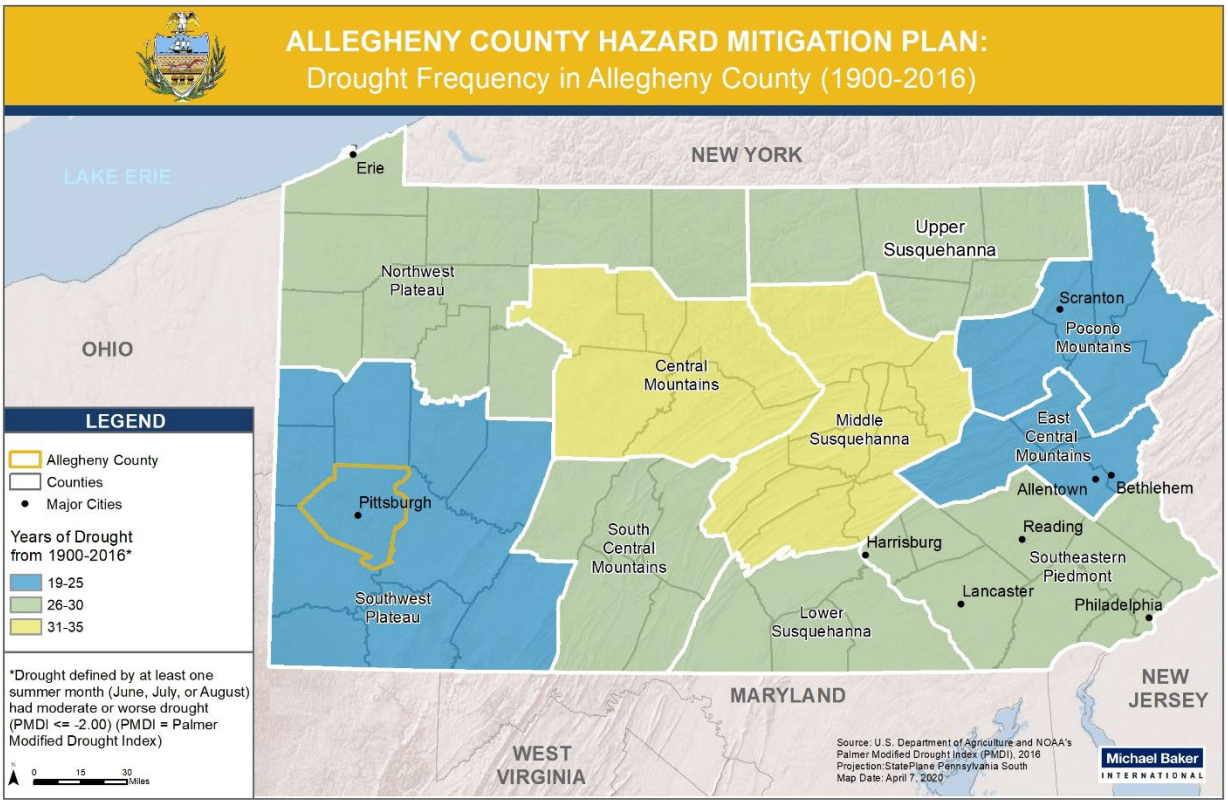
Time Period	Drought Status	Time Period	Drought Status
Jul 7, 1988 - Aug 24, 1988	Watch	Dec 16, 1998 - Jan 15, 1999	Warning
Aug 24, 1988 - Dec 12, 1988	Warning	Jan 15, 1999 - Mar 15, 1999	Warning
Mar 3, 1989 - May 15, 1989	Watch	Mar 15, 1999 - Jun 10, 1999	Watch
Jun 28, 1991 - Jul 24, 1991	Watch	Jun 10, 1999 - Jun 18, 1999	Watch
Jul 24, 1991 - Aug 16, 1991	Watch	Jun 18, 1999 - Jul 20, 1999	Warning
Aug 16, 1991 - Sep 13, 1991	Warning	Jul 20, 1999 - Sep 30,1999	Emergency
Sep 13, 1991 - Oct 21, 1991	Warning	Sep 30, 1999 - Dec 16, 1999	Warning
Oct 21, 1991 - Jan 16, 1992	Warning	Dec 16, 1999 - Feb 25,2000	Warning
Jan 17, 1992 - Apr 20, 1992	Warning	Feb 25, 2000 - May 5, 2000	Watch
Apr 20, 1992 - Jun 23, 1992	Warning	Sep 5, 2002 - Nov 7, 2002	Watch
Jun 23, 1992 - Sep 11, 1992	Watch	Apr 11, 2006 - Jun 30, 2006	Watch
Sep 1, 1995 - Sep 20, 1995	Watch	Aug 8, 2007 - Sep 5, 2007	Watch
Sep 20, 1995 - Nov 8, 1995	Watch	Nov 7, 2008 - Jan 26, 2009	Watch
Nov 8, 1995 - Dec 18, 1995	Watch	Sept 16, 2010 - Nov 10 2010	Warning
Dec 3, 1998 - Dec 8, 1998	Watch	Nov 10, 2010 - Dec 17, 2010	Watch

Table 4.3.1-2 Summary of Declared Drought Status from 1980 to 2020 for Allegheny County (PA DEP, 2020)			
Time Period	**Drought Status**	**Time Period**	**Drought Status**
Dec 8, 1998 - Dec 14, 1998	Watch	Aug 5, 2011 - Sept 2, 2011	Watch
Dec 14, 1998 - Dec 16, 1998	Warning	July 19, 2012 - Aug 31, 2012	Watch

4.3.1.4. Future Occurrence

It is difficult to forecast the severity and frequency of future drought events. Based on national data from 1895 to 1995, Allegheny County and the rest of Pennsylvania's Southwest Plateau is in severe or extreme drought approximately 5-9.9 percent of the time, shown in Figure 4.3.1-2. However, changing weather patterns have made many types of disasters more frequent and extreme. As temperatures climb, higher evaporation rates make droughts worse. The annual number of very hot days is growing and impacting areas that previously did not experience this hazard. Climate Central, an independent organization of scientists, predicts that drought intensity will more than double in the region around the City of Pittsburgh by 2050. The group also predicts that warming intensity will double by 2050, and there will be a sharp increase in heatwaves (Climate Central, 2019). The City of Pittsburgh adopted the Pittsburgh Climate Action Plan 3.0 in 2017. By focusing on reducing Green House Gas emissions, the City is contributing its part to slow the effects of climate change and its impact on temperature changes (City of Pittsburgh, 2017). Therefore, the future occurrence of drought can be considered possible according to the Risk Factor Methodology (see Table 4.4-1).

Figure 4.3.1-2 Drought Frequency in Allegheny County from 1900-2016 (USDA & NOAA's PMDI, 2016)



4.3.1.5. Vulnerability Assessment

The most significant losses resulting from drought events are typically found in the agriculture sector of any County's economy. For example, the drought in 1999 resulted in a Gubernatorial Proclamation of Emergency in part because of significant crop damage. Preliminary damage estimates by the US Department of Agriculture indicated possible crop losses across Pennsylvania in excess of $500 million. This figure did not include a 20 percent decrease in dairy milk production statewide, which also resulted in million dollar losses (NCDC, 2009).

While these were statewide impacts, they illustrate the potential for droughts to severely impair the local economy in more agricultural communities. As of the 2017 Census of Agriculture, the US Department of Agriculture counted 389 farms in Allegheny County, a 9% decrease in farms since 2012. Nearly 29,000 acres of land are in farms, and average farm size is 74 acres. Statewide, Allegheny County ranks 56th out of the 67 counties in Pennsylvania for market value of agricultural products sold. In 2017, the total market value of agricultural products sold was $13,743,000. Almost 90% of the total products come from crop sales. Allegheny County's strongest agricultural performance is in fruits, tree nuts, and berries as well as in vegetables, melons, potatoes, and sweet potatoes. According to the Agricultural Census, the county has a population of 14,094 layers (chickens), 4,375 turkeys, 2,218 cattle and calves, 667 sheep and lambs, and 579 horses and ponies.

Because agriculture is a small portion of Allegheny County's economy, it is important to recognize that the primary vulnerability in Allegheny County is a threat to the County's water supply. Allegheny County residents that use private domestic wells are more vulnerable to droughts because their drinking water can literally dry up, but public supplies may also be at risk.

Table 4.3.1-4 shows the number of domestic wells per municipality. It is important to note that the well data was obtained from the Pennsylvania Groundwater Information System (PaGWIS). PaGWIS 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. This is the most complete dataset of domestic wells available.

Table 4.3.1-3 **PaGWIS Domestic Water Wells Drilled Per Municipality (PA DEP, 2020)**

Municipality	Number of Reported Domestic Water Wells	Municipality	Number of Reported Domestic Water Wells
Aleppo Township	2	McCandless, Town of	74
Aspinwall Borough	7	McDonald Borough	0
Avalon Borough	0	McKees Rocks Borough	1
Baldwin Borough	0	McKeesport, City of	17
Baldwin Township	4	Millvale Borough	4
Bell Acres Borough	48	Monroeville Borough	13
Bellevue Borough	2	Moon Township	50
Ben Avon Borough	0	Mount Lebanon Township	1
Ben Avon Heights Borough	0	Mount Oliver Borough	2

Table 4.3.1-3 **PaGWIS Domestic Water Wells Drilled Per Municipality (PA DEP, 2020)**

Municipality	Number of Reported Domestic Water Wells	Municipality	Number of Reported Domestic Water Wells
Bethel Park Borough	21	Munhall Borough	0
Blawnox Borough	0	Neville Township	7
Brackenridge Borough	0	North Braddock Borough	0
Braddock Borough	0	North Fayette Township	78
Braddock Hills Borough	0	North Versailles Township	2
Bradford Woods Borough	3	Oakdale Borough	28
Brentwood Borough	0	Oakmont Borough	23
Bridgeville Borough	8	O'Hara Township	4
Carnegie Borough	3	Ohio Township	19
Castle Shannon Borough	9	Penn Hills, Municipality of	18
Chalfant Borough	0	Pennsbury Village Borough	0
Cheswick Borough	0	Pine Township	69
Churchill Borough	1	Pitcairn Borough	1
Clairton, City of	16	Pittsburgh, City of	169
Collier Township	6	Pleasant Hills Borough	0
Coraopolis Borough	1	Plum Borough	31
Crafton Borough	4	Port Vue Borough	0
Crescent Township	5	Rankin Borough	0
Dormont Borough	0	Reserve Township	0
Dravosburg Borough	0	Richland Township	161
Duquesne, City of	1	Robinson Township	18
East Deer Township	1	Ross Township	21
East McKeesport Borough	0	Rosslyn Farms Borough	2
East Pittsburgh Borough	0	Scott Township	9
Edgewood Borough	0	Sewickley Borough	22
Edgeworth Borough	1	Sewickley Heights	17
Elizabeth Borough	4	Sewickley Hills Borough	10
Elizabeth Township	6	Shaler Township	13
Emsworth Borough	1	Sharpsburg Borough	0
Etna Borough	0	South Fayette Township	18
Fawn Township	38	South Park Township	4
Findlay Township	67	South Versailles Township	2
Forest Hills Borough	0	Springdale Borough	1
Forward Township	9	Springdale Township	4
Fox Chapel Borough	6	Stowe Township	4

Table 4.3.1-3 PaGWIS Domestic Water Wells Drilled Per Municipality (PA DEP, 2020)			
Municipality	**Number of Reported Domestic Water Wells**	**Municipality**	**Number of Reported Domestic Water Wells**
Franklin Park Borough	53	Swissvale Borough	14
Frazer Township	16	Tarentum Borough	2
Glassport Borough	12	Thornburg Borough	0
Glen Osborne Borough	0	Trafford Borough	0
Glenfield Borough	2	Turtle Creek Borough	1
Green Tree Borough	1	Upper St. Clair Township	9
Hampton Township	30	Verona Borough	2
Harmar Township	3	Versailles Borough	2
Harrison Township	12	Wall Borough	0
Haysville Borough	0	West Deer Township	65
Heidelberg Borough	2	West Elizabeth Borough	3
Homestead Borough	3	West Homestead Borough	0
Indiana Township	26	West Mifflin Borough	90
Ingram Borough	3	West View Borough	2
Jefferson Hills Borough	23	Whitaker Borough	2
Kennedy Township	17	White Oak Borough	3
Kilbuck Township	5	Whitehall Borough	1
Leet Township	6	Wilkins Township	5
Leetsdale Borough	4	Wilkinsburg Borough	0
Liberty Borough	1	Wilmerding Borough	0
Lincoln Borough	0	Unknown	53
Marshall Township	69	**GRAND TOTAL**	**1,733**

While data on public water supplies is no longer publicly available in Pennsylvania, data provided in the 2015 plan provides insight on what municipalities and how much of the population water supplies have served in the past. In 2015 there were 36 public water supplies in Allegheny County, and many systems are multi-municipal entities that share the service. As shown in Table 4.3.1-4, these supplies are a combination of surface water supplies, ground water supplies, and consecutive systems (systems interconnected with other suppliers).

Table 4.3.1-4 Community Public Water Suppliers and Municipalities Served (ACHD, 2007)			
Name	**Type of System**	**Municipalities Served**	**Population Served**
Aleppo Township Authority	Consecutive System	Aleppo Township, Glenfield	1,362
Borough of Blawnox	Consecutive System	Blawnox Borough	1,700

Table 4.3.1-4 **Community Public Water Suppliers and Municipalities Served (ACHD, 2007)**

Name	Type of System	Municipalities Served	Population Served
Borough of Brackenridge	Surface Water Treatment Plant	Brackenridge Borough	3,784
The Water Authority of the Borough of Braddock	Consecutive System	Braddock Borough	4,280
Coraopolis Water & Sewer Authority	Groundwater Treatment Plant	Coraopolis Borough Moon Township (part)	6,750
City of Duquesne	Consecutive System	City of Duquesne West Mifflin Borough (part)	8,300
Township of East Deer	Consecutive System	East Deer Township	1,651
Municipal Authority of the Borough of Edgeworth	Consecutive System	Edgeworth Borough, Bell Acres Borough (part), Leetsdale Borough, Leet Township	5,500
Borough of Etna	Consecutive System	Etna Borough	4,201
Fawn-Frazer Joint Water Authority	Consecutive System	Fawn Township, Frazer Township, West Deer Township (part)	4,582
Findlay Township Municipal Authority	Consecutive System	Findlay Township	4,248
Fox Chapel Authority	Consecutive System	Fox Chapel Borough, Harmar Township (part), Indiana Township (part), O'Hara Township (part)	16,000
Hampton Township Municipal Authority	Consecutive System	Hampton Township, West Deer Township (part), Indiana Township (part), O'Hara Township (part), Richland Township (part)	22,200
Municipal Authority of the Township of Harmar	Groundwater Treatment Plant	Harmar Township, Cheswick Borough, Springdale Township (part)	3,144
Harrison Township Water Authority	Surface Water Treatment Plant	Harrison Township	11,673
Municipal Authority of Westmoreland County – McKeesport Water Treatment Plant	Surface Water Treatment Plant	City of McKeesport, Forward Township, North Versailles Township, Port Vue Borough, Versailles Borough, White Oak Borough (part)	35,178
Monroeville Municipal Authority	Consecutive System	Municipality of Monroeville	29,169
Moon Township Municipal Authority	Surface Water Treatment Plant	Moon Township, Findlay Township (part)	19,922
Township of Neville	Consecutive System	Neville Township	1,273
Borough of Oakdale	Consecutive System	Oakdale Borough	1,800
Municipal Authority of the Borough of Oakmont	Surface Water Treatment Plant	Oakmont Borough, Verona Borough, Plum Borough (part), Municipality of Penn Hills (part), Harmar Township (part) Indiana Township (part), West Deer (part), Middlesex Township (Butler County)	39,829

Table 4.3.1-4 **Community Public Water Suppliers and Municipalities Served (ACHD, 2007)**

Name	Type of System	Municipalities Served	Population Served
Pennsylvania American Water Company	Surface Water Treatment Plant	Baldwin Borough, Baldwin Township, Bethel Park Borough, Brentwood Borough, Bridgeville Borough, Carnegie Borough, Castle Shannon Borough, City of Clairton, Collier Township, Crafton Borough, Dormont Borough, Dravosburg Borough, Elizabeth Borough, Elizabeth Township, Glassport Borough, Green Tree Borough, Heidelberg Borough, Homestead Borough, Ingram Borough, Jefferson Borough, Liberty Borough, Lincoln Borough, McDonald Borough, Municipality of Mt. Lebanon, Mt. Oliver Borough, Pennsbury Borough, City of Pittsburgh (Ward, 29, 30, 31, 32, & Parts of 16, 18, 19, 20 & 28), Pleasant Hills Borough, Rosslyn Farms Borough, Scott Township, South Fayette Township, South Park Township, Thornburg Borough, Upper St. Clair Township, West Elizabeth Borough, West Mifflin Borough, Whitaker Borough, Whitehall Borough, and Communities in Washington County	569,328
The Pittsburgh Water & Sewer Authority	Surface Water Treatment Plant	City of Pittsburgh, Millvale, Aspinwall	370,000
Plum Borough Municipal Authority	Consecutive System	Plum Borough	25,500
Township of Reserve	Consecutive System	Reserve Township	3,860
Richland Township Municipal Authority	Consecutive System	Richland Township	6,186
Municipal Authority of the Township of Robinson	Surface Water Treatment Plant	Robinson Township, Findlay Township (part), North Fayette Township (part)	10,798
Sewickley Water Authority	Groundwater Treatment Plant	Sewickley Borough, Aleppo Township (part), Edgeworth Borough (part), Haysville Borough (part), Osborne Borough (part), Sewickley Heights Borough	7,575
Hampton/Shaler	Groundwater Treatment Plant	Shaler Township, Hampton Township (part)	31,500
Borough of Sharpsburg	Groundwater Treatment Plant	Sharpsburg Borough	3,781

Table 4.3.1-4 **Community Public Water Suppliers and Municipalities Served (ACHD, 2007)**

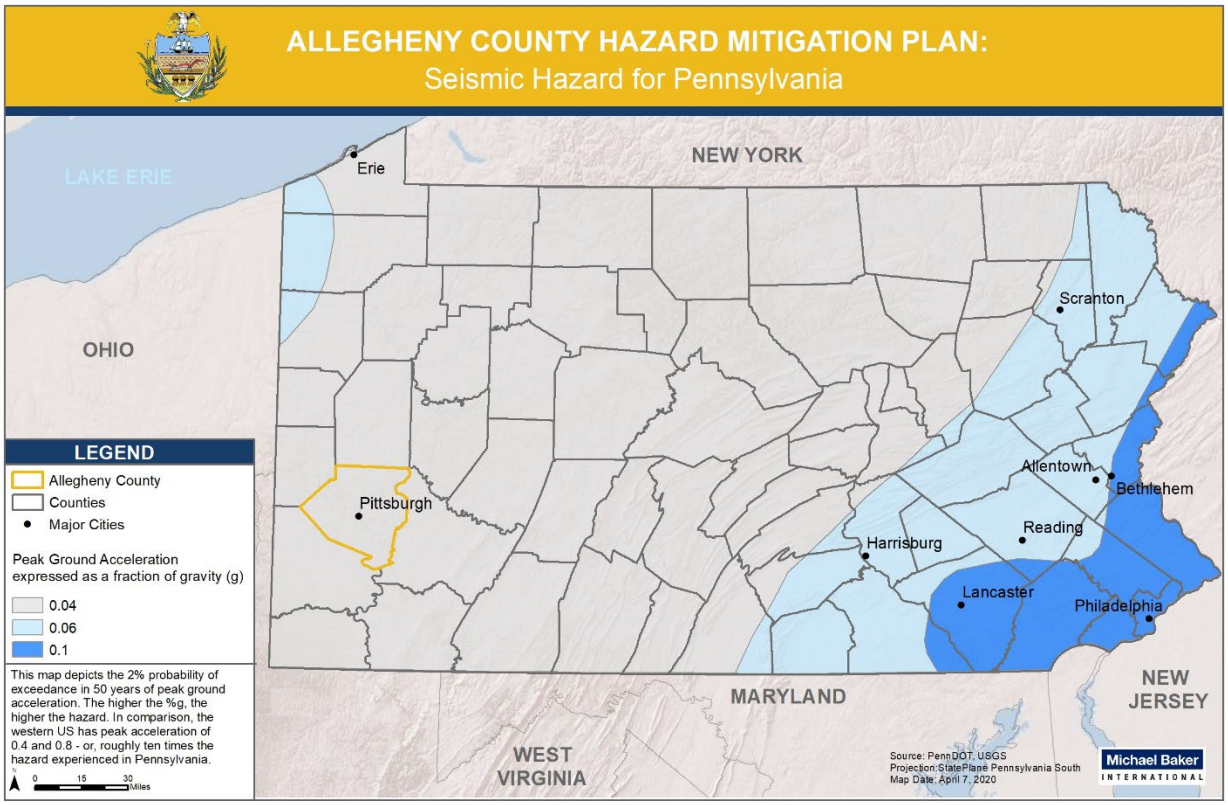
Name	Type of System	Municipalities Served	Population Served
Borough of Springdale	Groundwater Treatment Plant	Springdale Borough	3,992
Township of Springdale	Consecutive System	Springdale Township	1,870
Borough of Tarentum	Surface Water Treatment Plant	Tarentum Borough	5,609
Western Allegheny County Municipal Authority	Consecutive System	North Fayette Township	11,905
Municipal Authority of the Borough of West View	Surface Water Treatment Plant	West View Borough, Avalon Borough, Bellevue Borough, Ben Avon Borough, Ben Avon Heights Borough, Bradford Woods Borough, Emsworth Borough, Franklin Park Borough, Kennedy Township, Kilbuck Township, Marshall Township, Town of McCandless, McKees Rocks Borough, Ohio Township, Pine Township, City of Pittsburgh (Ward 28), Reserve Township (part), Robinson Township (part), Ross Township, Sewickley Hills Borough, Shaler Township (part), Stowe Township (part)	200,000
Wilkinsburg-Penn Joint Water Authority	Surface Water Treatment Plant	Braddock Hills Borough, Chalfant Borough, Churchill Borough, East McKeesport Borough, East Pittsburgh Borough, Edgewood Borough, Forest Hills Borough, Municipality of Monroeville (part), North Braddock Borough, Municipality of Penn Hills, Pitcairn Borough, City of Pittsburgh (Ward 13), Rankin Borough, Wilkinsburg Borough	125,000

4.3.2. Earthquake

4.3.2.1. Location and Extent

Earthquake events in Pennsylvania typically do not impact areas greater than 100 km from the epicenter, and according to available data it does not appear that there have been any earthquake epicenters within Allegheny County. The area is generally not known for seismicity, and USGS downgraded the probabilistic seismic hazard for much of Pennsylvania in 2014. Figure 4.3.2-1 shows the 2014 earthquake hazard in Pennsylvania and Allegheny County, expressed as the two-percent probability of exceedance in 50 years of peak ground acceleration (g). Allegheny County lies in the 0.04 zone, indicating that the hazard is minimal. Earthquakes originating from outside Pennsylvania can also impact the Commonwealth, as was the case with a magnitude 5.8 earthquake in Virginia in August 2011 (see Section 4.3.2.3).

Figure 4.3.2-1 Pennsylvania Relative Earthquake Hazard Zones



4.3.2.2. Range of Magnitude

Earthquake magnitude is often measured using the Richter Scale, an open-ended logarithmic scale that describes the energy release of an earthquake. Table 4.3.2-1 summarizes Richter Scale magnitudes as they relate to the spatial extent of impacted areas. While the highest known magnitude earthquake occurring within Pennsylvania registered 5.1 on the Richter Scale, most earthquakes with known magnitudes

generally fall between 2 and 3. Pennsylvania has not experienced any earthquakes with a magnitude greater than 6.0.

Table 4.3.2-1 **Richter Scale Magnitudes and Associated Earthquake Size Effects.**

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

The Richter Scale does not give any indication of the impact or damage of an earthquake, although it can be inferred that higher magnitude events cause more damage. Instead, the impact of an earthquake event is measured in terms of earthquake intensity, usually measured using the Modified Mercalli Intensity Scale, shown in Table 4.3.1-2. Based on historical data of earthquakes with a recorded Intensity, little damage is expected from earthquake events. Allegheny County does not have a record of measured earthquakes epicenters.

Table 4.3.2-2 **Modified Mercalli Intensity Scale with Associated Impacts.**

Scale	Intensity	Description of Effects	Corresponding Richter Scale Magnitude
I	Instrumental	Usually detected only on seismographs.	<4.2
II	Feeble	Felt only by a few persons at rest, especially on upper floors of buildings.	
III	Slight	Felt quite noticeably indoors, especially on upper floors. Most people don't recognize it as an earthquake (i.e. a truck rumbling).	
IV	Moderate	Can be felt by people walking; dishes, windows, and doors are disturbed.	
V	Slightly Strong	Sleepers are awoken; unstable objects are overturned.	<4.8
VI	Strong	Trees sway; suspended objects swing; objects fall off shelves; damage is slight.	<5.4
VII	Very Strong	Damage is negligible in buildings of good design and construction, slight to moderate in well-built ordinary structures, and considerable in poorly built or badly designed structures; some chimneys are broken.	<6.1

Table 4.3.2-2 Modified Mercalli Intensity Scale with Associated Impacts.			
Scale	**Intensity**	**Description of Effects**	**Corresponding Richter Scale Magnitude**
VIII	Destructive	Damage is slight in specially designed structures; considerable in ordinary, substantial buildings. Moving cars become uncontrollable; masonry fractures, poorly constructed buildings damaged.	<6.9
IX	Ruinous	Some houses collapse, ground cracks, pipes break open; damage is considerable in specially designed structures; buildings are shifted off foundations.	
X	Disastrous	Some well-built wooden structures are destroyed; most masonry and frame structures are destroyed along with foundations. Ground cracks profusely; liquefaction and landslides widespread.	<7.3
XI	Very Disastrous	Most buildings and bridges collapse, roads, railways, pipes and cables destroyed.	<8.1
XII	Catastrophic	Total destruction; trees fall; lines of sight and level are distorted; ground rises and falls in waves; objects are thrown upward into the air.	>8.1

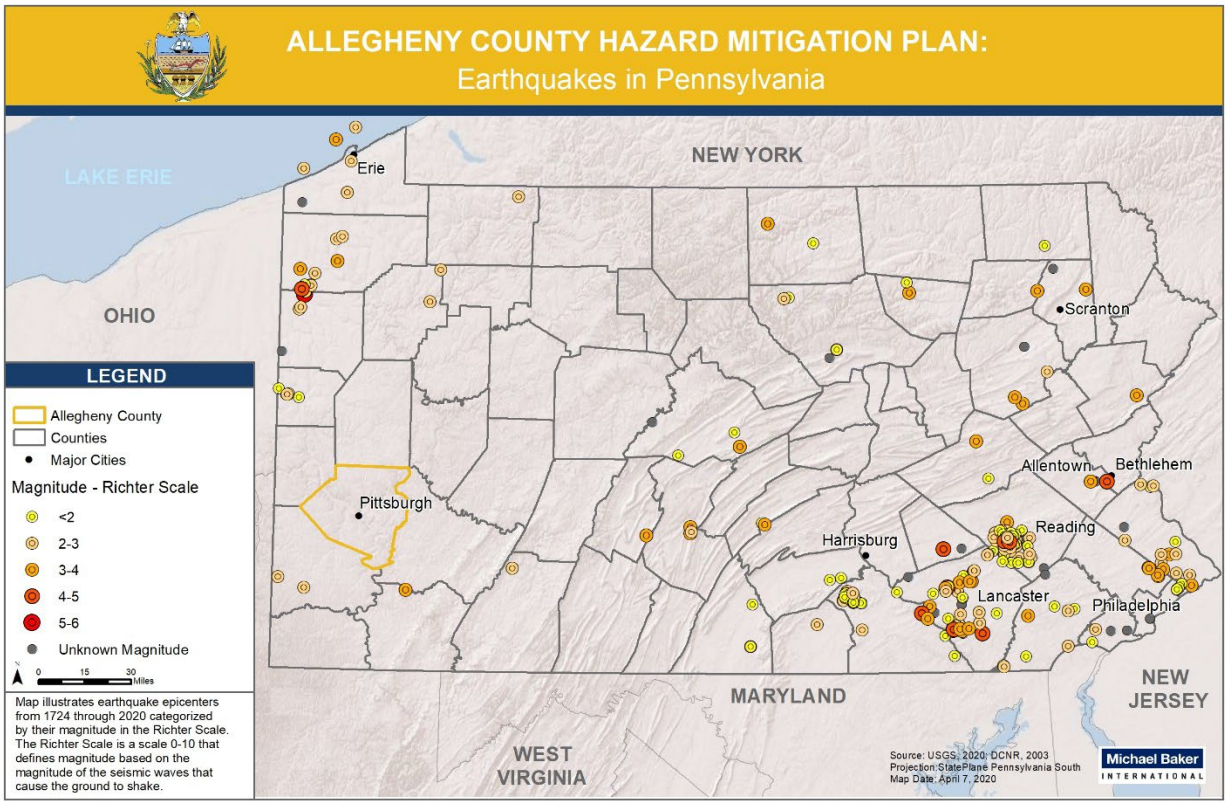
Since the worst earthquake recorded in Pennsylvania was a magnitude 5.2, a worst-case scenario for this hazard would be if an earthquake of similar magnitude occurred in Allegheny County or near the border in an adjacent county, causing mild damage in populated areas. Structural damage would not be expected in this scenario for most buildings, but blighted structures or those in a state of disrepair might experience further structural damage.

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

4.3.2.3. Past Occurrence

To date, no earthquake epicenters have been recorded in Allegheny County, as shown in Figure 4.3.2-2. The nearest epicenter was a shallow, 3.3 magnitude earthquake located in Fayette County in 1965. More recently, a magnitude 5.8 earthquake with an epicenter in rural Louisa County, VA was felt throughout Pennsylvania. In the Allegheny County area, the tremor prompted both mandatory and voluntary evacuations, including at the steel-and-glass PPG Place building downtown. This shallow earthquake occurring along the Spotsylvania Fault was felt as far north as Ontario, Canada and as far south as Alabama. Crawford and Mercer Counties to the north of Allegheny County have been affected by a significant number of earthquakes in the past, some of them sizable for the region.

Figure 4.3.2-2 Map of Earthquake Epicenters in Pennsylvania



4.3.2.4. Future Occurrence

One way to express an earthquake's severity is to compare its acceleration to the normal acceleration due to gravity. Peak ground acceleration (PGA) measures the strength of ground movements in this manner. PGA represents the rate in change of motion of the earth's surface during an earthquake as a ratio of the established rate of acceleration due to gravity. As shown in Figure 4.3.2-1, Allegheny County has a very low PGA ratio of 0.04. In contrast, the western United States has a peak ground acceleration ten times that of Allegheny County. Historical records indicate that the future likelihood of an earthquake is unlikely as defined by the Risk Factor Methodology probability criteria (see Table 4. 1-1).

4.3.2.5. Vulnerability Assessment

The magnitude of earthquakes in seen in Pennsylvania are small and shallow. Based on the past history of earthquake events in and near Allegheny County, the County's vulnerability to this hazard is expected to be low. In the event of an earthquake, unanchored objects may be upset, but few damages are expected.

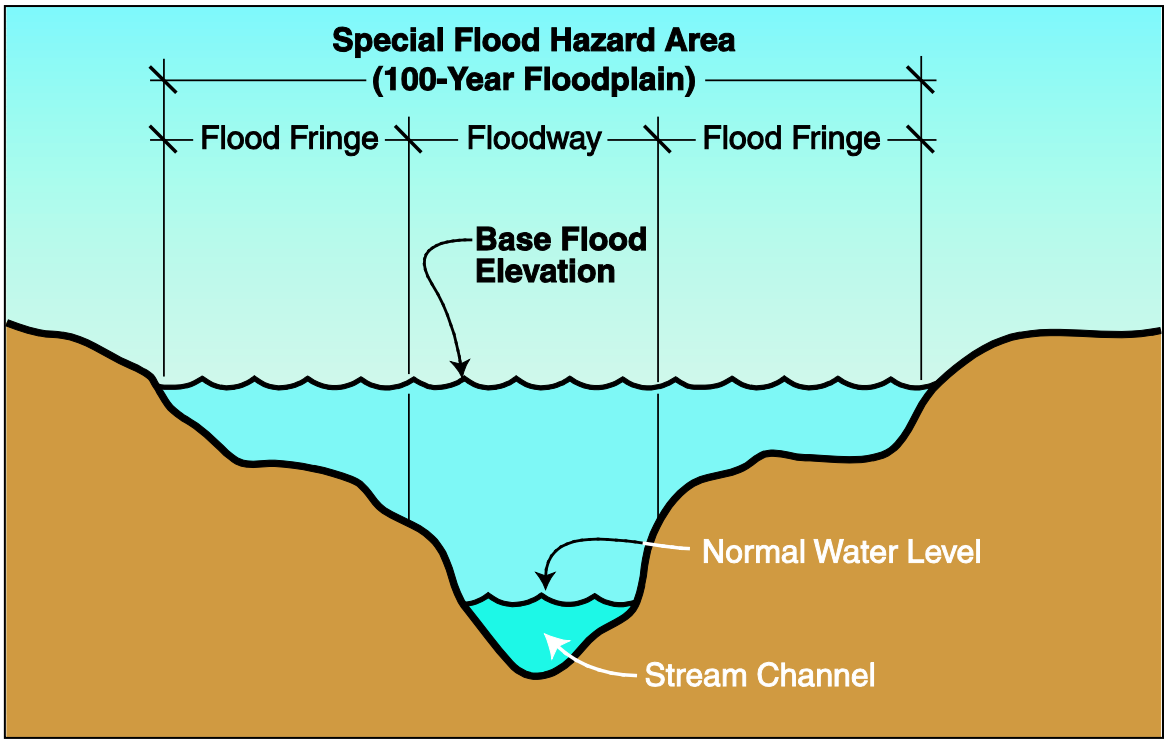
4.3.3. Flood, Flash Flood, Ice Jam

4.3.3.1. Location and Extent

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

The National Flood Insurance Program (NFIP), for which Flood Insurance Rate Maps (FIRM) are published, identifies the 1% annual chance flood. This 1% annual chance flood event is used to delineate the Special Flood Hazard Area (SFHA) and identify Base Flood Elevations. Figure 4.3.3-1 illustrates these terms. The SFHA serves as the primary regulatory boundary used by FEMA, the Commonwealth of Pennsylvania and Allegheny County local governments.

Figure 4.3.3-1 Identifying Special Flood Hazard Area, 1% Annual Chance (100-Year) Floodplain, and Flood Fringe

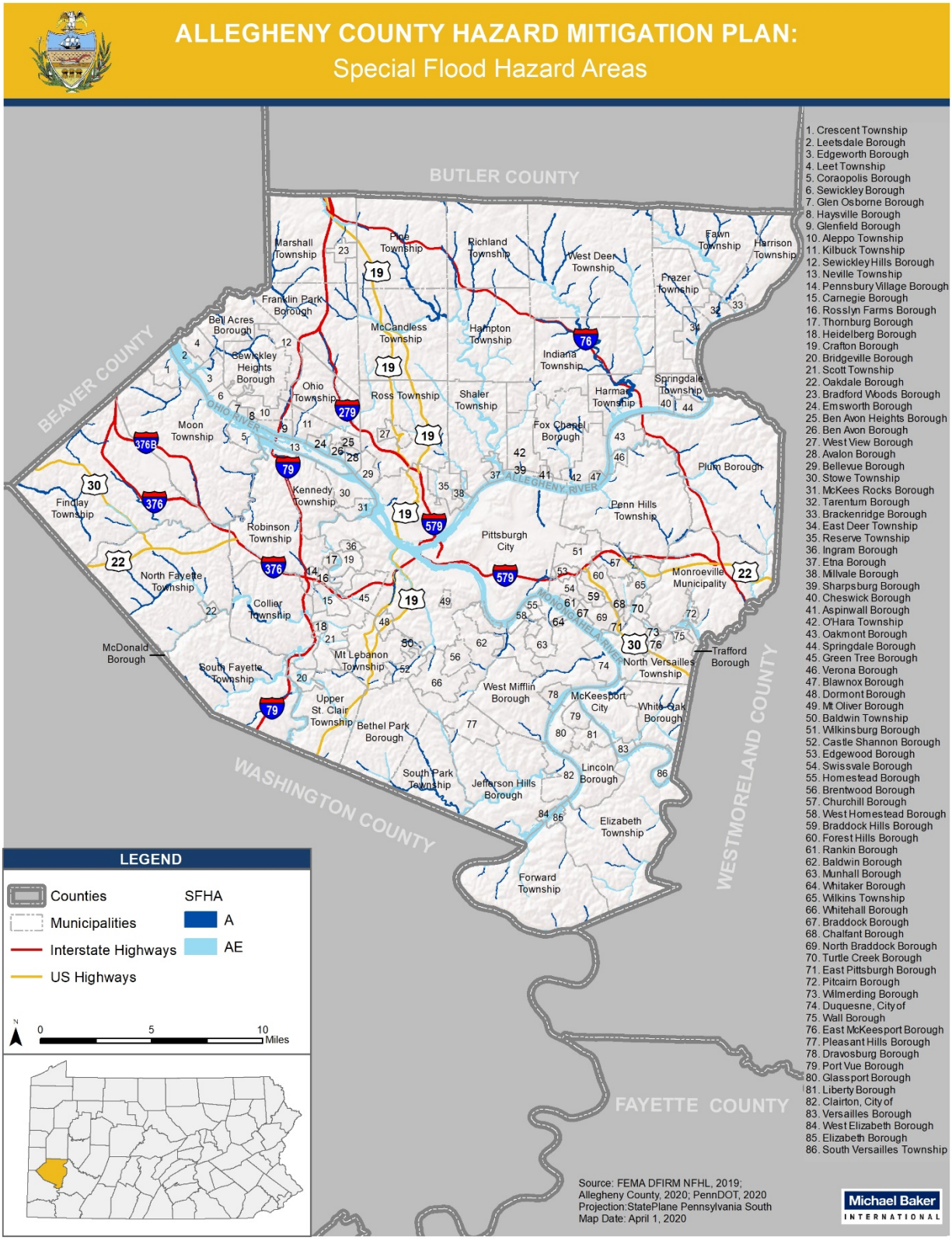


Allegheny County has FEMA effective Flood Insurance Rate Maps and a Countywide Flood Insurance Study. This study was conducted as a part of FEMA's Risk Mapping, Assessment, and Planning (Risk MAP) process and went effective on September 26, 2014. The purpose of the Risk MAP program is to assist communities nationwide to assess flood risk, encourage mitigation planning, and to strengthen local ability to make informed decisions about risk reduction. Individual map panels can be obtained from the FEMA Map Service Center (http://www.msc.fema.gov). These maps can be used to identify the expected spatial extent and elevation of flooding from a 1% and 0.2% annual chance event.

One hundred nineteen of the 130 communities in Allegheny County have determined SFHAs. The communities without SFHAs include the boroughs of: Ben Avon Heights, Braddock Hills, Chalfant, Dormont, East Pittsburgh, Edgewood, Forest Hills, Mount Oliver, Pennsbury Village, West View, and Wilkinsburg. Allegheny County is located in the Ohio, Monongahela, Lower Allegheny, and Youghiogheny River Basins; individual watersheds are mapped in Figure 2.1-3. Overbank flooding of the Monongahela River, including backwater flooding from the Allegheny River, is the principal flooding problem in Allegheny County. Allegheny County has been, and remains, one of the great industrial areas in the U.S., due in large part to the accessibility of major waterways for transportation of coal, steel, and other products. As such, substantial development took place and industrial facilities were situated in the 1-percent-annual-chance floodplain, which has led to many buildings being flooded. In addition to riverine flooding, there are many tributaries in the County that have experienced flash flooding and present flash flood hazards. The following streams and creeks and their associated tributaries present a recurring flood threat. These are mapped in Figure 4.3.3-2.

- Northwest Sector - Pine Creek, Girty's Run, Brush Creek, and Little Sewickley Creek
- Northeast Sector - Bull Creek, Deer Creek, Lowries Run and Rawlins Run
- East Sector - Plum Creek, Turtle Creek and Dirty Camp Run / Pitcairn
- Southeast Sector – Sawmill Run, Streets Run, Crooked Run, Long Run, and Peters Creek
- Southwest Sector - Chartiers Creek, Robinson Run, Moon Run, McLaughlin Run, Montour Run and Campbells Run

Figure 4.3.3-2 Locations of Watercourses and Flood Zones Throughout Allegheny County



The table below indicates municipal participation in the National Flood Insurance Program. Only one community does not participate: Pennsbury Village Borough. As noted above, 11 additional communities participate in the NFIP despite not having SFHAs.

Table 4.3.3-1 **Participation in the National Flood Insurance Program for Allegheny County.**

Community	Participation Status	CID	Initial FIRM Identified	Current Effective Map Date
Aleppo Township	PARTICIPATING	421266	09/01/86	09/26/2014
Aspinwall Borough	PARTICIPATING	420005	12/18/79	09/26/2014
Avalon Borough	PARTICIPATING	420006	12/15/78	09/26/2014
Baldwin Borough	PARTICIPATING	420007	08/15/78	09/26/2014
Baldwin Township	PARTICIPATING	422650	10/04/95	09/26/2014
Bell Acres Borough	PARTICIPATING	420008	05/01/85	09/26/2014
Bellevue Borough	PARTICIPATING	420009	12/15/78	09/26/2014
Ben Avon Heights Borough	PARTICIPATING	420011	10/04/95	09/26/2014
Ben Avon Borough	PARTICIPATING	420010	07/16/81	09/26/2014
Bethel Park Municipality	PARTICIPATING	420012	06/15/81	09/26/2014
Blawnox Borough	PARTICIPATING	420013	09/03/80	09/26/2014
Brackenridge Borough	PARTICIPATING	420014	08/15/80	09/26/2014
Braddock Hills Borough	PARTICIPATING	420016	08/10/79	09/26/2014
Braddock Borough	PARTICIPATING	420015	09/30/80	09/26/2014
Bradford Woods Borough	PARTICIPATING	421262	11/06/81	09/26/2014
Brentwood Borough	PARTICIPATING	420017	10/04/95	09/26/2014
Bridgeville Borough	PARTICIPATING	420018	01/05/84	09/26/2014
Carnegie Borough	PARTICIPATING	420019	05/01/78	09/26/2014
Castle Shannon Borough	PARTICIPATING	420020	10/04/95	09/26/2014
Chalfant Borough	PARTICIPATING	420021	10/04/95	09/26/2014
Cheswick Borough	PARTICIPATING	420022	06/18/80	09/26/2014
Churchill Borough	PARTICIPATING	420023	12/15/78	09/26/2014
Clairton, City of	PARTICIPATING	420024	10/16/79	09/26/2014
Collier Township	PARTICIPATING	421058	03/15/82	09/26/2014
Coraopolis Borough	PARTICIPATING	420025	06/15/79	09/26/2014
Crafton Borough	PARTICIPATING	420026	12/19/80	09/26/2014
Crescent Township	PARTICIPATING	421060	07/16/81	09/26/2014
Dormont Borough	PARTICIPATING	422630	10/04/95	09/26/2014
Dravosburg Borough	PARTICIPATING	420027	06/15/79	09/26/2014
Duquesne, City of	PARTICIPATING	420028	09/14/79	09/26/2014
East Deer Township	PARTICIPATING	421061	08/15/80	09/26/2014
East McKeesport Borough	PARTICIPATING	420029	10/04/95	09/26/2014
East Pittsburgh Borough	PARTICIPATING	422662	10/04/95	09/26/2014
Edgewood Borough	PARTICIPATING	422663	10/04/95	09/26/2014

Table 4.3.3-1 **Participation in the National Flood Insurance Program for Allegheny County.**

Community	Participation Status	CID	Initial FIRM Identified	Current Effective Map Date
Edgeworth Borough	PARTICIPATING	420032	05/01/80	09/26/2014
Elizabeth Borough	PARTICIPATING	421263	07/16/81	09/26/2014
Elizabeth Township	PARTICIPATING	420033	03/15/77	09/26/2014
Emsworth Borough	PARTICIPATING	420034	09/30/80	09/26/2014
Etna Borough	PARTICIPATING	421062	09/01/78	09/26/2014
Fawn Township	PARTICIPATING	421285	01/18/84	09/26/2014
Findlay Township	PARTICIPATING	421286	11/18/88	09/26/2014
Forest Hills Borough	PARTICIPATING	420035	09/01/86	09/26/2014
Forward Township	PARTICIPATING	421064	02/01/80	09/26/2014
Fox Chapel Borough	PARTICIPATING	420036	04/15/77	09/26/2014
Franklin Park Borough	PARTICIPATING	420037	01/01/82	09/26/2014
Frazer Township	PARTICIPATING	421288	12/19/80	09/26/2014
Glassport Borough	PARTICIPATING	420038	06/15/79	09/26/2014
Glen Osborne Borough	PARTICIPATING	420061	11/15/79	09/26/2014
Glenfield Borough	PARTICIPATING	420039	03/18/80	09/26/2014
Green Tree Borough	PARTICIPATING	420040	07/16/81	09/26/2014
Hampton Township	PARTICIPATING	420978	05/01/78	09/26/2014
Harmar Township	PARTICIPATING	421068	07/02/80	09/26/2014
Harrison Township	PARTICIPATING	420041	09/29/78	09/26/2014
Haysville Borough	PARTICIPATING	420042	03/18/80	09/26/2014
Heidelberg Borough	PARTICIPATING	420043	06/15/81	09/26/2014
Homestead Borough	PARTICIPATING	420044	10/04/95	09/26/2014
Indiana Township	PARTICIPATING	421070	10/18/83	09/26/2014
Ingram Borough	PARTICIPATING	420045	10/04/95	09/26/2014
Jefferson Hills Borough	PARTICIPATING	420046	04/01/80	09/26/2014
Kennedy Township	PARTICIPATING	421072	02/15/80	09/26/2014
Kilbuck Township	PARTICIPATING	421073	02/01/80	09/26/2014
Leet Township	PARTICIPATING	421075	09/14/79	09/26/2014
Leetsdale Borough	PARTICIPATING	420047	11/19/80	09/26/2014
Liberty Borough	PARTICIPATING	420048	11/01/79	09/26/2014
Lincoln Borough	PARTICIPATING	420049	09/28/79	09/26/2014
Marshall Township	PARTICIPATING	421080	11/04/81	09/26/2014
McCandless, Town of	PARTICIPATING	421081	06/18/80	09/26/2014
McDonald Borough	PARTICIPATING	420855	08/15/83	09/26/2014
McKees Rocks Borough	PARTICIPATING	420052	05/16/77	09/26/2014
McKeesport City	PARTICIPATING	420051	11/01/79	09/26/2014
Millvale Borough	PARTICIPATING	420053	07/16/79	09/26/2014

Table 4.3.3-1 **Participation in the National Flood Insurance Program for Allegheny County.**

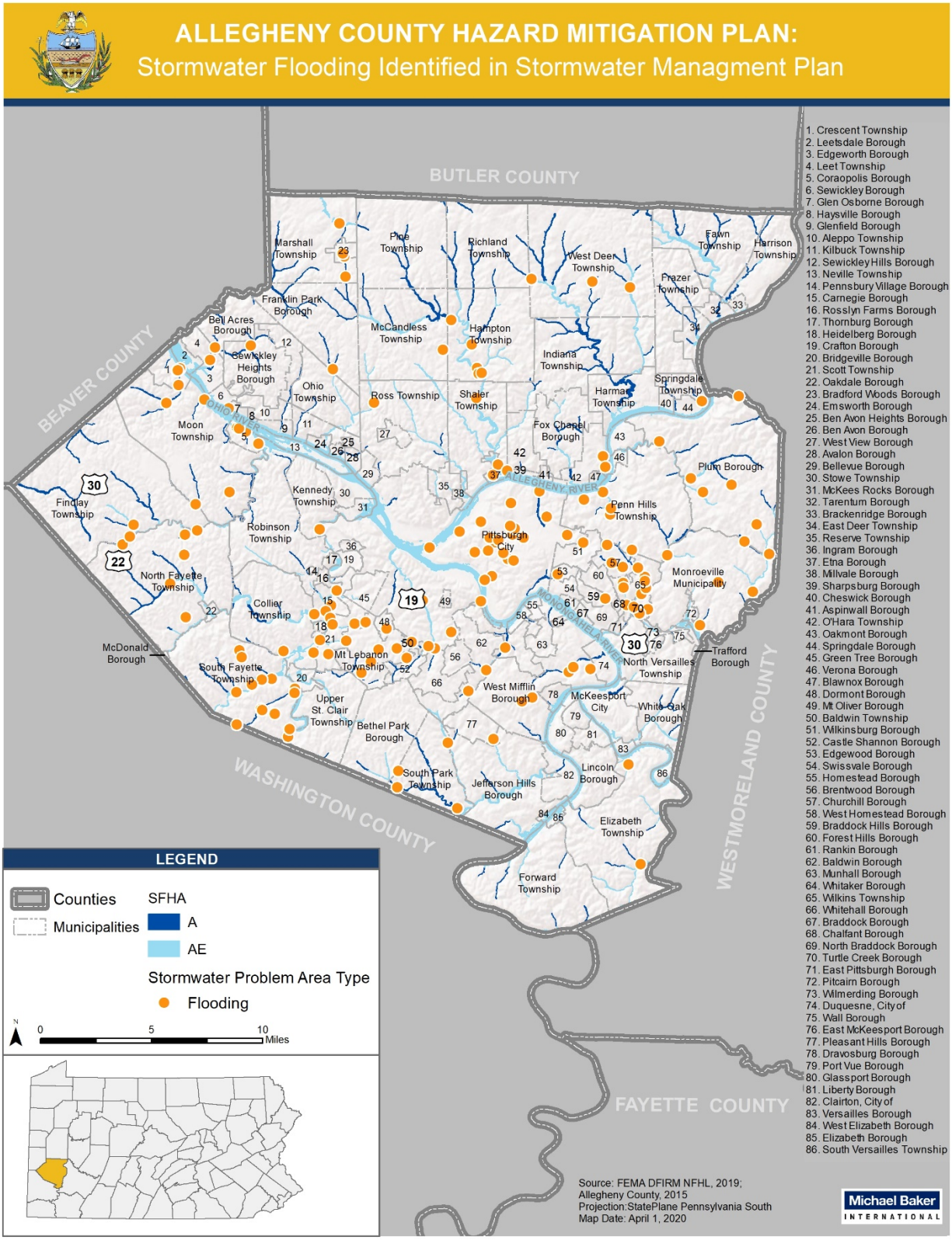
Community	Participation Status	CID	Initial FIRM Identified	Current Effective Map Date
Monroeville Borough	PARTICIPATING	420054	08/01/79	09/26/2014
Moon Township	PARTICIPATING	421082	08/15/79	09/26/2014
Mount Oliver Borough	PARTICIPATING	420055	10/04/95	09/26/2014
Mt. Lebanon Township	PARTICIPATING	421272	06/30/76	09/26/2014
Munhall Borough	PARTICIPATING	420056	04/24/81	09/26/2014
Neville Township	PARTICIPATING	425385	07/07/72	09/26/2014
North Braddock Borough	PARTICIPATING	420058	02/16/79	09/26/2014
North Fayette Township	PARTICIPATING	421085	10/18/83	09/26/2014
North Versailles Township	PARTICIPATING	421231	04/01/81	09/26/2014
O'Hara Township	PARTICIPATING	421088	07/02/80	09/26/2014
Oakdale Borough	PARTICIPATING	420059	08/15/83	09/26/2014
Oakmont Borough	PARTICIPATING	420060	01/16/81	09/26/2014
Ohio Township	PARTICIPATING	421089	11/04/88	09/26/2014
Penn Hills Township	PARTICIPATING	421092	06/15/81	09/26/2014
Pennsbury Village Borough	NOT PARTICIPATING	422665	10/04/95	09/26/2014
Pine Township	PARTICIPATING	421094	09/22/78	09/26/2014
Pitcairn Borough	PARTICIPATING	420062	04/01/80	09/26/2014
Pittsburgh, City of	PARTICIPATING	420063	12/15/81	09/26/2014
Pleasant Hills Borough	PARTICIPATING	420064	10/04/95	09/26/2014
Plum Borough	PARTICIPATING	420065	09/16/81	09/26/2014
Port Vue Borough	PARTICIPATING	420066	09/28/79	09/26/2014
Rankin Borough	PARTICIPATING	420067	07/02/80	09/26/2014
Reserve Township	PARTICIPATING	420068	04/15/77	09/26/2014
Richland Township	PARTICIPATING	421199	09/22/78	09/26/2014
Robinson Township	PARTICIPATING	421097	02/03/82	09/26/2014
Ross Township	PARTICIPATING	420979	12/18/79	09/26/2014
Rosslyn Farms Borough	PARTICIPATING	420069	05/19/81	09/26/2014
Scott Township	PARTICIPATING	421100	05/03/82	09/26/2014
Sewickley Heights Borough	PARTICIPATING	420071	05/01/86	09/26/2014
Sewickley Hills Borough	PARTICIPATING	420072	09/01/86	10/04/1995
Sewickley Borough	PARTICIPATING	420070	09/14/79	09/26/2014
Shaler Township	PARTICIPATING	421101	03/18/80	09/26/2014
Sharpsburg Borough	PARTICIPATING	420073	09/29/78	09/26/2014
South Fayette Township	PARTICIPATING	421106	02/03/82	09/26/2014
South Park Township	PARTICIPATING	421165	11/05/80	09/26/2014
South Versailles Township	PARTICIPATING	421281	08/01/79	09/26/2014
Springdale Borough	PARTICIPATING	421282	07/16/80	09/26/2014

Table 4.3.3-1 **Participation in the National Flood Insurance Program for Allegheny County.**

Community	Participation Status	CID	Initial FIRM Identified	Current Effective Map Date
Springdale Township	PARTICIPATING	420074	07/16/80	09/26/2014
Stowe Township	PARTICIPATING	421110	02/15/80	09/26/2014
Swissvale Borough	PARTICIPATING	420075	06/30/76	09/26/2014
Tarentum Borough	PARTICIPATING	420076	08/15/80	09/26/2014
Thornburg Borough	PARTICIPATING	420077	10/04/95	09/26/2014
Trafford Borough	PARTICIPATING	420903	09/28/79	09/26/2014
Turtle Creek Borough	PARTICIPATING	420079	11/19/80	09/26/2014
Upper St. Clair Township	PARTICIPATING	421119	03/15/84	09/26/2014
Verona Borough	PARTICIPATING	422611	01/16/81	09/26/2014
Versailles Boroughs	PARTICIPATING	420081	10/18/88	09/26/2014
Wall Borough	PARTICIPATING	420082	11/19/87	09/26/2014
West Deer Township	PARTICIPATING	421299	10/18/83	09/26/2014
West Elizabeth Borough	PARTICIPATING	420083	09/29/78	09/26/2014
West Homestead Borough	PARTICIPATING	420084	08/15/80	09/26/2014
West Mifflin Borough	PARTICIPATING	420085	02/15/80	09/26/2014
West View Borough	PARTICIPATING	420086	06/30/76	09/26/2014
Whitaker Borough	PARTICIPATING	420087	10/04/95	09/26/2014
White Oak Borough	PARTICIPATING	420089	09/14/79	09/26/2014
Whitehall Borough	PARTICIPATING	420088	10/04/95	09/26/2014
Wilkins Township	PARTICIPATING	420090	09/29/78	09/26/2014
Wilkinsburg Borough	PARTICIPATING	422667	10/04/95	09/26/2014
Wilmerding Borough	PARTICIPATING	420091	08/01/79	09/26/2014

The 2015 Allegheny County Stormwater Management Plan asked municipal officials to identify areas of stormwater-related flooding in their communities. Figure 4.3.3-3 shows these stormwater flooding areas. It is important to note that many of these identified areas are not in the SFHA, highlighting the need to look at comprehensive flood management in Allegheny County. The Stormwater Management Plan seeks to reduce these stormwater-related floods through stormwater best management practices and updated model ordinances in its second phase of work, which has been underway since the approval of the plan.

Figure 4.3.3-3 Community-Identified Stormwater Flooding Problem Areas.



4.3.3.2. Range of Magnitude

Floods are considered hazards when people and property are affected. Most injuries and deaths from flooding happen when people are swept away by flood currents and most property damage results from inundation by sediment-filled water. A large amount of rainfall over a short time span can result in flash flood conditions. Small amounts of rain can result in floods in locations where the soil is frozen or saturated from a previous wet period or if the rain is concentrated in an area of impermeable surfaces such as large parking lots, paved roadways, or other impervious developed areas.

Several factors determine the severity of floods, including rainfall intensity and duration, topography, ground cover and rate of snowmelt. Water runoff is greater in areas with steep slopes and little to no vegetative ground cover. Since the County has mountainous terrain, this can contribute to more severe floods as runoff reaches receiving water bodies more rapidly over steep terrain. Also, urbanization typically results in the replacement of vegetative ground cover with asphalt and concrete, increasing the volume of surface runoff and stormwater, particularly in areas with poorly planned stormwater drainage systems.

In Allegheny County there are seasonal differences in how floods are caused. A measurable amount of precipitation occurs around 160 to 165 days a year in Allegheny County. In the winter and early spring (February to April), major flooding has occurred as a result of heavy rainfall on dense snowpack throughout contributing watersheds. Summer floods have occurred from intense rainfall on previously saturated soils. Summer thunderstorms deposit large quantities of rainfall over a short period of time that can result in flash flood events, when the velocity of floodwaters has the potential to amplify the impacts of a flood event.

Winter floods have also resulted from runoff of intense rainfall on frozen ground, and, on rare occasions, local flooding has been exacerbated by ice jams in rivers. Ice jam floods, as mentioned in the previous section, occur on rivers that are totally or partially frozen. A rise in stream stage will break up a totally frozen river and create ice flows that can pile up on channel obstructions such as shallow riffles, log jams, or bridge piers. The jammed ice creates a dam across the channel over which the water and ice mixture continues to flow, allowing for more jamming to occur. Ice jams are particularly an issue on the Youghiogheny River and Pine Creek.

Flood effects can be volume or force related. Major floods along larger streams having wide floodplains tend to result in large-scale inundations. This causes widespread damage through soaking and silt deposits in homes, businesses, and industrial plants. In hilly regions where runoff paths are steep, flash floods may be prevalent. Flash floods are short in duration and usually occur in a somewhat localized area. In these floods, the velocity rather than the volume of water causes flood damages. Torrents of water can rush down minor hillside gullies at 30-50 miles per hour, carrying trees, debris, and rocks. These floods are often unpredictable and, particularly if they occur at night, can cause major panic and loss of life. Frozen surfaces can more than double normal runoff velocities, particularly in small drainage areas. This causes flash floods which can be compounded by ice and debris jams in channels and culverts. Obstructions within the floodplain such as bridges and undersized culverts can also increase flooding.

Although floods can cause damage to property and loss of life, floods are naturally occurring events that benefit riparian systems which have not been disrupted by human actions. Such benefits include groundwater recharge and the introduction of nutrient rich sediment improving soil fertility. However, the destruction of riparian buffers, changes to land use and land cover throughout a watershed, and the introduction of chemical or biological contaminants which often accompany human presence cause environmental harm when floods occur. Hazardous material facilities are potential sources of contamination during flood events. Other negative environmental impacts of flooding include: water-borne diseases, heavy siltation, damage or loss of crops, and drowning of both humans and animals.

Figure 4.3.3-4 1936 Flood Crest Marked on a Downtown Pittsburgh Building.

There are several examples of possible worst-case scenario flooding events in Allegheny County. An extremely high flood occurred in March 1936, the result of flooding on the Allegheny River and backwater flooding from the Monongahela River (FEMA FIS, 2014). This flood was caused by heavy rain and snowmelt from the 16th to the 18th of March and resulted in a stage of 46.0 feet (21 feet above flood stage) at the confluence of the Allegheny and Monongahela Rivers.

Another devastating flooding event occurred in Allegheny County in September 2004. The county received two to four inches of rainfall from Tropical Depression Frances starting on September 8 and then received another nine inches starting on September 16 from the remnants of Hurricane Ivan. Ivan developed off the west coast of Africa and entered the Caribbean, intensifying to a Category 5 storm three separate times while in the Caribbean. The storm made landfall in the continental US in Alabama, near the Florida border, on September 16. The storm then weakened, but still continued to drop significant amounts of rain and tornadoes in the southeastern US and as it moved forward. In Allegheny County, Ivan caused major flooding from September 17-19. The storm set the greatest daily precipitation on record for Pittsburgh, with 5.95 inches of rain failing in a 24-hour period (NOAA, 2020). This broke the previous record, set just days earlier with the remnants of Tropical Depression Frances. When Ivan hit, 89 of the 130 communities in Allegheny County declared a state of emergency, and the county 911 center received over 5,000 calls in a single hour. A Major Disaster Declaration was declared on September 19, 2004. The storm caused $26 million in property damage as well as one fatality and 92 injuries. According to the incident report from the NCDC:

> *Widespread flooding stranded thousands. A total of 9494 homes, 1060 businesses, 4 schools, 9 fire depts, 50 public buildings damaged or destroyed. 140 boats broke away and ran away down several rivers… In Carnegie, 22 people were trapped on a bridge as flood waters rose and surrounded them. They tied themselves together and waited for rescue... The Allegheny River flooded, from Freeport to Sharpsburg, from 11 PM EDT on 17th, until 5 AM EDT on 19th. Here are*

city, flood stage, crest, time: Freeport (flood stage 23 ft), 24.1 10 AM 18th; Natrona (21 ft), 24.2 11 AM 18th; Acmetonia (17), 19.8 1 PM 18th; Sharpsburg (21), 22.1 4 PM EDT 18th. The Ohio River flooded, from Pittsburgh to Dashields, from 10 PM on 17th, until 830 AM EDT on 19th. Pittsburgh (flood stage 25 ft), crested 31.0 at 4 PM EDT on 18th; Dashields (25 ft), crested 29.9 at 8 PM on 18th. On the Youghiogheny River, Sutersville rose above flood stage (20 ft) 1 PM on 18th, crested 20.7 at 430 PM, and fell below flood stage at 730 PM EDT on 18th.

4.3.3.3. Past Occurrence

Allegheny County has a long history of flooding problems. Since the Allegheny, Monongahela, and Ohio Rivers, along with a large number of their tributaries, are located in Allegheny County, the County has suffered damage from numerous major overbank floods and localized flash flooding. In addition to an historic pattern of development occurring in the floodplain, Allegheny County has steep slopes that allow fast runoff from storms, which exacerbates flooding conditions. There are also several bridges and culverts that get blocked with debris and cause backup flooding during a large storm.

Flood data from the National Oceanic and Atmospheric Administration (NOAA) National Climatic Data Center is included in Table 4.3.3-2.

Table 4.3.3-2 **Significant Flood Events in Allegheny County, 1968-2020 (NOAA, 2020).**

Date	Type of Flood Event	Estimated Damages ($)	Damage Description
10/31/2019	Flood	0	Road closures in Oakdale.
10/31/2019	Flood	0	Several homes flooded in Imperial.
10/31/2019	Flood	0	Creek flooding reached homes in Imperial.
10/31/2019	Flood	0	Road flooding in Coraopolis.
9/2/2019	Flash Flood	10,000	Water rescue performed in Mt. Lebanon.
9/1/2019	Flash Flood	5,000	Road flooding in Crafton.
9/1/2019	Flash Flood	5,000	Road closures in Option.
9/1/2019	Flash Flood	10,000	Road flooding in Crafton and Option.
9/1/2019	Flash Flood	5,000	Road flooding in Leetsdale.
9/1/2019	Flash Flood	20,000	Water rescued performed on a road with cars stuck in 6 feet of floodwater.
8/2/2019	Flash Flood	0	Road flooding in Munhall and Baldwin.
7/30/2019	Flash Flood	0	Road flooding in Pleasant Hills.
7/30/2019	Flash Flood	5,000	Vehicle stuck in floodwater in Pleasant Hills.
7/22/2019	Flood	5,000	Road closures in Oakmont and Penn Hills.
7/22/2019	Flood	5,000	Vehicle stuck in floodwater near Churchill.

Table 4.3.3-2 **Significant Flood Events in Allegheny County, 1968-2020 (NOAA, 2020).**

Date	Type of Flood Event	Estimated Damages ($)	Damage Description
7/22/2019	Flood	5,000	Road closures in Braddock.
7/22/2019	Flood	5,000	Road flooding in Plum.
7/22/2019	Flood	5,000	Road closures in Aspinwall.
7/22/2019	Flash Flood	5,000	Road flooding in Sandy Creek.
7/22/2019	Flood	15,000	Road closures due to floodwaters and debris in Oakmont.
7/21/2019	Flash Flood	10,000	Road flooding and trapped cars in Edgewood.
7/21/2019	Flash Flood	10,000	Road flooding and trapped cars in Aspinwall.
7/21/2019	Flash Flood	10,000	Road closures in Option.
7/21/2019	Flash Flood	10,000	Road flooding in Rosedale.
7/21/2019	Flash Flood	,5000	Road flooding and stuck vehicles in Rosedale
7/21/2019	Flash Flood	25,000	Water rescues performed in mobile homes in Plum.
7/21/2019	Flash Flood	1,000	Road flooding in Blawnox and Aspinwall.
7/21/2019	Flash Flood	5,000	Road flooding in New Texas and Renton.
7/11/2019	Flash Flood	20,000	Numerous flooded areas near Riverton and Clairton. Included roadways, a stuck vehicle, and homes.
7/11/2019	Flash Flood	50,000	Road closures due to widespread flooding in Bethel Park and Wilson. A road also collapsed in the flash flooding.
7/11/2019	Flash Flood	0	Road flooding in Natrona Heights.
7/11/2019	Flash Flood	100,000	Road flooding across the County. People trapped in their residences in Plum Borough. There was a landslide near Allison Park. Many vehicles were stuck in flood waters.
7/7/2019	Flash Flood	1,000	High water reported on roads in Sturgeon.
7/7/2019	Flash Flood	1,000	High water reported on road in Clifton.
7/7/2019	Flash Flood	5,000	Road closures in Noblestown and Bridgeville.

Table 4.3.3-2 **Significant Flood Events in Allegheny County, 1968-2020 (NOAA, 2020).**

Date	Type of Flood Event	Estimated Damages ($)	Damage Description
7/7/2019	Flash Flood	5,000	Road closures in Bower Hill and Sygan.
7/7/2019	Flash Flood	1,000	Road closures in Highland.
7/7/2019	Flash Flood	5,000	Road closures in Leetsdale.
7/6/2019	Flash Flood	0	Road closures in Option.
7/6/2019	Flash Flood	5,000	Road flooding and closures in Carnegie and Glendale.
7/6/2019	Flash Flood	5,000	Road flooding in Rook.
7/6/2019	Flash Flood	5,000	Road flooding in Dormont and Mt. Lebanon.
7/6/2019	Flash Flood	5,000	Road flooding in Whitehall and Willock.
7/6/2019	Flash Flood	5,000	Road flooding in Crafton.
7/6/2019	Flash Flood	5,000	Road closures in Oakdale.
7/4/2019	Flash Flood	5,000	Road closures in Etna.
7/4/2019	Flash Flood	5,000	Road flooding in Bairdford.
6/28/2019	Flash Flood	0	Road flooding in Port Vue.
6/19/2019	Flash Flood	0	Road closures in White Oak.
6/19/2019	Flash Flood	0	Road flooding up to three feet in Boston.
6/19/2019	Flash Flood	0	Road flooding up to one foot near Cochrans Mill and West Elizabeth.
5/29/2019	Flash Flood	10,000	Heavy rain caused a landslide in Millvale.
5/29/2019	Flash Flood	10,000	Land closures on roadways in Aspinwall.
5/29/2019	Flash Flood	10,000	Road closures between Bellevue and Option. Water rescues performed on Route 28 due to 30 inches of accumulated flood waters.
5/29/2019	Flash Flood	2,000	Road closures in Baldwin.
5/29/2019	Flash Flood	1,000	Road flooding in Wexford.
5/29/2019	Flood	2,000	Road closures between Brackenridge and Natrona Heights.
5/29/2019	Flood	2,000	Road closures between Millerstown and Natrona Heights.
5/28/2019	Flash Flood	6,000	Road and basement flooding in Natrona and Brackenridge. Flooding also dislodged several manholes.

Table 4.3.3-2 **Significant Flood Events in Allegheny County, 1968-2020 (NOAA, 2020).**

Date	Type of Flood Event	Estimated Damages ($)	Damage Description
10/4/2018	Flash Flood	10,000	Heavy rain resulted in a landslide in Munhall.
10/4/2018	Flash Flood	2,000	Vehicle stranded in flood waters in Baldwin.
10/4/2018	Flash Flood	2,000	Passenger stuck in stranded vehicle in Dormont.
10/4/2018	Flash Flood	5,000	Swift Water Rescue was deployed to save someone stranded in their vehicle near Brentwood.
10/4/2018	Flash Flood	10,000	Road flooding and ongoing water rescues in the South Hills section of the County.
10/2/2018	Flash Flood	0	Road flooding in Rook.
9/10/2018	Flood	1,000	Road flooding in West Mifflin and Dravosburg.
9/10/2018	Flood	10,000	Flooding and closure of I-376 Westbound.
9/9/2018	Flood	1,000	Road closures in White Oak and Boston.
9/9/2018	Flood	1,000	Road closures in Riverton and McKeesport.
9/9/2018	Flood	1,000	Road flooding in Bethel Park.
9/9/2018	Flood	1,000	Road closures in Brentwood and Whitehall.
9/9/2018	Flood	500	Montour Creek flooded out of its banks in Imperial.
9/9/2018	Flood	1,000	Road flooding in Dormont.
9/9/2018	Flood	1,000	Road closures in Boyce.
8/13/2018	Flash Flood	0	Flash flooding in Parkview.
8/10/2018	Flash Flood	0	Road closures in Elizabeth.
8/10/2018	Flash Flood	0	Road closures in Bruceton.
8/10/2018	Flash Flood	0	Vehicle stranded with passengers in Cochrans Mill.
8/10/2018	Flash Flood	0	Road closures with up to 2 feet of flooding in Brentwood.
8/10/2018	Flash Flood	0	Road closures in Blaine Hill.
8/10/2018	Flash Flood	0	Road flooding in Baldwin.
8/10/2018	Flash Flood	0	Road closures on Route 885.

Table 4.3.3-2 **Significant Flood Events in Allegheny County, 1968-2020 (NOAA, 2020).**

Date	Type of Flood Event	Estimated Damages ($)	Damage Description
8/10/2018	Flash Flood	0	Road closures in Pleasant Hills.
8/5/2018	Flash Flood	0	Road flooding and a stuck vehicle in Brentwood.
7/5/2018	Flash Flood	505,000	Road flooding and closures in Cherry City. Swift Water Rescue was dispatched to help a disabled Port Authority Bus with passengers. Residents rescued from the second floor of their flooded home.
7/4/2018	Flash Flood	11,000	Vehicles stuck in flooded roadways in Sandy Creek.
7/4/2018	Flash Flood	6,000	Road flooding and closures in Sharpsburg.
7/2/2018	Flash Flood	1,000	Road flooding at Chadwick.
7/2/2018	Flash Flood	6,000	Road flooding in Sharpsburg and Etna.
7/2/2018	Flash Flood	1,400,000	Road flooding and closures across the County. Some homes in O'Hara Township were total losses. One business had over 2 feet of flooding.
6/20/2018	Flash Flood	10,000	Road flooding and a stuck vehicle in Whitehall.
6/20/2018	Flash Flood	0	There were at least 66 swift water rescues in the County. Unfortunately, there was one death in the flood waters. Several small bridges were washed out, parked cars were swept downstream and destroyed, and one business had severe water damage. A state of emergency was declared in Upper St. Clair.
6/20/2018	Flash Flood	10,100,000	A number of roads in Bethel park were flooded or impassable. At least 400 homes were damaged in floodwaters, with 2 becoming uninhabitable. One man was injured while helping others trapped by the flood. One business flooded, and customers had to be rescued from the building.

Table 4.3.3-2 **Significant Flood Events in Allegheny County, 1968-2020 (NOAA, 2020).**

Date	Type of Flood Event	Estimated Damages ($)	Damage Description
6/20/2018	Flash Flood	5,000	Road flooding and closures in Mt. Lebanon and Longview.
6/20/2018	Flash Flood	100,000	Road closures in Dormont. Multiple vehicles were more than half-way submerged in flood waters.
6/20/2018	Flash Flood	5,000	Road closures in Rankin and Whitaker.
6/20/2018	Flash Flood	6,000	Road closures in Dormont and Crafton.
6/20/2018	Flash Flood	50000	Road closures in Rook and Woodville. 6 vehicles were trapped in floodwaters on one block.
6/20/2018	Flash Flood	6,000	Road closures in Cliff Mine.
6/20/2018	Flash Flood	5,000	Road flooding in Ingram and Gayly.
6/10/2018	Flash Flood	0	Road flooding in McKeesport.
6/10/2018	Flash Flood	0	Road flooding in Lincoln.
6/10/2018	Flash Flood	0	Road flooding in Dravosburg.
6/10/2018	Flash Flood	0	Road flooding in Chaleant.
6/10/2018	Flash Flood	0	Road closures in Brentwood.
6/10/2018	Flash Flood	0	Road flooding in Elizabeth.
6/10/2018	Flash Flood	0	Road flooding in McKeesport.
6/10/2018	Flash Flood	0	Flooding along Route 51 in Jefferson Hills.
6/10/2018	Flash Flood	0	Flooding along Route 51 in Jefferson Hills.
6/10/2018	Flash Flood	0	Road flooding in Cochrans Mill.
6/8/2018	Flood	0	Minor road flooding in Versailles.
6/8/2018	Flood	0	Minor flooding in Clairton.
6/8/2018	Flood	0	Minor road flooding in Boyce.
5/16/2018	Flash Flood	0	Road closures in and around Mt. Lebanon.
2/16/2018	Flood	0	Road flooding in Glendale and Woodville.
2/15/2018	Flood	0	Road closures in Brentwood.
2/15/2018	Flood	0	Road closures in Elizabeth.
1/12/2018	Flood	0	Creeks surpassed their banks flooding roads in Sweickley.
1/12/2018	Flood	0	Road closures between Highcliff and Laurel Gardens.

Table 4.3.3-2 **Significant Flood Events in Allegheny County, 1968-2020 (NOAA, 2020).**

Date	Type of Flood Event	Estimated Damages ($)	Damage Description
1/12/2018	Flood	0	Road flooding between Acmetonia and Cheswick.
1/12/2018	Flood	0	Road closures in Elfinwild.
1/12/2018	Flood	0	Road closures across the Southwestern portion of the County. Evacuations took place in Bridgeville.
1/12/2018	Flood	0	Road closures in Oakdale.
7/29/2017	Flash Flood	10,000	Flooding and trapped vehicles at Jergel's Bar in Warrendale.
7/29/2017	Flash Flood	0	Road closures in Braddock and Chaleant.
7/29/2017	Flash Flood	0	Road closures in Pine Forks.
7/29/2017	Flash Flood	0	Road and CSX track flooding between Bundle and Ehama.
7/28/2017	Flash Flood	0	Flooding along roadways and in baseball fields near Plum.
7/28/2017	Flash Flood	0	Minor road flooding in Blawnox.
7/28/2017	Flash Flood	0	Road closures with stuck vehicles in Dravosburg.
7/28/2017	Flash Flood	0	Road closures in Fairoaks.
7/28/2017	Flash Flood	10,000	Swift Water Rescue teams deployed for road closures in Mt. Lebanon.
7/28/2017	Flash Flood	0	Road closures with over 3 feet of water in Boyce.
7/28/2017	Flash Flood	0	Road closures in Option.
7/28/2017	Flash Flood	0	Road closure in Rook.
7/28/2017	Flash Flood	10,000	Road flooding in Montrose Hill. A vehicle was floating in the floodwaters at one intersection.
7/28/2017	Flash Flood	1,000	Road flooding in Rook.
7/28/2017	Flash Flood	100	Road flooding and closures in Cheswick.
7/6/2017	Flash Flood	0	Road flooding in Baldwin.
7/6/2017	Flash Flood	0	Road flooding in Dravosburg.
6/23/2017	Flash Flood	0	Road flooding in Dravosburg.
6/23/2017	Flash Flood	0	Road flooding in Dormont.

Table 4.3.3-2 **Significant Flood Events in Allegheny County, 1968-2020 (NOAA, 2020).**

Date	Type of Flood Event	Estimated Damages ($)	Damage Description
6/16/2017	Flash Flood	0	Swift Water Rescue teams were deployed to evacuate businesses in Ross Township.
6/16/2017	Flash Flood	0	Roadway flooded with a partial hill collapse in Mt. Vernon.
6/16/2017	Flash Flood	15,000	Road flooding in McKeesport and Liberty. Vehicles stuck in flood waters and one struck by a landslide in Dravosburg.
6/16/2017	Flash Flood	0	Road flooding and closures across the County.
6/15/2017	Flash Flood	5,000	Flooding resulted in a mudslide on Route 837.
6/15/2017	Flash Flood	0	Road closure between Baldwin and Munhall.
6/15/2017	Flash Flood	0	Road flooding and closures in Pleasant Hills.
6/15/2017	Flash Flood	0	Road closures in Pine Forks.
6/15/2017	Flash Flood	0	Swift Water Rescue team was deployed in Baldwin for occupants stuck in a vehicle.
6/15/2017	Flash Flood	0	Road closures in Dormont and Bethel Park.
6/14/2017	Flood	0	Road closures in Willock.
6/14/2017	Flash Flood	0	Road closures in the Southern portion of the County. Waters reached vehicles' roofs in some areas.
6/13/2017	Flood	0	Road closures and downed trees and wires across the County.
6/13/2017	Flash Flood	0	Swift Water Rescue team was deployed for a vehicle stuck in water in White Oak.
6/13/2017	Flash Flood	5,000	Flooding completely covered Route 837, and a car floated down the road.
12/18/2016	Flood	25,000	Snowmelt and heavy rain resulted in road flooding across the County.
8/28/2016	Flood	5,000	Flooding in I-376 near Exit 72.

Table 4.3.3-2 **Significant Flood Events in Allegheny County, 1968-2020 (NOAA, 2020).**

Date	Type of Flood Event	Estimated Damages ($)	Damage Description
8/28/2016	Flash Flood	250,000	Flood waters quickly rose to the top of vehicles in the Highland Park Area. One woman was rescued from her car.
7/30/2016	Flood	10,000	Road and resident flooding in New Eagle and Sutersville.
6/16/2016	Flood	5,000	Road closures in Bauerstown.
6/16/2016	Flood	5,000	Road flooding in Etna.
6/16/2016	Flood	5,000	Road closures in Etna.
6/16/2016	Flash Flood	10,000	Flash flooding caused a mudslide in Willock.
6/16/2016	Flash Flood	15,000	Road closures in Sharpsburg.
6/16/2016	Flash Flood	10,000	Bridge completely flooded in Elfinwild.
6/16/2016	Flash Flood	5,000	Hillside near Ross Park Mall washed into driveway.
6/16/2016	Flash Flood	5,000	Flash flooding on roadways in Gayly.
6/16/2016	Flash Flood	10,000	Roadway flooding breached into vehicles in Cliff Mine.
5/29/2016	Flash Flood	20,000	Road closures and damage in Dravosburg.
5/29/2016	Flash Flood	0	Road closures and abandoned cars in Homestead and near Hays. Flooding also caused a mudslide.
9/29/2015	Flood	0	Road closures in Willock and Whitehall.
9/29/2015	Flood	0	Tunnel and road closures in McKeerocks.
9/9/2015	Flash Flood	0	Road closures in Bell Acres.
9/9/2015	Flash Flood	0	Flooded roadways in Blawnox. Flood waters reached car windows.
9/9/2015	Flash Flood	0	Several road closures and a partial road collapse. Several feet of water were seen on flooded roads and vehicles were stuck in flood waters.
9/9/2015	Flash Flood	0	Road closures and a mudslide in Shalecrest. Several residents reported sewage backing up into their homes.
9/9/2015	Flash Flood	0	Road closures in Etna.
7/8/2015	Flood	0	Road and basement flooding in Shaler and McCandless Townships.

Table 4.3.3-2 **Significant Flood Events in Allegheny County, 1968-2020 (NOAA, 2020).**

Date	Type of Flood Event	Estimated Damages ($)	Damage Description
6/30/2015	Flood	2,000	Minor road flooding in Riverton and McKeesport.
6/30/2015	Flood	2,000	Minor road flooding in Liberty.
6/27/2015	Flash Flood	2,000	Minor road flooding in Gibsonia.
6/27/2015	Flash Flood	2,000	Minor road flooding in Wildwood.
6/23/2015	Flash Flood	10,000	Flash flooding resulted in a mud slide in Milesville.
6/23/2015	Flash Flood	2,000	Minor road flooding in Hardy.
6/20/2015	Flash Flood	10,000	The remnants of Tropical System Bill resulted in a foot of water on some roads in Etna.
6/18/2015	Flash Flood	5,000	Minor road flooding near Sewickley.
6/18/2015	Flash Flood	10,000	Heavy rain resulted in road closures due to vehicles stuck in flood waters in Willock.
6/18/2015	Flash Flood	2,000	Road flooding in Shalecrest.
6/15/2015	Flash Flood	15,000	Heavy rain resulted in a washed out a bridge and some basement flooding in Brackenridge.
6/15/2015	Flash Flood	5,000	Minor road flooding in Culmerville.
6/15/2015	Flash Flood	10,000	Heavy rain resulted in flash flooding and a landslide in Tarentum.
6/15/2015	Flash Flood	15,000	Minor road and basement flooding in Rural Ridge.
6/15/2015	Flash Flood	5,000	Minor road flooding in Allison Park.
6/15/2015	Flash Flood	50,000	Minor road flooding in Cheswick.
6/15/2015	Flash Flood	5,000	Minor road flooding in Ingomar.
6/15/2015	Flash Flood	5,000	Heavy rain resulted in road closures - over 2-3 feet of water flooded on Canal Street.
6/15/2015	Flash Flood	25,000	Heavy rain resulted in road closures and basement flooding in some parts of the County.
6/15/2015	Flash Flood	2,000	Minor road flooding in Natrona Heights.
6/15/2015	Flash Flood	10,000	Minor road flooding in Tarentum.
6/14/2015	Flash Flood	5,000	Minor road flooding in Willock.
6/14/2015	Flash Flood	5,000	Minor road flooding in Harwick.

Table 4.3.3-2 **Significant Flood Events in Allegheny County, 1968-2020 (NOAA, 2020).**

Date	Type of Flood Event	Estimated Damages ($)	Damage Description
6/14/2015	Flash Flood	5,000	Minor road flooding in Bairdford.
6/14/2015	Flash Flood	5,000	Minor road flooding in White Oak.
6/14/2015	Flash Flood	5,000	Minor road flooding in Munhall.
6/14/2015	Flash Flood	10,000	Heavy rain resulting in flash flooding in Dravosburg. One vehicle was stuck in the floodwaters.
6/14/2015	Flash Flood	15,000	Heavy rain resulting in flash flooding across the County.
5/29/2015	Flash Flood	0	Minor road flooding in the City of Cherry.
5/18/2015	Flash Flood	0	Minor road flooding in Bower Hill and Castle Shannon.
5/18/2015	Flash Flood	0	Minor road flooding in Bunola and Bundle.
5/18/2015	Flash Flood	0	Heavy rain resulting in flooding and a small landslide in Rook.
8/12/2014	Flood	25,000	Minor road flooding in Highcliff, Glendale, and the City of Pittsburgh.
8/12/2014	Flood	25,000	Flooding in Highcliff.
8/3/2014	Flood	1,000	Flooding in Brentwood.
8/3/2014	Flood	25,000	Flooding in Dormont.
8/3/2014	Flood	1,000	Flooding in Port Vue.
8/3/2014	Flood	10,000	Flooding in Wilkins Township.
6/28/2014	Flash Flood	5,000	Flooding in Rook.
6/28/2014	Flash Flood	15,000	Flooding in Heidelberg.
6/28/2014	Flash Flood	10,000	Flooding in Carnegie.
6/28/2014	Flash Flood	10,000	Flooding in Carnegie.
6/13/2014	Flood	3,000	Flooding in Wilkins Township.
6/13/2014	Flood	1,000	Flooding in Dravosburg.
6/13/2014	Flood	1,000	Flooding in Mc Keesport.
6/13/2014	Flood	1,000	Flooding in Riverton.
6/12/2014	Flood	2,000	Flooding in Elfinwild.
6/12/2014	Flood	2,000	Flooding in Shalecrest.
6/12/2014	Flood	2,000	Flooding in Port Vue.
6/12/2014	Flood	10,000	Flooding in New Texas.
5/27/2014	Flood	0	Flooding in Boyce.
5/27/2014	Flood	0	Flooding in Library.
9/11/2013	Flood	5,000	Flooding in Edgewood.

Table 4.3.3-2 **Significant Flood Events in Allegheny County, 1968-2020 (NOAA, 2020).**

Date	Type of Flood Event	Estimated Damages ($)	Damage Description
9/11/2013	Flash Flood	20,000	Flooding in Sandy Creek.
9/11/2013	Flash Flood	25,000	Flooding in Aspinwall.
9/11/2013	Flash Flood	25,000	Flooding in Acmetonia.
9/11/2013	Flash Flood	10,000	Flooding in Logans Ferry.
9/9/2013	Flood	10,000	Flooding in Wilkins Township.
8/8/2013	Flood	0	Flooding in Bairdford.
7/22/2013	Flood	25,000	Flooding in Option.
7/21/2013	Flash Flood	10,000	Flooding in Wall.
7/21/2013	Flash Flood	35,000	Flooding in Dravosburg.
7/21/2013	Flash Flood	10,000	Flooding in Riverton.
7/17/2013	Flash Flood	15,000	Flooding in Blaine Hill.
7/17/2013	Flash Flood	75,000	Flooding in Coulter.
7/17/2013	Flash Flood	100,000	Flooding in Coulter.
7/17/2013	Flash Flood	75,000	Flooding in Mc Keesport.
7/17/2013	Flash Flood	100,000	Flooding in Sutersville.
7/16/2013	Flash Flood	25,000	Flooding in Etna.
7/16/2013	Flash Flood	10,000	Flooding in Pleasant Hills.
7/16/2013	Flash Flood	35,000	Flooding in Glassport.
7/16/2013	Flash Flood	10,000	Flooding in Blaine Hill.
7/16/2013	Flash Flood	35,000	Flooding in Aspinwall.
7/16/2013	Flash Flood	10,000	Flooding in Wilson.
7/16/2013	Flash Flood	50,000	Flooding in Versailles.
7/16/2013	Flash Flood	100,000	Flooding in Mc Keesport.
7/16/2013	Flash Flood	20,000	Flooding in Mc Keesport.
7/10/2013	Flash Flood	10,000	Flooding in Baldwin.
7/10/2013	Flash Flood	10,000	Flooding in West Mifflin.
7/10/2013	Flash Flood	10,000	Flooding in Dormont.
7/10/2013	Flash Flood	25,000	Flooding in Cliff Mine.
7/10/2013	Flash Flood	25,000	Flooding in East Carnegie.
7/10/2013	Flash Flood	25,000	Flooding in Crafton.
7/10/2013	Flash Flood	50,000	Flooding in Dormont.
7/10/2013	Flash Flood	50,000	Flooding in West Mifflin.
7/10/2013	Flash Flood	20,000	Flooding in White Oak.
7/10/2013	Flash Flood	25,000	Flooding in Ingram.
7/10/2013	Flash Flood	50,000	Flooding in Elizabeth.
7/10/2013	Flash Flood	10,000	Flooding in Liberty.
7/10/2013	Flash Flood	10,000	Flooding in Dravosburg.

Table 4.3.3-2 **Significant Flood Events in Allegheny County, 1968-2020 (NOAA, 2020).**

Date	Type of Flood Event	Estimated Damages ($)	Damage Description
7/10/2013	Flash Flood	25,000	Flooding in Large.
7/10/2013	Flash Flood	10,000	Flooding in Clairton.
7/10/2013	Flash Flood	5,000	Flooding in Millerstown.
7/10/2013	Flash Flood	10,000	Flooding in Bruceton.
7/10/2013	Flash Flood	35,000	Flooding in Glendale.
7/10/2013	Flash Flood	5,000	Flooding in Clifton.
7/10/2013	Flash Flood	50,000	Flooding in Oakdale.
7/10/2013	Flash Flood	10,000	Flooding in Option.
7/10/2013	Flash Flood	5,000	Flooding in Crafton.
7/10/2013	Flash Flood	50,000	Flooding in Mustard.
7/10/2013	Flash Flood	15,000	Flooding in Rook.
7/10/2013	Flash Flood	50,000	Flooding in Baldwin.
7/10/2013	Flash Flood	10,000	Flooding in Crafton.
7/10/2013	Flash Flood	15,000	Flooding in Lincoln.
7/9/2013	Flood	5,000	Flooding in Willock.
7/9/2013	Flood	10,000	Flooding in Dormont.
6/30/2013	Flood	0	Flooding in Dormont.
6/30/2013	Flash Flood	0	Flooding in Wilkins Township.
6/30/2013	Flash Flood	0	Flooding in Sandy Creek.
6/26/2013	Flood	2,000	Flooding in Sharpsburg.
6/26/2013	Flood	8,000	Flooding in Dormont.
6/26/2013	Flood	5,000	Flooding in Ben Avon.
6/13/2013	Flood	5,000	Flooding in Brentwood.
6/13/2013	Flood	5,000	Flooding in Elizabeth.
6/13/2013	Flood	2,000	Flooding in Elizabeth.
6/13/2013	Flood	5,000	Flooding in Option.
6/13/2013	Flood	2,000	Flooding in West Elizabeth.
4/16/2013	Flash Flood	2,000	Flooding in Cliff Mine.
4/16/2013	Flash Flood	5,000	Flooding in Crafton.
10/30/2012	Flood	25,000	Flooding in Rosedale.
9/27/2012	Flash Flood	50,000	Flooding in Clairton.
9/27/2012	Flash Flood	10,000	Flooding in Aspinwall.
9/27/2012	Flash Flood	25,000	Flooding in Blawnox.
7/28/2012	Flood	10,000	Flooding in Talley Gavey.
7/27/2012	Flood	50,000	Flooding in Bakerstown Station.
7/27/2012	Flood	15,000	Flooding in Logans Ferry.
7/20/2012	Flash Flood	35,000	Flooding in Brentwood.

Table 4.3.3-2 **Significant Flood Events in Allegheny County, 1968-2020 (NOAA, 2020).**

Date	Type of Flood Event	Estimated Damages ($)	Damage Description
7/20/2012	Flash Flood	25,000	Flooding in Pleasant Hills.
7/20/2012	Flash Flood	25,000	Flooding in Cliff Mine.
7/20/2012	Flash Flood	25,000	Flooding in Oakdale.
7/20/2012	Flash Flood	10,000	Flooding in Riverton.
7/20/2012	Flash Flood	5,000	Flooding in Brentwood.
7/20/2012	Flash Flood	15,000	Flooding in Willock.
7/20/2012	Flash Flood	15,000	Flooding in Pleasant Hills.
7/20/2012	Flash Flood	25,000	Flooding in Riverton.
7/20/2012	Flash Flood	25,000	Flooding in Dormont.
7/20/2012	Flash Flood	15,000	Flooding in Dravosburg.
7/20/2012	Flash Flood	25,000	Flooding in Clairton.
7/20/2012	Flash Flood	15,000	Flooding in Noblestown.
7/20/2012	Flash Flood	20,000	Flooding in Gayly.
7/20/2012	Flash Flood	35,000	Flooding in Imperial.
7/20/2012	Flash Flood	75,000	Flooding in Pittsburgh.
8/19/2011	Flash Flood	500,000	Flooding in Pittsburgh on Washington Boulevard. 4 fatalities and 1 injury.
8/19/2011	Flash Flood	50,000	Flooding in Option.
7/18/2011	Flash Flood	50,000	Flooding in Aspinwall.
7/18/2011	Flood	20,000	Flooding in Jefferson.
7/4/2011	Flood	5,000	Flooding in Edgewood.
7/4/2011	Flash Flood	10,000	Flooding in Edgewood.
6/20/2011	Flood	35,000	Flooding in Bridgeville.
6/20/2011	Flash Flood	10,000	Flooding in Glendale.
6/19/2011	Flood	25,000	Flooding in Bridgeville.
5/13/2011	Flood	20,000	Flooding in Millvale.
5/13/2011	Flood	5,000	Flooding in Fairoaks.
5/12/2011	Flood	15,000	Flooding in Natrona.
3/10/2011	Flood	12,000	Flooding in Curtisville.
2/28/2011	Flash Flood	25,000	Flooding in Highcliff.
2/28/2011	Flood	100,000	Flooding in Tarentum.
2/28/2011	Flood	25,000	Flooding in Cherry City.
8/14/2010	Flash Flood	10,000	Flooding in Highcliff.
7/13/2010	Flash Flood	50,000	Flooding in Mt Lebanon.
7/9/2010	Flash Flood	5,000	Flooding in Carnegie.

Table 4.3.3-2 **Significant Flood Events in Allegheny County, 1968-2020 (NOAA, 2020).**

Date	Type of Flood Event	Estimated Damages ($)	Damage Description
6/5/2010	Flash Flood	200,000	Flooding in Whitaker ($100,000 damages), Brentwood ($50,000 damages), and Cliff Mine ($50,000 damages).
1/26/2010	Flood	75,000	Flooding in Option.
6/17/2009	Flash Flood	9,000	Flooding in Option.
8/14/2008	Flash Flood	25,000	Flooding in Cuddy.
8/5/2008	Flash Flood	10,000	Flooding in Sharpsburg.
7/23/2008	Flash Flood	50,000	Flooding in Pitcairn.
7/6/2008	Flash Flood	15,000	Flooding in Bellevue.
6/16/2008	Flash Flood	125,000	Flooding in Hardy.
3/4/2008	Flood	100,000	Flooding in Bridgeville.
8/9/2007	Flash Flood	15,180,000	Flooding in Millvale ($15,000,000 damages), Penn Hills ($100,000 damages), Shalecrest ($25,000 damages), Wilkinsburg ($25,000 damages), Glenshaw ($15,000), and Verona ($15,000 damages).
8/6/2007	Flash Flood	70,000	Flooding in Millvale ($50,000 damages) and Ingomar ($20,000 damages).
7/5/2007	Flash Flood	10,000	Flooding in Glenshaw.
6/8/2007	Flash Flood	3,000	Flooding in Springdale.
5/31/2007	Flash Flood	1,000	Flooding in Pittsburgh.
3/23/2007	Flash Flood	4,000	Flooding in White Oak.
8/20/2005	Flash Flood	0	Flooding in Whitehall.
7/13/2005	Flash Flood	35,000	Flooding in Springdale.
7/5/2005	Flash Flood	5,000	Flooding in Etna ($5,000 damages) and Sewickley (0 damages).
6/30/2005	Flash Flood	15,000	Flooding County-wide.
3/29/2005	Flood	0	Flooding in several counties.
1/6/2005	Flood	700,000	Flooding County-wide.
9/17/2004	Flash Flood	100,000,000+	Flooding County-wide. 1 fatality and 92 injuries. Most widespread and devastating flash flood in recent history that resulted in a Presidential Declaration of Disaster.
9/8/2004	Flood	40,000	Flooding County-wide.
8/20/2004	Flood	0	Flooding County-wide.

Table 4.3.3-2 **Significant Flood Events in Allegheny County, 1968-2020 (NOAA, 2020).**

Date	Type of Flood Event	Estimated Damages ($)	Damage Description
7/26/2004	Flood	0	Flooding County-wide.
6/17/2004	Flash Flood	8,000	Flooding in Tarentum.
6/15/2004	Flash Flood	0	Flooding in Pittsburgh.
5/18/2004	Flash Flood	20,000	Flooding in Sewickley.
4/14/2004	Flood	15,000	Flooding in several counties.
4/13/2004	Flood	0	Flooding County-wide.
3/7/2004	Flood	0	Flooding County-wide.
2/7/2004	Flood	18,000	Flooding in several counties.
2/6/2004	Flood	85,000	Flooding in several counties.
1/4/2004	Flood	25,000	Flooding County-wide.
12/10/2003	Flash Flood	0	Flooding in Russelton and Dravosburg.
11/19/2003	Flash Flood and Flood	101,000	Flooding in Baldwin, Turtle Creek, Dravosburg, Bell Acres ($5,000 damages), and several counties ($68,000 damages). Note: an additional $28,000 in damages was reported by other areas, but the locations were not reported to NCDC/SHELDUS.
8/12/2003	Flash Flood	0	Flooding in Emsworth.
8/10/2003	Flash Flood	0	Flooding in Oakmont.
8/6/2003	Flash Flood	0	Flooding in Monroeville.
8/4/2003	Flash Flood	0	Flooding in Bridgeville.
8/3/2003	Flash Flood	0	Flooding in Leetsdale.
7/23/2003	Flash Flood	5,000	Flooding in Pittsburgh.
7/22/2003	Flash Flood	120,000	Flooding in Russelton. Little Deer Creek Road in W. Deer Township flooded.
7/4/2003	Flash Flood	2,000	Flooding in Pittsburgh.
6/20/2003	Flash Flood	0	Flooding in Pittsburgh.
6/12/2003	Flash Flood	0	Flooding in Etna and Russelton.
5/10/2003	Flash Flood	0	Flooding in Bellevue and Castle Shannon.
2/24/2003	Flood	0	Flooding county-wide.
10/3/2002	Flood	0	Flooding at Unity Center.
8/12/2002	Flood	0	Flooding in Harmerville.
7/31/2002	Flood	2,000,000	Ice jams produced flooding along the Youghiogheny River from Boston to McKeesport. Destroyed 210 boat slips at the McKeesport Marina.

Table 4.3.3-2 **Significant Flood Events in Allegheny County, 1968-2020 (NOAA, 2020).**

Date	Type of Flood Event	Estimated Damages ($)	Damage Description
7/25/2002	Flood	5,000	Flooding in Pittsburgh.
7/18/2002	Flood	100,000	Flooding in Castle Shannon. Flash-flooding in Overbrook section of Pittsburgh. Cars stranded in 4-5 feet of water at intersection of Routes 51 and 88. First-floor flooding in the vicinity.
7/1/2002	Flood	0	Flooding in Pleasant Hills.
5/31/2002	Flood	0	Flooding in East McKeesport.
3/26/2002	Flood	96,000	Flooding in several counties.
3/21/2002	Flood	5,000	Flooding in Elizabeth.
7/1/2001	Flood	1,000	Flooding in Wexford.
5/18/2001	Flood	25,000	Flooding in Pittsburgh.
1/31/2001	Flood	2,000,000	Flooding in McKeesport.
9/2/2000	Flood	0	Flooding in Monroeville.
8/6/2000	Flood	10,010,000	Flooding county-wide. 51 communities reported some degree of damage; approximately 1,200 homes and 51 businesses were impacted. Street and roadway flooding throughout the County.
7/31/2000	Flood	20,000	Flooding in Bridgeville.
7/30/2000	Flood	10,000	Flooding in Wilkinsburg.
7/28/2000	Flood	5,000	Flooding in Imperial ($5,000 damages) and Emsworth (0 damages).
2/19/2000	Flood	6,300,000	Flooding in several counties. Flooding in Allegheny County ($5,000,000 damages). 31 homes in Elizabeth and West Elizabeth suffered minor damage. 1 home had major damage. Point State Park, Mon Parking Wharf, and the 10th Street Bypass were forced to close.

Table 4.3.3-2 **Significant Flood Events in Allegheny County, 1968-2020 (NOAA, 2020).**

Date	Type of Flood Event	Estimated Damages ($)	Damage Description
7/28/1999	Flash Flood	1,000,000	Flooding county-wide. Brentwood, Castle Shannon, Mt. Lebanon, Dormont, and W. Elizabeth declared emergencies; many streets, facilities, and businesses flooded. Roof, shingle, and siding damage to homes and businesses, some outbuildings destroyed. Port Authority's entire light-rail line was disabled due to flooding; 110,000 customers lost power; air traffic at Pittsburgh International Airport was suspended for 4 hours.
5/18/1999	Flash Flood	100,000	Flooding in East Portion.
4/22/1999	Flash Flood	0	Flooding in Pittsburgh.
4/9/1999	Flash Flood	2,000	Flooding in Pittsburgh.
8/16/1998	Flood	0	Flooding in Coraopolis.
6/27/1998	Flash Flood	0	Flooding in Mt Lebanon, Carnegie, and Imperial.
6/2/1998	Flash Flood	250,000	Flooding in Verona ($150,000 damages) and Wilkinsburg ($100,000 damages).
4/26/1998	Flash Flood	0	Flooding in Tarentum.
1/9/1998	Flood	0	Flooding county-wide.
7/1/1997	Flash Flood	10,000,000	429 homes, 12 businesses, 2 sewer systems, 1 park, and 13 roads/bridges in Pitcairn, Monroeville, Turtle Creek, and Wilkins Township were impacted; 13 structures in Pitcairn were moved from their foundations. An elementary school in Pitcairn (built over channelized creek bed) had several walls destroyed. Mud slide at a gas station along Route 22; bridge at the intersection of Routes 130 and 48 was washed out. 1 fatality.
6/18/1997	Flash Flood	0	Flooding in West Mifflin.
6/13/1997	Flash Flood	6,000	Flooding in Penn Hills.
5/25/1997	Flash Flood	10,000	Flooding in Penn Hills.

Table 4.3.3-2 **Significant Flood Events in Allegheny County, 1968-2020 (NOAA, 2020).**

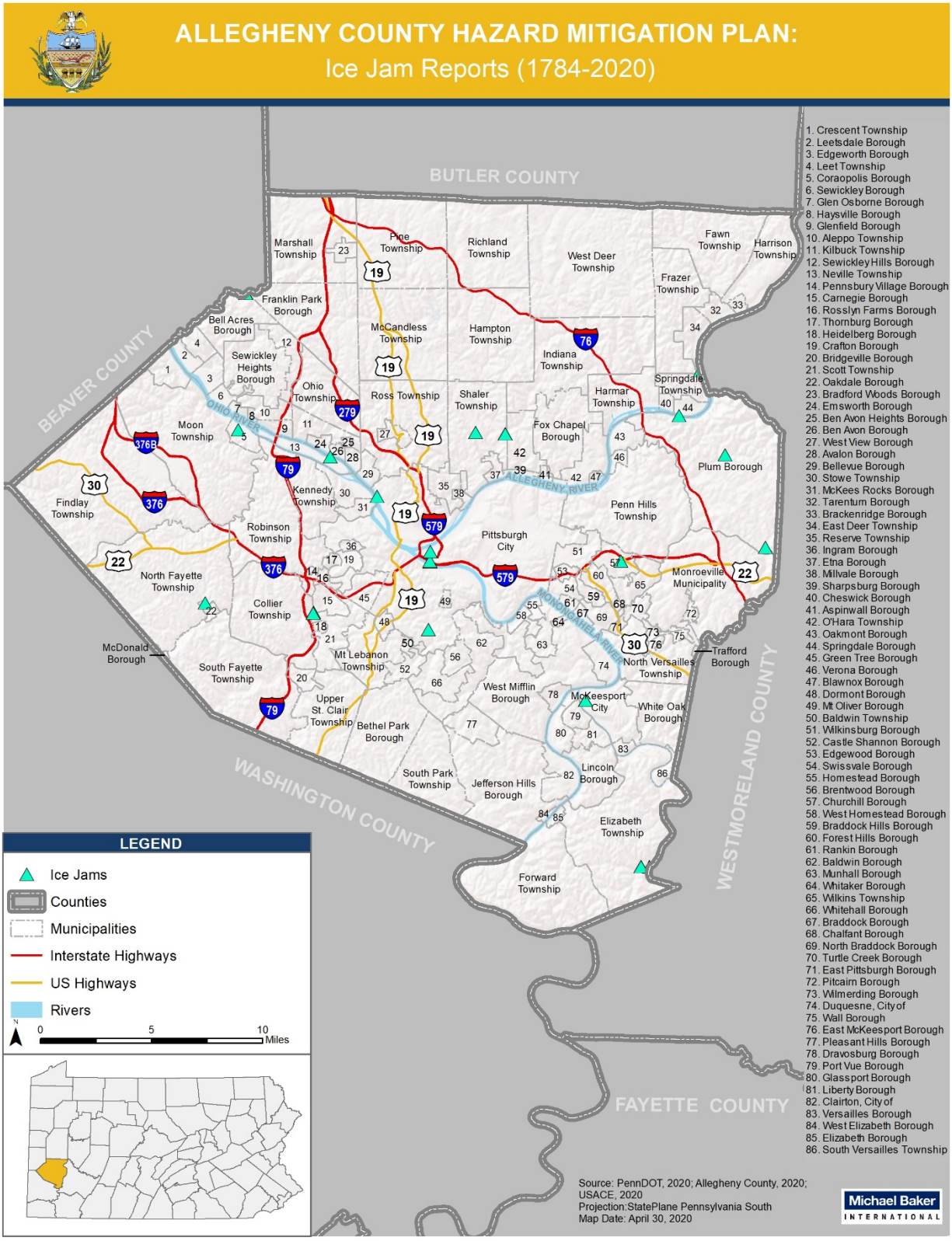
Date	Type of Flood Event	Estimated Damages ($)	Damage Description
3/2/1997	Flood	0	Flooding in several counties.
8/8/1996	Flash Flood	80,000	Flooding in Pittsburgh.
7/20/1996	Flood	16,000	Flooding in several counties.
7/19/1996	Flood	54,000	Flooding in several counties. Allegheny River Boulevard in Pittsburgh experienced extensive flooding. Mudslides along Route 51.
6/24/1996	Flash Flood	150,000	Flooding in Pittsburgh.
6/19/1996	Flash Flood	3,100,000	Flooding in McKeesport ($3,100,000 damages) and Leetsdale (0 damages).
6/18/1996	Flash Flood	0	Flooding in Bridgeville.
6/8/1996	Flash Flood	0	Flooding in Monroeville.
5/18/1996	Flood	0	Flooding in several counties.
5/17/1996	Flash Flood	0	Flooding in Moon.
3/19/1996	Flood	8,000	Flooding in Pittsburgh.
1/19/1996	Flash Flood and Flood	35,500,000	Flooding in several counties. Flooding in Allegheny County ($9,600,000 damages). 650 buildings damages, many in downtown Pittsburgh sustained extensive basement flooding. 22 cars submerged, many pleasure boats/barges broke away and were destroyed. Allegheny County Sanitary Authority had to shut down its sewage treatment plant that serves 113 communities. Several hundred people had to be evacuated. Point Park Museum was flooded with 4.5 feet of water.
8/11/1995	Flash Flood	200,000	Flooding county-wide.
8/2/1995	Flash Flood and Flood	10,000	Flooding county-wide.
7/15/1995	Flash Flood and Flood	2,000	Flooding in Monroeville.
6/24/1995	Flash Flood and Flood	70,000	Flooding county-wide.
6/21/1995	Flash Flood and Flood	12,000	Flooding in Emsworth ($5,000 damages), Avalon ($5,000 damages), Sewickley ($2,000), and Coraopolis (0 damages).
6/10/1995	Flash Flood and Flood	5,000	Flooding in Pittsburgh

Table 4.3.3-2 **Significant Flood Events in Allegheny County, 1968-2020 (NOAA, 2020).**

Date	Type of Flood Event	Estimated Damages ($)	Damage Description
6/3/1995	Flash Flood and Flood	0	Flooding in Pittsburgh.
8/27/1994	Flash Flood	550,000	Flooding county-wide.
8/2/1994	Flash Flood and Flood	0	Flooding in Pittsburgh.
7/6/1994	Flash Flood	50,000	Flooding in Pittsburgh.
6/18/1994	Flash Flood and Flood	0	Flooding in Sewickley.
3/10/1994	Flash Flood and Flood	0	Flooding in Pittsburgh.
1/28/1994	Flash Flood and Flood	5,000	Flooding county-wide.
8/16/1993	Flood	1,000	Flooding in Pittsburgh.
6/14/1990	Flash Flood	50,000	No additional details provided.
5/30/1986	Flash Flood	5,000,000	No additional details provided.
11/5/1985	Flood	500,000	No additional details provided.
5/24/1973	Heavy Rain, Flash Flooding	5,000	No additional details provided.
6/21/1972	Rain, Flooding	7,500,000	No additional details provided.
4/2/1970	Rain, Flooding	0	No additional details provided.
6/5/1968	Local Heavy Rain and Flooding	4,000	No additional details provided.

The Youghiogheny River and Pine Creek have also experienced localized flooding problems due to ice jams. Because of the shallow water and prominent sandbar conditions, the Youghiogheny River has caused flooding in the Boston area of Elizabeth Township and major ice flow damage in the McKeesport area (municipal docks). Just upstream from Boston (in the Coulter area), a massive sandbar can stop flowing ice and cause ice jams. After a period of time, large ice floes will break out of the jam and move downstream where they will again jam at the railroad bridge between Boston and McKeesport. At each jam, water will back up causing shore flooding, and as the jams start to break up and move downstream, they can cause damage to anything built near the shores. Pine Creek flows from North Park Lake through Hampton Township, Shaler Township, the Borough of Etna and Millvale and into the Allegheny River. On its path to the river, it runs along Route 8 with numerous crossings under Route 8. When ice forms in this stream, it can jam at the numerous turns or narrow spots, causing shoreline flooding. Figure 4.3.3-2 illustrates the locations of ice jams on Allegheny County's streams as documented in the US Army Corps of Engineers' Ice Jam Database.

Figure 4.3.3-5 **Ice Jam Reports and Ice Sightings Reported to the US Army Corps of Engineers.**



Floods are the most common and costly natural catastrophe in the United States. In terms of economic disruption, property damage, and loss of life, floods are "nature's number-one disaster." For that reason, flood insurance is almost never available under industry-standard homeowner's and renter's policies. The best way for citizens to protect their property against flood losses is to purchase flood insurance through the NFIP.

Congress established the NFIP in 1968 to help control the growing cost of federal disaster relief. The NFIP is administered by the Federal Emergency Management Agency (FEMA), part of the U.S. Department of Homeland Security. The NFIP offers federally-backed flood insurance in communities that adopt and enforce effective floodplain management ordinances to reduce future flood losses.

Since 1983, the chief means of providing flood insurance coverage has been a cooperative venture of FEMA and the private insurance industry known as the Write Your Own (WYO) Program. This partnership allows qualified property and casualty insurance companies to "write" (that is, issue) and service the NFIP's Standard Flood Insurance Policy (SFIP) under their own names.

Today, nearly 90 WYO insurance companies issue and service the SFIP under their own names. More than 4.4 million federal flood insurance policies are in force. These policies represent $650 billion in flood insurance coverage for homeowners, renters, and business owners throughout the United States and its territories.

The NFIP provides flood insurance to individuals in communities that are members of the program. Membership in the program is contingent on the community adopting and enforcing floodplain management and development regulations.

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

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

The Emergency Program is the initial phase of a community's participation in the NFIP. In return for the local government's agreeing to adopt basic floodplain management standards, the NFIP allows local property owners to buy modest amounts of flood insurance coverage.

In return for agreeing to adopt more comprehensive floodplain management measures, an Emergency Program community can be "promoted" to the Regular Program. Local policyholders immediately become eligible to buy greater amounts of flood insurance coverage. All participating municipalities in Allegheny County are in the Regular Program.

The minimum floodplain management requirements include:

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

Information on NFIP premiums and coverage, prior claims, and substantial damage claims provide additional information on past flood occurrences. Table 4.3.3-3 shows this information for each community in Allegheny County.

Table 4.3.3-3 **NFIP Policies and Claims Information (CIS, 2020).**

Municipality	Policies in Force	Total Coverage and Premium	Prior Claims	Total Amount of Paid Claims	Substantial Damage Claims
Aleppo Township	4	$1,086,875	3	$2,416	1
Aspinwall Borough	7	$1,997,719	13	$31,932	0
Avalon Borough	3	$404,057	0	$0	0
Baldwin Borough	37	$7,052,145	45	$529,486	0
Baldwin Township	4	$694,535	4	$10,549	0
Bell Acres Borough	9	$2,404,076	14	$1,506,699	1
Bellevue Borough	0	$0	1	$8,191	0
Ben Avon Borough	0	$6,389	6	$21,260	0
Ben Avon Heights Borough	7	$1,200,900	0	$0	0
Bethel Park, Municipality of	61	$16,671,773	89	$1,057,474	6
Blawnox Borough	4	$506,407	3	$11,750	0
Brackenridge Borough	20	$3,351,065	9	$30,327	0
Braddock Borough	0	$10,173	7	$41,963	0
Braddock Hills Borough	6	$3,142,000	13	$28,025	0
Bradford Woods Borough	1	$350,421	1	$0	0
Brentwood Borough	6	$1,520,094	6	$16,673	0
Bridgeville Borough	55	$8,249,428	203	$4,217,787	7
Carnegie Borough	94	$25,399,749	70	$2,809,898	11
Castle Shannon Borough	20	$4,028,931	36	$509,669	0
Chalfant Borough	0	$0	1	$3,618	0
Cheswick Borough	2	$367,231	12	$50,913	1
Churchill Borough	15	$3,149,257	10	$107,517	0
Clairton, City of	1	$42,180	16	$70,349	0
Collier Township	42	$10,654,858	36	$345,953	4

Table 4.3.3-3 **NFIP Policies and Claims Information (CIS, 2020).**

Municipality	Policies in Force	Total Coverage and Premium	Prior Claims	Total Amount of Paid Claims	Substantial Damage Claims
Coraopolis Borough	38	$6,623,095	24	$74,968	1
Crafton Borough	4	$1,121,863	6	$77,715	1
Crescent Township	8	$1,363,709	3	$487	0
Dormont Borough	4	$1,401,684	3	$10,843	0
Dravosburg Borough	2	$1,157,712	11	$68,542	0
Duquesne, City of	0	$0	2	$0	0
East Deer Township	44	$7,007,904	30	$89,297	1
East McKeesport Borough	1	$175,333	0	$0	0
East Pittsburgh Borough	2	$1,504,931	1	$143,139	0
Edgewood Borough	3	$392,863	0	$0	0
Edgeworth Borough	6	$1,832,987	1	$1,319	0
Elizabeth Borough	15	$2,613,193	57	$371,016	1
Elizabeth Township	94	$12,846,206	168	$2,916,909	8
Emsworth Borough	16	$3,539,807	22	$305,327	1
Etna Borough	173	$23,114,091	254	$6,012,803	42
Fawn Township	35	$4,108,070	77	$1,085,844	8
Findlay Township	22	$3,423,668	12	$83,579	0
Forest Hills Borough	14	$4,728,837	13	$63,616	2
Forward Township	15	$3,810,607	37	$194,265	1
Fox Chapel Borough	23	$7,467,267	17	$139,639	0
Franklin Park Borough	20	$5,469,162	3	$65,787	0
Frazer Township	0	$0	2	$5,345	0
Glassport Borough	1	$1,002,850	8	$26,076	0
Glen Osborne Borough	15	$2,780,248	18	$127,530	0
Glenfield Borough	25	$3,943,047	37	$275,273	2
Green Tree Borough	7	$1,712,830	9	$53,619	0
Hampton Township	47	$12,729,770	106	$1,650,805	16
Harmar Township	32	$6,882,502	68	$1,172,764	24
Harrison Township	7	$1,288,956	15	$127,575	2
Haysville Borough	5	$1,173,677	2	$3,749	0
Heidelberg Borough	42	$8,701,596	6	$701,823	3
Homestead Borough	1	$551,687	0	$0	0
Indiana Township	20	$6,397,800	21	$136,219	1
Ingram Borough	3	$230,802	2	$10,832	0
Jefferson Hills Borough	36	$8,811,925	74	$710,737	0
Kennedy Township	3	$806,093	0	$0	0
Kilbuck Township	9	$1,819,004	13	$416,976	1

Table 4.3.3-3 **NFIP Policies and Claims Information (CIS, 2020).**

Municipality	Policies in Force	Total Coverage and Premium	Prior Claims	Total Amount of Paid Claims	Substantial Damage Claims
Leet Township	29	$4,208,878	22	$124,237	1
Leetsdale Borough	41	$16,782,290	15	$25,384	0
Liberty Borough	0	$0	0	$0	0
Lincoln Borough	3	$410,639	0	$0	0
Marshall Township	26	$8,749,884	5	$62,478	1
McCandless, Town of	63	$18,560,362	39	$694,591	3
McDonald Borough	14	$2,712,412	23	$309,461	0
McKees Rocks Borough	87	$31,824,004	78	$1,884,165	1
McKeesport, City of	18	$7,159,786	48	$462,356	3
Millvale Borough	96	$12,695,628	284	$4,614,377	26
Monroeville	35	$10,544,476	39	$824,957	0
Moon Township	28	$6,857,602	20	$179,316	0
Mount Lebanon	0	$20,085	14	$93,574	0
Mount Oliver Borough	52	$14,361,000	0	$0	0
Munhall Borough	6	$721,300	7	$4,981	0
Neville Township	93	$22,677,608	24	$55,595	0
North Braddock Borough	1	$210,370	0	$0	0
North Fayette Township	39	$11,541,644	37	$1,257,073	6
North Versailles Township	8	$2,360,657	28	$94,668	0
Oakdale Borough	135	$31,161,204	63	$2,577,918	11
Oakmont Borough	39	$8,640,947	47	$642,337	0
O'Hara Township	91	$22,596,595	41	$636,650	1
Ohio Township	5	$1,502,671	4	$51,664	1
Penn Hills, Municipality of	54	$16,127,420	68	$1,857,683	4
Pennsbury Village Borough	N/A	$0	0	$0	0
Pine Township	11	$3,064,578	5	$22,676	0
Pitcairn Borough	48	$6,336,290	67	$634,373	2
Pittsburgh, City of	529	$184,536,154	599	$8,955,193	26
Pleasant Hills Borough	6	$1,233,771	10	$92,114	0
Plum Borough	55	$14,330,934	54	$2,553,146	4
Port Vue Borough	4	$2,157,134	5	$100,869	2
Rankin Borough	2	$783,185	1	$694	0
Reserve Township	14	$956,291	13	$33,123	3
Richland Township	14	$3,238,561	10	$52,800	0
Robinson Township	41	$10,576,868	33	$2,041,233	2
Ross Township	88	$25,880,024	187	$1,590,922	4
Rosslyn Farms Borough	5	$2,157,654	5	$2,894	0

Table 4.3.3-3 **NFIP Policies and Claims Information (CIS, 2020).**

Municipality	Policies in Force	Total Coverage and Premium	Prior Claims	Total Amount of Paid Claims	Substantial Damage Claims
Scott Township	42	$15,183,817	27	$661,610	1
Sewickley Borough	2	$772,560	16	$81,182	0
Sewickley Heights	3	$436,542	2	$19,147	0
Sewickley Hills Borough	16	$5,074,264	0	$0	0
Shaler Township	145	$31,863,036	257	$3,947,397	21
Sharpsburg Borough	83	$13,507,352	99	$1,582,028	10
South Fayette Township	65	$21,064,001	62	$2,983,681	6
South Park Township	25	$6,234,017	64	$1,822,654	8
South Versailles Township	5	$415,686	7	$17,497	2
Springdale Borough	1	$1,002,850	4	$61,632	0
Springdale Township	1	$105,459	3	$12,382	0
Stowe Township	5	$2,231,618	4	$20,746	0
Swissvale Borough	6	$1,465,086	1	$0	0
Tarentum Borough	26	$7,283,722	37	$256,512	6
Thornburg Borough	5	$2,559,463	6	$15,943	0
Trafford Borough	11	$3,054,241	11	$287,928	0
Turtle Creek Borough	32	$4,225,980	135	$1,235,621	2
Upper St. Clair Township	86	$26,599,510	47	$1,094,465	0
Verona Borough	29	$5,411,563	59	$411,662	0
Versailles Borough	2	$389,269	0	$0	0
Wall Borough	10	$985,124	1	$8,997	0
West Deer Township	21	$3,527,148	32	$96,490	3
West Elizabeth Borough	6	$570,428	65	$874,728	15
West Homestead Borough	2	$631,076	3	$382	0
West Mifflin Borough	13	$2,982,970	27	$236,367	2
West View Borough	5	$635,447	2	$5,720	0
Whitaker Borough	1	$350,442	0	$0	0
White Oak Borough	18	$3,971,229	16	$66,609	0
Whitehall Borough	25	$4,644,102	10	$83,342	0
Wilkins Township	16	$2,745,193	31	$896,279	2
Wilkinsburg Borough	4	$1,001,368	1	$4,042	0
Wilmerding Borough	5	$2,268,508	2	$1,353	0
GRAND TOTAL	**3,686**	**$925,751,957**	**4,646**	**$76,500,734**	**325**

In addition, Regular Program communities are eligible to participate in the NFIP's Community Rating System (CRS). Under the CRS, policyholders can receive premium discounts of 5 to 45 percent as their

cities and towns adopt more comprehensive flood mitigation measures. Currently, there are 3 municipalities in Allegheny County that participate in CRS. They are the Etna Borough, Shaler Township, and Upper Saint Clair Township. For more information on Allegheny County's compliance with the NFIP and CRS, please see Section 5.2.1.3.

The NFIP identifies properties that frequently experience flooding. The following definition of RL and SRL properties from the Hazard Mitigation Assistance (HMA) Unified Guidance from July 2013 reflects changes made in the Biggert-Waters Flood Insurance Reform Act of 2012. A **Repetitive Loss** property is a structure covered by a contract for flood insurance made available under the NFIP that:

(a) Has incurred flood-related damage on two occasions, in which the cost of the repair, on the average, equaled or exceeded 25 percent of the market value of the structure at the time of each such flood event; and

(b) At the time of the second incidence of flood-related damage, the contract for flood insurance contains increased cost of compliance coverage. (Please note: Homes are eligible for ICC coverage after first loss, however cost for ICC is part of all policies.)

A **Severe Repetitive Loss** property is a structure that:

(a) Is covered under a contract for flood insurance made available under the NFIP; and

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

As of March 5, 2021, there were 461 repetitive loss and 46 severe repetitive loss properties in Allegheny County, 20 of which have been mitigated (PEMA, 2021). These repetitive loss properties are located in 74 of the 130 municipalities in Allegheny County. The highest concentrations of RL properties are in Pittsburgh, Millvale, Bridgeville, Ross Township, Shaler Township, and Turtle Creek, as shown in Table 4.3.3-4.

Table 4.3.3-4 **Summary of Repetitive Loss Properties**

Community Name	Occupancy					
	Single Family	2-4 Family	Assumed Condo	Other Residential	Non Residential	Grand Total
Baldwin Borough	7	2	0	0	1	10
Bell Acres Borough	1	0	0	0	0	1
Bethel Park, Municipality of	6	0	0	0	1	7
Blawnox Borough	1	0	0	0	0	1
Brackenridge Borough	0	0	0	0	0	0
Brentwood Borough	1	0	0	0	0	1

Table 4.3.3-4 **Summary of Repetitive Loss Properties**

Community Name	Occupancy					
	Single Family	2-4 Family	Assumed Condo	Other Residential	Non Residential	Grand Total
Bridgeville Borough	22	7	0	1	6	36
Carnegie Borough	6	0	0	0	1	7
Castle Shannon Borough	0	0	0	2	3	5
Cheswick Borough	0	0	0	0	0	0
Churchill Borough	1	0	0	0	0	1
Clairton City	2	0	0	0	1	3
Collier Township	4	0	0	0	1	5
Coraopolis Borough	1	0	0	0	0	1
East Deer Township	3	0	0	0	0	3
Elizabeth Borough	5	0	0	0	1	6
Elizabeth Township	8	0	0	0	1	9
Emsworth Borough	1	0	0	0	1	2
Etna Borough	12	4	0	1	2	19
Fawn Township	7	1	1	0	0	9
Findlay Township	1	0	0	0	1	2
Forest Hills Borough	2	0	0	0	0	2
Forward Township	2	0	0	0	0	2
Fox Chapel Borough	1	0	0	0	0	1
Glassport Borough	0	0	0	0	0	0
Glen Osborne Borough	4	0	0	0	0	4
Glenfield Borough	5	0	0	0	0	5
Green Tree Borough	2	0	0	0	0	2
Hampton Township	7	0	1	0	0	8
Harmar Township	10	0	0	0	0	10
Harrison Township	1	0	0	0	0	1
Jefferson Hills Borough	4	0	0	0	4	8
Kilbuck Township	1	0	0	0	1	2
Marshall Township	0	0	0	0	0	0
McCandless, Town of	3	0	0	0	1	4
McKees Rocks Borough	4	0	0	0	3	7
McKeesport, City of	2	0	0	0	1	3
Millvale Borough	32	9	0	2	4	47
Monroeville, Municipality of	3	0	0	0	0	3
Moon Township	4	0	0	0	0	4
Neville Township	1	0	0	0	0	1
North Fayette Township	5	0	0	0	1	6
North Versailles Township	1	2	0	0	1	4

Table 4.3.3-4 **Summary of Repetitive Loss Properties**

Community Name	Occupancy					
	Single Family	2-4 Family	Assumed Condo	Other Residential	Non Residential	Grand Total
Oakdale Borough	2	1	0	0	3	6
Oakmont Borough	1	0	0	0	0	1
O'Hara Township	2	0	0	0	0	2
Penn Hills, Municipality of	2	0	0	0	5	7
Pine Township	0	0	0	0	0	0
Pitcairn Borough	0	1	0	0	1	2
Pittsburgh, City of	27	6	0	1	19	53
Pleasant Hills Borough	1	0	0	0	1	2
Plum Borough	2	0	0	0	4	6
Reserve Township	1	0	0	0	0	1
Richland Township	1	0	0	0	0	1
Robinson Township	0	0	0	0	4	4
Ross Township	13	0	0	1	10	24
Scott Township	2	0	0	0	1	3
Sewickley Borough	1	0	0	0	1	2
Shaler Township	18	1	0	0	4	23
Sharpsburg Borough	2	1	0	0	3	6
South Fayette Township	5	0	0	0	1	6
South Park Township	3	1	0	0	3	7
Stowe Township	0	0	0	0	1	1
Tarentum Borough	1	0	0	0	0	1
Thornburg Borough	1	0	0	0	0	1
Turtle Creek Borough	16	5	0	0	1	22
Upper St. Clair Township	3	0	0	0	3	6
Verona Borough	4	1	0	0	2	7
West Deer Township	1	0	0	0	1	2
West Elizabeth Borough	5	0	0	0	0	5
West Mifflin Borough	3	0	0	0	1	4
Whitehall Borough	0	0	0	0	0	0
Wilkins Township	3	0	0	0	1	4
Grand Total	**303**	**42**	**2**	**8**	**106**	**461**

Table 4.3.3-5 shows the number of severe repetitive loss properties by municipality and property type.

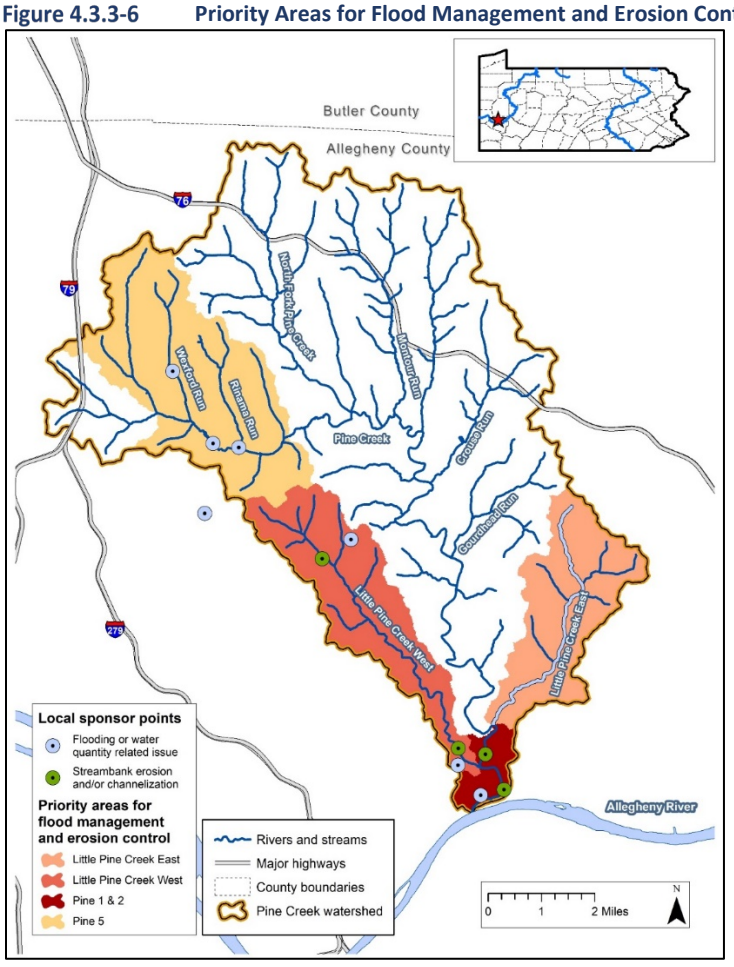
Table 4.3.3-5 **Summary of Severe Repetitive Loss Properties**

Community Name	Occupancy				
	Single Family	2-4 Family	Assumed Condo	Non Residential	Grand Total
Baldwin Borough	1	0	0	1	2
Bethel Park, Municipality of	0	0	0	1	1
Bridgeville Borough	1	0	0	1	2
Elizabeth Borough	1	0	0	1	2
Elizabeth Township	0	0	0	1	1
Etna Borough	0	0	0	1	1
Fawn Township	0	0	1	0	1
Hampton Township	0	0	1	0	1
Harmar Township	2	0	0	0	2
Jefferson Hills Borough	2	0	0	2	4
McCandless, Town of	0	0	0	1	1
Millvale Borough	0	0	0	1	1
North Fayette Township	2	0	0	0	2
Pitcairn Borough	0	0	0	1	1
Pittsburgh, City of	2	1	0	5	8
Plum Borough	0	0	0	1	1
Ross Township	3	0	0	2	5
Shaler Township	2	0	0	0	2
South Park Township	2	0	0	2	4
Turtle Creek Borough	3	1	0	0	4
Grand Total	**21**	**2**	**2**	**21**	**46**

In 2020 the Pine Creek Water Quality Improvement Plan was drafted to help prioritize specific subwatersheds in which to target best management practices that address causes and sources of water quality impairments, with the goal of improving these impaired segments to meet water quality standards. In this plan priority areas for flood management were chosen in the Pine Creek Watershed, which encompasses part of Allegheny County, based on past flooding and stream channel issues. Table 4.3.3-6 outlines the areas of the watershed that have experienced flood issues in the past, and Figure 4.3.3-6 illustrates where these problem areas have been identified by stakeholders. In the Pine Creek Watershed streams that have experienced past flood events include Little Pine Creek East, Little Pine Creek West, Pine 1 &2 and Pine 5. Mitigation Action number 142 looks to address priority areas in the Pine Creek Watershed.

Table 4.3.3-6	Priority Areas for Flood Management and Erosion Control in the Pine Creek Watershed	
Priority area for flood management and erosion control	**Issue/concern**	**Rationale**
Little Pine Creek East	Flooding along stream and streambank erosion	Stakeholders identified areas of flooding and large debris moving along this tributary to downstream communities
Little Pine Creek West	Flooding along stream and stream channelization	Stakeholders identified areas of flooding and stream channelization on this tributary to downstream communities.
Pine 1 & 2	Flooding along stream and streambank erosion	Stakeholders identified numerous areas of extreme flooding within these subwatersheds. Subwatersheds combined into one priority area due to their size.
Pine 5	Localized flooding in neighborhoods and streets	Stakeholders identified areas of flooding within residential areas

Figure 4.3.3-6 Priority Areas for Flood Management and Erosion Control in the Pine Creek Watershed



4.3.3.4. Future Occurrence

In Allegheny County, flooding occurs commonly and can occur during any season of the year. Therefore, the future occurrence of floods in Allegheny County can be characterized as highly likely as defined by the Risk Factor Methodology probability criteria (see Table 4.4-1).

Floods are described in terms of their extent (including the horizontal area affected and the vertical depth of floodwaters) and the related probability of occurrence. The NFIP recognizes the 1%-annual-chance flood, also known as the base flood, as the standard for identifying properties subject to federal flood insurance purchase requirements. 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. A specific flood that is used for a number of purposes is called the —base flood, which has a one percent chance of occurring in any particular year. The base flood is often referred to as the "100-year flood" since its probability of occurrence suggests it should reoccur once every 100 years, although this is not the case in practice. Experiencing a 100-year flood does not mean a similar flood cannot happen for the next 99 years; rather it reflects the probability that over a long period of time, a flood of that magnitude has a one percent chance of occurring in any given year. It is therefore referred to in this document as the 1%-chance flood Table 4.3.3-6 shows a range of flood recurrence intervals and associated probabilities of occurrence.

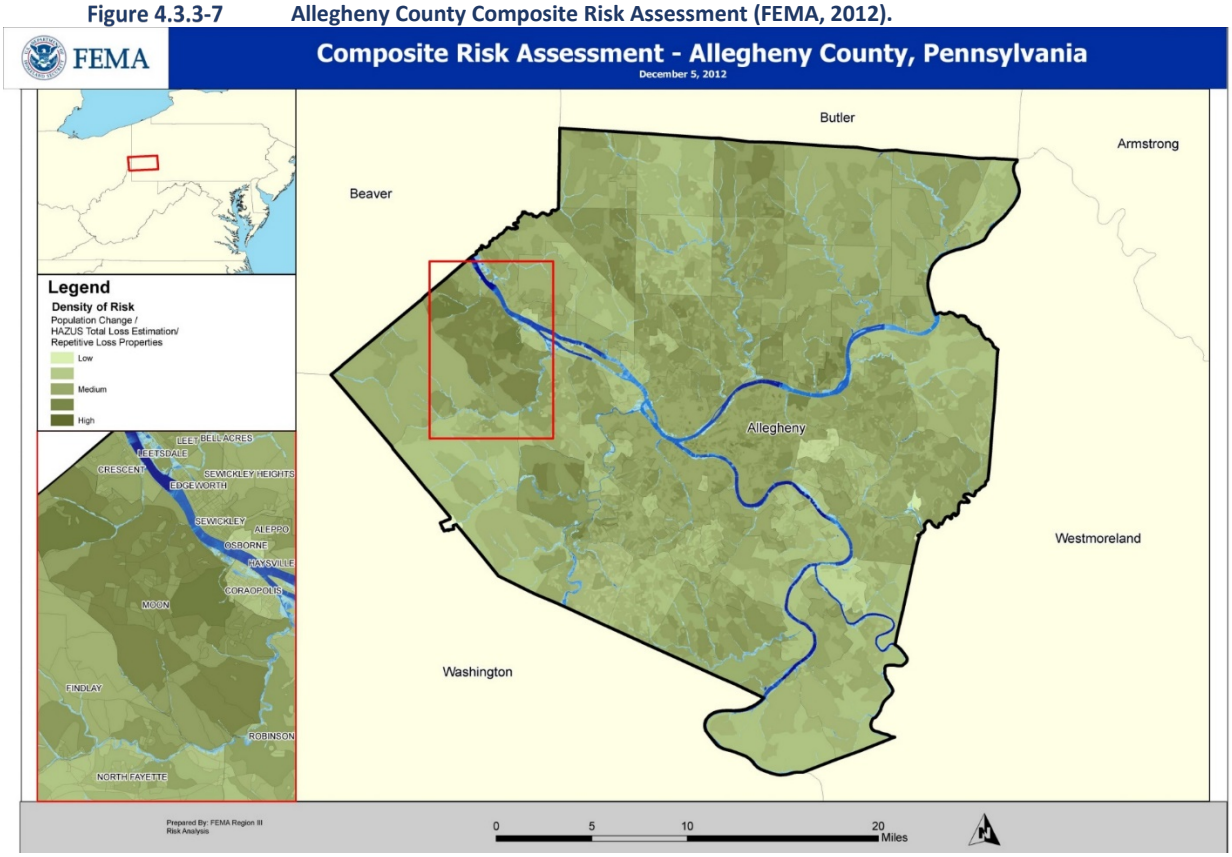
Table 4.3.3-7 **Recurrence Intervals and Associated Probabilities of Occurrence (FEMA, 2009).**

Recurrence Interval	Chance of Occurrence in Any Given Year (%)
10 year	10
50 year	2
100 year	1
500 year	0.2

DFIRMs and FIRMs published by FEMA can be used to identify areas subject to the 1%- and 0.2%-annual-chance flooding. Areas subject to 2%- and 10%-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 associated Flood Insurance Study Reports. The most recent Flood Insurance Study for each county in Pennsylvania is available from the FEMA Map Service Center.

In addition to the flood recurrence intervals, during the Risk MAP process, FEMA conducted a composite risk assessment that identified areas of the county by 'density of risk' – a measure incorporating population change, total economic losses calculated by Hazus, and repetitive loss properties. Figure 4.3.3-5 shows this Composite Risk Assessment, indicating that some of the areas of densest risk are north and west of Pittsburgh out the I-376 corridor and near the Pittsburgh Airport.

Figure 4.3.3-7 Allegheny County Composite Risk Assessment (FEMA, 2012).



Changing weather patterns have made many types of disasters more frequent and extreme. As frequent and intense rainfalls increase, more severe flooding is being seen in many areas across the State. In general, hazardous precipitation events are increasing in this region. This can also lead to higher instances of flash flooding and river overflow. Climate Central predicts that precipitation rates will more than double in the region surrounding the City of Pittsburgh by 2050, which will have a large impact on localized flooding (Climate Central, 2019). In response to changing weather patterns the City of Pittsburgh adopted the Pittsburgh Climate Action Plan 3.0 in 2017. By focusing on reducing Green House Gas emissions, the City is contributing its part to slow the effects of climate change and its impact on changing temperatures and more frequent storms. Specific projects include increasing tree coverage and implementing green stormwater infrastructure which can help reduce flood risk (City of Pittsburgh, 2017).

In 2017 PennDOT conducted an Extreme Weather Vulnerability Study which looks at how changing weather patterns could increase flooding and flood vulnerability. This study focuses on the evaluation of historic vulnerabilities, development of a framework for addressing climate change impacts, and an initial assessment of risks and priorities related to the identified vulnerabilities. To conduct this evaluation FEMA FIRM data was used. It was converted to depth grids and modeled into future flood scenarios using FIRM data and climate model projections for 2100. Table 4.3.3-7 below shows the structures projected to be vulnerable to flooding based on the 2100 projections compared to the structures vulnerable to flooding based on the current Special Flood Hazard Area. Map 4.3.3-7 calls out areas in Allegheny County that are

projected to experience the most significant change in vulnerability including areas in and around Pittsburgh, the upper Allegheny River near Frazer Township, along the Monongahela River in and around the City of McKeesport and areas near Lebanon Township.

Table 4.3.3-8 **Projected Changes in Flood Vulnerability Due to Impacts of Climate Change**

Municipality	Total Structures in SFHA 2020	Projected Structures in SFHA 2100	Difference	Percent Change
Aleppo Township	2	0	-2	0%
Aspinwall Borough	1	2	1	50%
Avalon Borough	11	0	-11	0%
Baldwin Borough	37	38	1	3%
Baldwin Township	28	0	-28	0%
Bell Acres Borough	11	9	-2	-22%
Bellevue Borough	0	0	0	0%
Ben Avon Borough	9	4	-5	-125%
Ben Avon Heights Borough	0	0	0	0%
Bethel Park, Municipality of	4	4	0	0%
Blawnox Borough	26	58	32	55%
Brackenridge Borough	85	133	48	36%
Braddock Borough	32	82	50	61%
Braddock Hills Borough	0	0	0	0%
Bradford Woods Borough	0	0	0	0%
Brentwood Borough	0	0	0	0%
Bridgeville Borough	192	210	18	9%
Carnegie Borough	35	54	19	35%
Castle Shannon Borough	25	0	-25	0%
Chalfant Borough	0	0	0	0%
Cheswick Borough	3	6	3	50%
Churchill Borough	2	0	-2	0%
Clairton, City of	0	0	0	0%
Collier Township	51	44	-7	-16%
Coraopolis Borough	187	382	195	51%
Crafton Borough	5	1	-4	-400%
Crescent Township	20	36	16	44%
Dormont Borough	0	0	0	0%
Dravosburg Borough	32	34	2	6%
Duquesne, City of	0	0	0	0%
East Deer Township	151	74	-77	-104%
East McKeesport Borough	0	0	0	0%
East Pittsburgh Borough	0	0	0	0%
Edgewood Borough	0	0	0	0%

Table 4.3.3-8 **Projected Changes in Flood Vulnerability Due to Impacts of Climate Change**

Municipality	Total Structures in SFHA 2020	Projected Structures in SFHA 2100	Difference	Percent Change
Edgeworth Borough	2	3	1	33%
Elizabeth Borough	45	57	12	21%
Elizabeth Township	304	356	52	15%
Emsworth Borough	29	35	6	17%
Etna Borough	372	390	18	5%
Fawn Township	68	56	-12	-21%
Findlay Township	79	78	-1	-1%
Forest Hills Borough	0	0	0	0%
Forward Township	55	48	-7	-15%
Fox Chapel Borough	3	3	0	0%
Franklin Park Borough	5	0	-5	0%
Frazer Township	1	0	-1	0%
Glassport Borough	2	2	0	0%
Glen Osborne Borough	25	25	0	0%
Glenfield Borough	64	61	-3	-5%
Green Tree Borough	0	0	0	0%
Hampton Township	66	62	-4	-6%
Harmar Township	14	24	10	42%
Harrison Township	14	20	6	30%
Haysville Borough	19	19	0	0%
Heidelberg Borough	40	69	29	42%
Homestead Borough	0	0	0	0%
Indiana Township	38	23	-15	-65%
Ingram Borough	0	0	0	0%
Jefferson Hills Borough	58	56	-2	-4%
Kennedy Township	3	3	0	0%
Kilbuck Township	10	12	2	17%
Leet Township	50	65	15	23%
Leetsdale Borough	74	187	113	60%
Liberty Borough	0	0	0	0%
Lincoln Borough	6	6	0	0%
Marshall Township	49	51	2	4%
McCandless, Town of	38	31	-7	-23%
McDonald Borough	1	9	8	89%
McKees Rocks Borough	210	415	205	49%
McKeesport, City of	137	73	-64	-88%
Millvale Borough	470	575	105	18%

Table 4.3.3-8 **Projected Changes in Flood Vulnerability Due to Impacts of Climate Change**

Municipality	Total Structures in SFHA 2020	Projected Structures in SFHA 2100	Difference	Percent Change
Monroeville, Municipality of	20	24	4	17%
Moon Township	41	11	-30	-273%
Mount Lebanon, Municipality of	3	0	-3	0%
Mount Oliver Borough	0	0	0	0%
Munhall Borough	46	0	-46	0%
Neville Township	128	315	187	59%
North Braddock Borough	1	1	0	0%
North Fayette Township	73	47	-26	-55%
North Versailles Township	17	15	-2	-13%
Oakdale Borough	91	97	6	6%
Oakmont Borough	99	132	33	25%
O'Hara Township	110	91	-19	-21%
Ohio Township	7	5	-2	-40%
Penn Hills, Municipality of	18	27	9	33%
Pennsbury Village Borough	0	0	0	0%
Pine Township	1	0	-1	0%
Pitcairn Borough	220	267	47	18%
Pittsburgh, City of	731	946	215	23%
Pleasant Hills Borough	0	0	0	0%
Plum Borough	68	67	-1	-1%
Port Vue Borough	8	4	-4	-100%
Rankin Borough	0	3	3	100%
Reserve Township	31	48	17	35%
Richland Township	8	0	-8	0%
Robinson Township	52	51	-1	-2%
Ross Township	90	99	9	9%
Rosslyn Farms Borough	0	2	2	100%
Scott Township	54	69	15	22%
Sewickley Borough	8	18	10	56%
Sewickley Heights	2	0	-2	0%
Sewickley Hills Borough	4	0	-4	0%
Shaler Township	315	330	15	5%
Sharpsburg Borough	278	711	433	61%
South Fayette Township	101	88	-13	-15%
South Park Township	43	25	-18	-72%
South Versailles Township	17	24	7	29%

Table 4.3.3-8 **Projected Changes in Flood Vulnerability Due to Impacts of Climate Change**

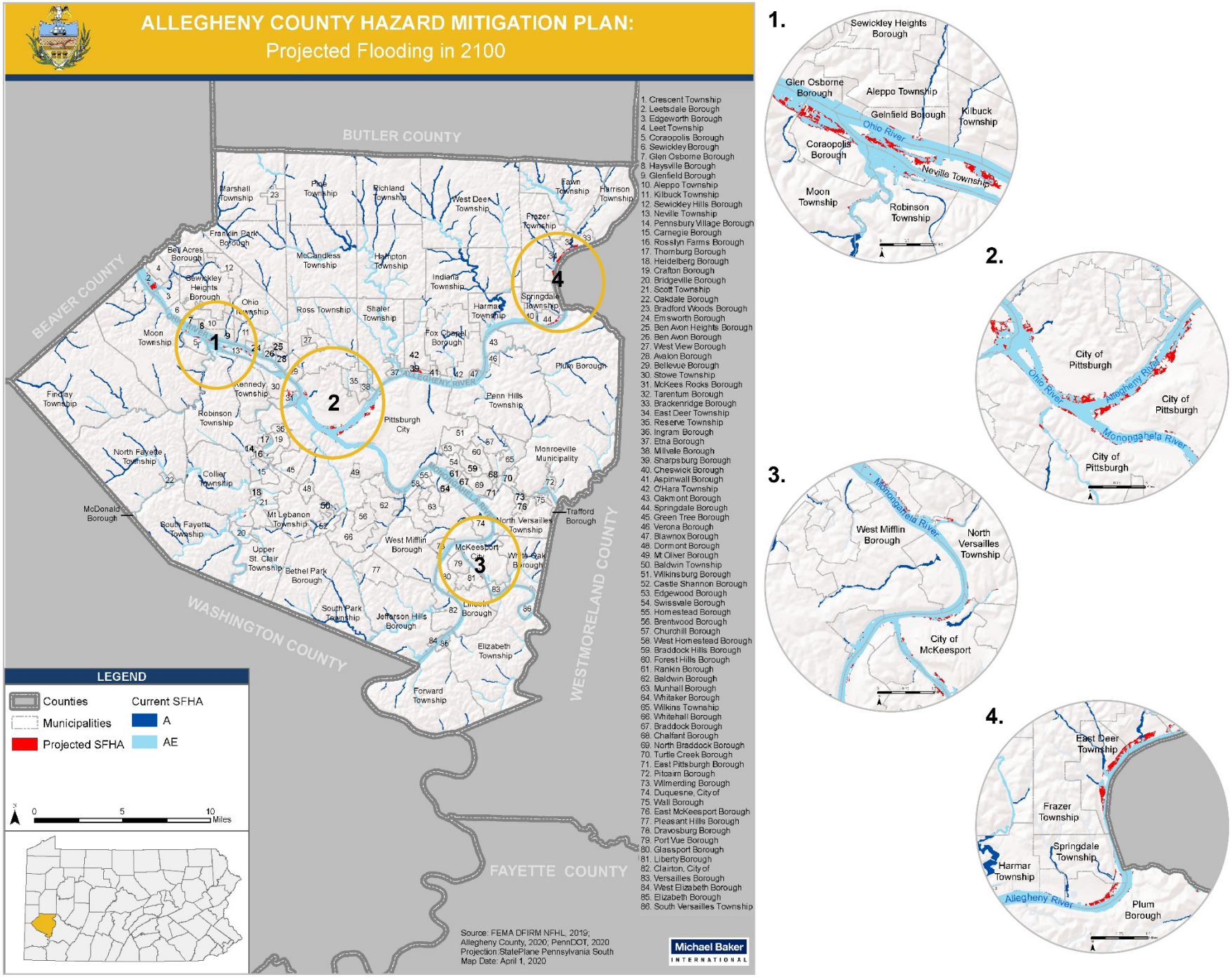
Municipality	Total Structures in SFHA 2020	Projected Structures in SFHA 2100	Difference	Percent Change
Springdale Borough	0	9	9	100%
Springdale Township	1	0	-1	0%
Stowe Township	0	2	2	100%
Swissvale Borough	2	2	0	0%
Tarentum Borough	44	144	100	69%
Thornburg Borough	0	0	0	0%
Trafford Borough	0	0	0	0%
Turtle Creek Borough	172	174	2	1%
Upper St. Clair Township	40	31	-9	-29%
Verona Borough	133	157	24	15%
Versailles Borough	1	2	1	50%
Wall Borough	19	6	-13	-217%
West Deer Township	39	39	0	0%
West Elizabeth Borough	90	114	24	21%
West Homestead Borough	12	1	-11	-1100%
West Mifflin Borough	31	2	-29	-1450%
West View Borough	0	0	0	0%
Whitaker Borough	0	0	0	0%
White Oak Borough	25	21	-4	-19%
Whitehall Borough	1	0	-1	0%
Wilkins Township	52	64	12	19%
Wilkinsburg Borough	0	0	0	0%
Wilmerding Borough	2	7	5	71%
Grand Total	**6,649**	**8,277**	1,628	20%

Current projections (for instance to 2100) show municipalities such as Coraopolis, Leetsdale, McKees Rocks, Sharpsburg, Blawnox, McDonald, Rankin, Rosslyn Farms, Sewickley, Springdale, Tarentum, and Wilmerding Boroughs and Neville and Stowe Township expected to see a greater than 50% increase in the number of structures in the SFHA. The County is encouraging these municipalities to apply for BRIC grant funding to support hazard mitigation projects, reducing the risks that face from disasters. The program supports communities through capability- and capacity-building; encouraging and enabling innovation; promoting partnerships; enabling large projects; maintaining flexibility; and providing consistency.

All municipalities except Blawnox, McDonald, Rankin, Rosslyn Farms, Springdale, and Wilmerding Boroughs and Stowe Township have selected actions to reduce the possibility of damage and loss of function to community-identified critical facilities in the floodplain (Action 92). Blawnox Borough has selected to review EAPs of dams to conform with DEP standards and include additional information as

needed (Action 15). Rosslyn Farms Borough has continued to identify properties in the community at high risk of flooding for purposes of property protection (Action 5).

Figure 4.3.3-8 Projected Flooding in 2100



This study also includes a planning-level analysis to evaluate flooding inundation of state-owned roadways and bridges based on existing Federal Emergency Management Agency (FEMA) one percent-chance flood zone maps and climate model projections for Pennsylvania. Based on this study major roadways around Pittsburgh seem to be most vulnerable to flooding impacts. While there are bridges vulnerable to flooding throughout the County there is a cluster of vulnerable bridges along route 51 near Mount Oliver. A publicly available map showing the findings of this analysis for Allegheny County can be found at this link: http://s3.amazonaws.com/tmp-map/climate/allegheny-future-conditions.html

4.3.3.5. Vulnerability Assessment

Allegheny County is vulnerable to flooding that causes loss of lives, property damage, and road closures. For purposes of assessing vulnerability, the County focused on community assets that are located in the 1%-annual-chance floodplain. While greater and smaller floods are possible, information about the extent and depths for this floodplain is available for all municipalities countywide, thus providing a consistent basis for analysis. Flood vulnerability maps for each applicable local municipality, showing the 1%-annual-chance flood hazard area and addressable structures, critical facilities and transportation routes within it, are included in Appendix D. These maps were created using the 2014 Effective DFIRM data.

Flood events are also a major cause for road closures in the County and its municipalities. Affected areas of roadway may vary from a few feet for only a few hours (as in the case of flash flooding) to several hundred feet for a few days (as in the case of riverine flooding). Road closures limit accessibility to certain areas of the County, which in turn delays the provision of emergency services to the residents in those areas. In addition, despite posted signs warning drivers to stay out of floodwaters, inevitably there are individuals who must be rescued from their cars that become stranded in floodwaters.

Other concerns during a flood include the safety of mobile homes and trailers, as they are typically lightweight and unanchored, and of hazardous material facilities. Table 4.3.3-7 provides the number of mobile homes and SARA facilities in the floodplain by jurisdiction. For more information on the number of mobile homes in each community, see Section 4.3.9.5; for the vulnerability of specific SARA facilities, see Appendix E.

Table 4.3.3-9 **Mobile home flood vulnerability in Allegheny County.**

Municipality	Total Mobile Homes	Total Mobile Homes in SFHA	Percent Mobile Homes in SFHA	SARA Facilities	SARA Facilities in SFHA	Percent SARA Facilities in SFHA
Aleppo Township	0	0	0%	0	0	0%
Aspinwall Borough	0	0	0%	0	0	0%
Avalon Borough	0	0	0%	1	0	0%
Baldwin Borough	0	0	0%	1	0	0%
Baldwin Township	0	0	0%	0	0	0%
Bell Acres Borough	5	1	20%	1	0	0%
Bellevue Borough	0	0	0%	1	0	0%
Ben Avon Borough	0	0	0%	0	0	0%

Table 4.3.3-9 **Mobile home flood vulnerability in Allegheny County.**

Municipality	Total Mobile Homes	Total Mobile Homes in SFHA	Percent Mobile Homes in SFHA	SARA Facilities	SARA Facilities in SFHA	Percent SARA Facilities in SFHA
Ben Avon Heights Borough	0	0	0%	0	0	0%
Bethel Park, Municipality of	2	0	0%	6	0	0%
Blawnox Borough	0	0	0%	1	0	0%
Brackenridge Borough	3	0	0%	2	1	50%
Braddock Borough	0	0	0%	3	0	0%
Braddock Hills Borough	0	0	0%	0	0	0%
Bradford Woods Borough	0	0	0%	0	0	0%
Brentwood Borough	0	0	0%	2	0	0%
Bridgeville Borough	0	0	0%	1	0	0%
Carnegie Borough	0	0	0%	5	0	0%
Castle Shannon Borough	0	0	0%	1	0	0%
Chalfant Borough	0	0	0%	0	0	0%
Cheswick Borough	0	0	0%	0	0	0%
Churchill Borough	0	0	0%	0	0	0%
Clairton, City of	0	0	0%	4	0	0%
Collier Township	320	0	0%	6	1	17%
Coraopolis Borough	0	0	0%	3	1	33%
Crafton Borough	0	0	0%	1	0	0%
Crescent Township	36	3	8%	0	0	0%
Dormont Borough	0	0	0%	2	0	0%
Dravosburg Borough	0	0	0%	1	0	0%
Duquesne, City of	7	0	0%	3	0	0%
East Deer Township	2	1	50%	4	3	75%
East McKeesport Borough	1	0	0%	1	0	0%
East Pittsburgh Borough	0	0	0%	0	0	0%
Edgewood Borough	0	0	0%	0	0	0%
Edgeworth Borough	0	0	0%	0	0	0%
Elizabeth Borough	1	0	0%	1	0	0%
Elizabeth Township	84	3	4%	6	0	0%
Emsworth Borough	0	0	0%	1	0	0%
Etna Borough	0	0	0%	1	1	100%
Fawn Township	52	3	6%	3	1	33%
Findlay Township	73	1	1%	15	0	0%
Forest Hills Borough	0	0	0%	0	0	0%

Table 4.3.3-9 **Mobile home flood vulnerability in Allegheny County.**

Municipality	Total Mobile Homes	Total Mobile Homes in SFHA	Percent Mobile Homes in SFHA	SARA Facilities	SARA Facilities in SFHA	Percent SARA Facilities in SFHA
Forward Township	268	4	1%	3	0	0%
Fox Chapel Borough	0	0	0%	2	0	0%
Franklin Park Borough	1	0	0%	0	0	0%
Frazer Township	50	0	0%	7	0	0%
Glassport Borough	1	0	0%	4	0	0%
Glen Osborne Borough	0	0	0%	0	0	0%
Glenfield Borough	0	0	0%	0	0	0%
Green Tree Borough	0	0	0%	1	0	0%
Hampton Township	3	0	0%	5	1	20%
Harmar Township	102	0	0%	11	0	0%
Harrison Township	7	1	14%	2	0	0%
Haysville Borough	0	0	0%	0	0	0%
Heidelberg Borough	0	0	0%	0	0	0%
Homestead Borough	0	0	0%	1	0	0%
Indiana Township	166	1	1%	11	0	0%
Ingram Borough	0	0	0%	0	0	0%
Jefferson Hills Borough	62	1	2%	8	2	25%
Kennedy Township	0	0	0%	4	0	0%
Kilbuck Township	0	0	0%	0	0	0%
Leet Township	0	0	0%	0	0	0%
Leetsdale Borough	0	0	0%	7	1	14%
Liberty Borough	0	0	0%	0	0	0%
Lincoln Borough	20	1	5%	0	0	0%
Marshall Township	0	0	0%	5	0	0%
McCandless, Town of	2	0	0%	3	0	0%
McDonald Borough	1	0	0%	0	0	0%
McKees Rocks Borough	0	0	0%	2	0	0%
McKeesport, City of	0	0	0%	5	0	0%
Millvale Borough	0	0	0%	1	0	0%
Monroeville, Municipality of	27	1	4%	17	1	6%
Moon Township	17	7	41%	8	1	13%
Mount Lebanon, Municipality of	0	0	0%	0	0	0%
Mount Oliver Borough	0	0	0%	1	0	0%
Munhall Borough	0	0	0%	1	0	0%

Table 4.3.3-9 **Mobile home flood vulnerability in Allegheny County.**

Municipality	Total Mobile Homes	Total Mobile Homes in SFHA	Percent Mobile Homes in SFHA	SARA Facilities	SARA Facilities in SFHA	Percent SARA Facilities in SFHA
Neville Township	0	0	0%	19	5	26%
North Braddock Borough	0	0	0%	3	0	0%
North Fayette Township	915	25	3%	6	0	0%
North Versailles Township	12	0	0%	2	0	0%
Oakdale Borough	0	0	0%	1	0	0%
Oakmont Borough	0	0	0%	3	0	0%
O'Hara Township	0	0	0%	14	1	7%
Ohio Township	0	0	0%	4	0	0%
Penn Hills, Municipality of	4	0	0%	8	0	0%
Pennsbury Village Borough	0	0	0%	0	0	0%
Pine Township	0	0	0%	2	0	0%
Pitcairn Borough	3	0	0%	0	0	0%
Pittsburgh, City of	84	0	0%	99	7	7%
Pleasant Hills Borough	0	0	0%	1	0	0%
Plum Borough	241	42	17%	14	1	7%
Port Vue Borough	0	0	0%	1	0	0%
Rankin Borough	0	0	0%	1	0	0%
Reserve Township	0	0	0%	0	0	0%
Richland Township	64	0	0%	1	0	0%
Robinson Township	268	0	0%	11	0	0%
Ross Township	1	0	0%	4	0	0%
Rosslyn Farms Borough	0	0	0%	0	0	0%
Scott Township	0	0	0%	1	0	0%
Sewickley Borough	0	0	0%	4	1	25%
Sewickley Heights	0	0	0%	0	0	0%
Sewickley Hills Borough	0	0	0%	0	0	0%
Shaler Township	66	1	2%	5	3	60%
Sharpsburg Borough	0	0	0%	1	0	0%
South Fayette Township	6	1	17%	7	0	0%
South Park Township	0	0	0%	1	0	0%
South Versailles Township	12	0	0%	0	0	0%
Springdale Borough	3	0	0%	7	0	0%
Springdale Township	84	0	0%	1	0	0%
Stowe Township	0	0	0%	5	0	0%
Swissvale Borough	0	0	0%	1	0	0%

Table 4.3.3-9 **Mobile home flood vulnerability in Allegheny County.**

Municipality	Total Mobile Homes	Total Mobile Homes in SFHA	Percent Mobile Homes in SFHA	SARA Facilities	SARA Facilities in SFHA	Percent SARA Facilities in SFHA
Tarentum Borough	5	0	0%	6	3	50%
Thornburg Borough	0	0	0%	1	0	0%
Trafford Borough	1	0	0%	0	0	0%
Turtle Creek Borough	0	0	0%	3	0	0%
Upper St. Clair Township	0	0	0%	2	0	0%
Verona Borough	0	0	0%	1	0	0%
Versailles Borough	0	0	0%	0	0	0%
Wall Borough	3	0	0%	1	0	0%
West Deer Township	164	0	0%	4	0	0%
West Elizabeth Borough	50	25	50%	3	0	0%
West Homestead Borough	0	0	0%	2	0	0%
West Mifflin Borough	170	5	3%	21	0	0%
West View Borough	0	0	0%	1	0	0%
Whitaker Borough	0	0	0%	0	0	0%
White Oak Borough	68	0	0%	1	0	0%
Whitehall Borough	0	0	0%	3	0	0%
Wilkins Township	0	0	0%	3	0	0%
Wilkinsburg Borough	0	0	0%	2	0	0%
Wilmerding Borough	0	0	0%	1	0	0%
Grand Total	**3,537**	**127**	**2**	**468**	**35**	**7%**

Table 4.3.3-8 displays the number of structures, critical facilities, and populations intersecting the SFHA. The number of vulnerable structures was calculated by overlaying the structures with the SFHA. Similarly, the estimated population in the SFHA was calculated by overlaying the centroids of the 2018 Census blocks with the SFHA; while clearly an estimate, using the block centroid helps to minimize overestimation of floodprone populations. One community, Glenfield Borough, has more than half of its structures in the SFHA, and Haysville, Millvale, and West Elizabeth Boroughs all have over 25% of their structures in the floodplain. Countywide, 5% of the county-defined critical facilities are located in the SFHA, a total of 109 facilities. Table 4.3.3-9 shows the number of structures in the SFHA by generalized land use type. Unsurprisingly, most vulnerable structures are residential properties.

Table 4.3.3-10 **Community flood vulnerability in Allegheny County.**

Municipality	Total Structures	Total Structures in SFHA	Percent Structures in SFHA	Total Critical Facilities	Critical Facilities in SFHA	Percent Critical Facilities in SFHA	Total Estimated 2018 Population	Population in SFHA	Percent Population in SFHA
Aleppo Township	904	2	0%	7	0	0%	300	0	0%
Aspinwall Borough	1,256	1	0%	6	0	0%	280	0	0%
Avalon Borough	2,359	11	0%	8	0	0%	410	0	0%
Baldwin Borough	9,159	37	0%	18	0	0%	1,410	0	0%
Baldwin Township	946	28	3%	3	0	0%	200	0	0%
Bell Acres Borough	625	11	2%	8	1	13%	400	0	0%
Bellevue Borough	3,005	0	0%	15	0	0%	790	0	0%
Ben Avon Borough	759	9	1%	3	0	0%	500	0	0%
Ben Avon Heights Borough	144	0	0%	1	0	0%	200	0	0%
Bethel Park, Municipality of	13,201	4	0%	34	0	0%	3,040	0	0%
Blawnox Borough	694	26	4%	7	0	0%	250	0	0%
Brackenridge Borough	1,538	85	6%	9	2	22%	290	60	21%
Braddock Borough	1,244	32	3%	9	0	0%	200	20	10%
Braddock Hills Borough	868	0	0%	5	0	0%	250	0	0%
Bradford Woods Borough	507	0	0%	4	0	0%	350	0	0%
Brentwood Borough	4,263	0	0%	14	0	0%	580	0	0%
Bridgeville Borough	2,277	192	8%	6	0	0%	600	150	25%
Carnegie Borough	3,748	35	1%	13	0	0%	790	0	0%
Castle Shannon Borough	3,698	25	1%	8	0	0%	530	0	0%
Chalfant Borough	417	0	0%	2	0	0%	200	0	0%
Cheswick Borough	904	3	0%	6	0	0%	450	0	0%
Churchill Borough	1,500	2	0%	6	0	0%	160	0	0%
Clairton, City of	4,008	0	0%	15	1	7%	170	80	47%
Collier Township	4,512	51	1%	23	2	9%	690	0	0%

Table 4.3.3-10 **Community flood vulnerability in Allegheny County.**

Municipality	Total Structures	Total Structures in SFHA	Percent Structures in SFHA	Total Critical Facilities	Critical Facilities in SFHA	Percent Critical Facilities in SFHA	Total Estimated 2018 Population	Population in SFHA	Percent Population in SFHA
Coraopolis Borough	2,666	187	7%	13	2	15%	500	0	0%
Crafton Borough	2,547	5	0%	6	0	0%	580	0	0%
Crescent Township	1,165	20	2%	3	0	0%	450	0	0%
Dormont Borough	3,481	0	0%	7	0	0%	910	0	0%
Dravosburg Borough	1,043	32	3%	5	1	20%	250	0	0%
Duquesne, City of	3,158	0	0%	14	1	7%	490	0	0%
East Deer Township	792	151	19%	11	3	27%	350	0	0%
East McKeesport Borough	1,034	0	0%	4	0	0%	250	0	0%
East Pittsburgh Borough	874	0	0%	4	0	0%	180	0	0%
Edgewood Borough	1,444	0	0%	5	0	0%	550	0	0%
Edgeworth Borough	673	2	0%	6	0	0%	600	0	0%
Elizabeth Borough	704	45	6%	6	2	33%	350	0	0%
Elizabeth Township	6,119	304	5%	29	6	21%	1,020	100	10%
Emsworth Borough	1,023	29	3%	8	1	13%	400	0	0%
Etna Borough	1,638	372	23%	8	5	63%	300	150	50%
Fawn Township	1,068	68	6%	13	1	8%	350	0	0%
Findlay Township	3,382	79	2%	27	0	0%	310	0	0%
Forest Hills Borough	3,198	0	0%	9	0	0%	710	0	0%
Forward Township	1,636	55	3%	17	1	6%	250	0	0%
Fox Chapel Borough	1,972	3	0%	14	1	7%	280	0	0%
Franklin Park Borough	5,675	5	0%	14	0	0%	1050	0	0%
Frazer Township	627	1	0%	14	0	0%	250	0	0%
Glassport Borough	2,147	2	0%	12	1	8%	420	0	0%
Glen Osborne Borough	243	25	10%	3	1	33%	200	0	0%

Table 4.3.3-10 **Community flood vulnerability in Allegheny County.**

Municipality	Total Structures	Total Structures in SFHA	Percent Structures in SFHA	Total Critical Facilities	Critical Facilities in SFHA	Percent Critical Facilities in SFHA	Total Estimated 2018 Population	Population in SFHA	Percent Population in SFHA
Glenfield Borough	108	64	59%	1	0	0%	100	0	0%
Green Tree Borough	2,516	0	0%	7	0	0%	440	0	0%
Hampton Township	7,273	66	1%	39	6	15%	1,160	100	9%
Harmar Township	1,850	14	1%	24	1	4%	330	0	0%
Harrison Township	5,428	14	0%	18	0	0%	800	100	13%
Haysville Borough	51	19	37%	1	0	0%	40	0	0%
Heidelberg Borough	643	40	6%	5	0	0%	350	0	0%
Homestead Borough	1,561	0	0%	10	0	0%	220	0	0%
Indiana Township	3,496	38	1%	31	0	0%	840	0	0%
Ingram Borough	1,313	0	0%	5	0	0%	270	0	0%
Jefferson Hills Borough	5,372	58	1%	30	2	7%	850	0	0%
Kennedy Township	3,899	3	0%	20	0	0%	770	0	0%
Kilbuck Township	368	10	3%	1	0	0%	250	0	0%
Leet Township	652	50	8%	5	0	0%	450	0	0%
Leetsdale Borough	676	74	11%	13	2	15%	300	300	100%
Liberty Borough	1,156	0	0%	7	0	0%	450	0	0%
Lincoln Borough	528	6	1%	4	0	0%	250	0	0%
Marshall Township	4,312	49	1%	20	0	0%	500	0	0%
McCandless, Town of	12,640	38	0%	38	1	3%	2,450	0	0%
McDonald Borough	187	1	1%	0	0	0%	70	70	100%
McKees Rocks Borough	3,069	210	7%	7	3	43%	430	130	30%
McKeesport, City of	9,965	137	1%	47	3	6%	1,600	70	4%
Millvale Borough	1,839	470	26%	9	1	11%	260	0	0%
Monroeville, Municipality of	11,943	20	0%	71	2	3%	2,080	0	0%

Table 4.3.3-10 **Community flood vulnerability in Allegheny County.**

Municipality	Total Structures	Total Structures in SFHA	Percent Structures in SFHA	Total Critical Facilities	Critical Facilities in SFHA	Percent Critical Facilities in SFHA	Total Estimated 2018 Population	Population in SFHA	Percent Population in SFHA
Moon Township	11,002	41	0%	53	3	6%	1,970	0	0%
Mount Lebanon, Municipality of	11,685	3	0%	42	0	0%	2,800	0	0%
Mount Oliver Borough	1,508	0	0%	4	0	0%	250	0	0%
Munhall Borough	5,161	46	1%	20	1	5%	760	0	0%
Neville Township	753	128	17%	22	6	27%	250	0	0%
North Braddock Borough	2,657	1	0%	10	0	0%	450	0	0%
North Fayette Township	7,950	73	1%	28	2	7%	1,010	0	0%
North Versailles Township	4,996	17	0%	15	0	0%	530	0	0%
Oakdale Borough	675	91	13%	27	2	7%	450	450	100%
Oakmont Borough	3,140	99	3%	3	2	67%	840	0	0%
O'Hara Township	4,311	110	3%	18	0	0%	910	0	0%
Ohio Township	3,249	7	0%	17	0	0%	350	0	0%
Penn Hills, Municipality of	19,869	18	0%	52	0	0%	2,680	0	0%
Pennsbury Village Borough	503	0	0%	4	0	0%	200	0	0%
Pine Township	5,834	1	0%	23	0	0%	510	0	0%
Pitcairn Borough	1,421	220	15%	6	1	17%	230	0	0%
Pittsburgh, City of	124,624	731	1%	539	18	3%	28,800	390	1%
Pleasant Hills Borough	3,480	0	0%	8	0	0%	710	0	0%
Plum Borough	12,099	68	1%	51	2	4%	1970	0	0%
Port Vue Borough	1,816	8	0%	5	0	0%	310	0	0%
Rankin Borough	987	0	0%	4	0	0%	210	150	71%
Reserve Township	1,561	31	2%	7	0	0%	500	250	50%
Richland Township	4,660	8	0%	19	1	5%	710	0	0%
Robinson Township	7,446	52	1%	33	0	0%	1,050	0	0%

Table 4.3.3-10 **Community flood vulnerability in Allegheny County.**

Municipality	Total Structures	Total Structures in SFHA	Percent Structures in SFHA	Total Critical Facilities	Critical Facilities in SFHA	Percent Critical Facilities in SFHA	Total Estimated 2018 Population	Population in SFHA	Percent Population in SFHA
Ross Township	15,167	90	1%	45	0	0%	2,690	0	0%
Rosslyn Farms Borough	216	0	0%	3	0	0%	250	0	0%
Scott Township	6,899	54	1%	21	0	0%	1470	0	0%
Sewickley Borough	1,628	8	0%	16	2	13%	350	0	0%
Sewickley Heights	421	2	0%	3	0	0%	250	0	0%
Sewickley Hills Borough	276	4	1%	2	0	0%	250	0	0%
Shaler Township	12,786	315	2%	29	5	17%	1,680	0	0%
Sharpsburg Borough	1,563	278	18%	9	1	11%	280	120	43%
South Fayette Township	7,098	101	1%	29	1	3%	1,220	100	8%
South Park Township	5,805	43	1%	15	0	0%	1,220	0	0%
South Versailles Township	168	17	10%	2	1	50%	200	0	0%
Springdale Borough	1,728	0	0%	14	0	0%	590	0	0%
Springdale Township	859	1	0%	7	0	0%	300	0	0%
Stowe Township	3,171	0	0%	13	0	0%	420	0	0%
Swissvale Borough	4,107	2	0%	8	0	0%	800	0	0%
Tarentum Borough	2,153	44	2%	19	3	16%	250	0	0%
Thornburg Borough	190	0	0%	3	0	0%	300	0	0%
Trafford Borough	52	0	0%	1	0	0%	150	0	0%
Turtle Creek Borough	2,646	172	7%	13	0	0%	280	0	0%
Upper St. Clair Township	7,841	40	1%	28	1	4%	2,130	150	7%
Verona Borough	1,364	133	10%	7	0	0%	400	0	0%
Versailles Borough	673	1	0%	3	0	0%	400	0	0%
Wall Borough	357	19	5%	2	0	0%	200	0	0%
West Deer Township	5,665	39	1%	24	0	0%	690	0	0%

Table 4.3.3-10 **Community flood vulnerability in Allegheny County.**

Municipality	Total Structures	Total Structures in SFHA	Percent Structures in SFHA	Total Critical Facilities	Critical Facilities in SFHA	Percent Critical Facilities in SFHA	Total Estimated 2018 Population	Population in SFHA	Percent Population in SFHA
West Elizabeth Borough	284	90	32%	7	2	29%	150	150	100%
West Homestead Borough	1,114	12	1%	6	0	0%	300	0	0%
West Mifflin Borough	9,910	31	0%	54	0	0%	1,770	0	0%
West View Borough	2,668	0	0%	12	0	0%	560	0	0%
Whitaker Borough	632	0	0%	2	0	0%	250	0	0%
White Oak Borough	3,804	25	1%	12	1	8%	480	0	0%
Whitehall Borough	5,771	1	0%	19	0	0%	1360	0	0%
Wilkins Township	2,771	52	2%	11	1	9%	540	0	0%
Wilkinsburg Borough	6,994	0	0%	28	0	0%	1180	0	0%
Wilmerding Borough	916	2	0%	6	0	0%	250	0	0%
Grand Total	**550,774**	**6,649**	**1%**	**2,379**	**109**	**5%**	**111,360**	**3,090**	**3%**

Table 4.3.3-11 **Structure Vulnerability by Land Use in Allegheny County.**

Municipality	Total Structures	Agriculture	Commercial	Government	Industrial	Other	Residential	Utilities	Unknown	Grand Total
Aleppo Township	904	0	0	0	0	0	1	0	1	2
Aspinwall Borough	1,256	0	0	0	0	0	0	0	1	1
Avalon Borough	2,359	0	0	0	0	0	4	0	7	11
Baldwin Borough	9,159	0	1	0	0	0	34	0	2	37
Baldwin Township	946	0	0	0	0	0	0	0	28	28
Bell Acres Borough	625	0	1	0	1	0	9	0	0	11
Bellevue Borough	3,005	0	0	0	0	0	0	0	0	0
Ben Avon Borough	759	0	0	0	0	0	7	0	2	9
Ben Avon Heights Borough	144	0	0	0	0	0	0	0	0	0
Bethel Park, Municipality of	13,201	0	2	0	1	0	1	0	0	4

Table 4.3.3-11 **Structure Vulnerability by Land Use in Allegheny County.**

Municipality	Total Structures	Agriculture	Commercial	Government	Industrial	Other	Residential	Utilities	Unknown	Grand Total
Blawnox Borough	694	0	0	0	0	0	2	0	24	26
Brackenridge Borough	1,538	0	2	1	0	1	81	0	0	85
Braddock Borough	1,244	0	0	0	0	0	6	0	26	32
Braddock Hills Borough	868	0	0	0	0	0	0	0	0	0
Bradford Woods Borough	507	0	0	0	0	0	0	0	0	0
Brentwood Borough	4,263	0	0	0	0	0	0	0	0	0
Bridgeville Borough	2,277	0	0	1	0	0	172	0	19	192
Carnegie Borough	3,748	0	0	0	0	0	0	0	35	35
Castle Shannon Borough	3,698	0	1	0	0	0	24	0	0	25
Chalfant Borough	417	0	0	0	0	0	0	0	0	0
Cheswick Borough	904	0	0	0	3	0	0	0	0	3
Churchill Borough	1,500	0	0	0	0	0	1	0	1	2
Clairton, City of	4,008	0	0	0	0	0	0	0	0	0
Collier Township	4,512	0	1	0	0	0	8	0	42	51
Coraopolis Borough	2,666	0	0	0	0	0	113	0	74	187
Crafton Borough	2,547	0	0	0	0	0	0	0	5	5
Crescent Township	1,165	0	4	1	0	0	15	0	0	20
Dormont Borough	3,481	0	0	0	0	0	0	0	0	0
Dravosburg Borough	1,043	0	0	0	0	0	32	0	0	32
Duquesne, City of	3,158	0	0	0	0	0	0	0	0	0
East Deer Township	792	0	11	2	2	0	136	0	0	151
East McKeesport Borough	1,034	0	0	0	0	0	0	0	0	0
East Pittsburgh Borough	874	0	0	0	0	0	0	0	0	0
Edgewood Borough	1,444	0	0	0	0	0	0	0	0	0
Edgeworth Borough	673	0	1	1	0	0	0	0	0	2
Elizabeth Borough	704	0	6	1	2	0	35	1	0	45
Elizabeth Township	6,119	0	20	7	9	0	267	1	0	304

Table 4.3.3-11 **Structure Vulnerability by Land Use in Allegheny County.**

Municipality	Total Structures	Agriculture	Commercial	Government	Industrial	Other	Residential	Utilities	Unknown	Grand Total
Emsworth Borough	1,023	0	0	0	0	0	18	0	11	29
Etna Borough	1,638	4	9	2	0	0	331	0	26	372
Fawn Township	1,068	0	7	1	1	0	59	0	0	68
Findlay Township	3,382	0	35	0	4	0	40	0	0	79
Forest Hills Borough	3,198	0	0	0	0	0	0	0	0	0
Forward Township	1,636	0	5	1	2	0	46	1	0	55
Fox Chapel Borough	1,972	0	0	0	0	0	2	0	1	3
Franklin Park Borough	5,675	1	1	0	0	0	3	0	0	5
Frazer Township	627	0	0	0	0	0	1	0	0	1
Glassport Borough	2,147	0	0	0	1	0	1	0	0	2
Glen Osborne Borough	243	0	0	0	0	0	25	0	0	25
Glenfield Borough	108	0	0	0	0	0	10	0	54	64
Green Tree Borough	2,516	0	0	0	0	0	0	0	0	0
Hampton Township	7,273	0	30	5	7	0	24	0	0	66
Harmar Township	1,850	0	1	1	2	0	6	0	4	14
Harrison Township	5,428	0	0	0	0	0	13	1	0	14
Haysville Borough	51	0	0	0	0	0	19	0	0	19
Heidelberg Borough	643	0	0	0	0	0	0	0	40	40
Homestead Borough	1,561	0	0	0	0	0	0	0	0	0
Indiana Township	3,496	1	7	0	6	0	22	0	2	38
Ingram Borough	1,313	0	0	0	0	0	0	0	0	0
Jefferson Hills Borough	5,372	0	17	0	16	0	25	0	0	58
Kennedy Township	3,899	0	0	0	0	0	0	0	3	3
Kilbuck Township	368	0	0	0	0	0	2	0	8	10
Leet Township	652	0	2	0	1	0	47	0	0	50
Leetsdale Borough	676	0	24	1	35	0	13	1	0	74
Liberty Borough	1,156	0	0	0	0	0	0	0	0	0

Table 4.3.3-11 **Structure Vulnerability by Land Use in Allegheny County.**

Municipality	Total Structures	Agriculture	Commercial	Government	Industrial	Other	Residential	Utilities	Unknown	Grand Total
Lincoln Borough	528	0	3	0	1	0	1	1	0	6
Marshall Township	4,312	0	27	2	0	0	20	0	0	49
McCandless, Town of	12,640	0	10	5	0	0	23	0	0	38
McDonald Borough	187	0	0	0	0	0	1	0	0	1
McKees Rocks Borough	3,069	0	0	0	0	0	0	0	180	210
McKeesport, City of	9,965	0	5	1	0	0	48	1	82	137
Millvale Borough	1,839	0	1	0	0	0	2	0	444	470
Monroeville, Municipality of	11,943	0	8	1	0	0	11	0	0	20
Moon Township	11,002	0	11	2	0	0	27	0	1	41
Mount Lebanon, Municipality of	11,685	0	0	0	0	0	2	0	1	3
Mount Oliver Borough	1,508	0	0	0	0	0	0	0	0	0
Munhall Borough	5,161	0	0	0	0	0	2	0	44	46
Neville Township	753	0	0	0	0	0	15	0	113	128
North Braddock Borough	2,657	0	0	0	0	0	1	0	0	1
North Fayette Township	7,950	0	9	1	2	0	48	0	13	73
North Versailles Township	4,996	0	0	0	0	0	0	0	17	17
Oakdale Borough	675	0	0	0	0	0	20	0	71	91
Oakmont Borough	3,140	0	0	0	0	0	85	0	14	99
O'Hara Township	4,311	0	8	2	1	0	75	0	24	110
Ohio Township	3,249	0	0	0	0	0	5	0	2	7
Penn Hills, Municipality of	19,869	0	2	2	0	0	4	0	10	18
Pennsbury Village Borough	503	0	0	0	0	0	0	0	0	0
Pine Township	5,834	0	0	1	0	0	0	0	0	1
Pitcairn Borough	1,421	0	55	3	4	0	158	0	0	220
Pittsburgh, City of	124,624	0	0	0	0	0	1	0	698	731
Pleasant Hills Borough	3,480	0	0	0	0	0	0	0	0	0

Table 4.3.3-11 **Structure Vulnerability by Land Use in Allegheny County.**

Municipality	Total Structures	Agriculture	Commercial	Government	Industrial	Other	Residential	Utilities	Unknown	Grand Total
Plum Borough	12,099	0	46	3	1	0	18	0	0	68
Port Vue Borough	1,816	0	0	0	0	0	7	0	1	8
Rankin Borough	987	0	0	0	0	0	0	0	0	0
Reserve Township	1,561	0	0	0	0	0	0	0	31	31
Richland Township	4,660	0	3	0	1	0	4	0	0	8
Robinson Township	7,446	0	2	0	2	0	21	0	27	52
Ross Township	15,167	0	3	0	0	0	42	1	44	90
Rosslyn Farms Borough	216	0	0	0	0	0	0	0	0	0
Scott Township	6,899	0	0	0	0	0	2	0	52	54
Sewickley Borough	1,628	0	0	0	0	0	5	2	1	8
Sewickley Heights	421	0	0	2	0	0	0	0	0	2
Sewickley Hills Borough	276	0	1	0	0	0	3	0	0	4
Shaler Township	12,786	0	29	2	2	0	191	1	90	315
Sharpsburg Borough	1,563	0	3	0	0	0	247	0	28	278
South Fayette Township	7,098	1	1	0	1	0	77	0	21	101
South Park Township	5,805	0	14	0	0	1	28	0	0	43
South Versailles Township	168	0	0	0	0	0	16	1	0	17
Springdale Borough	1,728	0	0	0	0	0	0	0	0	0
Springdale Township	859	0	0	0	0	0	1	0	0	1
Stowe Township	3,171	0	0	0	0	0	0	0	0	0
Swissvale Borough	4,107	0	0	0	0	0	2	0	0	2
Tarentum Borough	2,153	0	2	4	0	0	38	0	0	44
Thornburg Borough	190	0	0	0	0	0	0	0	0	0
Trafford Borough	52	0	0	0	0	0	0	0	0	0
Turtle Creek Borough	2,646	2	0	0	0	0	170	0	0	172
Upper St. Clair Township	7,841	0	9	0	0	0	24	0	7	40
Verona Borough	1,364	0	0	0	0	0	36	0	97	133

Table 4.3.3-11 **Structure Vulnerability by Land Use in Allegheny County.**

Municipality	Total Structures	Agriculture	Commercial	Government	Industrial	Other	Residential	Utilities	Unknown	Grand Total
Versailles Borough	673	0	0	0	1	0	0	0	0	1
Wall Borough	357	0	0	0	0	0	19	0	0	19
West Deer Township	5,665	0	5	0	0	0	34	0	0	39
West Elizabeth Borough	284	0	9	2	2	0	77	0	0	90
West Homestead Borough	1,114	0	0	0	0	0	0	0	12	12
West Mifflin Borough	9,910	0	4	0	0	0	19	0	8	31
West View Borough	2,668	0	0	0	0	0	0	0	0	0
Whitaker Borough	632	0	0	0	0	0	0	0	0	0
White Oak Borough	3,804	0	17	0	0	0	6	0	2	25
Whitehall Borough	5,771	0	0	0	0	0	0	0	1	1
Wilkins Township	2,771	0	3	1	0	0	46	0	2	52
Wilkinsburg Borough	6,994	0	0	0	0	0	0	0	0	0
Wilmerding Borough	916	0	0	0	2	0	0	0	0	2
Grand Total	550,774	9	478	59	113	2	3,337	12	2,554	6,649

4.3.4. Hurricane, Tropical Storm, Nor'easter

4.3.4.1.Location and Extent

Pennsylvania does not have any open-ocean coastline. However, the impacts of coastal storm systems such as hurricanes, tropical storms, and nor'easters can extend well inland. Tropical storms impacting Allegheny County develop in tropical or sub-tropical waters found in the Atlantic Ocean, Gulf of Mexico, or Caribbean Sea. Nor'easters are extra-tropical storms which typically develop from low-pressure centers off the Atlantic Coast north of North Carolina during the winter months. Extra-tropical is a term used to describe a hurricane or tropical storm that's cyclone has lost its 'tropical' characteristics. While an extra-tropical storm donates a change in weather pattern and how the storm is gathering energy, it may still have winds that are tropical storm or hurricane force.

Allegheny County is located more than 200 hundred miles from open coastline, but tropical storms can track inland causing heavy rainfall and strong winds. 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 Allegheny County are equally subject to the impacts of hurricanes, tropical storms, and Nor'easters that track through or near the County. However, areas within the county which are already at risk for flooding, wind, and winter storm damage are particularly vulnerable.

4.3.4.2. Range of Magnitude

Intense precipitation and wind resulting in flood and wind damage (see Sections 4.3.3 and 4.3.9 respectively) are the most common impacts associated with coastal storm systems in Pennsylvania. Nor'easters develop as extra-tropical cyclonic weather systems over the Atlantic Ocean and are capable of producing winds equivalent to hurricane or tropical storm force; precipitation from these storms may also come in the form of heavy snow or ice (see Section 4.3.11).

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

The impact tropical storm or hurricane events have on an area is typically measured in terms of wind speed. Expected damage from hurricane force winds is measured using the Saffir-Simpson Scale. The Saffir-Simpson Scale categorizes hurricane intensity linearly based upon maximum sustained winds, barometric pressure, and storm surge potential (a threat only to the tidal portions of the Delaware River), which are combined to estimate potential damage. Table 4.3.4-1 lists Saffir-Simpson Scale categories with associated wind speeds and expected damages. Categories 3, 4, and 5 are classified as "major" hurricanes. While major hurricanes comprise only 20% of all tropical cyclones making landfall, they account for over 70% of the damage in the United States.

Table 4.3.4-1 **Saffir-Simpson Scale Categories with Associated Wind Speeds and Damages (NHC, 2013).**

Storm Category	Wind Speed (mph)	Types of Damage Due to Hurricane Winds
1	74-95	Very dangerous winds will produce some damage: Well-constructed frame homes could have damage to roof, shingles, vinyl siding and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
2	96-110	Extremely dangerous winds will cause extensive damage: Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
3	111-130	Devastating damage will occur: Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.
4	131-155	Catastrophic damage will occur: Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
5	>155	Catastrophic damage will occur: A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.

It is important to recognize the potential for flooding events during hurricanes and tropical storms; the risk assessment and associated impact for these events is included Section 4.3.3. Wind impacts in Allegheny County could generally include downed trees and utility poles, which can spark widespread utility interruptions. Wind impacts are particularly an issue for mobile homes and other manufactured housing; these structures are often not well-anchored and are highly susceptible to wind damage in a hurricane, tropical storm, or Nor'easter.

The worst hurricane, tropical storm, or nor'easter in Allegheny County was the remnants of Tropical Depression Ivan in September 2004, as described in Section 4.3.3.2.

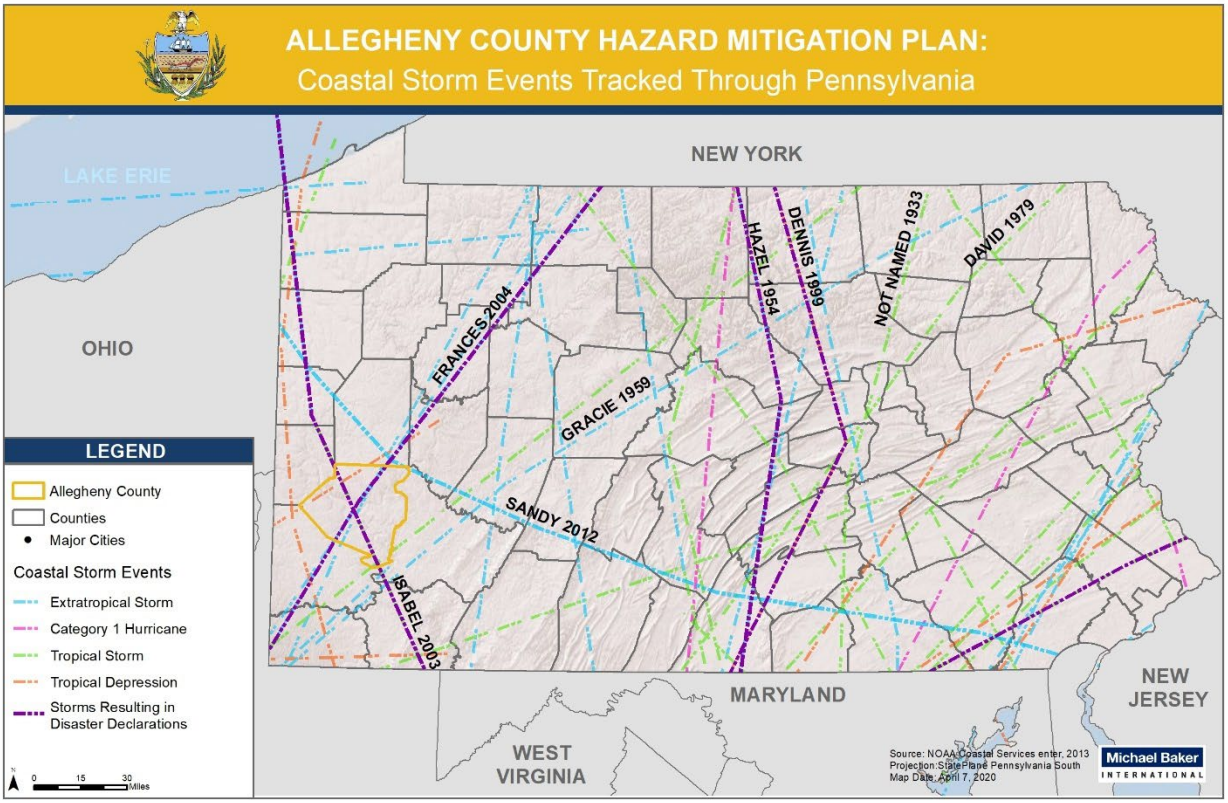
4.3.4.3. Past Occurrence

The National Oceanic and Atmospheric Administration's Coastal Services Center maintains records of all coastal storms occurring in the United States since the 1850s. Table 4.3.4-2 lists all coastal storms having centers of circulation to pass through Allegheny County. Figure 4.3.4-2 shows the historical coastal storms tracking through Pennsylvania, highlighting Allegheny County.

Table 4.3.4-2 **Previous Coastal Storms Tracking Through or Near Allegheny County.**

Year	Event	Strength in/near Allegheny County
1901	Not Named	Tropical Depression
1957	Audrey	Extra-tropical
1979	Frederic	Tropical Storm
2002	Isidore	Tropical Depression
2003	Isabel	Tropical Storm
2004	Frances	Tropical Depression
2012	Sandy	Extra-tropical
2018	Gordon	Tropical Storm

Figure 4.3.4-1 Map Showing Historical Coastal Storm Events Tracked Through Allegheny County



A number of hurricane, tropical storm, and nor'easter events may have impacted the County without tracking through or near it. Perhaps the best example of this is Tropical Storm Agnes (1972). While it was the most significant tropical storm event to impact the Commonwealth, the storm track for Agnes remained to the east of Pennsylvania and New Jersey until making landfall near New York City and traveling into upstate New York. Ivan is another example of these storms; the center of circulation never passed through Allegheny County. According to the National Weather Service, there have been 14 hurricanes and tropical storms whose remnants produced 24-hour record rainfall for Pittsburgh, shown in Table 4.3.4-3.

Table 4.3.4-3 **Hurricane and Tropical Storm Events Producing 24-hour Rainfall Records (NOAA NWS, 2005).**

Date	Name	Category at Landfall	Precipitation (Inches)
September 17, 1876	Hurricane #2	1	3.38
September 12, 1878	Hurricane #5	1	3.24
August 21, 1888	Hurricane #3	2	3.57
October 31, 1899	Hurricane #6	2	1.22
October 1, 1915	Hurricane #5	4	1.5
October 2, 1929	Hurricane #2	4	3.22
September 13-14, 1945	Hurricane #9	4	1.28 (24hr) /1.77(total)
October 15, 1954	Hazel	4	3.56
September 30-October 1, 1959	Gracie	4	1.18 (24hr)/1.21(total)
September 6-7, 1996	Fran	3	1.52 (24hr)/1.69(total)
September 8-9, 2004	Frances	2	3.60 (24hr)/3.83(total)
September 17, 2004	Ivan	4	5.95
October 29, 2012	Sandy	3	1.72 (24hr)/3.23(total)
September 7, 2018	Gordon	NA	3.73 (24hr)/5.64(total)
Source: http://www.erh.noaa.gov/pit/hurricane.htm			

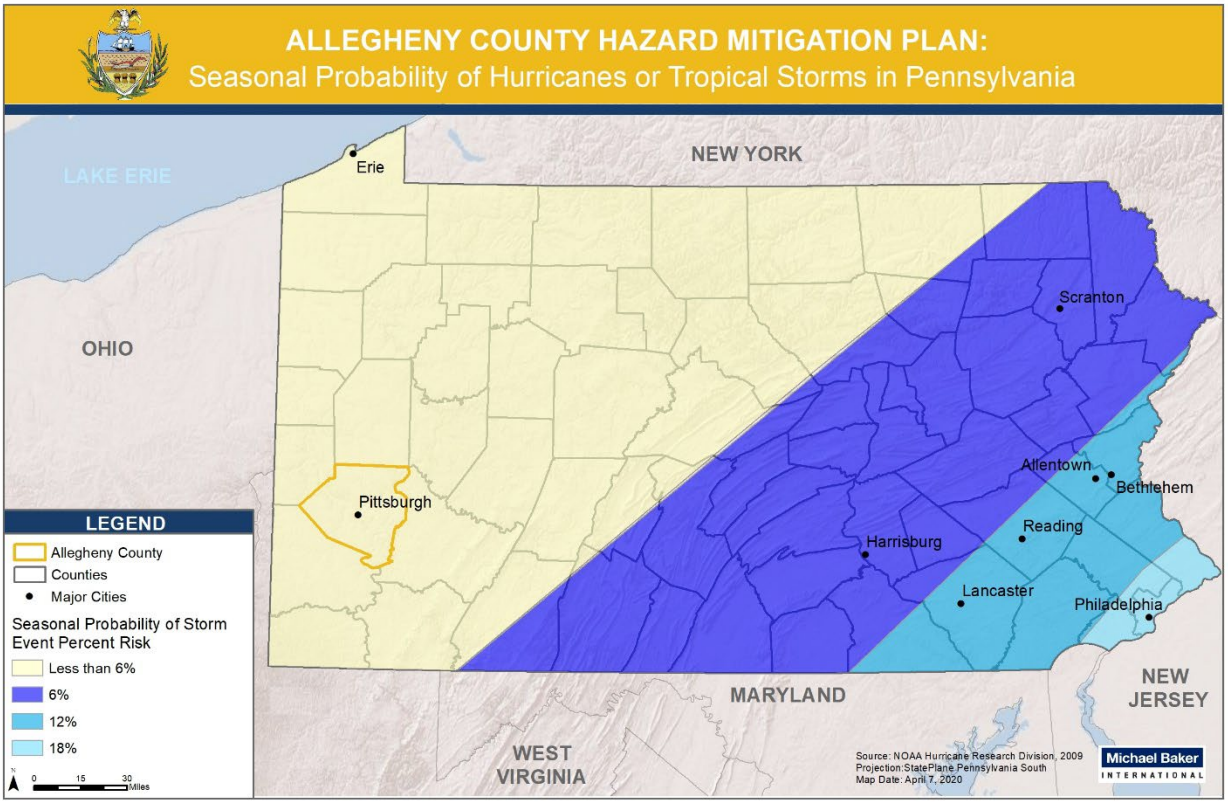
4.3.4.4. Future Occurrence

The National Oceanic and Atmospheric Administration Hurricane Research Division published the map included as Figure 4.3.4-2 showing the chance that a tropical storm or hurricane will affect a given area during the entire Atlantic hurricane season spanning from June to November. Note that this figure does not provide information on the probability of various storm intensities. However, based on historical data between 1944 and 1999, this map reveals there is a less-than-six percent chance of experiencing a tropical storm or hurricane event between June and November of any given year Western Pennsylvania. Note that these probabilities are the result of only a single study and may differ from other seasonal probability estimates not identified in this report. Outlier storms may also have a large impact on Pennsylvania even though their probability is low.

Changing weather patterns are being seen in relation to precipitation and severe storms. The annual number of very hot days is growing, which heats up waterways and oceans. Warm ocean waters fuel the energy for hurricanes and tropical storms. In recent years, more destructive tropical weather is hitting areas in the Southeast and Mid-Atlantic (Climate Central, 2019). Destructive storms have the potential to reach this region in Pennsylvania. Intense rainfall from these storms can lead to flood events. The probability of future hurricane, tropical storm, or nor'easter events is possible as defined by the Risk Factor Methodology probability criteria (see Table 4.4.1-1).

To try and address future conditions the City of Pittsburgh adopted the Pittsburgh Climate Action Plan 3.0 in 2017. By focusing on reducing Green House Gas emissions, the City is contributing its part to slow the effects of climate change and its impact on changing temperatures and more frequent storms (City of Pittsburgh, 2017).

Figure 4.3.4-2 Seasonal Probability of Atlantic Basin Hurricanes or Tropical Storms across Pennsylvania.



4.3.4.5. Vulnerability Assessment

A vulnerability assessment for hurricanes and tropical storms focuses on the impacts of flooding and severe wind. Therefore, the assessment for flood-related vulnerability is addressed in Section 4.3.3.5 and vulnerability to wind damage is addressed in Section 4.3.10.5. Allegheny County may be vulnerable to severe winter weather impacts caused by Nor'easters, as evaluated in Section 4.3.11.5.

4.3.5. Landslide

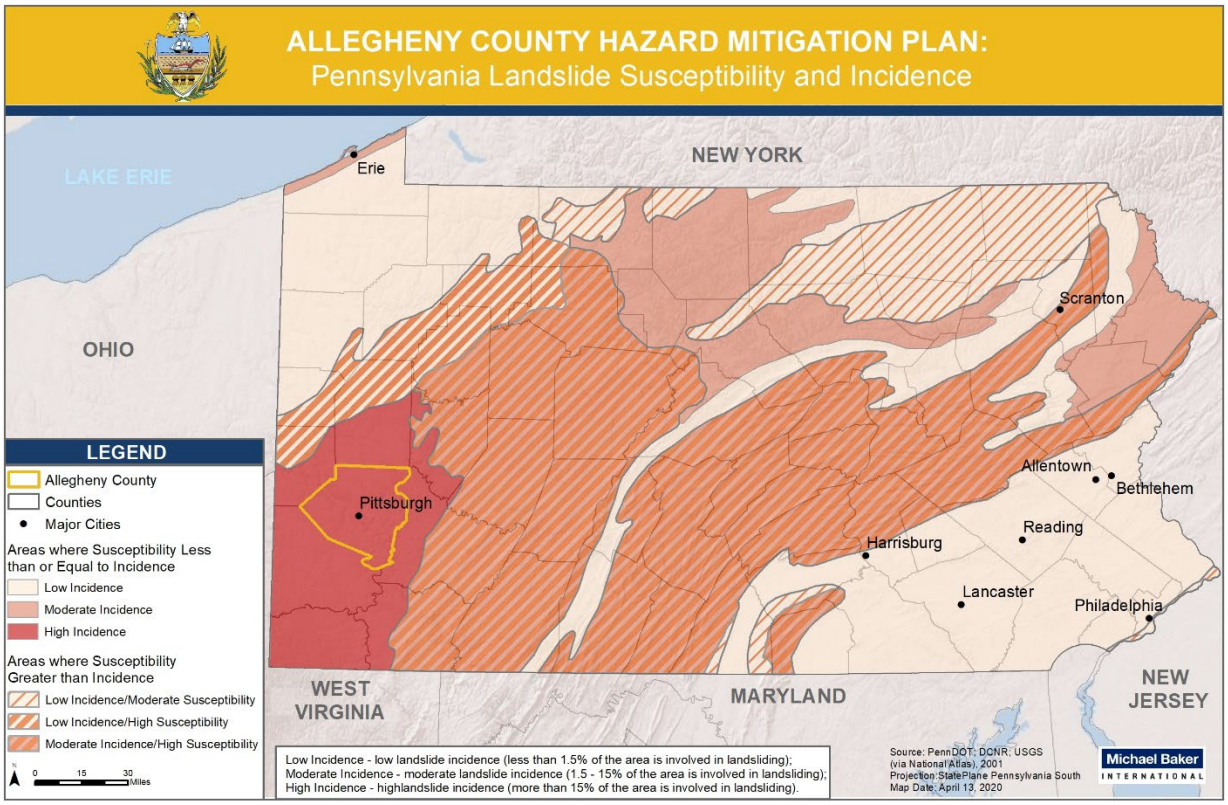
4.3.5.1. Location and Extent

Landslides occur primarily in colluvial (loose) soil and old landslide debris on steep slopes. Steep mountain slopes across the state have experienced debris avalanches associated with extreme rainfall or rain-on-snow events. Glacial and glacial-lake sediments underlie stream bank and lake bluff slumps and other failure areas across the much of the northern part of the state.

According to DCNR, southwestern Pennsylvania has by far the highest concentration of landslides, even though much of the state has susceptible areas. Most major and minor highways have sections cut in rock or soil that can fail. Outside the southwest, high susceptibility areas are smaller and have more varied geology and topography. This can be confirmed from the map below that illustrates the relative landslide hazard susceptibility across the Commonwealth of Pennsylvania. According to figure 4.3.5-1 Allegheny County has “high to moderate” and “highest” landslide susceptibility in the state. The DCNR website explains how geologists have studied that a 310-million-year-old landslide in northern Allegheny County slid into the river channel when the sedimentary deposits were young. At the time, southwestern Pennsylvania was a low, flat tropical river delta, draining to the west. These same sediments are now a weak red claystone known as the “Pittsburgh redbeds” which underlie many modern landslide problems predominant in the north-western part of the County.

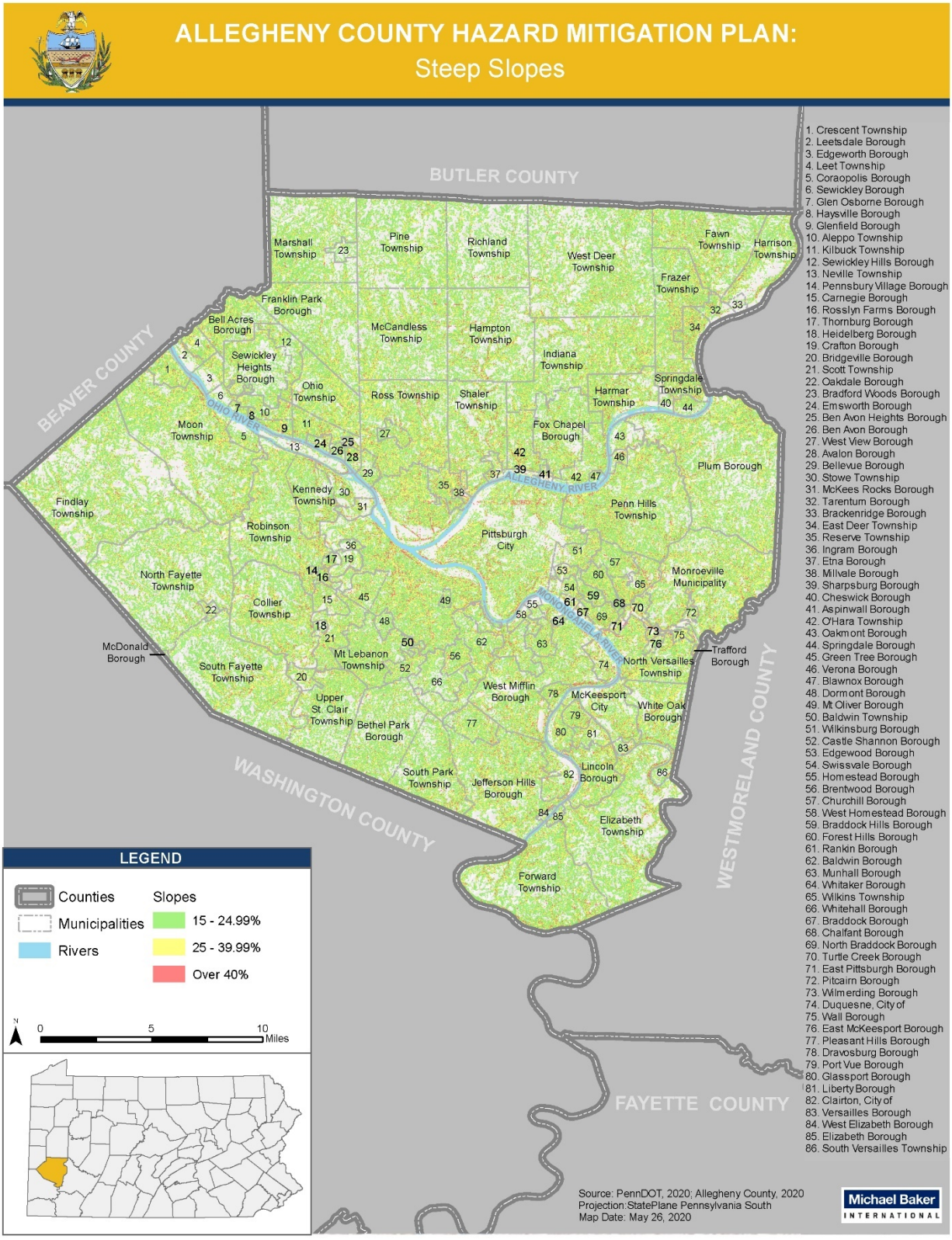
The Monongahela River Valley of northern West Virginia and southwestern Pennsylvania has a special place in landslide folklore. The name "Monongahela" is derived from an American Indian word that is translated as "river with the sliding banks" or "high banks which break off and fall down" (Espenshade, 1925). The Monongahela Valley and Pittsburgh in southwestern Pennsylvania is the most slide-prone portion of the Commonwealth. Figure 4.3.5-1 shows the USGS’s evaluation of landslide susceptibility and incidence, showing that all of Allegheny County is located in an area with high landslide incidence.

Figure 4.3.5-1 Landslide Susceptibility and Incidence for Allegheny County, (USGS, 2001).



Urban and rural land development increases both the number of landslides and the economic effects of natural slides. Major highway construction with large excavations and fills located in mountainous areas creates potential for many landslides (DCNR, 2001). In the Pittsburgh area, the major zones of weak rock involved in landsliding are claystones, including many red beds, some of which are located at varying distances below the Pittsburgh coal seam. A stable slope on these claystones may be so modified by human activity as to create problems where none had existed previously (Pittsburgh Geological Society, 1977). In other words, human activity can cause instability in an otherwise stable slope because of the presence of underlying weak red beds. In general, though, slopes with a gradient of 15% or higher may be prone to slide, especially in conjunction with heavy rain events. These steep slopes are shown in Figure 4.3.5-2.

Figure 4.3.5-2 Allegheny County Steep Slopes.



4.3.5.2. Range of Magnitude

Landslides can have potentially devastating consequences in localized areas. Landslides cause damage to transportation routes, utilities, and buildings and create travel delays and other side effects. Structures or infrastructure built on susceptible land will likely collapse as their footings slide downhill. Structures below the landslide can be crushed. Landslides next to roads and highways have the potential to fall on and damage vehicles or cause accidents.

According to the DCNR website, deaths and injuries due to landslides are rare in Pennsylvania. Most Pennsylvania landslides are moderate to slow moving and damage property rather than people. Almost all of the known deaths due to landslides have occurred when rock falls or other slides along highways involved vehicles. If residential and recreational development increases on and near steep mountain slopes, the hazard from these rapid events will also increase. Storm-induced debris flows are the only other type of landslide likely to cause death and injuries in Allegheny County. Most southwestern Pennsylvania landslides are small and move slowly.

Property losses due to landslides and associated effects are more common than injuries and deaths. An example of a worst case scenario is a small landslide in 1990 that involved a broken petroleum pipeline. Spilled petroleum products entered a major river, causing city water systems to shut down. The identified costs of repair of this landslide damage, clean-up of the spill, technical investigations, legal and court costs and environmental fines were approximately $12 million. The incalculable costs include lost productivity while people stayed at home because their businesses were closed or to care for children normally in schools that were closed due to lack of water supply, costs for the National Guard to deliver water to neighborhoods, and costs to the pipeline company and its customers due to business loss for several months. Although this example is extreme, associated damages such as this occur with many landslides.

Most damages are less expensive, but significant. "Backyard" landslides, common in the Pittsburgh area, are usually repaired incompletely or not at all. Cost estimates of several hundred thousand dollars for stabilization and repair of a landslide affecting two or three properties are typical. With repair estimates exceeding the value of the properties, abandonment is a frequent "solution". Sometimes local governments assist with relocation costs or "buy out" homeowners. Insurance covers landslide damage only for some business situations (PA DCNR 2011).

The Pennsylvania Department of Transportation and large municipalities incur substantial costs due to landslide damage and to extra construction costs for new roads in known landslide-prone areas. A 1991 estimate showed an average of $10 million per year is spent on landslide repair contracts across the Commonwealth and a similar amount is spent on mitigation costs for grading projects (PADCNR, 2009).

A study done by the USGS found that the total public and private costs of landslides in Allegheny County averaged at least $4 million per year from 1970 to 1976. Similar accounting for a more recent period is not available (PA DCNR 2011). A more recent 2002 report produced by DCNR for USGS put landslide costs at $3 million in public money and $650,025 in private funds in 2001 and 2002 alone. It is thought that actual costs are higher, as landslides are more frequent in wetter years (Delano, 2002).

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

4.3.5.3. Past Occurrence

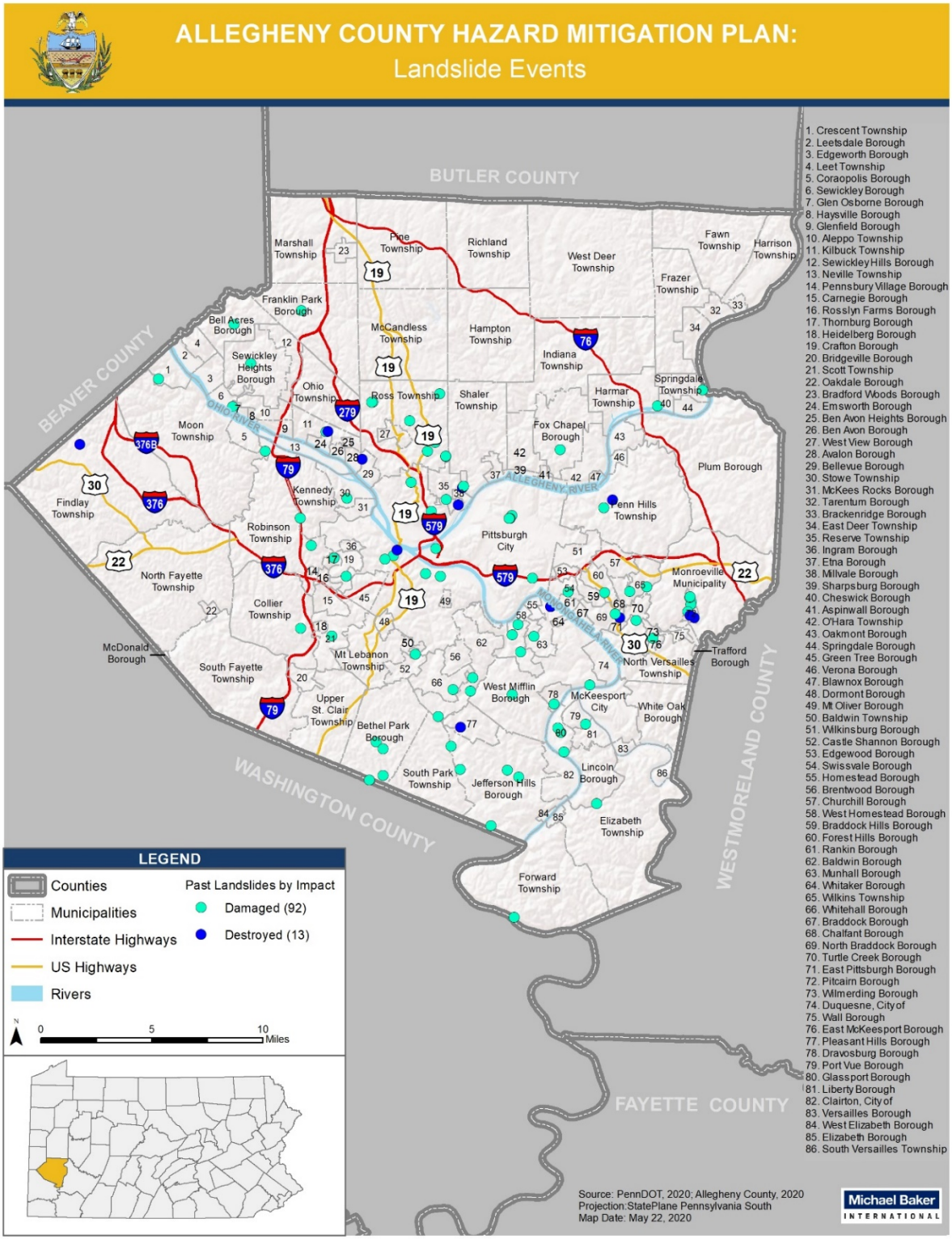
According to the Pennsylvania Department of Conservation and Natural Resources (DCNR), no one really knows how many landslides occur each year in Pennsylvania or how much damage they cause, although there have been a few efforts to determine totals. A 1986 study identified more than 700 recent and active landslides in Allegheny County. U.S. Geological Survey (USGS) landslide inventory maps identify more than 3,000 recent and 12,000 older landslides in Allegheny and Washington Counties (DCNR, 2001). A 1991 list from the Pennsylvania Department of Transportation (PennDOT) showed that there were 226 problem landslides in Allegheny County (Commonwealth of Pennsylvania, 2000).

2014 Landslide Damage on PJ McArdle Roadway.

More recently, NASA released a prototype Global Landslide Catalog. This is an open-source research and data dissemination tool stemming from work completed at the Goddard Space Flight Center. It should not be considered an exhaustive catalog of landslide events, but it provides more detail on the locations of landslide events than have been previously available. As shown in Figure 4.3.5-3, NASA's inventory lists 59 landslides in Allegheny County from April 2007 through March 2015. Most are rated as small in size. In addition, Figure 4.3.5-3 includes landslides identified by community officials during the 2014 Act 167 Stormwater Management Plan.

Allegheny County also developed an interactive landslide map that is available to the public in 2019. The interactive map shows the locations of reported landslides and slide-prone areas across the county, as well as road ownership. According to this map 105 landslides have been reported in Allegheny County. The landslides identified in this map are also included in Figure 4.3.5-3. The map can be accessed at this link: https://landslide-portal-alcogis.opendata.arcgis.com/pages/map-tools.

Figure 4.3.5-3 Landslides in Allegheny County.



Landslides are not the type of hazard that receives a disaster declaration, since they affect only localized sites. However, a few catastrophic landslide events have occurred in Pittsburgh in the past. In 1951, excavators for a new office building made an 8-foot deep cut at the base of a hill along Island Avenue in Stowe, triggering a 500-foot wide landslide that destroyed 6 houses and disrupted a streetcar line and utilities. In 1983, a rockslide killed 2 people who were sitting in their cars at a traffic light on Saw Mill Run Boulevard.

4.3.5.4. Future Occurrence

Since the exact number of previous landslides over a definite time interval is not known, it is not possible to determine a quantitative probability of future occurrence for landslides in Allegheny County. With many landslide events in the past, the presence of areas susceptible to landslides, and increasing human development near hillsides, landslides causing varying levels of damage are likely to continue to occur every year in the absence of mitigation activities. Changing weather patterns have resulted in increased precipitation in the region. Climate specialists predict that precipitation intensity will double in and around the City of Pittsburgh by 2050 (Climate Central, 2019). More frequent and intense rainfall is leading to severe flooding and can trigger flash floods and river overflow. Saturated soils create prime conditions for landslides and mudflows. As intense rainfall continues to increase in Allegheny County, it can be expected that there will be an increase in landslide occurrence during and after rain events. Utilizing the Risk Factor Methodology, the probability for a landslide event to occur is likely (see Table 4.4-1).

4.3.5.5. Vulnerability Assessment

A landslide vulnerability assessment involves determining the location of susceptible lands and then determining what community assets are located on those susceptible lands. The following steps are typically followed to determine the spatial extent of landslide hazard (FEMA, 2001):

- Identify existing or old landslides:
    - On or at the base of slopes;
    - In or at the base of minor drainage hollows;
    - At the base or top of an old fill slope;
    - At the base or top of a steep cut slope; or
    - Developed hillsides where leach field septic systems are used.
- Map the topography, since steeper slopes have greater probability of landslides.
- Map the geology, because in addition to the slope angle, the presence of rock or soil that weakens when saturated, as well as poorly drained rock or soil are indicators of slope instability as well.
- Contact local and state geological survey, other persons who might be knowledgeable about the local conditions in relation to landslides.

Conditions that may exacerbate or mitigate the severity and effects of landslides include erosion, unstable slopes, earthquakes, increase of weight of slopes, hydrologic factors and human activity. Human activities are responsible for initiating or intensifying certain conditions where otherwise there would have been little or no risk. Activities that increase vulnerability by triggering landslides include:

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

Landslide vulnerability is highly site-specific, but this HMP provides an estimate of structures or critical facilities that may be vulnerable to landslides by being located on slopes of 15% or steeper. Table 4.3.5-1 shows vulnerable structures and critical facilities vulnerable to landslides, and Table 4.3.5-2 shows the vulnerability by structure type.

Table 4.3.5-1 **Structures and critical facilities vulnerable to landslides.**

Municipality	Total Structures	Total Structures on Slopes Over 15%	Percent Structures on Slopes Over 15%	Total Critical Facilities	Critical Facilities on Slopes Over 15%	Percent Critical Facilities on Slopes Over 15%
Aleppo Township	904	70	8%	7	1	14%
Aspinwall Borough	1,256	17	1%	6	0	0%
Avalon Borough	2,359	88	4%	8	0	0%
Baldwin Borough	9,159	233	3%	18	1	6%
Baldwin Township	946	37	4%	3	1	33%
Bell Acres Borough	625	26	4%	8	1	13%
Bellevue Borough	3,005	112	4%	15	0	0%
Ben Avon Borough	759	31	4%	3	0	0%
Ben Avon Heights Borough	144	6	4%	1	0	0%
Bethel Park, Municipality of	13,201	414	3%	34	0	0%
Blawnox Borough	694	65	9%	7	1	14%
Brackenridge Borough	1,538	13	1%	9	0	0%
Braddock Borough	1,244	20	2%	9	0	0%
Braddock Hills Borough	868	93	11%	5	0	0%
Bradford Woods Borough	507	12	2%	4	0	0%
Brentwood Borough	4,263	365	9%	14	1	7%
Bridgeville Borough	2,277	189	8%	6	0	0%
Carnegie Borough	3,748	143	4%	13	0	0%
Castle Shannon Borough	3,698	211	6%	8	0	0%
Chalfant Borough	417	60	14%	2	0	0%
Cheswick Borough	904	38	4%	6	0	0%
Churchill Borough	1,500	156	10%	6	0	0%
Clairton, City of	4,008	191	5%	15	2	13%

Table 4.3.5-1 **Structures and critical facilities vulnerable to landslides.**

Municipality	Total Structures	Total Structures on Slopes Over 15%	Percent Structures on Slopes Over 15%	Total Critical Facilities	Critical Facilities on Slopes Over 15%	Percent Critical Facilities on Slopes Over 15%
Collier Township	4,512	203	4%	23	4	17%
Coraopolis Borough	2,666	134	5%	13	1	8%
Crafton Borough	2,547	84	3%	6	0	0%
Crescent Township	1,165	38	3%	3	1	33%
Dormont Borough	3,481	131	4%	7	0	0%
Dravosburg Borough	1,043	64	6%	5	0	0%
Duquesne, City of	3,158	93	3%	14	0	0%
East Deer Township	792	58	7%	11	0	0%
East McKeesport Borough	1,034	53	5%	4	0	0%
East Pittsburgh Borough	874	30	3%	4	0	0%
Edgewood Borough	1,444	49	3%	5	0	0%
Edgeworth Borough	673	6	1%	6	1	17%
Elizabeth Borough	704	43	6%	6	0	0%
Elizabeth Township	6,119	312	5%	29	2	7%
Emsworth Borough	1,023	60	6%	8	0	0%
Etna Borough	1,638	142	9%	8	0	0%
Fawn Township	1,068	40	4%	13	0	0%
Findlay Township	3,382	87	3%	27	0	0%
Forest Hills Borough	3,198	434	14%	9	1	11%
Forward Township	1,636	126	8%	17	0	0%
Fox Chapel Borough	1,972	67	3%	14	0	0%
Franklin Park Borough	5,675	174	3%	14	0	0%
Frazer Township	627	57	9%	14	3	21%
Glassport Borough	2,147	125	6%	12	0	0%
Glen Osborne Borough	243	8	3%	3	1	33%
Glenfield Borough	108	7	6%	1	0	0%
Green Tree Borough	2,516	61	2%	7	1	14%
Hampton Township	7,273	157	2%	39	1	3%
Harmar Township	1,850	61	3%	24	1	4%
Harrison Township	5,428	37	1%	18	2	11%
Haysville Borough	51	3	6%	1	1	100%
Heidelberg Borough	643	48	7%	5	0	0%
Homestead Borough	1,561	25	2%	10	0	0%
Indiana Township	3,496	202	6%	31	1	3%

Table 4.3.5-1 **Structures and critical facilities vulnerable to landslides.**

Municipality	Total Structures	Total Structures on Slopes Over 15%	Percent Structures on Slopes Over 15%	Total Critical Facilities	Critical Facilities on Slopes Over 15%	Percent Critical Facilities on Slopes Over 15%
Ingram Borough	1,313	49	4%	5	1	20%
Jefferson Hills Borough	5,372	296	6%	30	0	0%
Kennedy Township	3,899	230	6%	20	0	0%
Kilbuck Township	368	28	8%	1	0	0%
Leet Township	652	29	4%	5	0	0%
Leetsdale Borough	676	52	8%	13	0	0%
Liberty Borough	1,156	19	2%	7	0	0%
Lincoln Borough	528	26	5%	4	0	0%
Marshall Township	4,312	94	2%	20	2	10%
McCandless, Town of	12,640	314	2%	38	1	3%
McDonald Borough	187	6	3%	0	0	0%
McKees Rocks Borough	3,069	233	8%	7	0	0%
McKeesport, City of	9,965	309	3%	47	4	9%
Millvale Borough	1,839	303	16%	9	1	11%
Monroeville, Municipality of	11,943	245	2%	71	3	4%
Moon Township	11,002	348	3%	53	3	6%
Mount Lebanon, Municipality of	11,685	1,281	11%	42	6	14%
Mount Oliver Borough	1,508	91	6%	4	1	25%
Munhall Borough	5,161	329	6%	20	1	5%
Neville Township	753	0	0%	22	0	0%
North Braddock Borough	2,657	350	13%	10	1	10%
North Fayette Township	7,950	215	3%	28	0	0%
North Versailles Township	4,996	265	5%	15	1	7%
Oakdale Borough	675	28	4%	27	0	0%
Oakmont Borough	3,140	113	4%	3	0	0%
O'Hara Township	4,311	260	6%	18	1	6%
Ohio Township	3,249	221	7%	17	1	6%
Penn Hills, Municipality of	19,869	1,504	8%	52	6	11%
Pennsbury Village Borough	503	3	1%	4	2	50%
Pine Township	5,834	158	3%	23	0	0%
Pitcairn Borough	1,421	131	9%	6	0	0%
Pittsburgh, City of	124,624	6,987	6%	539	25	5%

Table 4.3.5-1 **Structures and critical facilities vulnerable to landslides.**

Municipality	Total Structures	Total Structures on Slopes Over 15%	Percent Structures on Slopes Over 15%	Total Critical Facilities	Critical Facilities on Slopes Over 15%	Percent Critical Facilities on Slopes Over 15%
Pleasant Hills Borough	3,480	130	4%	8	0	0%
Plum Borough	12,099	247	2%	51	4	8%
Port Vue Borough	1,816	200	11%	5	0	0%
Rankin Borough	987	25	3%	4	1	25%
Reserve Township	1,561	168	11%	7	3	43%
Richland Township	4,660	74	2%	19	0	0%
Robinson Township	7,446	247	3%	33	5	15%
Ross Township	15,167	589	4%	45	4	9%
Rosslyn Farms Borough	216	11	5%	3	0	0%
Scott Township	6,899	527	8%	21	2	10%
Sewickley Borough	1,628	58	4%	16	0	0%
Sewickley Heights	421	23	5%	3	0	0%
Sewickley Hills Borough	276	21	8%	2	1	50%
Shaler Township	12,786	405	3%	29	2	7%
Sharpsburg Borough	1,563	14	1%	9	0	0%
South Fayette Township	7,098	295	4%	29	2	7%
South Park Township	5,805	157	3%	15	2	13%
South Versailles Township	168	2	1%	2	0	0%
Springdale Borough	1,728	40	2%	14	3	21%
Springdale Township	859	29	3%	7	0	0%
Stowe Township	3,171	205	6%	13	0	0%
Swissvale Borough	4,107	168	4%	8	0	0%
Tarentum Borough	2,153	110	5%	19	0	0%
Thornburg Borough	190	18	9%	3	0	0%
Trafford Borough	52	0	0%	1	0	0%
Turtle Creek Borough	2,646	186	7%	13	1	8%
Upper St. Clair Township	7,841	378	5%	28	3	11%
Verona Borough	1,364	44	3%	7	0	0%
Versailles Borough	673	35	5%	3	0	0%
Wall Borough	357	67	19%	2	0	0%
West Deer Township	5,665	135	2%	24	3	13%
West Elizabeth Borough	284	4	1%	7	0	0%
West Homestead Borough	1,114	74	7%	6	1	17%
West Mifflin Borough	9,910	652	7%	54	3	6%

Table 4.3.5-1 **Structures and critical facilities vulnerable to landslides.**

Municipality	Total Structures	Total Structures on Slopes Over 15%	Percent Structures on Slopes Over 15%	Total Critical Facilities	Critical Facilities on Slopes Over 15%	Percent Critical Facilities on Slopes Over 15%
West View Borough	2,668	187	7%	12	1	8%
Whitaker Borough	632	34	5%	2	0	0%
White Oak Borough	3,804	118	3%	12	0	0%
Whitehall Borough	5,771	138	2%	19	1	5%
Wilkins Township	2,771	292	11%	11	0	0%
Wilkinsburg Borough	6,994	636	9%	28	2	7%
Wilmerding Borough	916	63	7%	6	1	17%
Grand Total	**550,774**	**27,132**	**5%**	**2,379**	**134**	**6%**

Table 4.3.5-2 **Structure vulnerable to landslide by land use in Allegheny County.**

Municipality	Total Structures	Agriculture	Commercial	Government	Industrial	Other	Residential	Utilities	Unknown	Grand Total
Aleppo Township	904	0	3	0	0	0	65	0	2	70
Aspinwall Borough	1,256	0	0	1	0	0	12	0	4	17
Avalon Borough	2,359	0	0	0	0	0	29	0	59	88
Baldwin Borough	9,159	0	2	0	0	0	93	0	135	233
Baldwin Township	946	0	0	0	0	0	1	0	36	37
Bell Acres Borough	625	1	1	1	0	0	23	0	0	26
Bellevue Borough	3,005	0	0	0	0	0	21	0	89	112
Ben Avon Borough	759	0	0	0	0	0	26	0	5	31
Ben Avon Heights Borough	144	0	0	0	0	0	0	0	6	6
Bethel Park, Municipality of	13,201	2	6	2	1	0	270	1	132	414
Blawnox Borough	694	0	0	0	0	0	9	0	56	65
Brackenridge Borough	1,538	0	0	0	0	0	13	0	0	13
Braddock Borough	1,244	0	0	0	0	0	6	0	14	20
Braddock Hills Borough	868	0	1	1	0	0	68	0	23	93
Bradford Woods Borough	507	0	0	0	0	0	12	0	0	12
Brentwood Borough	4,263	0	7	1	1	0	144	0	212	365
Bridgeville Borough	2,277	0	0	0	0	0	151	0	38	189
Carnegie Borough	3,748	0	0	0	0	0	0	0	143	143
Castle Shannon Borough	3,698	2	2	2	0	0	191	0	13	211
Chalfant Borough	417	0	0	0	0	0	8	0	52	60
Cheswick Borough	904	0	1	1	0	0	36	0	0	38
Churchill Borough	1,500	0	1	0	0	0	66	0	89	156
Clairton, City of	4,008	0	7	2	1	0	181	0	0	191
Collier Township	4,512	0	0	0	0	0	66	0	137	203
Coraopolis Borough	2,666	0	1	0	0	0	75	0	58	134
Crafton Borough	2,547	0	0	0	0	0	0	0	83	84

Table 4.3.5-2 **Structure vulnerable to landslide by land use in Allegheny County.**

Municipality	Total Structures	Agriculture	Commercial	Government	Industrial	Other	Residential	Utilities	Unknown	Grand Total
Crescent Township	1,165	0	3	0	0	0	34	1	0	38
Dormont Borough	3,481	0	0	0	0	0	0	0	130	131
Dravosburg Borough	1,043	0	4	0	0	0	60	0	0	64
Duquesne, City of	3,158	8	8	0	0	0	56	0	21	93
East Deer Township	792	0	8	0	0	0	50	0	0	58
East McKeesport Borough	1,034	0	1	0	0	0	52	0	0	53
East Pittsburgh Borough	874	0	1	2	0	0	19	0	8	30
Edgewood Borough	1,444	0	0	0	0	0	5	0	44	49
Edgeworth Borough	673	0	0	0	0	0	6	0	0	6
Elizabeth Borough	704	0	3	0	0	0	40	0	0	43
Elizabeth Township	6,119	1	29	2	1	0	279	0	0	312
Emsworth Borough	1,023	0	0	0	0	0	10	0	50	60
Etna Borough	1,638	0	1	0	0	0	121	0	20	142
Fawn Township	1,068	2	1	0	0	0	37	0	0	40
Findlay Township	3,382	1	5	0	4	0	77	0	0	87
Forest Hills Borough	3,198	0	0	0	0	0	240	0	194	434
Forward Township	1,636	3	2	0	1	0	120	0	0	126
Fox Chapel Borough	1,972	0	3	1	0	0	43	0	20	67
Franklin Park Borough	5,675	3	2	0	0	0	169	0	0	174
Frazer Township	627	2	4	0	0	0	51	0	0	57
Glassport Borough	2,147	0	4	0	0	0	121	0	0	125
Glen Osborne Borough	243	0	1	0	0	0	6	0	1	8
Glenfield Borough	108	0	0	0	0	0	7	0	0	7
Green Tree Borough	2,516	0	0	0	0	0	0	0	61	61
Hampton Township	7,273	0	12	1	1	0	143	0	0	157
Harmar Township	1,850	0	7	0	0	0	45	0	9	61

Table 4.3.5-2 **Structure vulnerable to landslide by land use in Allegheny County.**

Municipality	Total Structures	Agriculture	Commercial	Government	Industrial	Other	Residential	Utilities	Unknown	Grand Total
Harrison Township	5,428	0	2	0	0	0	35	0	0	37
Haysville Borough	51	0	0	0	0	0	3	0	0	3
Heidelberg Borough	643	0	0	0	0	0	0	0	48	48
Homestead Borough	1,561	0	0	0	0	0	0	0	24	25
Indiana Township	3,496	11	13	1	2	0	168	0	7	202
Ingram Borough	1,313	0	0	0	0	0	0	0	49	49
Jefferson Hills Borough	5,372	0	16	0	0	1	279	0	0	296
Kennedy Township	3,899	0	6	1	0	0	108	0	114	230
Kilbuck Township	368	0	0	0	0	0	8	0	20	28
Leet Township	652	1	2	0	0	0	26	0	0	29
Leetsdale Borough	676	0	1	0	2	0	49	0	0	52
Liberty Borough	1,156	2	1	0	0	0	16	0	0	19
Lincoln Borough	528	1	0	0	0	0	23	2	0	26
Marshall Township	4,312	0	17	0	0	0	77	0	0	94
McCandless, Town of	12,640	0	39	0	0	0	275	0	0	314
McDonald Borough	187	0	1	0	0	0	5	0	0	6
McKees Rocks Borough	3,069	0	0	0	0	0	0	0	226	233
McKeesport, City of	9,965	0	5	1	0	0	136	0	167	309
Millvale Borough	1,839	0	1	0	0	0	1	0	295	303
Monroeville, Municipality of	11,943	1	33	0	1	1	208	1	0	245
Moon Township	11,002	0	19	9	0	0	274	0	46	348
Mount Lebanon, Municipality of	11,685	0	22	8	2	0	639	0	606	1,281
Mount Oliver Borough	1,508	0	0	0	0	0	0	0	91	91
Munhall Borough	5,161	0	0	0	0	0	38	0	290	329
Neville Township	753	0	0	0	0	0	0	0	0	0
North Braddock Borough	2,657	0	6	2	0	0	201	0	141	350

Table 4.3.5-2 **Structure vulnerable to landslide by land use in Allegheny County.**

Municipality	Total Structures	Agriculture	Commercial	Government	Industrial	Other	Residential	Utilities	Unknown	Grand Total
North Fayette Township	7,950	0	52	0	0	0	155	0	8	215
North Versailles Township	4,996	1	7	3	0	0	220	0	34	265
Oakdale Borough	675	0	0	0	0	0	1	0	27	28
Oakmont Borough	3,140	0	3	0	0	0	50	0	60	113
O'Hara Township	4,311	0	5	0	0	0	139	0	116	260
Ohio Township	3,249	2	9	1	3	0	197	0	9	221
Penn Hills, Municipality of	19,869	0	40	2	2	0	568	0	892	1,504
Pennsbury Village Borough	503	0	0	0	0	0	0	0	3	3
Pine Township	5,834	2	15	2	0	0	139	0	0	158
Pitcairn Borough	1,421	0	7	0	0	0	124	0	0	131
Pittsburgh, City of	124,624	0	12	5	0	0	194	0	6,736	6,987
Pleasant Hills Borough	3,480	0	2	1	0	0	127	0	0	130
Plum Borough	12,099	4	66	2	3	0	172	0	0	247
Port Vue Borough	1,816	0	1	0	0	0	174	0	25	200
Rankin Borough	987	0	0	0	0	0	3	0	22	25
Reserve Township	1,561	0	3	0	0	0	22	0	142	168
Richland Township	4,660	0	16	2	0	0	56	0	0	74
Robinson Township	7,446	0	1	0	0	0	85	0	161	247
Ross Township	15,167	1	20	2	0	0	378	0	188	589
Rosslyn Farms Borough	216	0	0	0	0	0	0	0	11	11
Scott Township	6,899	0	4	2	0	0	95	0	419	527
Sewickley Borough	1,628	0	1	3	0	0	53	1	0	58
Sewickley Heights	421	2	0	0	0	0	21	0	0	23
Sewickley Hills Borough	276	0	0	0	0	0	21	0	0	21
Shaler Township	12,786	1	7	1	0	0	299	0	95	405
Sharpsburg Borough	1,563	0	1	0	0	0	13	0	0	14

Table 4.3.5-2 **Structure vulnerable to landslide by land use in Allegheny County.**

Municipality	Total Structures	Agriculture	Commercial	Government	Industrial	Other	Residential	Utilities	Unknown	Grand Total
South Fayette Township	7,098	1	6	0	0	0	264	1	23	295
South Park Township	5,805	0	16	3	0	0	138	0	0	157
South Versailles Township	168	0	0	0	0	0	2	0	0	2
Springdale Borough	1,728	0	6	0	0	0	34	0	0	40
Springdale Township	859	0	3	0	0	0	26	0	0	29
Stowe Township	3,171	0	0	0	0	0	0	0	201	205
Swissvale Borough	4,107	0	0	0	0	0	22	0	146	168
Tarentum Borough	2,153	0	4	1	0	0	105	0	0	110
Thornburg Borough	190	0	0	0	0	0	0	0	18	18
Trafford Borough	52	0	0	0	0	0	0	0	0	0
Turtle Creek Borough	2,646	0	0	0	0	0	162	0	24	186
Upper St. Clair Township	7,841	0	6	3	0	0	197	0	172	378
Verona Borough	1,364	0	0	0	0	0	16	0	28	44
Versailles Borough	673	0	2	0	0	0	33	0	0	35
Wall Borough	357	3	0	4	0	0	60	0	0	67
West Deer Township	5,665	0	6	0	0	0	128	1	0	135
West Elizabeth Borough	284	0	0	0	0	0	4	0	0	4
West Homestead Borough	1,114	0	0	0	0	0	0	0	73	74
West Mifflin Borough	9,910	0	9	1	0	0	278	0	364	652
West View Borough	2,668	0	0	0	0	0	50	0	137	187
Whitaker Borough	632	0	0	0	0	0	2	0	32	34
White Oak Borough	3,804	0	4	0	0	0	84	0	30	118
Whitehall Borough	5,771	0	1	2	0	0	129	0	6	138
Wilkins Township	2,771	0	1	0	0	0	128	0	163	292
Wilkinsburg Borough	6,994	0	14	1	0	0	355	0	266	636
Wilmerding Borough	916	0	4	0	0	0	59	0	0	63

Table 4.3.5-2 **Structure vulnerable to landslide by land use in Allegheny County.**

Municipality	Total Structures	Agriculture	Commercial	Government	Industrial	Other	Residential	Utilities	Unknown	Grand Total
Grand Total	**550,774**	**58**	**669**	**80**	**25**	**2**	**11,508**	**8**	**14,699**	**27,132**

4.3.6. Pandemic and Infectious Disease

4.3.6.1.Location and Extent

Pandemic is defined as a disease affecting or attacking the population of an extensive region, including several countries, and/or continent(s). It is further described as extensively epidemic. Generally, pandemic diseases cause sudden, pervasive illness in all age groups on a global scale. Infectious diseases are also highly virulent but are not spread person-to-person.

Pandemic and infectious disease events cover a wide geographical area and can affect large populations, potentially including the entire population of the county. The exact size and extent of an infected population is dependent upon how easily the illness is spread, the mode of transmission, and the amount of contact between infected and uninfected individuals. The transmission rates of pandemic illnesses are often higher in denser areas where there are large concentrations of people. The transmission rate of infectious disease will depend on the mode of transmission of a given illness. Pandemic events can also occur after other natural disasters, particularly floods, when there is the potential for bacteria to grow and contaminate water (PA SHMP, 2018).

Allegheny County is primarily concerned with three diseases with pandemic and infectious potential: West Nile Virus, influenza and coronavirus. West Nile Virus is a vector-borne disease that can cause headache, high fever, neck stiffness, disorientation, tremors, convulsions, muscle weakness, paralysis, and, in its most serious form, death. The virus spreads via mosquito bite and is aided by warm temperatures and wet climates conducive to mosquito breeding. West Nile Virus has been detected in all 67 counties throughout Pennsylvania at least once in the past 10 years. The virus is highly temporal with most cases occurring between April and October (DEP-WNCP, 2020). Coronavirus is an illness caused by a virus that can spread from person to person. It is a new coronavirus that has spread throughout the world, and symptoms range from mild, or no symptoms, to severe illness that can lead to death (CDC, 2020).

Pandemic influenza planning began in response to the H5N1 (avian) flu outbreak in Asia, Africa, Europe, the Pacific, and the Near East in the late 1990s and early 2000s. H5N1 did not reach pandemic proportions in the United States, but the Commonwealth began actively planning for an occurrence of an influenza pandemic. As stated in the Pennsylvania Department of Health (DOH) Influenza Pandemic Response Plan, “an influenza pandemic is inevitable and will probably give little warning” (PA DOH, 2005). Influenza, also known as “the flu”, is a contagious disease that is caused by the influenza virus and most commonly attacks the respiratory tract in humans. Influenza is considered to have pandemic potential if it is novel, meaning that people have no immunity to it, virulent, meaning that it causes deaths in normally healthy individuals, and easily transmittable from person-to-person. The estimated morbidity and mortality during an influenza pandemic within 12-16 weeks nationwide and in Pennsylvania are shown in Table 4.3.6-1.

Table 4.3.6-1 **Estimated Morbidity and Mortality during an Influenza Pandemic within 12-16 Weeks (PA DOH, 2005).**

Morbidity	United States	Pennsylvania
Require Outpatient Care	50 Million	1.6 Million

Table 4.3.6-1 **Estimated Morbidity and Mortality during an Influenza Pandemic within 12-16 Weeks (PA DOH, 2005).**

Morbidity	United States	Pennsylvania
Hospitalizations	2 Million	37,800
Deaths	500,000	9,100

Different strands of influenza mutate over time and replace older stands of the virus and thus have drastically different effects. The H1N1 virus, colloquially known as swine flu, is of particular concern. This virus was first detected in people in the United States in April 2009. On June 11, 2009, the world health organization signaled that a pandemic of 2009 H1N1 flu was underway (CDC, 2009). Avian influenza, also known as bird flu, infects birds. A recent strain, H5N1, has caused particular concern due to its ability to pass from wild birds to poultry then on to people. This virus has killed more than half of the people infected with it, although the avian flu is less like to infect humans.

During the Hazard Mitigation Plan Update process, a novel coronavirus spread into a worldwide pandemic. Named COVID-19, this type of coronavirus is a new virus that causes respiratory illness and is extremely contagious. Flu like in nature, symptoms of the virus include fever, cough, shortness of breath, and diarrhea. This virus became a great concern due to its high rates of transmission, in addition to so little being known about it. People were advised to practice social distancing; only leaving the house for essentials like grocery shopping, and no gathering even in small groups. Even when going on walks, people should remain six feet apart to slow the spread of transmission (PA DOH, 2020b).

4.3.6.2. Range of Magnitude

The magnitude of a pandemic or infectious disease threat in the Allegheny County will range significantly depending on the aggressiveness of the virus in question and the ease of transmission. In the case of West Nile Virus, slightly less than 80% of cases are clinically asymptomatic. Approximately 20% of cases result in mild infection, called West Nile Fever, lasting two to seven days. However, one in 150 cases result in severe neurological disease or death. Since the appearance of West Nile Virus in Pennsylvania in 2000, the worst year statewide was 2003 when 237 Pennsylvanians were infected with the virus and 9 people died. The worst years in Allegheny County were 2002 with 22 human infections, 2003 with ten human infections, and 2005 with six human infections (DEP-WNCP, 2020). The virus is typically more serious in older adults.

Pandemic influenza is more easily transmitted from person-to-person than West Nile, but advances in medical technologies have greatly reduced the number of deaths caused by influenza over time. In terms of lives lost, the impact various pandemic influenza outbreaks have had globally over the last century has declined (see Table 4.3.6-3). The severity of illness from the 2009-10 H1N1 influenza flu virus varied, with the gravest cases occurring mainly among those considered at high risk. High risk populations considered more vulnerable include children, the elderly, pregnant women, and chronic disease patients with reduced immune system capacity. Most people infected with H1N1 in 2009 recovered without needing medical treatment, and this flu strain is now included in flu shots. According to the CDC, about 70% of

those who hospitalized with the 2009 H1N1 flu virus in the United States belonged to a high risk group (CDC, 2009). This pattern is expected to continue with future novel flu strains.

The magnitude of a pandemic may be exacerbated by the fact that an influenza pandemic will cause outbreaks across the United States, limiting the ability to transfer assistance from one jurisdiction to another. Additionally, effective preventative and therapeutic measures, including vaccines and other medications, will likely be in short supply or will not be available.

The 1918 Spanish flu pandemic remains the worst case pandemic event on record both in Pennsylvania and worldwide. While mortality figures were probably under-reported, in the first month of the pandemic alone, 8,000 Pennsylvanians died from the flu or its complications (US DHHS, 2010). As the densest city in the Commonwealth, Philadelphia was particularly hurt from this event.

It is believed that the coronavirus originated in an open-air market in the Wuhan province of China in November 2019. Shortly afterwards, the virus began to spread to nearby countries like Japan and South Korea. By March 2020, the virus had reached almost every country worldwide, with the most cases in the US. At first, people were mostly concerned with people who might be infected due to recent travel. However, community infections soon began to crop up in many cities and towns. This led to a statewide shutdown of schools and businesses and the cancellation of large events for Spring and Summer 2020. Only life sustaining services were permitted to remain open, including medical facilities, pharmacies, and grocery stores. People were advised to remain home as much as possible in attempt to slow the transmission of COVID-19. State health officials note that the virus has infected all age ranges at about the same rate, and that no age group can be considered more or less vulnerable to infection.

4.3.6.3. Past Occurrence

West Nile Virus arrived in the United States in 1999 and was first detected in Pennsylvania in 2000 when mosquito pools, dead birds, and/ or horses in 19 counties tested positive for the virus. Since then, the number of positive counties, human cases, and West Nile deaths has fluctuated with the temperature and precipitation each year. Table 4.3.6-2 illustrates the virus' presence in Allegheny County, human infection, and mortality since 2001.

Table 4.3.6-2 **Previous West Nile Virus Occurrences in Allegheny County 2001-2019 (DEP-WNCP, 2020).**

Year	Virus Detected	Positive Human Cases	Human Deaths
2001	No	0	0
2002	Yes	22	4
2003	Yes	10	0
2004	Yes	0	0
2005	Yes	6	0
2006	Yes	0	0
2007	Yes	1	0

Table 4.3.6-2 **Previous West Nile Virus Occurrences in Allegheny County 2001-2019 (DEP-WNCP, 2020).**

Year	Virus Detected	Positive Human Cases	Human Deaths
2008	Yes	0	0
2009	Yes	0	0
2010	Yes	0	0
2011	Yes	1	0
2012	No	0	0
2013	Yes	0	0
2014	Yes	1	0
2015	Yes	3	Unknown
2016	No	0	0
2017	Yes	2	Unknown
2018	Yes	5	Unknown
2019	No	0	0

While West Nile Virus occurrences are fairly recent, the United States Department of Health and Human Services estimates that influenza pandemics have occurred for at least 300 years at unpredictable intervals. There have been several pandemic influenza outbreaks over the past 100 years. A list of events worldwide is shown in Table 4.3.6-3.

Table 4.3.6-3 **List of Previous Significant Outbreaks of Influenza over the Past Century (Global Security, 2009; WHO, 2010; Roos, 2012).**

Date	Pandemic Name/Subtype	Worldwide Deaths (Approximate)
1918-1920	Spanish Flu / H1N1	50 million
1957-1958	Asian Flu / H2N2	1.5-2 million
1968-1969	Hong Kong Flu / H3N2	1 million
2009-2011	Swine Flu / A/H1N1	284,000

Deaths occurred in the United States as a result of the Spanish Flu, Asian flu, and Hong Kong Flu outbreaks. The Spanish Flu claimed 500,000 lives in the United States, and there were 350,000 cases in Pennsylvania – 150,000 were in Philadelphia alone. Most deaths resulting from the Asian flu occurred between September 1957 and March 1958; there were about 70,000 deaths in the United States and approximately 15% of the population of Pennsylvania was affected. The first cases of the Hong Kong Flu in the U.S. were detected in September of 1968 with deaths peaking between December 1968 and January 1969 (Global Security, 2009). In the 2009/2010 flu season, when H1N1 was a primary concern. The World Health Organization declared a pandemic in June 2009.

Confirmed flu cases have been on the rise in Allegheny County over the past few years. Figure 4.3.6-4 lists the number of confirmed flu cases, hospitalizations, and deaths in Allegheny County by flu season. According to the Pennsylvania Department of Health (DOH), there were 13,694 confirmed cases in Allegheny County the most recent influenza season from September 2019 to March 2020 (PA DOH, 2020a).

The CDC marked the 2014-2015 flu season as severe, with approximately 710,000 hospitalizations. The CDC does not track national deaths in adults, but the organization reported 148 pediatric deaths from influenza. The 2017-2018 flu season was another severe season. The CDC reported that the H3N2 flu, along with other strains including H1N1, led to more cases, doctors' visits, hospital visits, and deaths than previous flu seasons. The CDC also noted that the flu became widespread in all states and jurisdictions at the same time. In January 2018, approximately halfway through the flu season, 37 pediatric deaths were reported. The CDC estimated that 34 million Americans were affected by the flu (CDC, 2018).

Table 4.3.6-4 **Flu Cases in Allegheny County 2015-2020 (ACHD, 2020c).**

Flu Season	Number of Cumulative Cases	Number of Cumulative Hospitalizations	Number of Cumulative Gaps
2015-2016	3,147	228	7
2016-2017	5,025	428	9
2017-2018	12,793	803	31
2018-2019	9,856	288	29
2019-2020	13,801	174	15

The COVID-19 outbreak began in China in November 2019. The virus reached the US in late February 2020, and most counties in Pennsylvania were affected by March 2020. As of November 4th, the county had 16,210 confirmed cases and 437 deaths related to COVID-19 (ACHD, 2020d). These numbers are expected to continue to increase. While those who tested positive are isolating in their homes, county officials urge the entire population to isolate and act as if the virus is everywhere. In response to the impact of the outbreak all non-essential businesses were closed through mid-summer 2020, and while many businesses have re-opened, they have done so with many restrictions as of November 2020.

4.3.6.4. Future Occurrence

Future occurrences of pandemic are unclear. For example, instances of the West Nile Virus have been generally decreasing due to aggressive planning and eradication efforts, but some scientists suggest that as global temperatures rise and extreme weather conditions increase due to climate change, the range of the virus in the United States will grow (Paz, 2015).

As with West Nile Virus, the precise timing of pandemic influenza is uncertain, but occurrences are most likely when the Influenza Type A virus makes a dramatic change, or antigenic shift, that results in a new

or “novel” virus to which the population has no immunity. This emergence of a novel virus is the first step toward a pandemic.

Future pandemics may also emerge from other diseases, especially invasive pathogens that Pennsylvanians do not have natural immunity to, as we have seen with COVID-19. The COVID-19 pandemic has shown that occurrences of pandemic can be unpredictable, with unknown impact. It takes just one occurrence to have a major impact. Therefore, while future occurrences of pandemic are unclear, if a pandemic event is to occur it can be anticipated that it will be impactful.

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

4.3.6.5. Vulnerability Assessment

In general, municipalities that are more densely populated are more vulnerable to disease threats when the disease is directly spread from human to human, but every jurisdiction has some vulnerability to pandemic and infectious disease threats. Colleges and universities with large residential student populations may also be more vulnerable, as a pandemic is more likely to spread through human contact in these settings.

There are some occupation-specific risks that may make some employees more vulnerable, though. For example, those working in direct patient care situations are more likely to be exposed to a pandemic disease; similarly, county employees working outdoors for extended periods of time in the warm months may be more vulnerable to West Nile Virus.

There are no true environmental impacts of pandemics and infectious disease threats, but there will be significant economic and social costs beyond the possibility of disease-related deaths. Widespread illness may increase the likelihood of shortages of personnel to perform essential community services. In addition, high rates of illness and worker absenteeism occur within the business community, and these contribute to social and economic disruption. On a national scale, the Congressional Budget Office Estimates that a severe pandemic could cost the US economy more than $600 million, or 5% of the Gross Domestic Product (US DHHS 2005). Social and economic disruptions could be temporary but may be amplified in today’s closely interrelated and interdependent systems of trade and commerce. Social disruption may be greatest when rates of absenteeism impair essential services, such as power, transportation, and communications.

Municipal losses in a pandemic or infectious disease outbreak stem from lost wages and productivity, not losses to buildings or land. Losses are difficult to estimate because the exact rates of absenteeism and cost of treating a widespread disease will depend on the virus or bacterium in question, the availability of vaccination or treatment, and the severity of symptoms. For historical context, though, the Asian and Hong Kong Flu pandemics killed over 1.5 million people worldwide and caused an estimated $32 billion loss due to lost productivity and medical expenses (Smith, 2004). With Pennsylvania’s economy so integral

to the national economy, economic losses from a pandemic or infectious disease threat could be significant.

It is expected that there will be immense losses due to the COVID-19 pandemic. Thousands of individuals were laid off across the commonwealth at non-essential businesses were forced to close. In just one week, over three million Americans filed for unemployment; the greatest amount ever (Long & Fowers, 2020). There is specific concern for those who worked in service and hospitality industries. Construction projects and other businesses are in limbo, while many others decide to permanently close. However, the commonwealth and the federal government are releasing relief packages for individuals and businesses. The ACHD complied a growing list with links to medical information, relief packages, and other resources. It is currently unknown how COVID-19 will change the county.

The Allegheny County Health Department is charged with influenza surveillance and planning. The Health Department conducts proactive planning for influenza and other infectious diseases that will reduce overall vulnerability to future pandemic events (ACHD, 2020c). These services include:

- Health services and treatment
- Surveillance
- Immunization
- Laboratory identification
- Communications
- Emergency preparedness
- Distributing antiviral medications.

4.3.7. Radon Exposure

4.3.7.1. Location and Extent

Radioactivity caused by airborne radon has been recognized for many years as an important component in the natural background radioactivity exposure of humans, but it was not until the 1980s that the wide geographic distribution of elevated values in houses and the possibility of extremely high radon values in houses were recognized. In 1984, routine monitoring of employees leaving the Limerick nuclear power plant near Reading, PA while it was still under construction and not yet functional, showed that readings on a construction worker at the plant frequently exceeded expected radiation levels. However, only natural, nonfission-product radioactivity was detected on him.

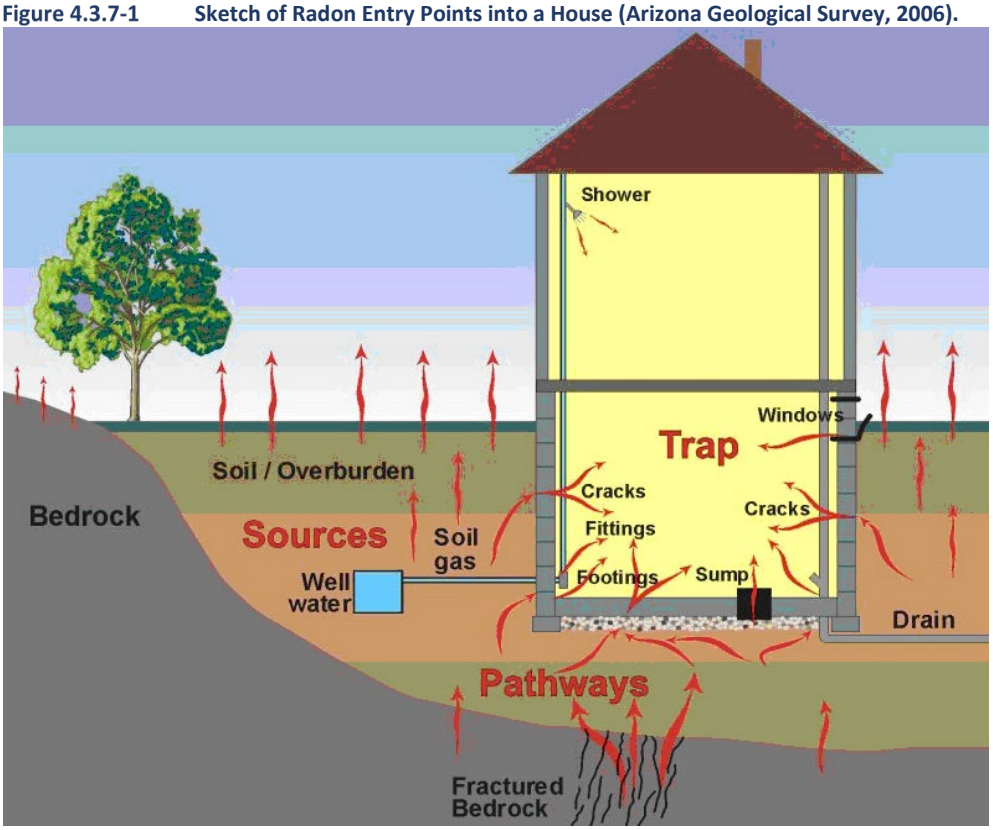
Subsequent testing of the employee's home in the Reading Prong section of Pennsylvania showed extremely high radon levels around 2,500 pCi/L (pico Curies per Liter). To put this amount in perspective, the Environmental Protection Agency (EPA) guidelines state that actions should be taken if radon levels exceed 4 pCi/L in a home, and uranium miners have a maximum exposure of 67 pCi/L. As a result of this event, the Reading Prong became the focus of the first large-scale radon scare in the world.

Radon is a gas that cannot be seen or smelled. It is a noble gas that originates by the natural radioactive decay of uranium and thorium. Like other noble gases (e.g., helium, neon, and argon), radon forms essentially no chemical compounds and tends to exist as a gas or as a dissolved atomic constituent in groundwater. Two isotopes of radon are significant in nature, 222Rn and 220Rn, formed in the radioactive decay series of 238U and 232Th, respectively. The isotope thoron (i.e. 220Rn) has a half-life (time for decay of half of a given group of atoms) of 55 seconds, barely long enough for it to migrate from its source to the air inside a house and pose a health risk. However, radon (i.e. 222Rn), which has a half-life of 3.8 days, is a widespread hazard. The distribution of radon is correlated with the distribution of radium (i.e. 226Ra), its immediate radioactive parent, and with uranium, its original ancestor. Due to the short half-life of radon, the distance that radon atoms can travel from their parent before decay is generally limited to distances of feet or tens of feet.

Three sources of radon in houses are now recognized (shown in Figure 4.3.7-1):

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

Figure 4.3.7-1 Sketch of Radon Entry Points into a House (Arizona Geological Survey, 2006).



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

The radon concentration of soil gas depends upon a number of soil properties, the importance of which is still being evaluated. In general, ten to fifty percent of newly formed radon atoms escape the host mineral of their parent radium and gain access to the air-filled pore space. The radon content of soil gas clearly tends to be higher in soils containing higher levels of radium and uranium, especially if the radium occupies a site on or near the surface of a grain from which the radon can easily escape. The amount of pore space in the soil and its permeability for air flow, including cracks and channels, are important factors determining radon concentration in soil gas and its rate of flow into a house. Soil depth and moisture

content, mineral host and form for radium, and other soil properties may also be important. For houses built on bedrock, fractured zones may supply air having radon concentrations similar to those in deep soil.

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

- Areas of very elevated uranium content (>50 ppm) around uranium deposits and prospects. Although very high levels of radon can occur in such areas, the hazard normally is restricted to within a few hundred feet of the deposit. In Pennsylvania, such localities occupy an insignificant area.
- Areas of common rocks having higher than average uranium content (5 to 50 ppm). In Pennsylvania, such rock types include granitic and felsic alkali igneous rocks and black shales. In the Reading Prong, high uranium values in rock or soil and high radon levels in houses are associated with Precambrian granitic gneisses commonly containing 10 to 20 ppm uranium, but locally containing more than 500 ppm uranium. In Pennsylvania, elevated uranium occurs in black shales of the Devonian Marcellus Formation and possibly the Ordovician Martinsburg Formation. High radon values are locally present in areas underlain by these formations.
- Areas of soil or bedrock that have normal uranium content but properties that promote high radon levels in houses. This group is incompletely understood at present. Relatively high soil permeability can lead to high radon, the clearest example being houses built on glacial eskers. Limestone-dolomite soils also appear to be predisposed for high radon levels in houses, perhaps because of the deep clay-rich residuum in which radium is concentrated by weathering on iron oxide or clay surfaces, coupled with moderate porosity and permeability. The importance of carbonate soils is indicated by the fact that radon contents in 93 percent of a sample of houses built on limestone-dolomite soils near State College, Centre County, exceeded 4 pCi/L, and 21 percent exceeded 20 pCi/L, even though the uranium values in the underlying bedrock are all in the normal range of 0.5 to 5 ppm uranium.

The second factor listed above is most likely the cause of radon levels in Allegheny County, although high test results may be a result of multiple factors. Figures 4.3.7-2 and 4.3.7-3 show the radon test data available for Allegheny County by zip code. Most communities have average basement radon readings of over the threshold of action of 4 pCi/L. Communities with no data available did not have a sufficient sample size.

Figure 4.3.7-2 Allegheny Average Basement Radon Test Results.

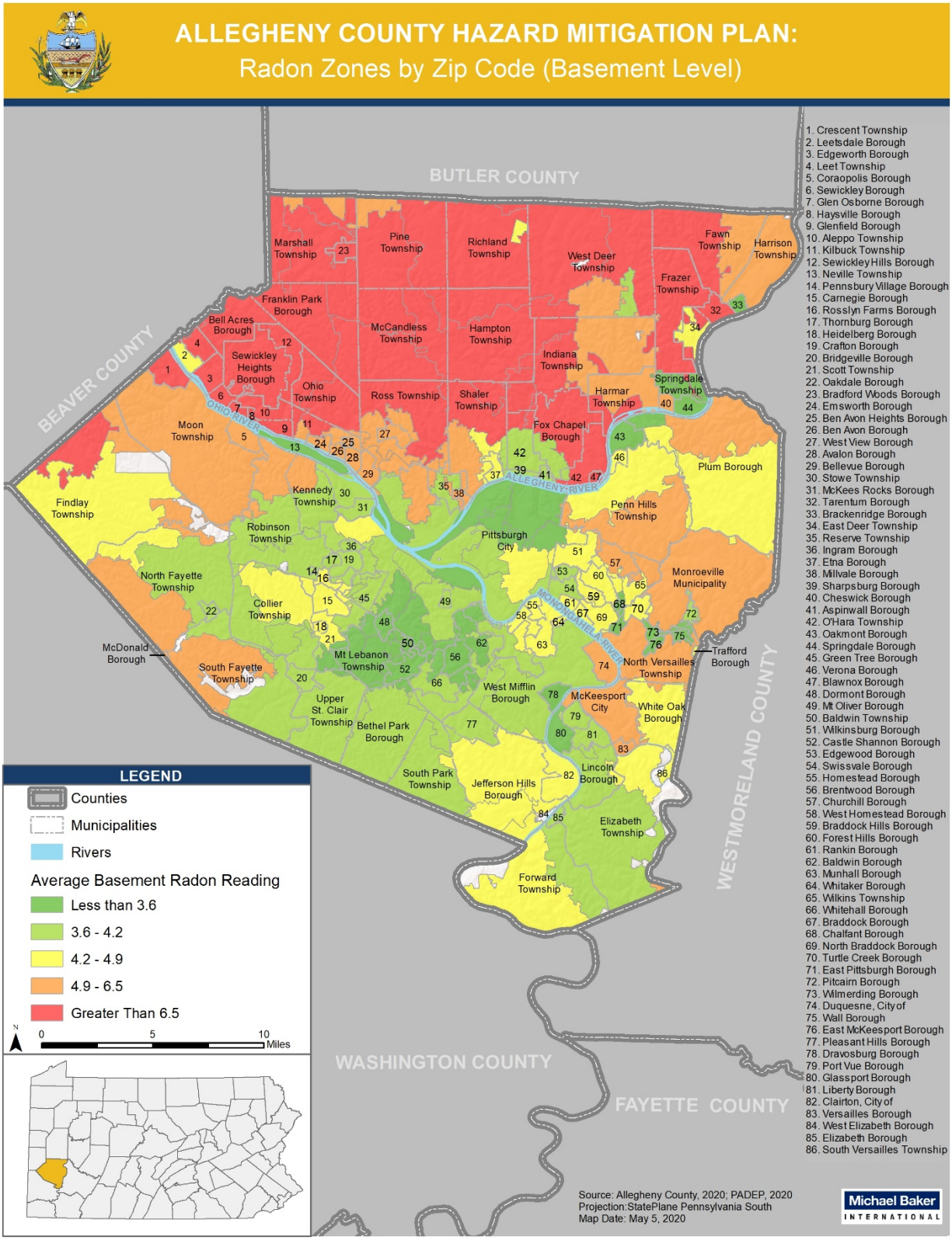
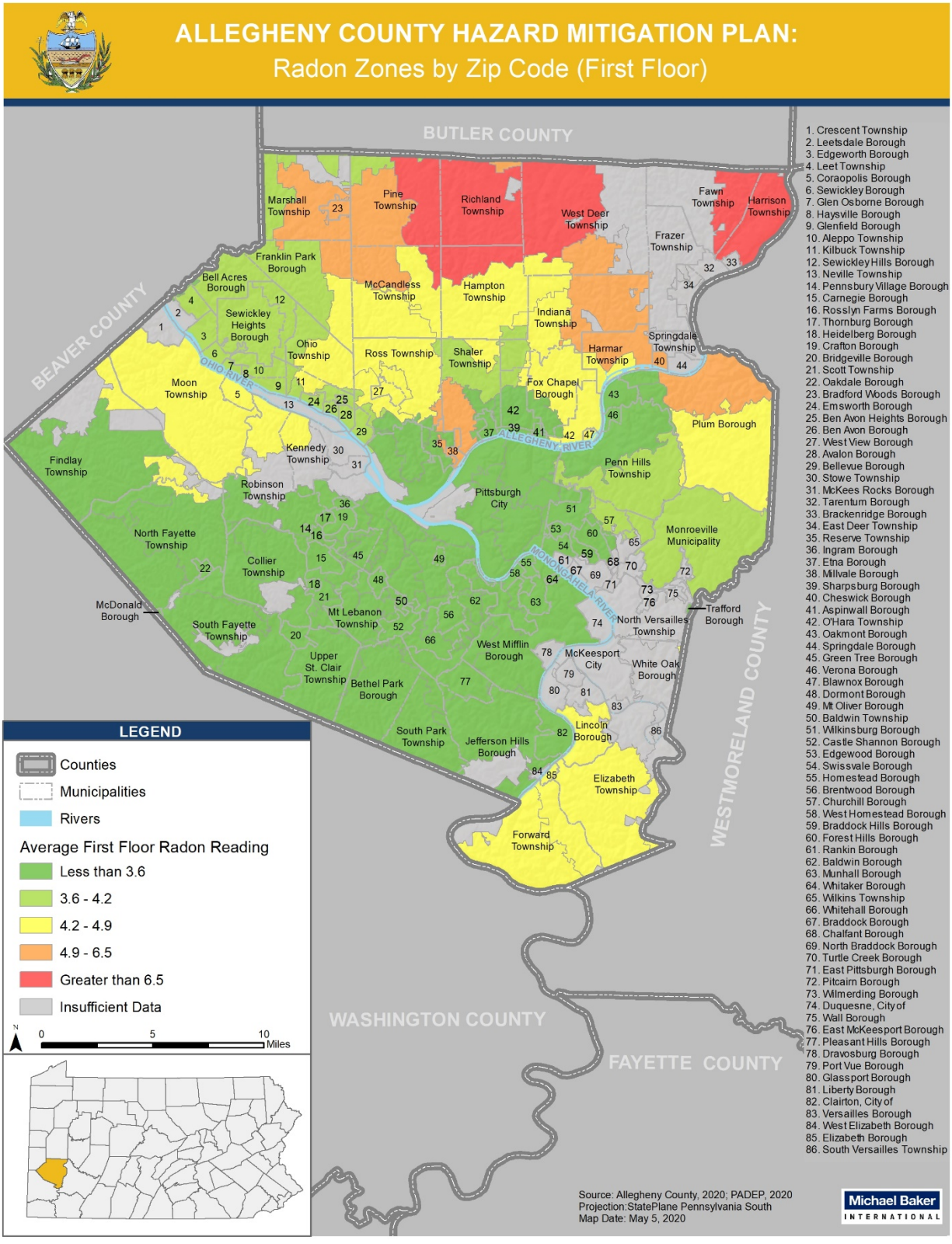


Figure 4.3.7-3 Average First Floor Radon Test Results.



4.3.7.2. Range of Magnitude

Exposure to radon is the second leading cause of lung cancer after smoking. It is the number one cause of lung cancer among non-smokers. Radon is responsible for about 21,000 lung cancer deaths every year; approximately 2,900 of which occur among people who have never smoked. Lung cancer is the only known effect on human health from exposure to radon in air and thus far, there is no evidence that children are at greater risk of lung cancer than are adults (EPA, 2016). The main hazard is actually from the radon daughter products (218Po, 214Pb, 214Bi), which may become attached to lung tissue and induce lung cancer by their radioactive decay.

According to the EPA, the average radon concentration in the indoor air of homes nationwide is about 1.3 pCi/L. The EPA recommends homes be fixed if the radon level is 4 pCi/L or more. However, because there is no known safe level of exposure to radon, the EPA also recommends that Americans consider fixing their home for radon levels between 2 pCi/L and 4 pCi/L. Table 4.3.7-1 shows the relationship between various radon levels, probability of lung cancer, comparable risks from other hazards, and action thresholds. As is shown in Table 4.3.7-1, a smoker exposed to radon has a much higher risk of lung cancer (EPA, 2016).

Table 4.3.7-1 **Radon Risk for Smokers and Non-Smokers (EPA, 2016).**

Radon Level (pCi/L)	If 1,000 People Were Exposed to this Level Over a Lifetime…*	RISK OF CANCER FROM RADON EXPOSURE COMPARES TO…**	ACTION THRESHOLD
Smokers			
20	About 260 people could get lung cancer	250 times the risk of drowning	Fix Structure
10	About 150 people could get lung cancer	200 times the risk of dying in a home fire	
8	About 120 people could get lung cancer	30 times the risk of dying in a fall	
4	About 62 people could get lung cancer	5 times the risk of dying in a car crash	
2	About 32 people could get lung cancer	6 times the risk of dying from poison	Consider fixing structure between 2 and 4 pCi/L
1.3	About 20 people could get lung cancer	(Average indoor radon level)	Reducing radon levels below 2pCi/L is difficult
0.4	About 3 people could get lung cancer	(Average outdoor radon level)	
Non-Smokers			
20	About 36 people could get lung cancer	35 times the risk of drowning	Fix Structure
10	About 18 people could	20 times the risk	

Table 4.3.7-1 **Radon Risk for Smokers and Non-Smokers (EPA, 2016).**

Radon Level (pCi/L)	If 1,000 People Were Exposed to this Level Over a Lifetime…*	RISK OF CANCER FROM RADON EXPOSURE COMPARES TO…**	ACTION THRESHOLD
	get lung cancer	of dying in a home fire	
8	About 15 people could get lung cancer	4 times the risk of dying in a fall	
4	About 7 people could get lung cancer	The risk of dying in a car crash	
2	About 4 people could get lung cancer	The risk of dying from poison	Consider fixing structure between 2 and 4 pCi/L
1.3	About 2 people could get lung cancer	(Average indoor radon level)	Reducing radon levels below 2pCi/L is difficult
0.4	-	(Average outdoor radon level)	

NOTE: Risk may be lower for former smokers.
* Lifetime risk of lung cancer deaths from EPA Assessment of Risks from Radon in Homes (EPA 402-R-03-003).
** Comparison data calculated using the Centers for Disease Control and Prevention's 1999-2001 National Center for Injury Prevention and Control Reports.

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

4.3.7.3. Past Occurrence

Current data on abundance and distribution of radon as it affects individual houses in the state of Pennsylvania in general is considered incomplete and potentially biased. Allegheny County is no exception. The EPA has estimated that the national average indoor radon concentration is 1.3 pCi/L and the level for action is 4.0 pCi/L; however, they have estimated that the average indoor concentration in Pennsylvania basements is about 7.1 pCi/L and 3.6 pCi/L on the first floor (PADEP, 2019).

The Pennsylvania Department of Environmental Protection Bureau of Radiation Protection provides information for homeowners on how to test for radon in their houses. If a test results in radon concentrations over 4 pCi/L, then the Bureau works to help the homeowners make repairs to their houses to mitigate against high radon levels. The total number tests reported to the Bureau since 1990 and their results are provided by zip code on the Bureau's website. However, this information is only provided if over 30 tests total were reported in order to best approximate the average for the area.

In Allegheny County, 110 zip codes had sufficient tests reported to the Bureau to list their findings, which are shown in Table 4.3.7-2. This table includes zip codes that are located partially in Allegheny County, like Aliquippa, and does not include the 51 ZIP codes for which insufficient data was collected or data did not exist.

Table 4.3.7-2 **Radon Level Tests and Results in Allegheny County Zip Codes (PADEP, 2020).**

Zip Code	Community	Basement			First Floor	
		Number of Tests	Maximum Results (pCi/L)	Average Result (pCi/L)	Number of Tests	Average Result (pCi/L)
15001*	Aliquippa	3,512	224.5	7.9	144	7.9
15003*	Ambridge	863	227	8.3	38	3.1
15005*	Baden	1,252	169	7	65	3.8
15007	Bakerstown	30	11.2	4.4	Insufficient data	Insufficient data
15014	Brackenridge	110	13.3	2.9	Insufficient data	Insufficient data
15015	Bradfordwoods	460	205.7	10.2	43	6.2
15017	Bridgeville	2,134	156.5	4	167	2.2
15024	Cheswick	931	131	6	51	6.2
15025	Clairton	615	80	4.5	62	2.9
15026*	Clinton	355	170.9	10.9	Insufficient data	Insufficient data
15030	Creighton	30	21.8	4.9	Insufficient data	Insufficient data
15034	Dravosburg	44	15.6	3.3	Insufficient data	Insufficient data
15035	East MC Keesport	51	11.5	3.2	Insufficient data	Insufficient data
15037	Elizabeth	693	34.4	4.2	48	4.4
15044	Gibsonia	6,567	325.7	8	491	6.6
15045	Glassport	128	26	3.2	Insufficient data	Insufficient data
15046	Crescent	273	49.9	6.9	Insufficient data	Insufficient data
15049	Harwick	59	17	2.8	Insufficient data	Insufficient data
15051	Indianola	52	47.6	7.8	Insufficient data	Insufficient data
15056	Leetsdale	126	33.8	4.4	Insufficient data	Insufficient data
15057*	MC Donald	1,252	106.5	5.7	56	2.9
15063*	Monongahela	637	60.8	4.5	33	4.6
15065*	Natrona Heights	730	101	5.9	36	7.8
15067*	New Eagle	92	64.3	4.4	Insufficient data	Insufficient data
15068*	New Kensington	2,097	78.4	5.7	128	6
15071	Oakdale	864	116.8	3.9	69	3
15076	Russellton	34	20.4	3.7	Insufficient data	Insufficient data
15084	Tarentum	475	75.6	6.8	Insufficient data	Insufficient data
15085*	Trafford	902	304	4.9	44	3.2

Table 4.3.7-2 **Radon Level Tests and Results in Allegheny County Zip Codes (PADEP, 2020).**

Zip Code	Community	Basement			First Floor	
		Number of Tests	Maximum Results (pCi/L)	Average Result (pCi/L)	Number of Tests	Average Result (pCi/L)
15086	Warrendale	75	72	7.9	Insufficient data	Insufficient data
15089*	West Newton	256	75	5.7	55	4.5
15090	Wexford	8,826	229.5	8.9	825	6.1
15101	Allison Park	4,960	172.6	7.2	481	4.4
15102	Bethel Park	5,073	143.3	4	320	2.3
15104	Braddock	145	35.9	4.7	Insufficient data	Insufficient data
15106	Carnegie	1,532	128	4.7	102	2.6
15108	Coraopolis	4,332	162.9	6.2	513	4.5
15110	Duquesne	78	100.1	5.8	Insufficient data	Insufficient data
15112	East Pittsburgh	82	12.9	3.1	Insufficient data	Insufficient data
15116	Glenshaw	2,554	309	6.6	189	4
15120	Homestead	1,105	73.4	4.3	50	2.3
15122	West Mifflin	1,360	37	4	49	2.9
15126	Imperial	986	151	4.6	74	3.3
15127	Ingomar	58	40.8	5.6	Insufficient data	Insufficient data
15129	South Park	1,197	93.1	4.2	109	2.4
15131	McKeesport	806	90.7	4.4	Insufficient data	Insufficient data
15132	McKeesport	446	130	5.7	Insufficient data	Insufficient data
15133	McKeesport	244	52.6	4.2	Insufficient data	Insufficient data
15135	McKeesport	249	27.8	4.3	Insufficient data	Insufficient data
15136	McKees Rocks	746	86.5	3.9	Insufficient data	Insufficient data
15137	North Versailles	507	97.7	5	Insufficient data	Insufficient data
15139	Oakmont	733	155.9	3.5	68	1.5
15140	Pitcairn	128	22.8	4	Insufficient data	Insufficient data
15142	Presto	309	78.6	4.2	Insufficient data	Insufficient data
15143	Sewickley	6,450	268.9	7.2	567	3.9
15144	Springdale	318	43.9	3.6	Insufficient data	Insufficient data
15145	Turtle Creek	326	66.1	4.3	Insufficient data	Insufficient data
15146	Monroeville	4063	267	5.9	219	3.9
15147	Verona	1,122	190	4.7	74	3.3
15148	Wilmerding	48	13.6	2.9	Insufficient data	Insufficient data
15201	Pittsburgh	1,143	8.4	3	53	2
15202	Pittsburgh	1,843	190.2	5.4	106	3.8

Table 4.3.7-2 **Radon Level Tests and Results in Allegheny County Zip Codes (PADEP, 2020).**

Zip Code	Community	Basement			First Floor	
		Number of Tests	Maximum Results (pCi/L)	Average Result (pCi/L)	Number of Tests	Average Result (pCi/L)
15203	Pittsburgh	879	73.7	2.8	74	1.6
15204	Pittsburgh	340	40.8	4.5	Insufficient data	Insufficient data
15205	Pittsburgh	1,856	63.6	3.9	175	2.6
15206	Pittsburgh	2,197	45.4	3.2	195	1.9
15207	Pittsburgh	717	54.7	4	32	3.5
15208	Pittsburgh	950	61.6	3.6	116	1.8
15209	Pittsburgh	1,248	55.9	5.5	123	5.7
15210	Pittsburgh	930	43	4.2	38	1.8
15211	Pittsburgh	863	198	4	48	1.9
15212	Pittsburgh	1,807	234	4	110	2.2
15213	Pittsburgh	679	66.3	3.7	134	1.9
15214	Pittsburgh	1,100	100	5	70	3.2
15215	Pittsburgh	2,298	65.3	4.2	214	3.1
15216	Pittsburgh	2,729	189	3.2	231	2.1
15217	Pittsburgh	5,271	103.1	4.5	631	2.4
15218	Pittsburgh	2,329	73.5	3.8	159	2.5
15219	Pittsburgh	214	29.4	4	Insufficient data	Insufficient data
15220	Pittsburgh	1,679	63.1	3.9	154	2.8
15221	Pittsburgh	2,761	126	4.5	231	2.9
15222	Pittsburgh	111	62.9	3.3	Insufficient data	Insufficient data
15223	Pittsburgh	619	35.6	4.7	32	2.6
15224	Pittsburgh	488	20	2	33	1.4
15225	Pittsburgh	62	13.1	3.4	Insufficient data	Insufficient data
15226	Pittsburgh	1,341	53.2	3.4	50	1.9
15227	Pittsburgh	2,547	56.1	3.6	182	1.7
15228	Pittsburgh	4,033	73	3.6	540	2.2
15229	Pittsburgh	2,154	121	6.4	179	4.7
15232	Pittsburgh	1,299	61.5	2.8	147	1.6
15233	Pittsburgh	126	18.4	2.6	Insufficient data	Insufficient data
15234	Pittsburgh	1,973	63.1	3.6	180	2.2
15235	Pittsburgh	3,607	101.7	5	246	3.9
15236	Pittsburgh	3,311	283.3	3.8	269	2.6
15237	Pittsburgh	10,749	237.9	7.6	974	4.8

Table 4.3.7-2 **Radon Level Tests and Results in Allegheny County Zip Codes (PADEP, 2020).**

Zip Code	Community	Basement			First Floor	
		Number of Tests	Maximum Results (pCi/L)	Average Result (pCi/L)	Number of Tests	Average Result (pCi/L)
15238	Pittsburgh	4,539	171.9	7.7	490	4.8
15239	Pittsburgh	2,013	611.6	4.9	97	4.9
15241	Pittsburgh	5,035	82.5	4.1	626	2.9
15243	Pittsburgh	2,872	44	3.4	342	2.2
15317*	Canonsburg	5,438	117.5	4	383	2.9
15321*	Cecil	166	92.3	5.2	Insufficient data	Insufficient data
15332*	Finleyville	485	42.6	4.5	Insufficient data	Insufficient data
15367*	Venetia	1,755	109.8	4.5	104	3.2
15642*	Irwin	2,956	88.9	5	124	4.7
15668*	Murrysville	3,272	149	7	175	5.2
16046*	Mars	3,129	149.2	6.5	306	3.8
16055*	Sarver	879	111.9	10.2	40	5.4
16056*	Saxonburg	476	176	9	37	4.2
16059*	Valencia	906	359.2	11.2	84	5.7
16066*	Cranberry Township	7,040	180	5.3	232	4.1

*Zip codes partially in Allegheny County

4.3.7.4. Future Occurrence

Radon exposure in Allegheny County remains a probability given present soil, geologic, and geomorphic factors. Future occurrence of high radon level hazards can be considered possible as defined by the Risk Factor Methodology probability criteria (see Table 4.4-1).

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

4.3.7.5. Vulnerability Assessment

Structures in Allegheny County, particularly in high vulnerability areas as shown in Figures 4.3.7-2 and 4.3.7-3, could be susceptible to moderate levels of radon. Smokers can be up to ten times more vulnerable to lung cancer from high levels of radon depending on the level of radon they are exposed to. Older houses that have crawl spaces or unfinished basements are more vulnerable as well because of the increased exposure to soils which could be releasing higher levels of radon gas. Additionally, houses that rely on

wells for their water may face an additional risk, although this type of exposure is low and rare in Pennsylvania.

Proper testing for radon levels should be completed throughout Allegheny County, especially in the areas of higher incidence levels and for vulnerable populations that face the contributing risks described above. This testing will determine the level of vulnerability that residents face in their homes, as well as in their businesses and schools. The Pennsylvania Department of Environmental Protection Bureau of Radiation Protection provides short and long term tests to determine radon levels as well as information on how to mitigate high levels of radon in a building. According to the PADEP, repairs to protect against radon can cost on average the same as routine house repairs (PADEP, 2019). As seen in Figures 4.3.7-2 and 4.3.7-3, areas with the highest reported tests were primarily located in the northern portions of the County, while much of the central and southern portions of the county has moderate basement radon levels. First floor radon levels were also highest throughout the northern portion of the County.

4.3.8. Subsidence, Sinkhole

4.3.8.1. Location and Extent

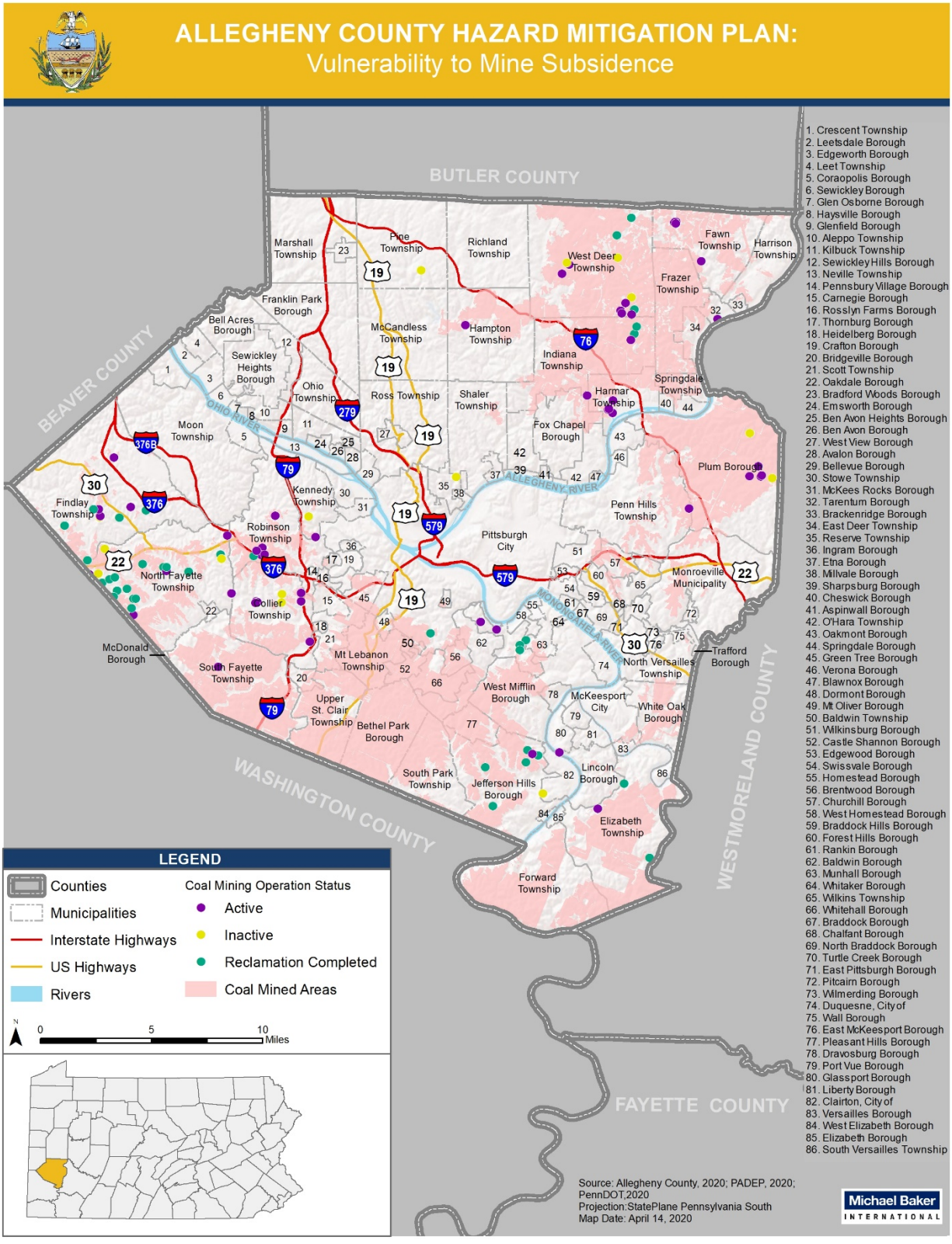
There are two common causes of subsidence in Pennsylvania: 1) mining activity and 2) dissolution of carbonate rock such as limestone or dolomite. In some parts of Pennsylvania, sinkholes are found in areas underlain by carbonate bedrock. Although Allegheny County is partially underlain by carbonate rock, those particular formations are not conducive to dissolution. Cave subsidence is not reported to be a major problem in the County (Pittsburgh Geological Society, 1977). Hence this plan addresses only mine subsidence.

Sub-surface (i.e. underground) extraction of materials such as oil, gas, coal, metal ores (i.e. copper, iron, and zinc), clay, shale, limestone, or water may result in slow-moving or abrupt shifts in the ground surface.

According to the Pennsylvania Department of Environmental Protection (DEP) website, there are two distinct coal fields in Pennsylvania known as the Anthracite and Bituminous coal regions. Bituminous coal is mined in 21 Pennsylvania counties, including Allegheny County. Allegheny County faces the problem of mine subsidence in all the areas of the County that have been undermined. These areas are shown in Figure 4.3.8-1. These mine subsidence areas include surface and deep coal and non-coal mined areas. The coal mined areas cover almost the entire southern half of the County and some portion in the northeastern part of the county.

Sinkholes generally develop where the cover above a mine is thin. Piggott and Eynon (1978) 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. In western Pennsylvania, most sinkholes develop where the soil and rock above a mine are less than fifty feet thick (Bruhn et al., 1978). A study of subsidence in the Pittsburgh area revealed that the majority of sinkholes, which constituted about 95% of all reported subsidence incidents, occurred on sites located less than sixty feet above mine level (Bruhn et al., 1981).

Figure 4.3.8-1 Areas of Allegheny County Vulnerable to Mine Subsidence, (PADEP, 2020).



4.3.8.2. Range of Magnitude

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

If long-term subsidence or sinkhole formation is not recognized and mitigation measures are not implemented, fractures or complete collapse of building foundations and roadways may result. If mitigation measures are not taken, the cost to fill in and stabilize sinkholes can be significant although sinkholes are limited in extent.

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

In general, the deeper the mine, the lower the risk of damage due to subsidence. Significant subsidence usually will occur when the depth of the soil and rock strata above the mined out area is less than 100 feet and more than 20 percent of the coal has been removed. Subsidence will occur quite rapidly if all the coal is removed, though subsidence will usually cease within one year after the coal has been removed particularly when modern mining methods are employed. If the mined out area is supported by pillars of coal, subsidence may not occur for several years or may not occur at all. Longwall mining, where a broad face of coal is removed at once, has also become prevalent. The associated subsidence is generally not as severe, and more predictable.

The worst mine subsidence event in recent history in Allegheny County occurred in 2013, when 69 homes in Hyde Park sustained mine subsidence damage. PA DEP responded to the subsidence by filling the mine voids at a cost of $3.7 million (Thomas, 2013).

4.3.8.3. Past Occurrence

PA DEP expects that mine-related subsidence is and will continue to be a regular occurrence in Allegheny County with the extent of mined areas. Isolated incidents throughout the coal regions over the years have occurred when houses, garages, and trees are swallowed up by subsidence holes. Lengths of local streets and highways, and countless building foundations have been damaged.

There is no comprehensive list of mine subsidence events in Allegheny County, but a review of news stories as well as instances provided by local officials includes some of the following occurrences:

- In 2013, 10 homes in Mount Oliver sustained mine subsidence damage.

- In 2014, a portion of Monroeville Trestle Road in Plum Borough was closed due to mine subsidence.
- In June 2015, a baseball field in Upper St Clair Township dropped three feet due, cancelling play for an extended period.
- In March 2016, 2 homes in Pleasant Hills experienced considerable structural damage due to an incident of mine subsidence. (PADEP, 2016)
- In 2020 local officials in the City of Duquesne provided a list of past occurrences and areas vulnerable to undermining.
    - Past Occurrences:
        - A home on Kinsley Avenue had mining damages
        - At Huckster's Bar the dining room collapsed in the early 2000s
    - Areas vulnerable to undermining:
        - Karl Avenue
        - Peter Street
        - Kinsley Avenue

4.3.8.4. Future Occurrence

There is currently no reliable information regarding the probability of future occurrences of mine subsidence. One way of estimating probability of future occurrence would be to project the historical trends into the future, but there is no comprehensive documentation of previous occurrences for mine subsidence events in the County. PA DEP indicates that mine subsidence events are constant, though they vary in intensity and damage (Thomas, 2013). Overall, mine subsidence can be considered possible as defined by the Risk Factor Methodology probability criteria (see Table 4.4-1).

4.3.8.5. Vulnerability Assessment

Allegheny County faces the problem of mine subsidence in all the areas of the County that have been mined. Deep coal mining has occurred under approximately 250 square miles or 35% of the land surface of Allegheny County (ACES, 1995). A mined area may be differentially prone to subsidence based on its geology and depth of coal seam, but reliable information about the different locations of varying depths of coal seam is not available. Geologists agree that all areas that are mined are prone to subsidence; therefore, the coal mined areas are shown as vulnerable to mine subsidence.

In 1994, mine subsidence occurred in Shaler Township in areas not previously known to be undermined. Since that time, there has been a countywide campaign to enable residents to be covered by mine subsidence insurance. Mine subsidence insurance has been available in Pennsylvania since 1987; this insurance coverage is available to both residential and commercial structures up to $50,000 for a single structure. As recently as April 2015, PA DEP targeted education and outreach campaigns to Allegheny County homeowners relating to purchasing mine subsidence insurance (MSI). MSI is incredibly affordable, with premiums starting at $10 for $5,000 of coverage, and discounts are available for senior citizens. Additional information about mine subsidence insurance can be found online at: http://www.dep.state.pa.us/dep/deputate/minres/bmr/MSIpage/msi_info.htm.

Table 4.3.8-1 shows the structures and critical facilities in Allegheny County potentially vulnerable to mine subsidence – those underlain by coal mined areas. Five communities are almost completely undermined: Baldwin Township, Bethel Park, Castle Shannon, Mount Lebanon, and Pleasant Hills; 19 have over half of all structures vulnerable to mine subsidence. Table 4.3.8-2 shows the vulnerable structures by structure type.

Table 4.3.8-1 **Structures and critical facilities vulnerable to subsidence.**

Municipality	Total Structures	Total Structures on Underground Mine Areas	Percent Structures on Underground Mine Areas	Total Critical Facilities	Critical Facilities on Underground Mine Areas	Percent Critical Facilities on Underground Mine Areas
Aleppo Township	904	0	0%	7	0	0%
Aspinwall Borough	1,256	0	0%	6	0	0%
Avalon Borough	2,359	0	0%	8	0	0%
Baldwin Borough	9,159	5,369	59%	18	13	72%
Baldwin Township	946	911	96%	3	3	100%
Bell Acres Borough	625	0	0%	8	0	0%
Bellevue Borough	3,005	0	0%	15	0	0%
Ben Avon Borough	759	0	0%	3	0	0%
Ben Avon Heights Borough	144	0	0%	1	0	0%
Bethel Park, Municipality of	13,201	12,451	94%	34	29	85%
Blawnox Borough	694	0	0%	7	0	0%
Brackenridge Borough	1,538	103	7%	9	1	11%
Braddock Borough	1,244	0	0%	9	0	0%
Braddock Hills Borough	868	0	0%	5	0	0%
Bradford Woods Borough	507	0	0%	4	0	0%
Brentwood Borough	4,263	3,383	79%	14	12	86%
Bridgeville Borough	2,277	962	42%	6	0	0%
Carnegie Borough	3,748	154	4%	13	0	0%
Castle Shannon Borough	3,698	3,423	93%	8	8	100%
Chalfant Borough	417	0	0%	2	0	0%
Cheswick Borough	904	57	6%	6	0	0%
Churchill Borough	1,500	786	52%	6	5	83%
Clairton, City of	4,008	0	0%	15	0	0%
Collier Township	4,512	1,962	43%	23	7	30%
Coraopolis Borough	2,666	0	0%	13	0	0%

Table 4.3.8-1 **Structures and critical facilities vulnerable to subsidence.**

Municipality	Total Structures	Total Structures on Underground Mine Areas	Percent Structures on Underground Mine Areas	Total Critical Facilities	Critical Facilities on Underground Mine Areas	Percent Critical Facilities on Underground Mine Areas
Crafton Borough	2,547	0	0%	6	0	0%
Crescent Township	1,165	0	0%	3	0	0%
Dormont Borough	3,481	1,465	42%	7	3	43%
Dravosburg Borough	1,043	24	2%	5	0	0%
Duquesne, City of	3,158	0	0%	14	0	0%
East Deer Township	792	178	22%	11	0	0%
East McKeesport Borough	1,034	0	0%	4	0	0%
East Pittsburgh Borough	874	0	0%	4	0	0%
Edgewood Borough	1,444	0	0%	5	0	0%
Edgeworth Borough	673	0	0%	6	0	0%
Elizabeth Borough	704	0	0%	6	0	0%
Elizabeth Township	6,119	2,846	47%	29	15	52%
Emsworth Borough	1,023	0	0%	8	0	0%
Etna Borough	1,638	0	0%	8	0	0%
Fawn Township	1,068	445	42%	13	7	54%
Findlay Township	3,382	39	1%	27	3	11%
Forest Hills Borough	3,198	434	14%	9	0	0%
Forward Township	1,636	874	53%	17	9	53%
Fox Chapel Borough	1,972	402	20%	14	1	7%
Franklin Park Borough	5,675	0	0%	14	0	0%
Frazer Township	627	545	87%	14	12	86%
Glassport Borough	2,147	0	0%	12	0	0%
Glen Osborne Borough	243	0	0%	3	0	0%
Glenfield Borough	108	0	0%	1	0	0%
Green Tree Borough	2,516	993	39%	7	3	43%
Hampton Township	7,273	1,688	23%	39	6	15%
Harmar Township	1,850	802	43%	24	8	33%
Harrison Township	5,428	807	15%	18	6	33%
Haysville Borough	51	0	0%	1	0	0%
Heidelberg Borough	643	37	6%	5	0	0%
Homestead Borough	1,561	0	0%	10	0	0%
Indiana Township	3,496	2701	77%	31	23	74%

Table 4.3.8-1 **Structures and critical facilities vulnerable to subsidence.**

Municipality	Total Structures	Total Structures on Underground Mine Areas	Percent Structures on Underground Mine Areas	Total Critical Facilities	Critical Facilities on Underground Mine Areas	Percent Critical Facilities on Underground Mine Areas
Ingram Borough	1,313	0	0%	5	0	0%
Jefferson Hills Borough	5,372	3,379	63%	30	16	53%
Kennedy Township	3,899	172	4%	20	3	15%
Kilbuck Township	368	0	0%	1	0	0%
Leet Township	652	0	0%	5	0	0%
Leetsdale Borough	676	0	0%	13	0	0%
Liberty Borough	1,156	0	0%	7	0	0%
Lincoln Borough	528	27	5%	4	1	25%
Marshall Township	4,312	0	0%	20	0	0%
McCandless, Town of	12,640	21	0%	38	0	0%
McDonald Borough	187	57	30%	0	0	0%
McKees Rocks Borough	3,069	0	0%	7	0	0%
McKeesport, City of	9,965	300	3%	47	2	4%
Millvale Borough	1,839	0	0%	9	0	0%
Monroeville, Municipality of	11,943	1,805	15%	71	3	4%
Moon Township	11,002	0	0%	53	0	0%
Mount Lebanon, Municipality of	11,685	11,387	97%	42	40	95%
Mount Oliver Borough	1,508	336	22%	4	1	25%
Munhall Borough	5,161	843	16%	20	1	5%
Neville Township	753	0	0%	22	0	0%
North Braddock Borough	2,657	0	0%	10	0	0%
North Fayette Township	7,950	1,831	23%	28	8	29%
North Versailles Township	4,996	50	1%	15	0	0%
Oakdale Borough	675	0	0%	27	0	0%
Oakmont Borough	3,140	0	0%	3	0	0%
O'Hara Township	4,311	26	1%	18	0	0%
Ohio Township	3,249	0	0%	17	0	0%
Penn Hills, Municipality of	19,869	5,459	27%	52	15	28%

Table 4.3.8-1 **Structures and critical facilities vulnerable to subsidence.**

Municipality	Total Structures	Total Structures on Underground Mine Areas	Percent Structures on Underground Mine Areas	Total Critical Facilities	Critical Facilities on Underground Mine Areas	Percent Critical Facilities on Underground Mine Areas
Pennsbury Village Borough	503	0	0%	4	0	0%
Pine Township	5,834	0	0%	23	0	0%
Pitcairn Borough	1,421	0	0%	6	0	0%
Pittsburgh, City of	124,624	7,536	6%	539	9	2%
Pleasant Hills Borough	3,480	3,366	97%	8	4	50%
Plum Borough	12,099	7,114	59%	51	29	57%
Port Vue Borough	1,816	45	2%	5	0	0%
Rankin Borough	987	0	0%	4	0	0%
Reserve Township	1,561	0	0%	7	0	0%
Richland Township	4,660	0	0%	19	0	0%
Robinson Township	7,446	2,081	28%	33	11	33%
Ross Township	15,167	0	0%	45	0	0%
Rosslyn Farms Borough	216	0	0%	3	0	0%
Scott Township	6,899	3,997	58%	21	8	38%
Sewickley Borough	1,628	0	0%	16	0	0%
Sewickley Heights	421	0	0%	3	0	0%
Sewickley Hills Borough	276	0	0%	2	0	0%
Shaler Township	12,786	398	3%	29	0	0%
Sharpsburg Borough	1,563	0	0%	9	0	0%
South Fayette Township	7,098	5,358	75%	29	18	62%
South Park Township	5,805	2,849	49%	15	4	27%
South Versailles Township	168	0	0%	2	0	0%
Springdale Borough	1,728	50	3%	14	0	0%
Springdale Township	859	687	80%	7	5	71%
Stowe Township	3,171	0	0%	13	0	0%
Swissvale Borough	4,107	0	0%	8	0	0%
Tarentum Borough	2,153	24	1%	19	4	21%
Thornburg Borough	190	65	34%	3	0	0%
Trafford Borough	52	0	0%	1	0	0%
Turtle Creek Borough	2,646	0	0%	13	0	0%

Table 4.3.8-1 **Structures and critical facilities vulnerable to subsidence.**

Municipality	Total Structures	Total Structures on Underground Mine Areas	Percent Structures on Underground Mine Areas	Total Critical Facilities	Critical Facilities on Underground Mine Areas	Percent Critical Facilities on Underground Mine Areas
Upper St. Clair Township	7,841	6,812	87%	28	20	71%
Verona Borough	1,364	0	0%	7	0	0%
Versailles Borough	673	9	1%	3	0	0%
Wall Borough	357	4	1%	2	0	0%
West Deer Township	5,665	3,955	70%	24	17	71%
West Elizabeth Borough	284	0	0%	7	0	0%
West Homestead Borough	1,114	0	0%	6	0	0%
West Mifflin Borough	9,910	2,460	25%	54	26	48%
West View Borough	2,668	0	0%	12	0	0%
Whitaker Borough	632	0	0%	2	0	0%
White Oak Borough	3,804	834	22%	12	6	50%
Whitehall Borough	5,771	4,776	83%	19	17	89%
Wilkins Township	2,771	685	25%	11	1	9%
Wilkinsburg Borough	6,994	621	9%	28	0	0%
Wilmerding Borough	916	0	0%	6	0	0%
Grand Total	**550,774**	**123,260**	**22%**	**2,379**	**443**	**19%**

Table 4.3.8-2 **Structures by land use flood vulnerability in Allegheny County.**

Municipality	Total Structures	Agriculture	Commercial	Government	Industrial	Other	Residential	Utilities	Unknown	Grand Total
Aleppo Township	904	0	0	0	0	0	0	0	0	0
Aspinwall Borough	1,256	0	0	0	0	0	0	0	0	0
Avalon Borough	2,359	0	0	0	0	0	0	0	0	0
Baldwin Borough	9,159	3	40	6	2	0	4,359	1	934	5369
Baldwin Township	946	0	12	0	0	0	63	0	836	911
Bell Acres Borough	625	0	0	0	0	0	0	0	0	0
Bellevue Borough	3,005	0	0	0	0	0	0	0	0	0
Ben Avon Borough	759	0	0	0	0	0	0	0	0	0
Ben Avon Heights Borough	144	0	0	0	0	0	0	0	0	0
Bethel Park, Municipality of	13,201	16	369	38	27	0	10,231	4	1,766	12451
Blawnox Borough	694	0	0	0	0	0	0	0	0	0
Brackenridge Borough	1,538	0	2	0	0	0	101	0	0	103
Braddock Borough	1,244	0	0	0	0	0	0	0	0	0
Braddock Hills Borough	868	0	0	0	0	0	0	0	0	0
Bradford Woods Borough	507	0	0	0	0	0	0	0	0	0
Brentwood Borough	4,263	0	84	14	6	0	1,782	5	1,486	3383
Bridgeville Borough	2,277	0	3	0	0	0	671	0	288	962
Carnegie Borough	3,748	0	0	0	0	0	0	0	154	154
Castle Shannon Borough	3,698	24	79	30	2	0	2,971	1	313	3423
Chalfant Borough	417	0	0	0	0	0	0	0	0	0
Cheswick Borough	904	0	0	0	0	0	57	0	0	57
Churchill Borough	1,500	0	2	0	0	0	405	0	379	786
Clairton, City of	4,008	0	0	0	0	0	0	0	0	0
Collier Township	4,512	0	19	0	0	0	766	1	1,174	1962
Coraopolis Borough	2,666	0	0	0	0	0	0	0	0	0
Crafton Borough	2,547	0	0	0	0	0	0	0	0	0

Table 4.3.8-2 **Structures by land use flood vulnerability in Allegheny County.**

Municipality	Total Structures	Agriculture	Commercial	Government	Industrial	Other	Residential	Utilities	Unknown	Grand Total
Crescent Township	1,165	0	0	0	0	0	0	0	0	0
Dormont Borough	3,481	0	0	0	0	0	0	0	1,446	1,465
Dravosburg Borough	1,043	0	1	0	0	0	23	0	0	24
Duquesne, City of	3,158	0	0	0	0	0	0	0	0	0
East Deer Township	792	0	5	0	0	0	172	0	1	178
East McKeesport Borough	1,034	0	0	0	0	0	0	0	0	0
East Pittsburgh Borough	874	0	0	0	0	0	0	0	0	0
Edgewood Borough	1,444	0	0	0	0	0	0	0	0	0
Edgeworth Borough	673	0	0	0	0	0	0	0	0	0
Elizabeth Borough	704	0	0	0	0	0	0	0	0	0
Elizabeth Township	6,119	23	250	17	9	0	2,545	2	0	2,846
Emsworth Borough	1,023	0	0	0	0	0	0	0	0	0
Etna Borough	1,638	0	0	0	0	0	0	0	0	0
Fawn Township	1,068	11	12	5	4	0	412	1	0	445
Findlay Township	3,382	1	10	4	12	0	11	1	0	39
Forest Hills Borough	3,198	0	0	0	1	0	47	0	386	434
Forward Township	1,636	52	195	4	7	1	613	1	1	874
Fox Chapel Borough	1,972	0	4	0	0	0	325	0	73	402
Franklin Park Borough	5,675	0	0	0	0	0	0	0	0	0
Frazer Township	627	15	60	11	3	0	455	1	0	545
Glassport Borough	2,147	0	0	0	0	0	0	0	0	0
Glen Osborne Borough	243	0	0	0	0	0	0	0	0	0
Glenfield Borough	108	0	0	0	0	0	0	0	0	0
Green Tree Borough	2,516	0	0	0	0	0	0	0	993	993
Hampton Township	7,273	4	119	7	8	0	1,548	2	0	1,688
Harmar Township	1,850	1	176	5	16	0	501	1	102	802

Table 4.3.8-2 **Structures by land use flood vulnerability in Allegheny County.**

Municipality	Total Structures	Agriculture	Commercial	Government	Industrial	Other	Residential	Utilities	Unknown	Grand Total
Harrison Township	5,428	0	47	8	5	1	745	1	0	807
Haysville Borough	51	0	0	0	0	0	0	0	0	0
Heidelberg Borough	643	0	0	0	0	0	0	0	37	37
Homestead Borough	1,561	0	0	0	0	0	0	0	0	0
Indiana Township	3,496	61	301	21	20	1	2,268	8	21	2,701
Ingram Borough	1,313	0	0	0	0	0	0	0	0	0
Jefferson Hills Borough	5,372	3	413	11	1	2	2,944	5	0	3,379
Kennedy Township	3,899	0	1	1	0	0	50	0	119	172
Kilbuck Township	368	0	0	0	0	0	0	0	0	0
Leet Township	652	0	0	0	0	0	0	0	0	0
Leetsdale Borough	676	0	0	0	0	0	0	0	0	0
Liberty Borough	1,156	0	0	0	0	0	0	0	0	0
Lincoln Borough	528	2	0	6	0	0	18	1	0	27
Marshall Township	4,312	0	0	0	0	0	0	0	0	0
McCandless, Town of	12,640	0	1	0	0	0	20	0	0	21
McDonald Borough	187	0	1	0	0	0	56	0	0	57
McKees Rocks Borough	3,069	0	0	0	0	0	0	0	0	0
McKeesport, City of	9,965	0	12	0	1	0	133	0	154	300
Millvale Borough	1,839	0	0	0	0	0	0	0	0	0
Monroeville, Municipality of	11,943	1	97	7	4	0	1,694	2	0	1,805
Moon Township	11,002	0	0	0	0	0	0	0	0	0
Mount Lebanon, Municipality of	11,685	17	209	51	9	0	4,211	8	6,854	11,387
Mount Oliver Borough	1,508	0	0	0	0	0	0	0	336	336
Munhall Borough	5,161	0	0	0	0	0	0	0	838	843
Neville Township	753	0	0	0	0	0	0	0	0	0
North Braddock Borough	2,657	0	0	0	0	0	0	0	0	0

Table 4.3.8-2 **Structures by land use flood vulnerability in Allegheny County.**

Municipality	Total Structures	Agriculture	Commercial	Government	Industrial	Other	Residential	Utilities	Unknown	Grand Total
North Fayette Township	7,950	26	183	7	31	2	1,470	0	112	1,831
North Versailles Township	4,996	0	0	1	0	0	49	0	0	50
Oakdale Borough	675	0	0	0	0	0	0	0	0	0
Oakmont Borough	3,140	0	0	0	0	0	0	0	0	0
O'Hara Township	4,311	0	0	0	0	0	17	0	9	26
Ohio Township	3,249	0	0	0	0	0	0	0	0	0
Penn Hills, Municipality of	19,869	5	645	20	8	0	4,586	4	191	5,459
Pennsbury Village Borough	503	0	0	0	0	0	0	0	0	0
Pine Township	5,834	0	0	0	0	0	0	0	0	0
Pitcairn Borough	1,421	0	0	0	0	0	0	0	0	0
Pittsburgh, City of	124,624	1	63	21	2	0	956	5	6,474	7,536
Pleasant Hills Borough	3,480	0	93	8	21	0	3,242	2	0	3,366
Plum Borough	12,099	65	939	56	53	12	5,987	2	0	7,114
Port Vue Borough	1,816	0	0	0	0	0	45	0	0	45
Rankin Borough	987	0	0	0	0	0	0	0	0	0
Reserve Township	1,561	0	0	0	0	0	0	0	0	0
Richland Township	4,660	0	0	0	0	0	0	0	0	0
Robinson Township	7,446	1	61	6	0	0	1,107	0	903	2,081
Ross Township	15,167	0	0	0	0	0	0	0	0	0
Rosslyn Farms Borough	216	0	0	0	0	0	0	0	0	0
Scott Township	6,899	0	59	5	2	0	623	1	3,243	3,997
Sewickley Borough	1,628	0	0	0	0	0	0	0	0	0
Sewickley Heights	421	0	0	0	0	0	0	0	0	0
Sewickley Hills Borough	276	0	0	0	0	0	0	0	0	0
Shaler Township	12,786	0	9	4	0	0	146	0	239	398
Sharpsburg Borough	1,563	0	0	0	0	0	0	0	0	0

Table 4.3.8-2 **Structures by land use flood vulnerability in Allegheny County.**

Municipality	Total Structures	Agriculture	Commercial	Government	Industrial	Other	Residential	Utilities	Unknown	Grand Total
South Fayette Township	7,098	3	81	14	4	0	4,735	0	521	5,358
South Park Township	5,805	4	232	6	1	0	2,604	2	0	2,849
South Versailles Township	168	0	0	0	0	0	0	0	0	0
Springdale Borough	1,728	0	1	0	1	0	48	0	0	50
Springdale Township	859	2	48	2	3	0	632	0	0	687
Stowe Township	3,171	0	0	0	0	0	0	0	0	0
Swissvale Borough	4,107	0	0	0	0	0	0	0	0	0
Tarentum Borough	2,153	1	2	2	0	0	19	0	0	24
Thornburg Borough	190	0	0	0	0	0	0	0	65	65
Trafford Borough	52	0	0	0	0	0	0	0	0	0
Turtle Creek Borough	2,646	0	0	0	0	0	0	0	0	0
Upper St. Clair Township	7,841	2	115	23	1	2	5,146	5	1,518	6,812
Verona Borough	1,364	0	0	0	0	0	0	0	0	0
Versailles Borough	673	0	6	0	1	0	2	0	0	9
Wall Borough	357	0	1	0	0	0	0	3	0	4
West Deer Township	5,665	87	235	26	23	1	3,579	4	0	3,955
West Elizabeth Borough	284	0	0	0	0	0	0	0	0	0
West Homestead Borough	1,114	0	0	0	0	0	0	0	0	0
West Mifflin Borough	9,910	1	62	7	3	0	2,265	2	120	2,460
West View Borough	2,668	0	0	0	0	0	0	0	0	0
Whitaker Borough	632	0	0	0	0	0	0	0	0	0
White Oak Borough	3,804	1	94	33	1	0	661	0	44	834
Whitehall Borough	5,771	5	90	23	4	0	4,550	3	99	4,776
Wilkins Township	2,771	0	1	0	0	0	239	0	445	685
Wilkinsburg Borough	6,994	0	17	2	0	0	590	0	12	621
Wilmerding Borough	916	0	0	0	0	0	0	0	0	0

Table 4.3.8-2 **Structures by land use flood vulnerability in Allegheny County.**

Municipality	Total Structures	Agriculture	Commercial	Government	Industrial	Other	Residential	Utilities	Unknown	Grand Total
Grand Total	**550,774**	**438**	**5,561**	**512**	**296**	**22**	**83,495**	**79**	**32,686**	**123,260**

4.3.9. Tornado, Windstorm

4.3.9.1. Location and Extent

Tornadoes and windstorms can occur throughout Allegheny County, though events are usually localized. However, severe thunderstorms may result in conditions favorable to the formation of numerous or long-lived tornadoes. Tornadoes can occur at any time during the day or night but are most frequent during late afternoon into early evening, the warmest hours of the day, and most likely to occur during the spring and early summer months of March through June.

Tornado movement is characterized in two ways: direction and speed of spinning winds, and forward movement of the tornado, also known as the storm track. The forward motion of the tornado path can be a few hundred yards or several hundred miles in length. The width of tornadoes can vary greatly, but generally range in size from less than 100 feet to over a mile in width. Some tornadoes never touch the ground and are short-lived, while others may touch the ground several times.

Straight-line winds and windstorms are experienced on a more region-wide scale. While such winds usually accompany tornadoes, straight-line winds are caused by the movement of air from areas of higher pressure to areas of lower pressure. Stronger winds are the result of greater differences in pressure. Windstorms are generally defined with sustained wind speeds of 40 mph or greater lasting for one hour or longer, or winds of 58 mph or greater for any duration.

4.3.9.2. Range of Magnitude

Each year, tornadoes account for $400 million in damages and cause over 70 deaths nationally (National Geographic, 2019). While the extent of tornado damage is usually localized, the vortex of extreme wind associated with a tornado can result in some of the most destructive forces on Earth. Rotational wind speeds can range from 100 mph to more than 250 mph. In addition, the speed of forward motion can range from 0 to 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 damage caused by a tornado is a result of the high wind velocity and wind-blown debris, also accompanied by lightning or large hail. The most violent tornadoes have rotating winds of 250 miles per hour or more and are capable of causing extreme destruction and turning normally harmless objects into deadly missiles.

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

The Enhanced Fujita Scale, also known as the “EF-Scale,” measures tornado strength and associated damages. The EF-Scale is an update to the earlier Fujita Scale, also known as the “F-Scale,” that was published in 1971. It classifies United States tornadoes into six intensity categories, as shown in Table 4.3.8-1, based upon the estimated maximum winds occurring within the wind vortex. Since its implementation by the National Weather Service in 2007, the EF-Scale has become the definitive metric for estimating wind speeds within tornadoes based upon damage to buildings and structures. F-Scale

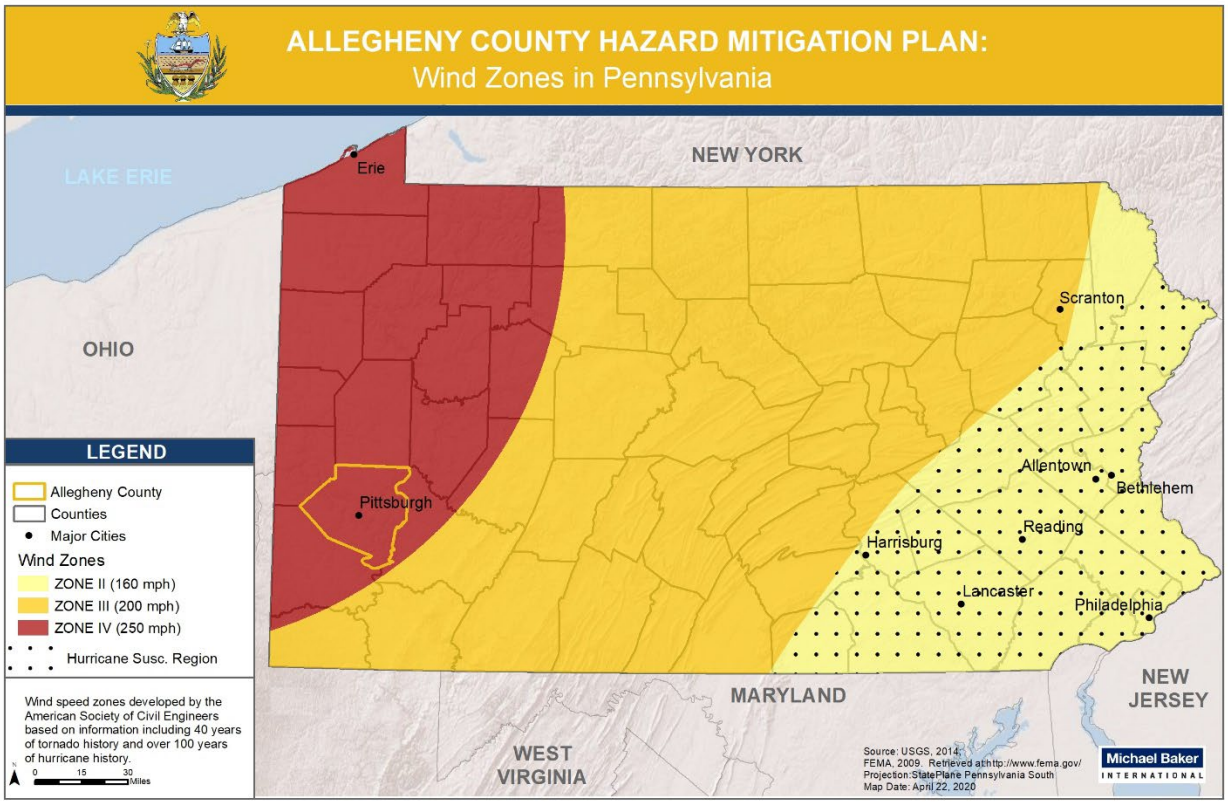
categories with corresponding EF-Scale wind speeds are provided in Table 4.3.9-1 since the magnitude of previous tornado occurrences is based on the F-Scale.

Table 4.3.9-1 **Enhanced Fujita Scale (EF-Scale) Categories with Associated Wind Speeds and Description of Damages.**

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

Figure 4.3.9-1 shows the wind speed zones developed by the American Society of Civil Engineers based on tornado and hurricane historical events. These wind speed zones are intended to guide the design and evaluation of the structural integrity of shelters and critical facilities. All of Allegheny County falls within Zone IV. Shelters and critical facilities should be able to withstand a 3-second gust of up to 250 mph, regardless of whether the gust is the result of a tornado, coastal storm, or windstorm event. Therefore, these structures should be able to withstand the wind speeds experienced in an F5 tornado event.

Figure 4.3.9-1 Wind Zone Associated with Allegheny County.



The worst tornado event on record, an example of the worst case scenario, occurred on July 15, 2004 in Campbelltown, Lebanon County. This F3 tornado, which had estimated wind speeds of 175-200 miles per hour, leveled 32 houses, severely damaged 37 homes, and an additional 50 homes suffered more minor damage. Two people were hospitalized from the tornado, one critically injured. While only on the ground for 10-15 minutes, the NCDC estimates that the tornado caused $18 million in property damage.

Another example of the worst case scenario occurred on August 3, 1963 when an F3 tornado ripped through Allegheny County, causing two deaths, 70 injuries, and 25 million in property damage.

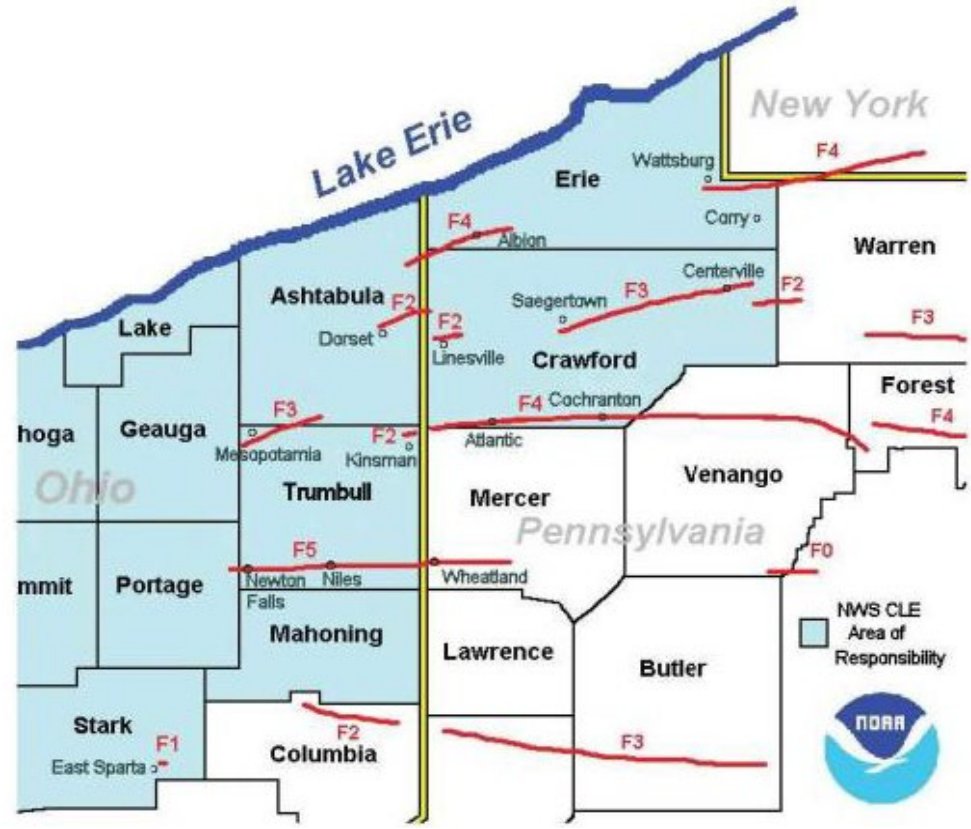
Since tornado events are typically localized, environmental impacts are rarely widespread. The impacts of windstorms on the environment typically take place over a larger area. In either case, where these events occur, severe damage to plant species is likely. This includes uprooting or total destruction of trees and an increased threat of wildfire in areas where dead trees are not removed. Hazardous material facilities should meet design requirements for the wind zones identified in Figure 4.3.9-1 in order to prevent release of hazardous materials into the environment.

4.3.9.3. Past Occurrence

Tornadoes have occurred throughout Pennsylvania. Western and southeastern sections of the Commonwealth have been struck more frequently. On May 31, 1985 a very rare outbreak of 21 tornadoes tracked across northeast Ohio and northwest Pennsylvania, including Erie, Warren, Crawford, Forest, Mercer, Venango, Mercer, and Butler counties (just north of Allegheny County), killing 76 people (Figure

4.3.9-2). One of these tornadoes was rated an F6 while six were rated F4s on the old Fujita Scale. The deadliest tornado touched down near Jamestown, PA as an F4 on the old Fujita Scale, killing 23 people and destroying 371 homes. It stayed on the ground for over an hour and produced a 56-mile long damage path.

Figure 4.3.9-2 Map Showing the Path of the 1985 Tornado Outbreak



On August 3, 1963 an F3 tornado ripped through Allegheny County, causing two deaths, 70 injuries, and 25 million dollars in property damage, while another outbreak of tornadoes on June 3, 1980 included an F4 tornado that caused 250 million dollars of damage to property and injured 20 people.

The most recent tornado experienced by Allegheny County was an EF1 and occurred on April 8, 2020. According to local officials the tornado traveled east from West Deer and Frazer Townships and also hit Tarentum Borough. There were several large trees that came down, power lines came down with associated power outages, houses had shingles and siding torn off, and some buildings had bricks fall from chimneys and parapet walls. There were several carports that had collapsed or had been lifted off of properties and dropped into roadways. For the most part, the local Public Works, Power Company, and Fire and Police Departments were able clean up the damage, or individuals made claims with their homeowners' insurance. In Tarentum Borough the tornado hit Riverview Park and took a large tree down with it.

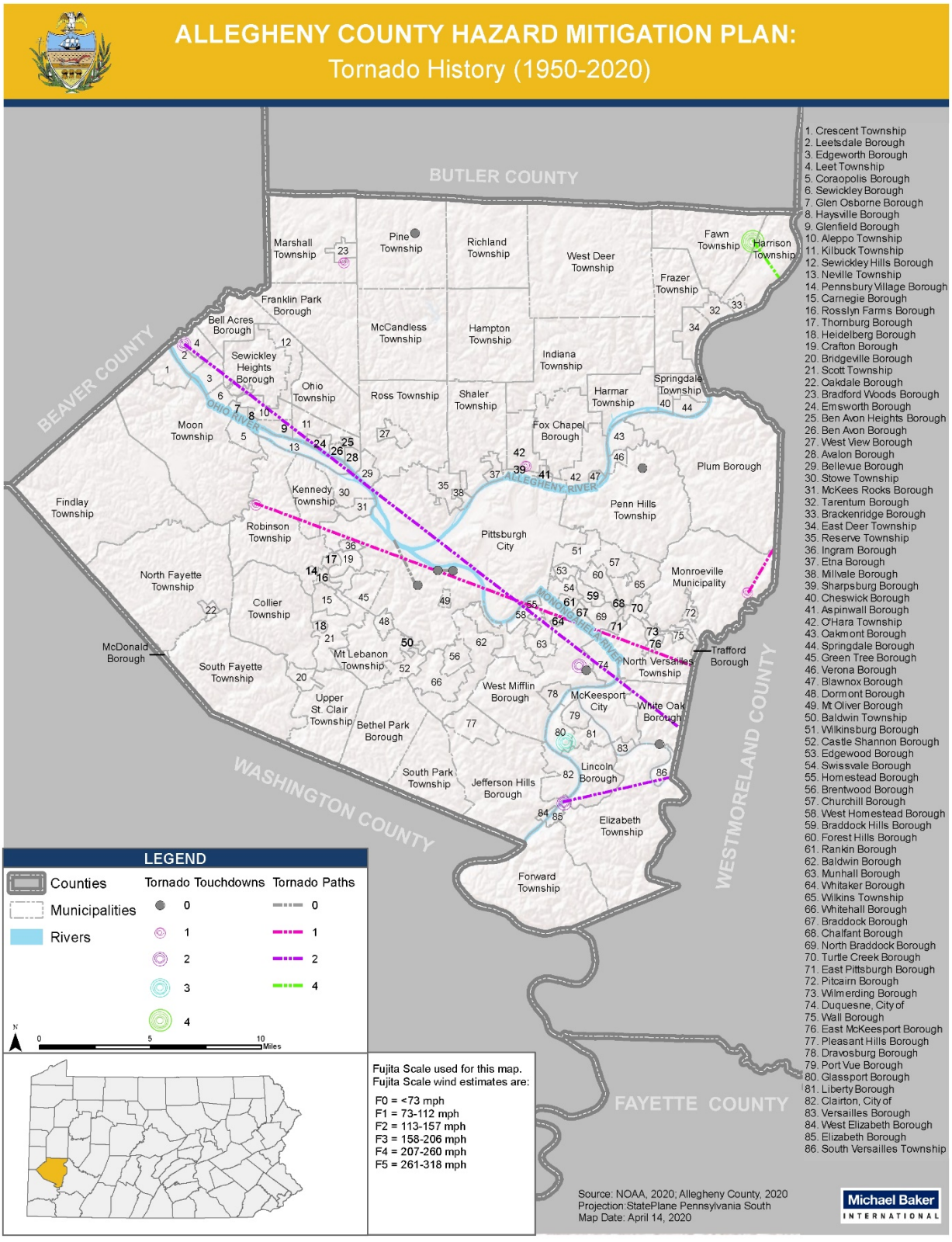
Table 4.3.9-2 lists previous tornado events that have occurred in Allegheny County. Figure 4.3.9-3 depicts the locations of tornado touchdowns and paths.

Table 4.3.9-2 **History of Tornadoes in Allegheny County (NCDC 2020).**

Location	Date	F-Scale	Deaths	Injuries	Property Damage ($)
West Deer, Tarentum and Frazer*	April 8, 2020	EF1	0	0	Unknown
Wall	November 19, 2017	EF1	0	0	25,000
Duquesne	September 27, 2012	EF0	0	0	50,000
Unknown	August 9, 2007	F0	0	0	100,000
Carnegie	June 12, 2003	F0	0	0	30,000
Carnegie	June 2, 1998	F1	0	50	13,000,000
Greenrock	June 2, 1998	F0	0	0	5,000
County-wide	July 13, 1992	F0	0	0	3,000
County-wide	May 22, 1983	F2	0	0	2,667,000
County-wide	June 21, 1981	F1	0	0	25,000
County-wide	June 3, 1980	F4	0	20	250,017,000
County-wide	July 7, 1977	F0	0	0	0
County-wide	April 25, 1976	F0	0	0	4,000
Unknown	June 4, 1975	Unknown	0	0	25,000
County-wide	July 31, 1970	F1	0	0	4,000
County-wide	August 3, 1963	F3	2	70	30,000,000
County-wide	May 13, 1956	F2	0	5	250,000
County-wide	June 10, 1954	F0	0	0	0

*Local knowledge. Not obtained from NCDC.

Figure 4.3.9-3 Tornado History for Allegheny County (1950-2020)



Windstorm events may be the result of thunderstorms, hurricanes, tropical storms, winter storms, or nor'easters. There have been nearly 400 events with wind speeds of greater than 50 knots in Allegheny County since 1995. These events frequently occurred in conjunction with thunderstorms. Also, these events seem to more frequently occur in the west and center of the County. Table 4.3.9-3 lists only windstorm events that have caused deaths, injuries, and property damage and Figure 4.3.9-4 shows the density of windstorm occurrences in Allegheny County.

Table 4.3.9-3 **History of Windstorms in Allegheny County (NCDC, 2020).**

Location	Date	Type of Event	Magnitude	Deaths	Injuries	Property Damage ($)
Allegheny Co.	7/15/1995	Thunderstorm Wind	52	0	0	$1,000
Allegheny (Zone)	4/30/1996	High Wind	51	0	0	$25,000
Allegheny (Zone)	10/30/1996	High Wind	54	0	0	$20,000
Allegheny (Zone)	2/22/1997	High Wind	63	0	0	$4,000
Allegheny (Zone)	2/27/1997	High Wind	52	0	0	$20,000
Allegheny Co.	6/30/1998	Thunderstorm Wind	74	0	10	$41,000,000
Allegheny Co.	4/9/1999	Thunderstorm Wind	50	0	0	$2,000
Allegheny Co.	4/22/1999	Thunderstorm Wind	50	0	0	$3,000
Allegheny Co.	5/24/1999	Thunderstorm Wind	52	0	0	$1,000
Allegheny Co.	7/9/1999	Thunderstorm Wind	60	0	0	$50,000
Allegheny (Zone)	1/10/2000	High Wind	50	0	0	$1,000
Allegheny (Zone)	1/10/2000	High Wind	50	0	0	$2,000
Allegheny (Zone)	12/12/2000	High Wind	50	0	0	$100,000
Allegheny (Zone)	12/14/2001	High Wind	50	0	0	$5,000
Allegheny Co.	5/31/2002	Thunderstorm Wind	91	1	54	$10,000,000
Allegheny Co.	6/8/2003	Thunderstorm Wind	52	0	0	$15,000
Allegheny Co.	6/8/2003	Thunderstorm Wind	78	0	0	$20,000
Allegheny Co.	6/8/2003	Thunderstorm Wind	55	0	0	$10,000
Allegheny Co.	6/8/2003	Thunderstorm Wind	52	0	0	$1,000
Allegheny Co.	6/8/2003	Thunderstorm Wind	55	0	0	$15,000
Allegheny Co.	6/8/2003	Thunderstorm Wind	52	0	0	$1,000
Allegheny Co.	6/12/2003	Thunderstorm Wind	50	0	0	$7,000
Allegheny Co.	7/4/2003	Thunderstorm Wind	50	0	0	$1,000
Allegheny Co.	7/8/2003	Thunderstorm Wind	50	0	0	$2,000
Allegheny Co.	7/8/2003	Thunderstorm Wind	50	0	0	$1,000
Allegheny Co.	7/8/2003	Thunderstorm Wind	50	0	0	$1,000
Allegheny Co.	7/8/2003	Thunderstorm Wind	50	0	0	$10,000
Allegheny Co.	7/10/2003	Thunderstorm Wind	50	0	0	$1,000
Allegheny Co.	7/10/2003	Thunderstorm Wind	50	0	0	$1,000
Allegheny Co.	7/21/2003	Thunderstorm Wind	50	0	0	$2,000
Allegheny (Zone)	7/21/2003	High Wind	50	0	0	$1,000

Table 4.3.9-3 **History of Windstorms in Allegheny County (NCDC, 2020).**

Location	Date	Type of Event	Magnitude	Deaths	Injuries	Property Damage ($)
Allegheny Co.	8/16/2003	Thunderstorm Wind	50	0	0	$8,000
Allegheny Co.	10/14/2003	Thunderstorm Wind	60	0	0	$5,000
Allegheny Co.	11/12/2003	Thunderstorm Wind	50	0	0	$2,000
Allegheny Co.	11/12/2003	Thunderstorm Wind	50	0	0	$3,000
Allegheny Co.	5/21/2004	Thunderstorm Wind	52	0	0	$10,000
Allegheny Co.	6/14/2004	Thunderstorm Wind	52	0	0	$40,000
Allegheny Co.	6/17/2004	Thunderstorm Wind	50	0	0	$2,000
Allegheny Co.	8/4/2004	Thunderstorm Wind	50	0	0	$5,000
Allegheny Co.	8/19/2004	Thunderstorm Wind	50	0	0	$10,000
Allegheny Co.	8/19/2004	Thunderstorm Wind	61	0	0	$5,000
Allegheny Co.	8/20/2004	Thunderstorm Wind	50	0	0	$5,000
Allegheny Co.	8/29/2004	Thunderstorm Wind	50	0	0	$3,000
Allegheny Co.	4/20/2005	Thunderstorm Wind	50	0	0	$6,000
Allegheny Co.	5/23/2005	Thunderstorm Wind	52	0	0	$30,000
Allegheny Co.	6/11/2005	Thunderstorm Wind	50	0	0	$6,000
Allegheny Co.	6/28/2005	Thunderstorm Wind	50	0	0	$1,000
Allegheny Co.	6/30/2005	Thunderstorm Wind	50	0	0	$5,000
Allegheny Co.	7/5/2005	Thunderstorm Wind	50	0	0	$3,000
Allegheny Co.	7/5/2005	Thunderstorm Wind	50	0	0	$25,000
Allegheny Co.	7/13/2005	Thunderstorm Wind	50	0	0	$3,000
Allegheny Co.	7/25/2005	Thunderstorm Wind	50	0	0	$20,000
Allegheny Co.	7/25/2005	Thunderstorm Wind	50	0	0	$30,000
Allegheny Co.	7/26/2005	Thunderstorm Wind	50	0	0	$5,000
Allegheny Co.	7/26/2005	Thunderstorm Wind	50	0	0	$6,000
Allegheny Co.	8/13/2005	Thunderstorm Wind	50	0	0	$20,000
Allegheny Co.	8/20/2005	Thunderstorm Wind	50	0	0	$15,000
Allegheny Co.	8/20/2005	Thunderstorm Wind	50	0	0	$10,000
Allegheny Co.	8/20/2005	Thunderstorm Wind	50	0	0	$6,000
Allegheny Co.	11/6/2005	Thunderstorm Wind	50	0	0	$8,000
Allegheny Co.	11/9/2005	Thunderstorm Wind	50	0	0	$5,000
Allegheny Co.	5/26/2006	Thunderstorm Wind	52	0	0	$8,000
Allegheny Co.	6/22/2006	Thunderstorm Wind	50	0	0	$15,000
Allegheny Co.	6/22/2006	Thunderstorm Wind	50	0	0	$15,000
Allegheny Co.	7/30/2006	Thunderstorm Wind	50	0	0	$15,000
Allegheny Co.	8/3/2006	Thunderstorm Wind	50	0	0	$3,000
Allegheny Co.	12/1/2006	Thunderstorm Wind	50	0	0	$5,000
Allegheny (Zone)	12/1/2006	High Wind	55	0	0	$75,000

Table 4.3.9-3 **History of Windstorms in Allegheny County (NCDC, 2020).**

Location	Date	Type of Event	Magnitude	Deaths	Injuries	Property Damage ($)
Allegheny Co.	6/13/2007	Thunderstorm Wind	50	0	0	$2,000
Allegheny Co.	6/19/2007	Thunderstorm Wind	50	0	0	$2,000
Allegheny Co.	6/19/2007	Thunderstorm Wind	50	0	0	$3,000
Allegheny Co.	6/19/2007	Thunderstorm Wind	50	0	0	$3,000
Allegheny Co.	6/19/2007	Thunderstorm Wind	50	0	0	$3,000
Allegheny Co.	6/21/2007	Thunderstorm Wind	50	0	0	$3,000
Allegheny Co.	6/21/2007	Thunderstorm Wind	50	0	0	$4,000
Allegheny Co.	6/27/2007	Thunderstorm Wind	50	0	0	$2,000
Allegheny Co.	7/17/2007	Thunderstorm Wind	50	0	0	$5,000
Allegheny Co.	7/17/2007	Thunderstorm Wind	50	0	0	$5,000
Allegheny Co.	8/8/2007	Thunderstorm Wind	50	0	0	$10,000
Allegheny Co.	8/8/2007	Thunderstorm Wind	50	0	0	$10,000
Allegheny Co.	8/9/2007	Thunderstorm Wind	50	0	0	$10,000
Allegheny Co.	8/9/2007	Thunderstorm Wind	50	0	0	$50,000
Allegheny Co.	8/9/2007	Thunderstorm Wind	74	0	0	$250,000
Allegheny Co.	8/9/2007	Thunderstorm Wind	50	0	0	$30,000
Allegheny Co.	8/9/2007	Thunderstorm Wind	50	0	0	$50,000
Allegheny Co.	8/9/2007	Thunderstorm Wind	50	0	0	$50,000
Allegheny Co.	9/26/2007	Thunderstorm Wind	50	0	0	$30,000
Allegheny (Zone)	1/30/2008	High Wind	50	0	0	$75,000
Allegheny (Zone)	2/6/2008	High Wind	50	0	0	$75,000
Allegheny (Zone)	2/10/2008	High Wind	50	0	0	$100,000
Allegheny Co.	6/16/2008	Thunderstorm Wind	50	0	0	$50,000
Allegheny Co.	6/16/2008	Thunderstorm Wind	50	0	0	$75,000
Allegheny Co.	6/26/2008	Thunderstorm Wind	50	0	0	$75,000
Allegheny Co.	6/26/2008	Thunderstorm Wind	50	0	0	$35,000
Allegheny Co.	6/26/2008	Thunderstorm Wind	50	0	0	$25,000
Allegheny Co.	6/28/2008	Thunderstorm Wind	50	0	0	$75,000
Allegheny Co.	6/28/2008	Thunderstorm Wind	50	0	0	$35,000
Allegheny Co.	6/28/2008	Thunderstorm Wind	50	0	0	$100,000
Allegheny Co.	6/29/2008	Thunderstorm Wind	50	0	0	$125,000
Allegheny Co.	6/29/2008	Thunderstorm Wind	50	0	0	$75,000
Allegheny Co.	6/29/2008	Thunderstorm Wind	50	0	0	$75,000
Allegheny (Zone)	9/14/2008	High Wind	58	0	0	$10,000
Allegheny Co.	2/11/2009	Thunderstorm Wind	50	0	0	$50,000
Allegheny (Zone)	2/12/2009	High Wind	50	0	0	$300,000
Allegheny Co.	6/26/2009	Thunderstorm Wind	50	0	0	$50,000

Table 4.3.9-3 **History of Windstorms in Allegheny County (NCDC, 2020).**

Location	Date	Type of Event	Magnitude	Deaths	Injuries	Property Damage ($)
Allegheny Co.	4/16/2010	Thunderstorm Wind	55	0	1	$4,000
Allegheny Co.	4/16/2010	Thunderstorm Wind	55	0	0	$200,000
Allegheny Co.	4/16/2010	Thunderstorm Wind	50	0	0	$75,000
Allegheny Co.	4/16/2010	Thunderstorm Wind	57	0	0	$75,000
Allegheny Co.	4/16/2010	Thunderstorm Wind	50	0	0	$25,000
Allegheny Co.	4/16/2010	Thunderstorm Wind	60	0	0	$100,000
Allegheny Co.	4/16/2010	Thunderstorm Wind	50	0	0	$35,000
Allegheny Co.	4/25/2010	Thunderstorm Wind	50	0	0	$5,000
Allegheny Co.	5/11/2010	Thunderstorm Wind	50	0	0	$100,000
Allegheny Co.	5/28/2010	Thunderstorm Wind	50	0	0	$25,000
Allegheny Co.	6/2/2010	Thunderstorm Wind	50	0	0	$75,000
Allegheny Co.	6/2/2010	Thunderstorm Wind	50	0	0	$25,000
Allegheny Co.	6/2/2010	Thunderstorm Wind	50	0	0	$25,000
Allegheny Co.	6/2/2010	Thunderstorm Wind	50	0	0	$25,000
Allegheny Co.	6/23/2010	Thunderstorm Wind	50	0	0	$50,000
Allegheny Co.	7/21/2010	Thunderstorm Wind	50	0	0	$10,000
Allegheny Co.	9/22/2010	Thunderstorm Wind	50	0	0	$10,000
Allegheny Co.	9/22/2010	Thunderstorm Wind	50	0	0	$10,000
Allegheny Co.	9/22/2010	Thunderstorm Wind	50	0	0	$2,000
Allegheny Co.	9/22/2010	Thunderstorm Wind	60	0	0	$15,000
Allegheny Co.	10/26/2010	Thunderstorm Wind	50	0	0	$25,000
Allegheny Co.	10/26/2010	Thunderstorm Wind	50	0	0	$5,000
Allegheny Co.	10/26/2010	Thunderstorm Wind	50	0	0	$35,000
Allegheny Co.	10/26/2010	Thunderstorm Wind	50	0	0	$10,000
Allegheny Co.	5/26/2011	Thunderstorm Wind	50	0	0	$2,000
Allegheny Co.	5/26/2011	Thunderstorm Wind	50	0	0	$1,000
Allegheny Co.	7/4/2011	Thunderstorm Wind	50	0	0	$10,000
Allegheny Co.	7/11/2011	Thunderstorm Wind	50	0	0	$10,000
Allegheny Co.	7/18/2011	Thunderstorm Wind	52	0	0	$30,000
Allegheny Co.	7/22/2011	Thunderstorm Wind	50	0	0	$15,000
Allegheny Co.	7/22/2011	Thunderstorm Wind	50	0	0	$5,000
Allegheny Co.	7/28/2011	Thunderstorm Wind	50	0	0	$10,000
Allegheny Co.	8/19/2011	Thunderstorm Wind	50	0	0	$10,000
Allegheny Co.	8/19/2011	Thunderstorm Wind	50	0	0	$35,000
Allegheny Co.	8/19/2011	Thunderstorm Wind	50	0	0	$25,000
Allegheny (Zone)	2/24/2012	High Wind	50	0	0	$20,000
Allegheny Co.	5/29/2012	Thunderstorm Wind	50	0	0	$15,000

Table 4.3.9-3 **History of Windstorms in Allegheny County (NCDC, 2020).**

Location	Date	Type of Event	Magnitude	Deaths	Injuries	Property Damage ($)
Allegheny Co.	5/29/2012	Thunderstorm Wind	50	0	0	$35,000
Allegheny Co.	5/29/2012	Thunderstorm Wind	50	0	0	$35,000
Allegheny Co.	6/29/2012	Thunderstorm Wind	60	0	0	$5,000
Allegheny Co.	6/29/2012	Thunderstorm Wind	60	0	0	$2,500
Allegheny Co.	6/29/2012	Thunderstorm Wind	60	0	0	$5,000
Allegheny Co.	7/18/2012	Thunderstorm Wind	50	0	0	$15,000
Allegheny Co.	7/18/2012	Thunderstorm Wind	50	0	0	$25,000
Allegheny Co.	7/18/2012	Thunderstorm Wind	50	0	0	$35,000
Allegheny Co.	7/26/2012	Thunderstorm Wind	50	0	0	$15,000
Allegheny Co.	7/26/2012	Thunderstorm Wind	50	0	0	$35,000
Allegheny Co.	7/26/2012	Thunderstorm Wind	50	0	0	$50,000
Allegheny Co.	7/26/2012	Thunderstorm Wind	50	0	0	$40,000
Allegheny Co.	8/8/2012	Thunderstorm Wind	50	0	0	$1,000
Allegheny Co.	8/9/2012	Thunderstorm Wind	50	0	0	$250
Allegheny Co.	9/8/2012	Thunderstorm Wind	57	0	0	$5,000
Allegheny Co.	9/8/2012	Thunderstorm Wind	50	0	0	$25,000
Allegheny Co.	9/8/2012	Thunderstorm Wind	50	0	0	$2,000
Allegheny Co.	9/8/2012	Thunderstorm Wind	50	0	0	$1,000
Allegheny Co.	9/8/2012	Thunderstorm Wind	50	0	0	$5,000
Allegheny Co.	9/8/2012	Thunderstorm Wind	66	0	0	$25,000
Allegheny Co.	9/8/2012	Thunderstorm Wind	61	0	0	$5,000
Allegheny Co.	9/22/2012	Thunderstorm Wind	50	0	0	$2,000
Allegheny Co.	9/22/2012	Thunderstorm Wind	50	0	0	$40,000
Allegheny Co.	9/22/2012	Thunderstorm Wind	50	0	0	$20,000
Allegheny Co.	9/22/2012	Thunderstorm Wind	50	0	0	$60,000
Allegheny Co.	9/22/2012	Thunderstorm Wind	50	0	0	$35,000
Allegheny Co.	9/22/2012	Thunderstorm Wind	50	0	0	$15,000
Allegheny Co.	9/22/2012	Thunderstorm Wind	50	0	0	$50,000
Allegheny Co.	9/22/2012	Thunderstorm Wind	50	0	0	$35,000
Allegheny Co.	9/22/2012	Thunderstorm Wind	50	0	0	$35,000
Allegheny Co.	9/22/2012	Thunderstorm Wind	50	0	0	$40,000
Allegheny Co.	9/22/2012	Thunderstorm Wind	50	0	0	$35,000
Allegheny Co.	9/22/2012	Thunderstorm Wind	50	0	0	$40,000
Allegheny Co.	9/22/2012	Thunderstorm Wind	50	0	0	$10,000
Allegheny Co.	9/22/2012	Thunderstorm Wind	50	0	0	$45,000
Allegheny Co.	9/22/2012	Thunderstorm Wind	50	0	0	$20,000
Allegheny Co.	9/22/2012	Thunderstorm Wind	50	0	0	$40,000

Table 4.3.9-3 History of Windstorms in Allegheny County (NCDC, 2020).

Location	Date	Type of Event	Magnitude	Deaths	Injuries	Property Damage ($)
Allegheny Co.	9/22/2012	Thunderstorm Wind	50	0	0	$40,000
Allegheny Co.	9/22/2012	Thunderstorm Wind	50	0	0	$35,000
Allegheny Co.	9/22/2012	Thunderstorm Wind	50	0	0	$20,000
Allegheny Co.	9/22/2012	Thunderstorm Wind	50	0	0	$25,000
Allegheny Co.	9/22/2012	Thunderstorm Wind	50	0	0	$10,000
Allegheny Co.	9/22/2012	Thunderstorm Wind	50	0	0	$25,000
Allegheny Co.	9/22/2012	Thunderstorm Wind	50	0	0	$35,000
Allegheny Co.	9/22/2012	Thunderstorm Wind	50	0	0	$45,000
Allegheny Co.	9/27/2012	Thunderstorm Wind	50	0	0	$10,000
Allegheny (Zone)	9/27/2012	High Wind	50	0	0	$35,000
Allegheny Co.	9/27/2012	Thunderstorm Wind	50	0	0	$15,000
Allegheny Co.	9/27/2012	Thunderstorm Wind	50	0	0	$25,000
Allegheny Co.	1/30/2013	Thunderstorm Wind	50	0	0	$5,000
Allegheny Co.	1/30/2013	Thunderstorm Wind	50	0	0	$10,000
Allegheny Co.	1/30/2013	Thunderstorm Wind	50	0	0	$10,000
Allegheny Co.	4/16/2013	Thunderstorm Wind	50	0	0	$2,000
Allegheny Co.	4/16/2013	Thunderstorm Wind	50	0	0	$1,000
Allegheny Co.	5/10/2013	Thunderstorm Wind	50	0	0	$25,000
Allegheny Co.	5/10/2013	Thunderstorm Wind	50	0	0	$1,000
Allegheny Co.	6/13/2013	Thunderstorm Wind	50	0	0	$2,000
Allegheny Co.	6/13/2013	Thunderstorm Wind	50	0	0	$2,500
Allegheny Co.	6/13/2013	Thunderstorm Wind	50	0	0	$2,000
Allegheny Co.	6/13/2013	Thunderstorm Wind	50	0	0	$500
Allegheny Co.	6/13/2013	Thunderstorm Wind	50	0	0	$1,000
Allegheny Co.	6/13/2013	Thunderstorm Wind	50	0	0	$1,000
Allegheny Co.	6/13/2013	Thunderstorm Wind	50	0	0	$1,000
Allegheny Co.	6/13/2013	Thunderstorm Wind	50	0	0	$1,000
Allegheny Co.	6/13/2013	Thunderstorm Wind	50	0	0	$1,000
Allegheny Co.	6/13/2013	Thunderstorm Wind	50	0	0	$1,000
Allegheny Co.	6/13/2013	Thunderstorm Wind	50	0	0	$1,000
Allegheny Co.	6/13/2013	Thunderstorm Wind	50	0	0	$1,000
Allegheny Co.	6/25/2013	Thunderstorm Wind	50	0	0	$2,000
Allegheny Co.	6/25/2013	Thunderstorm Wind	50	0	0	$500
Allegheny Co.	6/25/2013	Thunderstorm Wind	50	0	0	$500
Allegheny Co.	6/25/2013	Thunderstorm Wind	50	0	0	$500
Allegheny Co.	6/25/2013	Thunderstorm Wind	50	0	0	$1,000
Allegheny Co.	6/25/2013	Thunderstorm Wind	50	0	0	$500

Table 4.3.9-3 **History of Windstorms in Allegheny County (NCDC, 2020).**

Location	Date	Type of Event	Magnitude	Deaths	Injuries	Property Damage ($)
Allegheny Co.	6/25/2013	Thunderstorm Wind	50	0	0	$2,000
Allegheny Co.	6/25/2013	Thunderstorm Wind	50	0	0	$500
Allegheny Co.	6/25/2013	Thunderstorm Wind	50	0	0	$2,000
Allegheny Co.	6/25/2013	Thunderstorm Wind	50	0	0	$2,000
Allegheny Co.	6/28/2013	Thunderstorm Wind	50	0	0	$2,000
Allegheny Co.	6/28/2013	Thunderstorm Wind	50	0	0	$2,000
Allegheny Co.	6/28/2013	Thunderstorm Wind	50	0	0	$2,000
Allegheny Co.	6/28/2013	Thunderstorm Wind	50	0	0	$1,000
Allegheny Co.	7/10/2013	Thunderstorm Wind	50	0	0	$25,000
Allegheny Co.	7/10/2013	Thunderstorm Wind	50	0	0	$25,000
Allegheny Co.	7/10/2013	Thunderstorm Wind	50	0	0	$25,000
Allegheny Co.	7/10/2013	Thunderstorm Wind	50	0	0	$25,000
Allegheny Co.	7/10/2013	Thunderstorm Wind	50	0	0	$10,000
Allegheny Co.	7/16/2013	Thunderstorm Wind	50	0	0	$35,000
Allegheny Co.	7/17/2013	Thunderstorm Wind	50	0	0	$20,000
Allegheny Co.	7/17/2013	Thunderstorm Wind	50	0	0	$25,000
Allegheny Co.	7/17/2013	Thunderstorm Wind	50	0	0	$15,000
Allegheny Co.	7/17/2013	Thunderstorm Wind	50	0	0	$5,000
Allegheny Co.	7/23/2013	Thunderstorm Wind	50	0	0	$10,000
Allegheny Co.	7/23/2013	Thunderstorm Wind	50	0	0	$10,000
Allegheny Co.	9/11/2013	Thunderstorm Wind	50	0	0	$15,000
Allegheny Co.	9/12/2013	Thunderstorm Wind	50	0	0	$25,000
Allegheny Co.	9/12/2013	Thunderstorm Wind	50	0	0	$50,000
Allegheny Co.	9/12/2013	Thunderstorm Wind	50	0	0	$15,000
Allegheny Co.	9/12/2013	Thunderstorm Wind	50	0	0	$2,000
Allegheny Co.	11/1/2013	Thunderstorm Wind	50	0	0	$25,000
Allegheny Co.	11/1/2013	Thunderstorm Wind	50	0	0	$50,000
Allegheny Co.	11/1/2013	Thunderstorm Wind	50	0	0	$25,000
Allegheny Co.	11/1/2013	Thunderstorm Wind	50	0	0	$20,000
Allegheny Co.	11/1/2013	Thunderstorm Wind	50	0	0	$2,000
Allegheny Co.	11/1/2013	Thunderstorm Wind	50	0	0	$25,000
Allegheny Co.	11/1/2013	Thunderstorm Wind	50	0	0	$35,000
Allegheny Co.	11/17/2013	Thunderstorm Wind	50	0	0	$75,000
Allegheny Co.	11/17/2013	Thunderstorm Wind	50	0	0	$25,000
Allegheny Co.	11/17/2013	Thunderstorm Wind	50	0	0	$20,000
Allegheny Co.	11/17/2013	Thunderstorm Wind	50	0	0	$25,000
Allegheny Co.	11/17/2013	Thunderstorm Wind	50	0	0	$25,000

Table 4.3.9-3 **History of Windstorms in Allegheny County (NCDC, 2020).**

Location	Date	Type of Event	Magnitude	Deaths	Injuries	Property Damage ($)
Allegheny Co.	12/22/2013	Thunderstorm Wind	50	0	0	$1,000
Allegheny Co.	5/27/2014	Thunderstorm Wind	50	0	0	$250
Allegheny Co.	5/27/2014	Thunderstorm Wind	50	0	0	$250
Allegheny Co.	5/27/2014	Thunderstorm Wind	50	0	0	$1,000
Allegheny Co.	5/27/2014	Thunderstorm Wind	50	0	0	$250
Allegheny Co.	5/27/2014	Thunderstorm Wind	50	0	0	$500
Allegheny Co.	5/27/2014	Thunderstorm Wind	50	0	0	$1,000
Allegheny Co.	5/27/2014	Thunderstorm Wind	50	0	0	$1,000
Allegheny Co.	6/3/2014	Thunderstorm Wind	50	0	0	$2,000
Allegheny Co.	6/11/2014	Thunderstorm Wind	50	0	0	$5,000
Allegheny Co.	6/11/2014	Thunderstorm Wind	50	0	0	$5,000
Allegheny Co.	6/11/2014	Thunderstorm Wind	50	0	0	$5,000
Allegheny Co.	6/11/2014	Thunderstorm Wind	50	0	0	$500
Allegheny Co.	6/11/2014	Thunderstorm Wind	50	0	0	$15,000
Allegheny Co.	6/18/2014	Thunderstorm Wind	50	0	0	$1,000
Allegheny Co.	6/18/2014	Thunderstorm Wind	50	0	0	$5,000
Allegheny Co.	6/18/2014	Thunderstorm Wind	50	0	0	$5,000
Allegheny Co.	6/18/2014	Thunderstorm Wind	50	0	0	$3,000
Allegheny Co.	6/18/2014	Thunderstorm Wind	50	0	0	$10,000
Allegheny Co.	6/24/2014	Thunderstorm Wind	74	0	0	$100,000
Allegheny Co.	6/24/2014	Thunderstorm Wind	50	0	0	$10,000
Allegheny Co.	6/24/2014	Thunderstorm Wind	50	0	0	$10,000
Allegheny Co.	6/24/2014	Thunderstorm Wind	50	0	0	$10,000
Allegheny Co.	7/8/2014	Thunderstorm Wind	50	0	0	$2,000
Allegheny Co.	7/13/2014	Thunderstorm Wind	50	0	0	$15,000
Allegheny Co.	7/13/2014	Thunderstorm Wind	50	0	0	$15,000
Allegheny Co.	7/13/2014	Thunderstorm Wind	50	0	0	$25,000
Allegheny Co.	7/13/2014	Thunderstorm Wind	50	0	0	$2,000
Allegheny Co.	7/13/2014	Thunderstorm Wind	50	0	0	$15,000
Allegheny Co.	7/13/2014	Thunderstorm Wind	50	0	0	$5,000
Allegheny Co.	7/13/2014	Thunderstorm Wind	50	0	0	$5,000
Allegheny Co.	8/12/2014	Thunderstorm Wind	50	0	0	$2,000
Allegheny Co.	8/12/2014	Thunderstorm Wind	50	0	0	$1,000
Allegheny Co.	8/12/2014	Thunderstorm Wind	50	0	0	$1,000
Allegheny Co.	8/12/2014	Thunderstorm Wind	50	0	0	$5,000
Allegheny Co.	8/12/2014	Thunderstorm Wind	50	0	0	$500
Allegheny Co.	8/12/2014	Thunderstorm Wind	50	0	0	$500

Table 4.3.9-3 **History of Windstorms in Allegheny County (NCDC, 2020).**

Location	Date	Type of Event	Magnitude	Deaths	Injuries	Property Damage ($)
Allegheny Co.	4/9/2015	Thunderstorm Wind	50	0	0	$5,000
Allegheny Co.	4/9/2015	Thunderstorm Wind	50	0	0	$5,000
Allegheny Co.	4/9/2015	Thunderstorm Wind	50	0	0	$5,000
Allegheny Co.	4/9/2015	Thunderstorm Wind	50	0	0	$2,000
Allegheny Co.	4/9/2015	Thunderstorm Wind	50	0	0	$10,000
Allegheny Co.	4/9/2015	Thunderstorm Wind	56	0	0	$0
Allegheny Co.	4/9/2015	Thunderstorm Wind	50	0	0	$5,000
Allegheny Co.	4/9/2015	Thunderstorm Wind	50	0	0	$5,000
Allegheny Co.	4/9/2015	Thunderstorm Wind	50	0	0	$2,000
Allegheny Co.	4/9/2015	Thunderstorm Wind	70	0	0	$25,000
Allegheny Co.	5/11/2015	Thunderstorm Wind	50	0	0	$250
Allegheny Co.	5/11/2015	Thunderstorm Wind	50	0	0	$1,000
Allegheny Co.	5/11/2015	Thunderstorm Wind	50	0	0	$8,000
Allegheny Co.	5/11/2015	Thunderstorm Wind	50	0	0	$1,000
Allegheny Co.	5/11/2015	Thunderstorm Wind	50	0	0	$1,000
Allegheny Co.	5/29/2015	Thunderstorm Wind	50	0	0	$10,000
Allegheny Co.	5/29/2015	Thunderstorm Wind	50	0	0	$1,000
Allegheny Co.	5/30/2015	Thunderstorm Wind	50	0	2	$15,000
Allegheny Co.	6/5/2015	Thunderstorm Wind	50	0	0	$2,000
Allegheny Co.	6/5/2015	Thunderstorm Wind	50	0	0	$2,000
Allegheny Co.	6/5/2015	Thunderstorm Wind	50	0	0	$2,000
Allegheny Co.	6/5/2015	Thunderstorm Wind	50	0	0	$2,000
Allegheny Co.	6/14/2015	Thunderstorm Wind	50	0	0	$2,000
Allegheny Co.	6/14/2015	Thunderstorm Wind	50	0	0	$2,000
Allegheny Co.	6/14/2015	Thunderstorm Wind	50	0	0	$0
Allegheny Co.	6/18/2015	Thunderstorm Wind	50	0	0	$5,000
Allegheny Co.	6/18/2015	Thunderstorm Wind	50	0	0	$2,000
Allegheny Co.	6/18/2015	Thunderstorm Wind	50	0	0	$5,000
Allegheny Co.	6/18/2015	Thunderstorm Wind	50	0	0	$10,000
Allegheny Co.	6/18/2015	Thunderstorm Wind	50	0	0	$5,000
Allegheny Co.	6/18/2015	Thunderstorm Wind	50	0	0	$8,000
Allegheny Co.	6/18/2015	Thunderstorm Wind	50	0	0	$5,000
Allegheny Co.	6/18/2015	Thunderstorm Wind	50	0	0	$10,000
Allegheny Co.	6/18/2015	Thunderstorm Wind	50	0	0	$5,000
Allegheny Co.	6/23/2015	Thunderstorm Wind	50	0	0	$10,000
Allegheny Co.	6/30/2015	Thunderstorm Wind	50	0	0	$1,000
Allegheny Co.	6/30/2015	Thunderstorm Wind	50	0	0	$5,000

Table 4.3.9-3 **History of Windstorms in Allegheny County (NCDC, 2020).**

Location	Date	Type of Event	Magnitude	Deaths	Injuries	Property Damage ($)
Allegheny Co.	6/30/2015	Thunderstorm Wind	50	0	0	$2,000
Allegheny Co.	7/7/2015	Thunderstorm Wind	50	0	0	$500
Allegheny Co.	7/7/2015	Thunderstorm Wind	50	0	0	$250
Allegheny Co.	7/7/2015	Thunderstorm Wind	50	0	0	$2,000
Allegheny Co.	7/7/2015	Thunderstorm Wind	50	0	0	$500
Allegheny Co.	8/3/2015	Thunderstorm Wind	50	0	0	$5,000
Allegheny Co.	9/9/2015	Thunderstorm Wind	50	0	0	$1,500
Allegheny Co.	6/11/2016	Thunderstorm Wind	43	0	0	$5,000
Allegheny Co.	6/16/2016	Thunderstorm Wind	50	0	1	$20,000
Allegheny Co.	6/16/2016	Thunderstorm Wind	50	0	0	$10,000
Allegheny Co.	6/16/2016	Thunderstorm Wind	50	0	0	$5,000
Allegheny Co.	6/16/2016	Thunderstorm Wind	50	0	0	$5,000
Allegheny Co.	7/14/2016	Thunderstorm Wind	50	0	0	$8,000
Allegheny Co.	7/14/2016	Thunderstorm Wind	50	0	0	$2,000
Allegheny Co.	7/24/2016	Thunderstorm Wind	50	0	0	$2,000
Allegheny Co.	7/24/2016	Thunderstorm Wind	50	0	0	$5,000
Allegheny Co.	7/24/2016	Thunderstorm Wind	50	0	0	$8,000
Allegheny Co.	7/24/2016	Thunderstorm Wind	50	0	0	$10,000
Allegheny Co.	7/24/2016	Thunderstorm Wind	50	0	0	$5,000
Allegheny Co.	7/25/2016	Thunderstorm Wind	50	0	0	$3,000
Allegheny Co.	7/25/2016	Thunderstorm Wind	50	0	0	$5,000
Allegheny Co.	7/25/2016	Thunderstorm Wind	50	0	0	$5,000
Allegheny Co.	7/25/2016	Thunderstorm Wind	50	0	0	$8,000
Allegheny Co.	7/25/2016	Thunderstorm Wind	50	0	0	$3,000
Allegheny Co.	8/16/2016	Thunderstorm Wind	50	0	0	$5,000
Allegheny Co.	8/16/2016	Thunderstorm Wind	50	0	0	$10,000
Allegheny Co.	8/28/2016	Thunderstorm Wind	50	0	0	$10,000
Allegheny Co.	4/16/2017	Thunderstorm Wind	50	0	0	$2,500
Allegheny Co.	4/27/2017	Thunderstorm Wind	48	0	0	$1,000
Allegheny Co.	5/1/2017	Thunderstorm Wind	48	0	0	$100
Allegheny Co.	5/1/2017	Thunderstorm Wind	50	0	0	$250
Allegheny Co.	5/1/2017	Thunderstorm Wind	48	0	0	$100
Allegheny Co.	5/1/2017	Thunderstorm Wind	50	0	0	$500
Allegheny Co.	5/1/2017	Thunderstorm Wind	50	0	0	$500
Allegheny Co.	5/1/2017	Thunderstorm Wind	50	0	0	$500
Allegheny Co.	5/18/2017	Thunderstorm Wind	50	0	0	$1,000
Allegheny Co.	5/31/2017	Thunderstorm Wind	50	0	0	$500

Table 4.3.9-3 **History of Windstorms in Allegheny County (NCDC, 2020).**

Location	Date	Type of Event	Magnitude	Deaths	Injuries	Property Damage ($)
Allegheny Co.	5/31/2017	Thunderstorm Wind	50	0	0	$2,500
Allegheny Co.	5/31/2017	Thunderstorm Wind	50	0	0	$500
Allegheny Co.	5/31/2017	Thunderstorm Wind	50	0	0	$500
Allegheny Co.	5/31/2017	Thunderstorm Wind	50	0	0	$500
Allegheny Co.	5/31/2017	Thunderstorm Wind	50	0	0	$250
Allegheny Co.	6/13/2017	Thunderstorm Wind	50	0	0	$35,000
Allegheny Co.	6/15/2017	Thunderstorm Wind	50	0	0	$2,000
Allegheny Co.	6/15/2017	Thunderstorm Wind	50	0	0	$500
Allegheny Co.	6/15/2017	Thunderstorm Wind	50	0	0	$3,000
Allegheny Co.	6/15/2017	Thunderstorm Wind	55	0	0	$3,000
Allegheny Co.	6/15/2017	Thunderstorm Wind	50	0	0	$3,000
Allegheny Co.	6/15/2017	Thunderstorm Wind	50	0	0	$500
Allegheny Co.	7/10/2017	Thunderstorm Wind	50	0	0	$1,000
Allegheny Co.	7/11/2017	Thunderstorm Wind	50	0	0	$2,000
Allegheny Co.	8/4/2017	Thunderstorm Wind	50	0	0	$2,500
Allegheny Co.	8/4/2017	Thunderstorm Wind	50	0	0	$2,500
Allegheny Co.	8/4/2017	Thunderstorm Wind	50	0	0	$1,000
Allegheny Co.	8/4/2017	Thunderstorm Wind	50	0	0	$5,000
Allegheny Co.	8/19/2017	Thunderstorm Wind	50	0	0	$5,000
Allegheny Co.	8/22/2017	Thunderstorm Wind	50	0	0	$500
Allegheny Co.	8/22/2017	Thunderstorm Wind	50	0	0	$1,000
Allegheny Co.	8/22/2017	Thunderstorm Wind	50	0	0	$1,000
Allegheny Co.	8/22/2017	Thunderstorm Wind	50	0	0	$500
Allegheny Co.	8/22/2017	Thunderstorm Wind	50	0	0	$1,000
Allegheny Co.	8/22/2017	Thunderstorm Wind	50	0	0	$20,000
Allegheny Co.	8/22/2017	Thunderstorm Wind	50	0	0	$500
Allegheny Co.	8/22/2017	Thunderstorm Wind	50	0	0	$1,000
Allegheny Co.	11/19/2017	Thunderstorm Wind	74	0	0	$10,000
Allegheny Co.	4/3/2018	Thunderstorm Wind	50	0	0	$5,000
Allegheny Co.	4/3/2018	Thunderstorm Wind	50	0	0	$500
Allegheny Co.	4/3/2018	Thunderstorm Wind	50	0	0	$500
Allegheny Co.	5/12/2018	Thunderstorm Wind	50	0	0	$500
Allegheny Co.	5/22/2018	Thunderstorm Wind	50	0	0	$250
Allegheny Co.	5/22/2018	Thunderstorm Wind	50	0	0	$500
Allegheny Co.	6/5/2018	Thunderstorm Wind	50	0	0	$500
Allegheny Co.	7/4/2018	Thunderstorm Wind	55	0	0	$0
Allegheny Co.	7/4/2018	Thunderstorm Wind	55	0	0	$0

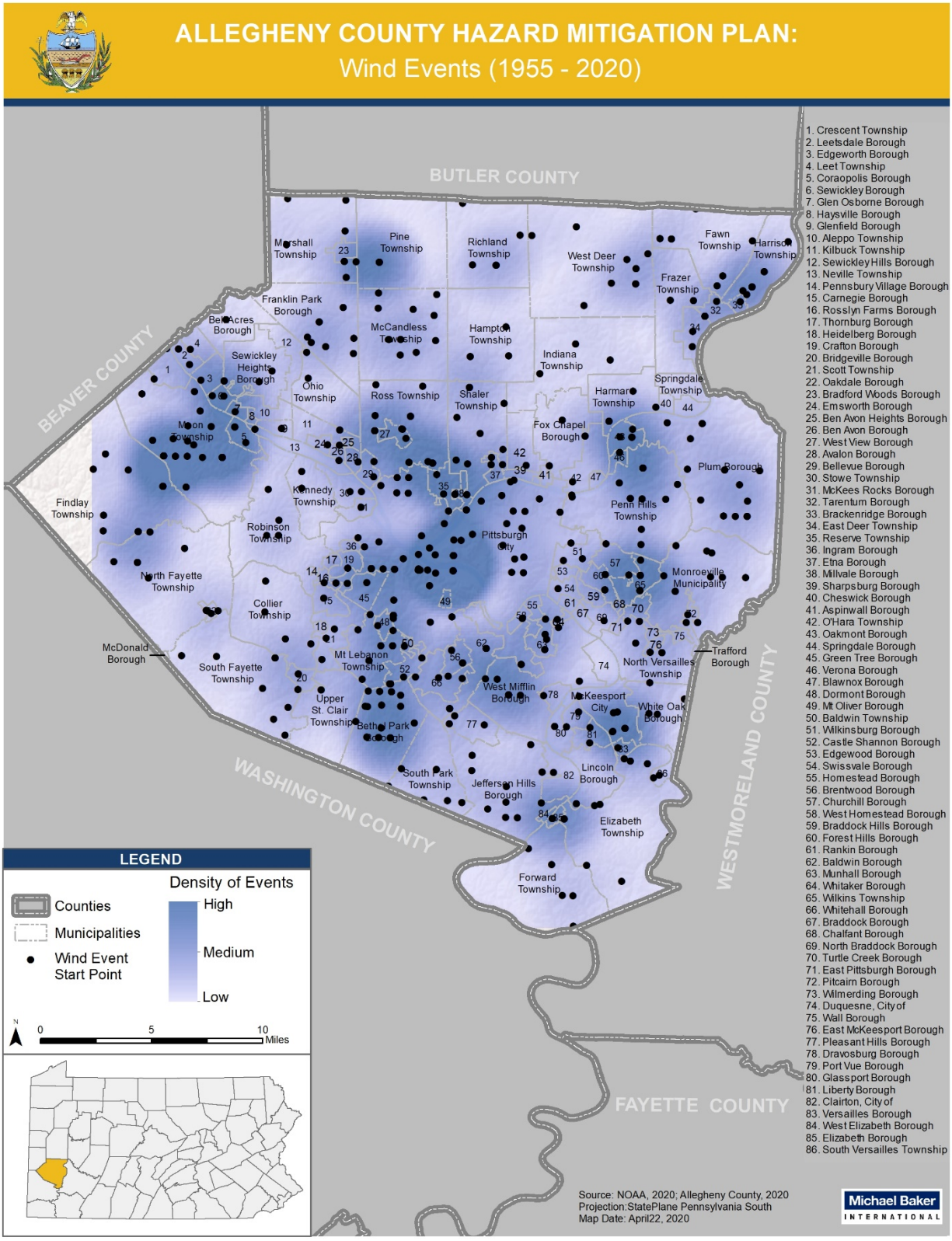
Table 4.3.9-3 **History of Windstorms in Allegheny County (NCDC, 2020).**

Location	Date	Type of Event	Magnitude	Deaths	Injuries	Property Damage ($)
Allegheny Co.	7/4/2018	Thunderstorm Wind	55	0	0	$0
Allegheny Co.	7/4/2018	Thunderstorm Wind	55	0	0	$0
Allegheny Co.	7/4/2018	Thunderstorm Wind	55	0	0	$0
Allegheny Co.	7/4/2018	Thunderstorm Wind	55	0	0	$0
Allegheny Co.	7/15/2018	Thunderstorm Wind	50	0	0	$0
Allegheny Co.	7/15/2018	Thunderstorm Wind	50	0	0	$0
Allegheny Co.	7/15/2018	Thunderstorm Wind	50	0	0	$0
Allegheny Co.	8/5/2018	Thunderstorm Wind	50	0	0	$2,000
Allegheny Co.	8/5/2018	Thunderstorm Wind	50	0	0	$500
Allegheny Co.	9/21/2018	Thunderstorm Wind	50	0	0	$0
Allegheny Co.	9/21/2018	Thunderstorm Wind	50	0	0	$0
Allegheny Co.	9/21/2018	Thunderstorm Wind	50	0	0	$0
Allegheny Co.	9/21/2018	Thunderstorm Wind	50	0	0	$0
Allegheny Co.	2/24/2019	High Wind	53	0	0	$0
Allegheny Co.	2/24/2019	High Wind	50	0	0	$0
Allegheny Co.	5/28/2019	Thunderstorm Wind	50	0	0	$0
Allegheny Co.	5/29/2019	Thunderstorm Wind	50	0	0	$0
Allegheny Co.	5/29/2019	Thunderstorm Wind	50	0	0	$0
Allegheny Co.	5/29/2019	Thunderstorm Wind	50	0	0	$0
Allegheny Co.	5/29/2019	Thunderstorm Wind	50	0	0	$0
Allegheny Co.	6/24/2019	Thunderstorm Wind	50	0	0	$0
Allegheny Co.	6/24/2019	Thunderstorm Wind	50	0	0	$0
Allegheny Co.	6/24/2019	Thunderstorm Wind	50	0	0	$0
Allegheny Co.	6/27/2019	Thunderstorm Wind	50	0	0	$0
Allegheny Co.	6/27/2019	Thunderstorm Wind	50	0	0	$1,000
Allegheny Co.	6/27/2019	Thunderstorm Wind	50	0	0	$1,000
Allegheny Co.	6/28/2019	Thunderstorm Wind	50	0	0	$1,000
Allegheny Co.	6/28/2019	Thunderstorm Wind	50	0	0	$2,000
Allegheny Co.	6/28/2019	Thunderstorm Wind	50	0	0	$2,000
Allegheny Co.	6/29/2019	Thunderstorm Wind	50	0	0	$2,000
Allegheny Co.	6/29/2019	Thunderstorm Wind	50	0	0	$2,000
Allegheny Co.	6/29/2019	Thunderstorm Wind	50	0	0	$2,000
Allegheny Co.	6/29/2019	Thunderstorm Wind	50	0	0	$1,000
Allegheny Co.	7/2/2019	Thunderstorm Wind	50	0	0	$10,000
Allegheny Co.	7/6/2019	Thunderstorm Wind	50	0	0	$0
Allegheny Co.	7/6/2019	Thunderstorm Wind	50	0	0	$0
Allegheny Co.	7/21/2019	Thunderstorm Wind	50	0	0	$0

Table 4.3.9-3 **History of Windstorms in Allegheny County (NCDC, 2020).**

Location	Date	Type of Event	Magnitude	Deaths	Injuries	Property Damage ($)
Allegheny Co.	8/8/2019	Thunderstorm Wind	50	0	0	$0
Allegheny Co.	8/8/2019	Thunderstorm Wind	50	0	0	$0
Allegheny Co.	8/8/2019	Thunderstorm Wind	50	0	0	$1,000
Allegheny Co.	8/8/2019	Thunderstorm Wind	50	0	0	$500
Allegheny Co.	8/8/2019	Thunderstorm Wind	50	0	0	$1,000
Allegheny Co.	8/15/2019	Thunderstorm Wind	50	0	0	$5,000
Allegheny Co.	8/15/2019	Thunderstorm Wind	50	0	0	$5,000
Allegheny Co.	8/15/2019	Thunderstorm Wind	50	0	0	$1,000
Allegheny Co.	8/15/2019	Thunderstorm Wind	50	0	0	$2,000
Allegheny Co.	8/17/2019	Thunderstorm Wind	50	0	0	$1,000
Allegheny Co.	8/17/2019	Thunderstorm Wind	50	0	0	$10,000
Allegheny Co.	8/17/2019	Thunderstorm Wind	50	0	0	$10,000
Allegheny Co.	8/17/2019	Thunderstorm Wind	50	0	0	$5,000
Allegheny Co.	9/1/2019	Thunderstorm Wind	51	0	0	$0
TOTAL				**1**	**68**	**$57,631,450**

Figure 4.3.9-4 Windstorm History for Allegheny County (1955-2020)



4.3.9.4. Future Occurrence

The frequency of tornadoes and windstorms is expected to remain constant across Allegheny County. These storms can affect the entire county, windstorms especially can occur across the entire county during one event. The probability of a tornado or windstorm directly affecting Allegheny County is relatively high, and there have been some significant past damages. Most of Pennsylvania is susceptible to tornadoes of a magnitude of at most an EF-3. It can reasonably be assumed that future tornadoes will be similar in nature to those that have affected the County in the past. The probability of the County and its municipalities experiencing severe winds is difficult to quantify but is considered relatively high. The degree of damage and impact to the county will vary as it has in years past.

Changing weather patterns have led to more frequent and extreme storms across the Nation. This includes intense winds associated with severe rain and tropical storms. Further, the annual number of very hot days is growing. Warmer and wetter conditions provide more energy for thunderstorms and tornadoes. While it is difficult to predict, it is expected that these conditions will continue to intensify in Allegheny County. Overall, the probably of future tornado and windstorms should be considered likely according to the Risk Factor Methodology (see Table 4.4 -1).

4.3.9.5. Vulnerability Assessment

Tornadoes and windstorms may affect the entire County, including all critical infrastructure and all structures. However, there are a number of evaluation criteria to consider when discussing the vulnerability of structures and critical facilities. These criteria include age of the building (and what building codes may have been in effect at the time it was built), type of construction, and condition of the structure (i.e., how well has the structure been maintained). For most assets, this would require site-specific analysis.

The primary structure type vulnerable to a tornado or windstorm is mobile homes due to their lightweight, unanchored design. Table 4.3.9-4 provides the number of structures on mobile home parcels by municipality. These should be considered an estimate of mobile homes (see Section 2.5 for data limitations).

Table 4.3.9-4 **Estimated Mobile Homes Per Municipality.**

Municipality	Total Structures	Structures on mobile home parcels	Percent Mobile Homes
Aleppo Township	904	0	0.00%
Aspinwall Borough	1,256	0	0.00%
Avalon Borough	2,359	0	0.00%
Baldwin Borough	9,159	0	0.00%
Baldwin Township	946	0	0.00%
Bell Acres Borough	625	5	0.80%
Bellevue Borough	3,005	0	0.00%
Ben Avon Borough	759	0	0.00%
Ben Avon Heights Borough	144	0	0.00%

Table 4.3.9-4 **Estimated Mobile Homes Per Municipality.**

Municipality	Total Structures	Structures on mobile home parcels	Percent Mobile Homes
Bethel Park, Municipality of	13,201	2	0.02%
Blawnox Borough	694	0	0.00%
Brackenridge Borough	1,538	3	0.20%
Braddock Borough	1,244	0	0.00%
Braddock Hills Borough	868	0	0.00%
Bradford Woods Borough	507	0	0.00%
Brentwood Borough	4,263	0	0.00%
Bridgeville Borough	2,277	0	0.00%
Carnegie Borough	3,748	0	0.00%
Castle Shannon Borough	3,698	0	0.00%
Chalfant Borough	417	0	0.00%
Cheswick Borough	904	0	0.00%
Churchill Borough	1,500	0	0.00%
Clairton, City of	4,008	0	0.00%
Collier Township	4,512	320	7.09%
Coraopolis Borough	2,666	0	0.00%
Crafton Borough	2,547	0	0.00%
Crescent Township	1,165	36	3.09%
Dormont Borough	3,481	0	0.00%
Dravosburg Borough	1043	0	0.00%
Duquesne, City of	3,158	7	0.22%
East Deer Township	792	2	0.25%
East McKeesport Borough	1,034	1	0.10%
East Pittsburgh Borough	874	0	0.00%
Edgewood Borough	1,444	0	0.00%
Edgeworth Borough	673	0	0.00%
Elizabeth Borough	704	1	0.14%
Elizabeth Township	6,119	84	1.37%
Emsworth Borough	1023	0	0.00%
Etna Borough	1,638	0	0.00%
Fawn Township	1,068	52	4.87%
Findlay Township	3,382	73	2.16%
Forest Hills Borough	3,198	0	0.00%
Forward Township	1,636	268	16.38%
Fox Chapel Borough	1,972	0	0.00%
Franklin Park Borough	5,675	1	0.02%
Frazer Township	627	50	7.97%

Table 4.3.9-4 **Estimated Mobile Homes Per Municipality.**

Municipality	Total Structures	Structures on mobile home parcels	Percent Mobile Homes
Glassport Borough	2,147	1	0.05%
Glen Osborne Borough	243	0	0.00%
Glenfield Borough	108	0	0.00%
Green Tree Borough	2,516	0	0.00%
Hampton Township	7,273	3	0.04%
Harmar Township	1,850	102	5.51%
Harrison Township	5,428	7	0.13%
Haysville Borough	51	0	0.00%
Heidelberg Borough	643	0	0.00%
Homestead Borough	1,561	0	0.00%
Indiana Township	3,496	166	4.75%
Ingram Borough	1,313	0	0.00%
Jefferson Hills Borough	5,372	62	1.15%
Kennedy Township	3,899	0	0.00%
Kilbuck Township	368	0	0.00%
Leet Township	652	0	0.00%
Leetsdale Borough	676	0	0.00%
Liberty Borough	1,156	0	0.00%
Lincoln Borough	528	20	3.79%
Marshall Township	4,312	0	0.00%
McCandless, Town of	12,640	2	0.02%
McDonald Borough	187	1	0.53%
McKees Rocks Borough	3,069	0	0.00%
McKeesport, City of	9,965	0	0.00%
Millvale Borough	1,839	0	0.00%
Monroeville, Municipality of	11,943	27	0.23%
Moon Township	11,002	17	0.15%
Mount Lebanon, Municipality of	11,685	0	0.00%
Mount Oliver Borough	1,508	0	0.00%
Munhall Borough	5,161	0	0.00%
Neville Township	753	0	0.00%
North Braddock Borough	2,657	0	0.00%
North Fayette Township	7,950	915	11.51%
North Versailles Township	4,996	12	0.24%
Oakdale Borough	675	0	0.00%
Oakmont Borough	3140	0	0.00%
O'Hara Township	4,311	0	0.00%

Table 4.3.9-4 **Estimated Mobile Homes Per Municipality.**

Municipality	Total Structures	Structures on mobile home parcels	Percent Mobile Homes
Ohio Township	3,249	0	0.00%
Penn Hills, Municipality of	19,869	4	0.02%
Pennsbury Village Borough	503	0	0.00%
Pine Township	5,834	0	0.00%
Pitcairn Borough	1,421	3	0.21%
Pittsburgh, City of	124,624	84	0.07%
Pleasant Hills Borough	3,480	0	0.00%
Plum Borough	12,099	241	1.99%
Port Vue Borough	1,816	0	0.00%
Rankin Borough	987	0	0.00%
Reserve Township	1,561	0	0.00%
Richland Township	4,660	64	1.37%
Robinson Township	7,446	268	3.60%
Ross Township	15,167	1	0.01%
Rosslyn Farms Borough	216	0	0.00%
Scott Township	6,899	0	0.00%
Sewickley Borough	1,628	0	0.00%
Sewickley Heights	421	0	0.00%
Sewickley Hills Borough	276	0	0.00%
Shaler Township	12,786	66	0.52%
Sharpsburg Borough	1,563	0	0.00%
South Fayette Township	7,098	6	0.08%
South Park Township	5,805	0	0.00%
South Versailles Township	168	12	7.14%
Springdale Borough	1,728	3	0.17%
Springdale Township	859	84	9.78%
Stowe Township	3,171	0	0.00%
Swissvale Borough	4,107	0	0.00%
Tarentum Borough	2,153	5	0.23%
Thornburg Borough	190	0	0.00%
Trafford Borough	52	1	1.92%
Turtle Creek Borough	2,646	0	0.00%
Upper St. Clair Township	7,841	0	0.00%
Verona Borough	1,364	0	0.00%
Versailles Borough	673	0	0.00%
Wall Borough	357	3	0.84%
West Deer Township	5,665	164	2.89%

Table 4.3.9-4 **Estimated Mobile Homes Per Municipality.**

Municipality	Total Structures	Structures on mobile home parcels	Percent Mobile Homes
West Elizabeth Borough	284	50	17.61%
West Homestead Borough	1,114	0	0.00%
West Mifflin Borough	9,910	170	1.72%
West View Borough	2,668	0	0.00%
Whitaker Borough	632	0	0.00%
White Oak Borough	3,804	68	1.79%
Whitehall Borough	5,771	0	0.00%
Wilkins Township	2,771	0	0.00%
Wilkinsburg Borough	6,994	0	0.00%
Wilmerding Borough	916	0	0.00%
Grand Total	**550,774**	**3,537**	**0.64%**

4.3.10. Wildfire

4.3.10.1. 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.

Under dry conditions or droughts, wildfires have the potential to burn forests as well as croplands. The greatest potential for wildfires is in the spring months of March, April, and May, and the autumn months of October and November. In 2019 over 90% of all Pennsylvania wildfires occurred 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. Most fires are caused by human carelessness or negligence, especially debris burning. However, some are precipitated by lightning strikes and, in rare instances, spontaneous combustion. Figure 4.3.10-1 shows the percentage of wildfires occurring every month in Pennsylvania, showing the spikes in March, April, and May (DCNR, 2015).

Figure 4.3.10-1 Percentage of Wildfires Occurring Each Month in Pennsylvania.

4.3.10.2. Range of Magnitude

Wildfire events can range from small fires that can be managed by local firefighters to large fires impacting many acres of land. Large events may require evacuation from one or more communities and necessitate

regional or national firefighting support. The impact of a severe wildfire can be devastating. A wildfire has the potential to kill people, livestock, fish, and wildlife. They often destroy property, valuable timber, forage, and recreational and scenic values.

In addition to the risk wildfires pose to the general public and to 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 includes 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.

Vegetation loss is often a concern, but it typically is not a serious impact since natural re-growth occurs with time. The most significant environmental impact is the potential for severe erosion, silting of stream beds and reservoirs, and flooding due to ground-cover loss following a fire event.

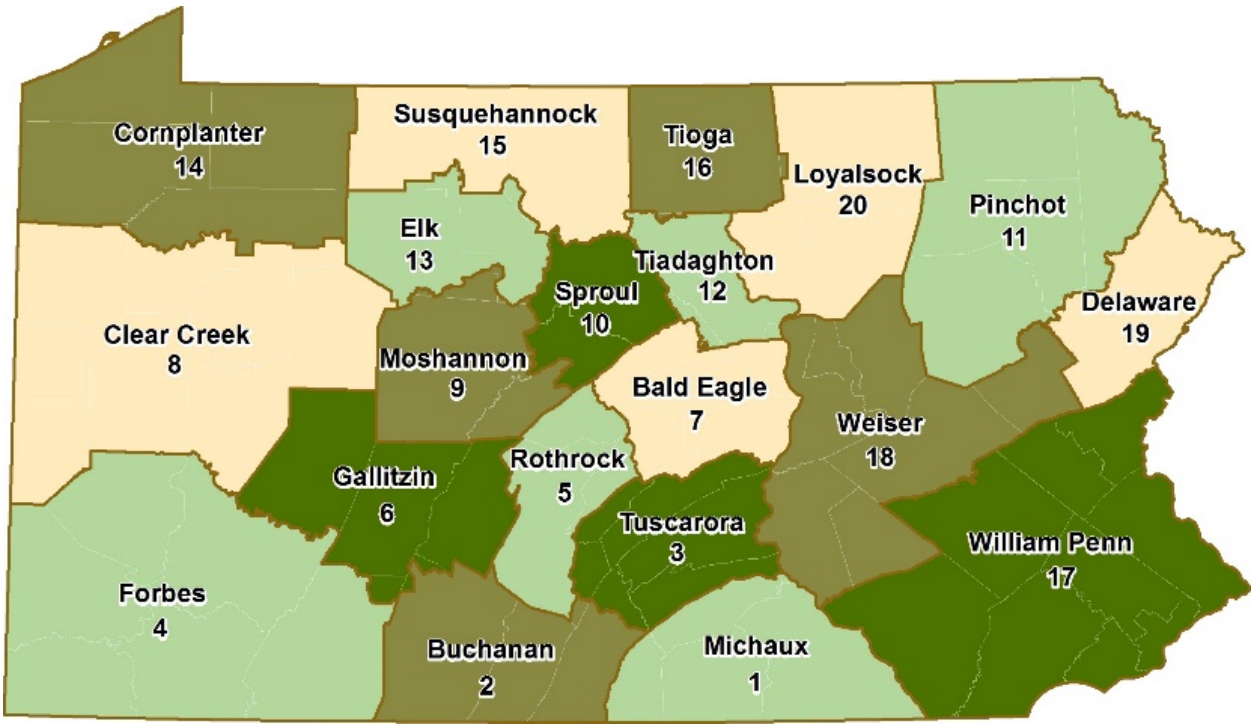
Wildfires have a positive environmental impact in that they burn dead trees, leaves, and grasses to allow more open spaces for new and different types of vegetation to grow and receive sunlight. Another positive effect of a wildfire is that it stimulates the growth of new shoots on trees and shrubs and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

The largest wildfire in Pennsylvania in recent years burned 10,000 acres in the north-central area of the Commonwealth. This fire was controlled within a week. It destroyed five cabins, but there was no loss of life. Another large wildfire burned 8,000 acres in the Poconos in 2016. About 100 people were evacuated and it took 130 firefighters to stop the blaze. Several other fires have burned over 2,000 acres each and again have been controlled within a week of the reported start. This kind of a scenario is unlikely in Allegheny County, where the largest wildfire reported to DCNR burned 3 acres but is illustrative of a worst-case scenario.

4.3.10.3. Past Occurrence

Allegheny County falls in Pennsylvania Forest District 4, a six county district in southwest Pennsylvania, as shown in Figure 4.3.10-10.

Figure 4.3.10-2 Fire Districts in Pennsylvania



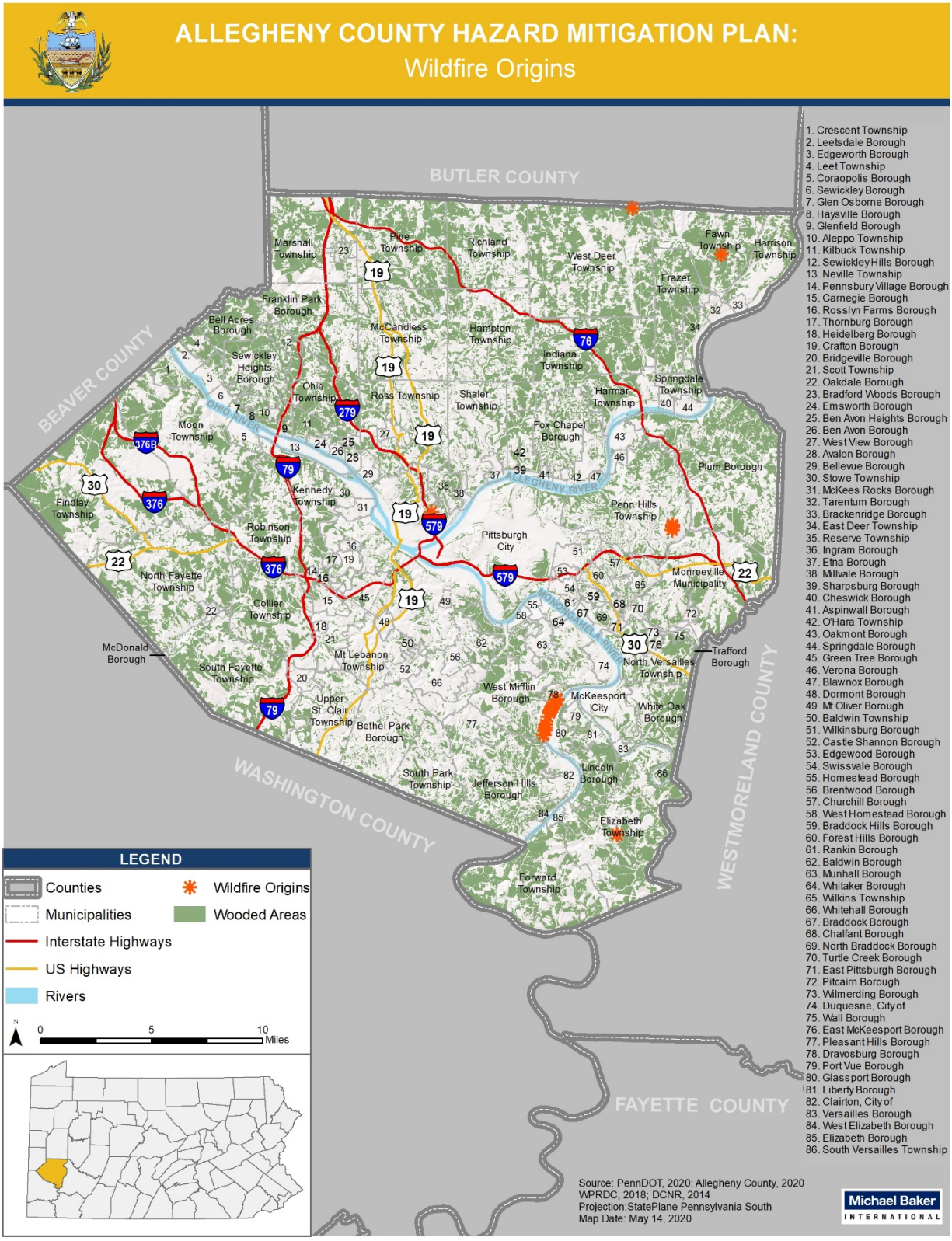
The following table lists wildfire statistics for PA Forest District 4. This data accounts for more than just Allegheny County. However, it points towards the regional risk to wildfire.

Table 4.3.10-1 Wildfires in PA Forest District 4 2010-2019 (DCNR 2020)

Year	# Fires	Acres Burned
2019	50	61.9
2018	50	79.6
2017	52	74.8
2016	85	926.6
2015	92	169.9
2014	104	176.1
2013	49	99
2012	24	57.8
2011	7	20.8
2010	30	75.1

Figure 4.3.10-2 shows the geography of the aforementioned wildfires from 2008-2010 documented in Table 4.3.10-1 (a point location for the 2005 event was not available) overlaid on the county's wooded areas. Because most of Allegheny County is developed, the risk for wildfires is relatively low.

Figure 4.3.10-3 Wildfire Origins for Allegheny County, (PA DCNR, Bureau of Forestry, 2010).



4.3.10.4. Future Occurrence

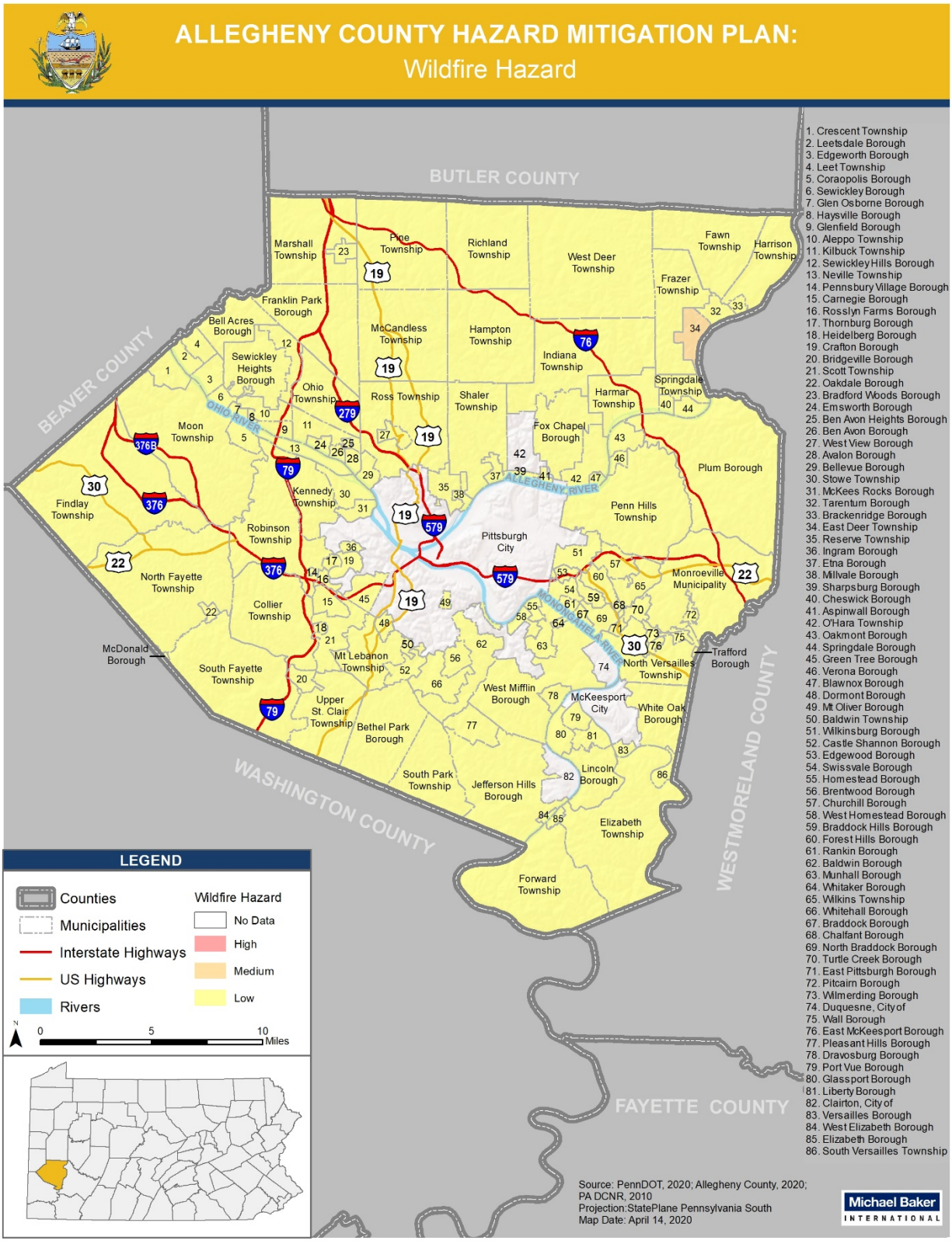
Wildfire events will occur in Pennsylvania every year but are not likely to grow from small, contained brush fires to actual wildfires in Allegheny County in any given year. The likelihood of one of those fires attaining significant size and intensity is unpredictable and highly dependent on environmental conditions and firefighting response. As a result, the probably of future wildfires should be considered unlikely according to the Risk Factor Methodology (see Table 4.4 -1). However, weather conditions, particularly drought events, increase the likelihood of wildfires occurring. Changing weather patterns are creating prime conditions for future wildfires. It is expected that there will be an increase in drought events as the number of very hot days continues to increase. The Allegheny County region in particular is predicted to more than double in drought intensity (Climate Central, 2019).

It is important to note that 99% of wildfires in Pennsylvania are human-caused (DCNR, 2019). Thus, there is rationale for including this hazard under the summary of human-made hazards. Nonetheless, the critical inference to draw from this statistic is the fact that the occurrence of future wildfire events will strongly depend on patterns of human activity. Wildfires may also be more likely after invasive species infestations or high wind events; these events would add additional potential fuel load to fire-prone locations.

4.3.10.5. Vulnerability Assessment

The Pennsylvania Bureau of Forestry has conducted an independent wildfire hazard risk assessment for the various municipalities across Allegheny County. Results of that assessment are shown in Figure 4.3.10-4. Wildfire hazard is defined based on conditions that affect wildfire ignition and/or behavior such as fuel, topography and local weather. Based on this assessment, Allegheny County as a whole has a low risk to wildfires; only East Deer Township has a medium risk. Wildfire hazard risk was not calculated for Allegheny County's cities (Pittsburgh, Clairton, Duquesne, McKeesport, etc.).

Figure 4.3.10-4 Allegheny Risk to Wildfire, (DCNR Bureau of Forestry, 2010).



Because there is ignition potential in wooded areas, this plan evaluates the number and type of structures and critical facilities vulnerable to wildfires by highlighting those located within the county's wooded areas. Table 4.3.10-3 shows the total structures and critical facilities in wooded areas, and Table 4.3.10-4 shows the structures by generalized land use type. While these structures may be vulnerable, Allegheny County has had a general ban on open burning since 1970. This ordinance sets standards that require outdoor burns to be at least 10 feet from the nearest structure or inhabited area and prohibit the burning of trash, leaves, and debris. Continued enforcement of this ban will assist in preventing future fires.

Table 4.3.10-2 **Structures and critical facilities vulnerable to wildfire.**

Municipality	Total Structures	Total Structures in Wooded Areas	Percent Structures in Wooded Areas	Total Critical Facilities	Critical Facilities in Wooded Areas	Percent Critical Facilities in Wooded Areas
Aleppo Township	904	283	31%	7	0	0%
Aspinwall Borough	1,256	1	0%	6	3	50%
Avalon Borough	2,359	1	0%	8	0	0%
Baldwin Borough	9,159	41	0%	18	0	0%
Baldwin Township	946	0	0%	3	0	0%
Bell Acres Borough	625	79	13%	8	0	0%
Bellevue Borough	3,005	1	0%	15	3	20%
Ben Avon Borough	759	1	0%	3	0	0%
Ben Avon Heights Borough	144	3	2%	1	0	0%
Bethel Park, Municipality of	13,201	379	3%	34	0	0%
Blawnox Borough	694	3	0%	7	1	14%
Brackenridge Borough	1,538	0	0%	9	0	0%
Braddock Borough	1,244	0	0%	9	0	0%
Braddock Hills Borough	868	9	1%	5	0	0%
Bradford Woods Borough	507	22	4%	4	1	25%
Brentwood Borough	4,263	0	0%	14	1	7%
Bridgeville Borough	2,277	2	0%	6	0	0%
Carnegie Borough	3,748	183	5%	13	0	0%
Castle Shannon Borough	3,698	13	0%	8	0	0%
Chalfant Borough	417	11	3%	2	1	50%
Cheswick Borough	904	2	0%	6	0	0%
Churchill Borough	1,500	5	0%	6	0	0%
Clairton, City of	4,008	18	0%	15	0	0%
Collier Township	4,512	889	20%	23	0	0%
Coraopolis Borough	2,666	0	0%	13	2	15%
Crafton Borough	2,547	4	0%	6	0	0%

Table 4.3.10-2 **Structures and critical facilities vulnerable to wildfire.**

Municipality	Total Structures	Total Structures in Wooded Areas	Percent Structures in Wooded Areas	Total Critical Facilities	Critical Facilities in Wooded Areas	Percent Critical Facilities in Wooded Areas
Crescent Township	1,165	177	15%	3	0	0%
Dormont Borough	3,481	0	0%	7	0	0%
Dravosburg Borough	1,043	3	0%	5	0	0%
Duquesne, City of	3,158	1	0%	14	1	7%
East Deer Township	792	20	3%	11	0	0%
East McKeesport Borough	1,034	2	0%	4	0	0%
East Pittsburgh Borough	874	0	0%	4	0	0%
Edgewood Borough	1,444	0	0%	5	0	0%
Edgeworth Borough	673	6	1%	6	0	0%
Elizabeth Borough	704	0	0%	6	1	17%
Elizabeth Township	6,119	165	3%	29	0	0%
Emsworth Borough	1,023	4	0%	8	3	38%
Etna Borough	1,638	1	0%	8	0	0%
Fawn Township	1,068	33	3%	13	0	0%
Findlay Township	3,382	376	11%	27	1	4%
Forest Hills Borough	3,198	16	1%	9	3	33%
Forward Township	1,636	37	2%	17	0	0%
Fox Chapel Borough	1,972	87	4%	14	1	7%
Franklin Park Borough	5,675	1026	18%	14	0	0%
Frazer Township	627	51	8%	14	2	14%
Glassport Borough	2,147	6	0%	12	2	17%
Glen Osborne Borough	243	10	4%	3	1	33%
Glenfield Borough	108	4	4%	1	0	0%
Green Tree Borough	2,516	24	1%	7	0	0%
Hampton Township	7,273	780	11%	39	0	0%
Harmar Township	1,850	136	7%	24	1	4%
Harrison Township	5,428	114	2%	18	1	6%
Haysville Borough	51	1	2%	1	0	0%
Heidelberg Borough	643	0	0%	5	0	0%
Homestead Borough	1,561	0	0%	10	0	0%
Indiana Township	3,496	673	19%	31	0	0%
Ingram Borough	1,313	0	0%	5	2	40%
Jefferson Hills Borough	5,372	679	13%	30	0	0%
Kennedy Township	3,899	399	10%	20	3	15%
Kilbuck Township	368	12	3%	1	3	300%

Table 4.3.10-2 **Structures and critical facilities vulnerable to wildfire.**

Municipality	Total Structures	Total Structures in Wooded Areas	Percent Structures in Wooded Areas	Total Critical Facilities	Critical Facilities in Wooded Areas	Percent Critical Facilities in Wooded Areas
Leet Township	652	43	7%	5	0	0%
Leetsdale Borough	676	11	2%	13	0	0%
Liberty Borough	1,156	4	0%	7	0	0%
Lincoln Borough	528	21	4%	4	0	0%
Marshall Township	4,312	1131	26%	20	1	5%
McCandless, Town of	12,640	583	5%	38	4	11%
McDonald Borough	187	6	3%	0	0	0%
McKees Rocks Borough	3,069	1	0%	7	0	0%
McKeesport, City of	9,965	29	0%	47	0	0%
Millvale Borough	1,839	2	0%	9	0	0%
Monroeville, Municipality of	11,943	477	4%	71	0	0%
Moon Township	11,002	1121	10%	53	1	2%
Mount Lebanon, Municipality of	11,685	92	1%	42	2	5%
Mount Oliver Borough	1,508	0	0%	4	1	25%
Munhall Borough	5,161	24	0%	20	0	0%
Neville Township	753	1	0%	22	0	0%
North Braddock Borough	2,657	10	0%	10	0	0%
North Fayette Township	7,950	1450	18%	28	1	4%
North Versailles Township	4,996	111	2%	15	6	40%
Oakdale Borough	675	1	0%	27	1	4%
Oakmont Borough	3,140	79	3%	3	2	67%
O'Hara Township	4,311	236	5%	18	0	0%
Ohio Township	3,249	1587	49%	17	0	0%
Penn Hills, Municipality of	19,869	153	1%	52	0	0%
Pennsbury Village Borough	503	0	0%	4	4	100%
Pine Township	5,834	2056	35%	23	0	0%
Pitcairn Borough	1,421	9	1%	6	1	17%
Pittsburgh, City of	124,624	472	0%	539	0	0%
Pleasant Hills Borough	3,480	149	4%	8	7	88%
Plum Borough	12,099	1025	8%	51	1	2%
Port Vue Borough	1,816	7	0%	5	5	100%
Rankin Borough	987	1	0%	4	0	0%
Reserve Township	1,561	12	1%	7	0	0%
Richland Township	4,660	834	18%	19	0	0%
Robinson Township	7,446	1235	17%	33	3	9%

Table 4.3.10-2 **Structures and critical facilities vulnerable to wildfire.**

Municipality	Total Structures	Total Structures in Wooded Areas	Percent Structures in Wooded Areas	Total Critical Facilities	Critical Facilities in Wooded Areas	Percent Critical Facilities in Wooded Areas
Ross Township	15,167	354	2%	45	7	16%
Rosslyn Farms Borough	216	2	1%	3	3	100%
Scott Township	6,899	60	1%	21	0	0%
Sewickley Borough	1,628	9	1%	16	0	0%
Sewickley Heights	421	27	6%	3	2	67%
Sewickley Hills Borough	276	60	22%	2	1	50%
Shaler Township	12,786	391	3%	29	1	3%
Sharpsburg Borough	1,563	0	0%	9	3	33%
South Fayette Township	7,098	1636	23%	29	0	0%
South Park Township	5,805	205	4%	15	3	20%
South Versailles Township	168	3	2%	2	3	150%
Springdale Borough	1,728	2	0%	14	1	7%
Springdale Township	859	11	1%	7	0	0%
Stowe Township	3,171	12	0%	13	1	8%
Swissvale Borough	4,107	6	0%	8	0	0%
Tarentum Borough	2,153	4	0%	19	0	0%
Thornburg Borough	190	4	2%	3	3	100%
Trafford Borough	52	1	2%	1	1	100%
Turtle Creek Borough	2,646	2	0%	13	0	0%
Upper St. Clair Township	7,841	269	3%	28	0	0%
Verona Borough	1,364	66	5%	7	1	14%
Versailles Borough	673	1	0%	3	0	0%
Wall Borough	357	3	1%	2	0	0%
West Deer Township	5,665	611	11%	24	0	0%
West Elizabeth Borough	284	0	0%	7	6	86%
West Homestead Borough	1,114	2	0%	6	0	0%
West Mifflin Borough	9,910	58	1%	54	0	0%
West View Borough	2,668	1	0%	12	2	17%
Whitaker Borough	632	2	0%	2	0	0%
White Oak Borough	3,804	51	1%	12	0	0%
Whitehall Borough	5,771	227	4%	19	2	11%
Wilkins Township	2,771	32	1%	11	0	0%
Wilkinsburg Borough	6,994	3	0%	28	0	0%
Wilmerding Borough	916	1	0%	6	0	0%
Grand Total	**550,774**	**23,882**	**4%**	**2,379**	**117**	**5%**

Table 4.3.10-3 **Structures vulnerable to Wildfires by Generalized Land Use Type**

Municipality	Total Structures	Agriculture	Commercial	Government	Industrial	Other	Residential	Utilities	Unknown	Grand Total
Aleppo Township	904	0	0	0	0	0	282	0	1	283
Aspinwall Borough	1,256	0	0	0	0	0	0	0	1	1
Avalon Borough	2,359	0	0	0	0	0	0	0	1	1
Baldwin Borough	9,159	0	0	0	0	0	9	0	32	41
Baldwin Township	946	0	0	0	0	0	0	0	0	0
Bell Acres Borough	625	1	0	2	0	0	76	0	0	79
Bellevue Borough	3,005	0	0	0	0	0	1	0	0	1
Ben Avon Borough	759	0	0	0	0	0	1	0	0	1
Ben Avon Heights Borough	144	0	0	0	0	0	0	0	3	3
Bethel Park, Municipality of	13,201	1	9	1	0	0	357	0	11	379
Blawnox Borough	694	0	0	0	0	0	0	0	3	3
Brackenridge Borough	1,538	0	0	0	0	0	0	0	0	0
Braddock Borough	1,244	0	0	0	0	0	0	0	0	0
Braddock Hills Borough	868	0	0	0	0	0	5	0	4	9
Bradford Woods Borough	507	0	0	0	0	10	12	0	0	22
Brentwood Borough	4,263	0	0	0	0	0	0	0	0	0
Bridgeville Borough	2,277	0	0	0	0	0	2	0	0	2
Carnegie Borough	3,748	0	0	0	0	0	0	0	183	183
Castle Shannon Borough	3,698	0	0	0	0	0	13	0	0	13
Chalfant Borough	417	0	0	0	0	0	0	0	11	11
Cheswick Borough	904	0	0	0	0	0	2	0	0	2
Churchill Borough	1,500	0	0	0	0	0	0	0	5	5
Clairton, City of	4,008	0	1	0	0	0	17	0	0	18
Collier Township	4,512	0	8	0	0	0	531	0	350	889
Coraopolis Borough	2,666	0	0	0	0	0	0	0	0	0
Crafton Borough	2,547	0	0	0	0	0	0	0	4	4
Crescent Township	1,165	0	3	0	0	0	174	0	0	177

Table 4.3.10-3 **Structures vulnerable to Wildfires by Generalized Land Use Type**

Municipality	Total Structures	Agriculture	Commercial	Government	Industrial	Other	Residential	Utilities	Unknown	Grand Total
Dormont Borough	3,481	0	0	0	0	0	0	0	0	0
Dravosburg Borough	1,043	0	0	0	0	0	3	0	0	3
Duquesne, City of	3,158	0	0	0	0	0	1	0	0	1
East Deer Township	792	0	0	0	0	0	20	0	0	20
East McKeesport Borough	1,034	0	0	0	0	0	2	0	0	2
East Pittsburgh Borough	874	0	0	0	0	0	0	0	0	0
Edgewood Borough	1,444	0	0	0	0	0	0	0	0	0
Edgeworth Borough	673	0	0	1	0	0	5	0	0	6
Elizabeth Borough	704	0	0	0	0	0	0	0	0	0
Elizabeth Township	6,119	6	1	1	1	0	156	0	0	165
Emsworth Borough	1,023	0	0	0	0	0	1	0	3	4
Etna Borough	1,638	0	0	0	0	0	1	0	0	1
Fawn Township	1,068	2	2	0	1	0	28	0	0	33
Findlay Township	3,382	41	17	2	24	0	291	0	1	376
Forest Hills Borough	3,198	0	0	0	0	0	16	0	0	16
Forward Township	1,636	6	1	0	1	0	29	0	0	37
Fox Chapel Borough	1,972	0	1	0	0	0	61	0	25	87
Franklin Park Borough	5,675	2	12	6	1	0	1,004	1	0	1,026
Frazer Township	627	3	27	1	0	0	20	1	0	52
Glassport Borough	2,147	0	1	0	0	0	5	0	0	6
Glen Osborne Borough	243	0	0	1	0	0	6	0	3	10
Glenfield Borough	108	0	0	0	0	0	4	0	0	4
Green Tree Borough	2,516	0	0	0	0	0	0	0	24	24
Hampton Township	7,273	1	25	0	1	0	753	0	0	780
Harmar Township	1,850	0	96	0	2	0	25	0	13	136
Harrison Township	5,428	0	0	2	0	0	112	0	0	114
Haysville Borough	51	0	0	0	0	0	1	0	0	1

Table 4.3.10-3 **Structures vulnerable to Wildfires by Generalized Land Use Type**

Municipality	Total Structures	Agriculture	Commercial	Government	Industrial	Other	Residential	Utilities	Unknown	Grand Total
Heidelberg Borough	643	0	0	0	0	0	0	0	0	0
Homestead Borough	1,561	0	0	0	0	0	0	0	0	0
Indiana Township	3,496	29	7	5	4	0	609	2	17	673
Ingram Borough	1,313	0	0	0	0	0	0	0	0	0
Jefferson Hills Borough	5,372	1	34	0	0	0	642	2	0	679
Kennedy Township	3,899	0	14	0	1	0	201	0	180	399
Kilbuck Township	368	0	0	0	0	0	10	0	2	12
Leet Township	652	0	0	0	0	0	43	0	0	43
Leetsdale Borough	676	0	2	0	7	0	2	0	0	11
Liberty Borough	1,156	2	0	0	0	0	2	0	0	4
Lincoln Borough	528	1	0	0	0	0	19	1	0	21
Marshall Township	4,312	2	115	2	1	0	1,010	1	0	1,131
McCandless, Town of	12,640	0	76	2	0	1	504	0	0	583
McDonald Borough	187	0	0	0	0	0	6	0	0	6
McKees Rocks Borough	3,069	0	0	0	0	0	0	0	1	1
McKeesport, City of	9,965	0	1	0	0	0	14	0	14	29
Millvale Borough	1,839	0	1	0	0	0	0	0	1	2
Monroeville, Municipality of	11,943	1	24	2	1	0	448	1	0	477
Moon Township	11,002	0	31	3	0	0	988	0	99	1,121
Mount Lebanon, Municipality of	11,685	0	3	0	0	0	38	0	51	92
Mount Oliver Borough	1,508	0	0	0	0	0	0	0	0	0
Munhall Borough	5,161	0	0	0	0	0	3	0	21	24
Neville Township	753	0	0	0	0	0	1	0	0	1
North Braddock Borough	2,657	0	0	0	0	0	4	0	6	10
North Fayette Township	7,950	1	219	0	3	0	1,205	0	22	1,450
North Versailles Township	4,996	0	32	1	1	0	76	0	1	111
Oakdale Borough	675	0	0	0	0	0	0	0	1	1

Table 4.3.10-3 **Structures vulnerable to Wildfires by Generalized Land Use Type**

Municipality	Total Structures	Agriculture	Commercial	Government	Industrial	Other	Residential	Utilities	Unknown	Grand Total
Oakmont Borough	3,140	0	0	0	0	0	79	0	0	79
O'Hara Township	4,311	0	5	0	0	0	210	0	21	236
Ohio Township	3,249	1	469	1	1	0	1,109	0	6	1,587
Penn Hills, Municipality of	19,869	0	58	2	0	0	51	0	42	153
Pennsbury Village Borough	503	0	0	0	0	0	0	0	0	0
Pine Township	5,834	24	25	1	0	0	2,005	1	0	2,056
Pitcairn Borough	1,421	0	6	0	0	0	3	0	0	9
Pittsburgh, City of	124,624	0	0	0	0	0	11	0	454	472
Pleasant Hills Borough	3,480	0	0	0	0	0	149	0	0	149
Plum Borough	12,099	4	143	6	8	1	863	0	0	1,025
Port Vue Borough	1,816	0	0	0	0	0	6	0	1	7
Rankin Borough	987	0	0	0	0	0	0	0	1	1
Reserve Township	1,561	0	1	0	0	0	1	0	10	12
Richland Township	4,660	3	26	9	9	0	788	0	0	835
Robinson Township	7,446	0	1	1	0	0	962	0	271	1,235
Ross Township	15,167	1	2	2	0	0	288	0	61	354
Rosslyn Farms Borough	216	0	0	0	0	0	0	0	1	2
Scott Township	6,899	0	0	0	0	0	2	0	58	60
Sewickley Borough	1,628	0	1	1	0	0	6	1	0	9
Sewickley Heights	421	0	0	1	0	0	26	0	0	27
Sewickley Hills Borough	276	0	0	2	0	0	59	0	0	61
Shaler Township	12,786	0	11	1	0	0	298	0	81	391
Sharpsburg Borough	1,563	0	0	0	0	0	0	0	0	0
South Fayette Township	7,098	1	0	1	0	0	1,536	0	98	1,636
South Park Township	5,805	0	2	0	1	0	202	0	0	205
South Versailles Township	168	1	0	0	0	0	2	0	0	3
Springdale Borough	1,728	0	0	0	1	0	1	0	0	2

Table 4.3.10-3 **Structures vulnerable to Wildfires by Generalized Land Use Type**

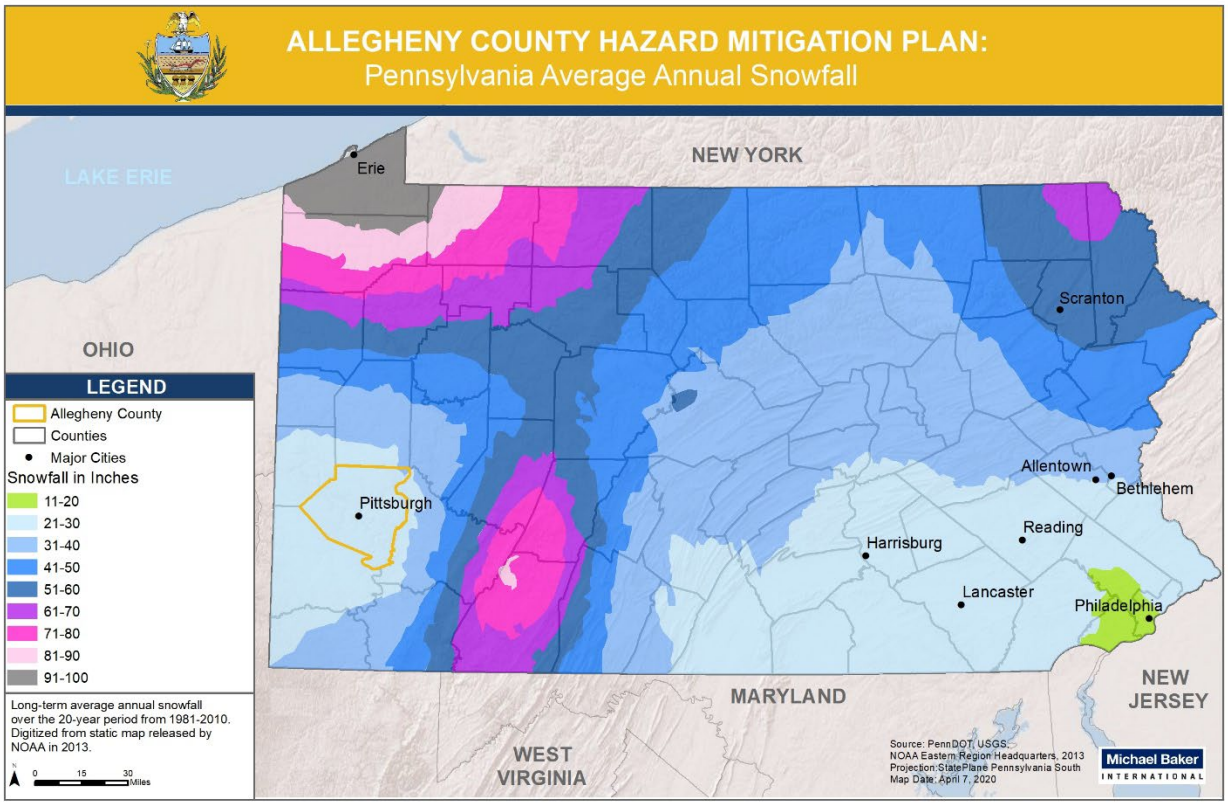
Municipality	Total Structures	Agriculture	Commercial	Government	Industrial	Other	Residential	Utilities	Unknown	Grand Total
Springdale Township	859	0	0	1	0	0	10	0	0	11
Stowe Township	3,171	0	0	0	0	0	0	0	12	12
Swissvale Borough	4,107	0	0	0	0	0	4	0	2	6
Tarentum Borough	2,153	1	1	1	0	0	1	0	0	4
Thornburg Borough	190	0	0	0	0	0	0	0	4	4
Trafford Borough	52	0	1	0	0	0	0	0	0	1
Turtle Creek Borough	2,646	0	0	0	0	0	2	0	0	2
Upper St. Clair Township	7,841	0	4	6	0	0	231	1	27	269
Verona Borough	1,364	0	0	0	0	0	64	0	2	66
Versailles Borough	673	0	0	0	0	0	1	0	0	1
Wall Borough	357	0	0	0	0	0	3	0	0	3
West Deer Township	5,665	4	13	1	7	0	586	0	0	611
West Elizabeth Borough	284	0	0	0	0	0	0	0	0	0
West Homestead Borough	1,114	0	0	0	0	0	0	0	1	2
West Mifflin Borough	9,910	0	2	0	0	0	44	0	12	58
West View Borough	2,668	0	0	0	0	0	0	0	1	1
Whitaker Borough	632	0	0	0	0	0	1	0	1	2
White Oak Borough	3,804	1	2	3	1	0	41	0	3	51
Whitehall Borough	5,771	1	2	1	0	0	223	0	0	227
Wilkins Township	2,771	0	0	1	0	0	27	0	4	32
Wilkinsburg Borough	6,994	0	0	0	0	0	3	0	0	3
Wilmerding Borough	916	0	0	0	0	0	1	0	0	1
Grand Total	**550,774**	**142**	**1,538**	**74**	**77**	**12**	**19,750**	**12**	**2,268**	**23,885**

4.3.11. Winter Storm

4.3.11.1. Location and Extent

Winter storms are regional events that affect most of Pennsylvania on an annual basis. In many cases, surrounding states and even the larger northeastern U.S. region are affected. As such, every county in the Commonwealth, including Allegheny, is subject to severe winter storms. Winter storms begin as low-pressure systems that move through Pennsylvania either following the jet stream or developing as extra-tropical cyclonic weather systems over the Atlantic Ocean called Nor'easters. The effects of these storms can sometimes last for weeks, bringing several inches or even feet of snow and ice and cold temperatures. From 1981-2010, annual snowfall in Allegheny County averaged between 21 and 30 inches, shown in Figure 4.3.11-1. This is a reduction in average annual snowfall from the previous twenty-year average annual snowfall observation of between 30 and 40 inches.

Figure 4.3.11-1 Average Annual Snowfall for Allegheny County.



4.3.11.2. Range of Magnitude

Winter storms consist of cold temperatures, heavy snow or ice and sometimes strong winds. They begin as low-pressure systems that move through Pennsylvania either following the jet stream or developing as extra-tropical cyclonic weather systems over the Atlantic Ocean called nor'easters. Due to their regular occurrence, these storms are considered hazards only when they result in damage to specific structures or cause disruption to traffic, communications, electric power, or other utilities.

A winter storm can adversely affect roadways, utilities, business activities, and can cause frostbite or loss of life. These storms may include one or more of the following weather events:

- **Heavy Snowstorm:** Accumulations of four inches or more in a six-hour period, or six inches or more in a twelve-hour period.
- **Sleet Storm:** Significant accumulations of solid pellets which form from the freezing of raindrops or partially melted snowflakes causing slippery surfaces posing hazards to pedestrians and motorists.
- **Ice Storm:** Significant accumulations of rain or drizzle freezing on objects (trees, power lines, roadways, etc.) as it strikes them, causing slippery surfaces and damage from the sheer weight of ice accumulation.
- **Blizzard:** Wind velocity of 35 miles per hour or more, temperatures below freezing, considerable blowing snow with visibility frequently below one-quarter mile prevailing over an extended period of time.
- **Severe Blizzard:** Wind velocity of 45 miles per hour, temperatures of 10 degrees Fahrenheit or lower, a high density of blowing snow with visibility frequently measured in feet prevailing over an extended period time.

Any of the above events can result in the closing of major or secondary roads, particularly in rural locations, stranded motorists, transportation accidents, loss of utility services, and depletion of oil heating supplies. Environmental impacts often include damage to shrubbery and trees due to heavy snow loading, ice build-up and/or high winds which can break limbs or even bring down large trees. Gradual melting of snow and ice provides excellent groundwater recharge. However, high temperatures following a heavy snowfall can cause rapid surface water runoff and severe flooding.

4.3.11.3. Past Occurrence

Allegheny County and the Commonwealth of Pennsylvania have a long history of severe winter weather. The worst winter storm on record occurred on March 12-13, 1993. This blizzard, often called "the Storm of the Century," stretched from Canada to the Gulf of Mexico but was worst in the Eastern United States, including all of Pennsylvania. This storm caused widespread blackout conditions; snowfall totals ranged from twelve inches in Philadelphia to 20 inches in Harrisburg and Scranton to 24 inches in the Pittsburgh area. This event garnered a Presidential Emergency Declaration; the overall damage estimate for all states in this event was $6.6 billion. This event was the third-largest snowstorm on record for the Pittsburgh weather station with a snowfall of 25.3 inches.

In the winter of 1993-1994, the state was hit by a series of protracted winter storms. The severity and nature of these storms combined with accompanying record-breaking frigid temperatures posed a major threat to the lives, safety and well-being of Commonwealth residents and caused major disruptions to the activities of schools, businesses, hospitals and nursing homes.

One of these devastating winter storms occurred in early January 1994 with record snowfall depths in many areas of the Commonwealth, strong winds, and sleet/freezing rains. Numerous storm-related power outages were reported and as many as 600,000 residents were without electricity, in some cases for

several days at a time. A ravaging ice storm followed which closed major arterial roads and downed trees and power lines. Utility crews from a five-state area were called to assist in power restoration repairs. Officials from PPL Corporation stated that this was the worst winter storm in the history of the company; related damage-repair costs exceeded $5,000,000.

Serious power supply shortages continued through mid-January because of record cold temperatures at many places, causing sporadic power generation outages across the Commonwealth. The entire Pennsylvania-New Jersey-Maryland grid and its partners in the District of Columbia, New York and Virginia experienced 15-30 minute rolling blackouts, threatening the lives of people and the safety of the facilities in which they resided. Power and fuel shortages affecting Pennsylvania and the East Coast power grid system required the Governor to recommend power conservation measures be taken by all commercial, residential and industrial power consumers.

The record cold conditions resulted in numerous water-main breaks and interruptions of service to thousands of municipal and city water customers throughout the Commonwealth. Additionally, the extreme cold in conjunction with accumulations of frozen precipitation resulted in acute shortages of road salt. As a result, trucks were dispatched to haul salt from New York to expedite deliveries to Pennsylvania Department of Transportation storage sites.

Another more recent event to hit Allegheny County was in February of 2010. The Pittsburgh Tribune reported that, “Road crews were having trouble keeping up with all the snow. PennDOT said portions of the Parkway West inbound, the Parkway North outbound and Route 19 in both directions were closed after several accidents. The Port Authority ordered all of its drivers to pull to the side of the road shortly after 9 p.m. because of ‘worsening and very dangerous conditions,’ spokesman Jim Ritchie said. Allegheny Power was reporting more than 6,800 customers without power last night. Some 4,000 Duquesne Light customers in Beaver and Allegheny counties also were without service.” The February 2010 storm was one of the top 5 ever for the Pittsburgh area – total accumulation neared 22 inches for the event.

In addition to the events described above, other winter storm events are listed in Table 4.3.11-1.

Table 4.3.11-1 **History of Winter Storms in Allegheny County (NCDC 2015 and SHELDUS 2011).**

Date	Type	Property Damage ($)
November 17, 2019	Winter Weather	0
November 12, 2019	Winter Weather	0
February 20, 2019	Winter Weather	0
January 30, 2019	Extreme Cold/Wind Chill	0
November 14, 2018	Winter Weather	0
April 1, 2018	Winter Weather	0
March 20, 2018	Heavy Snow	0
February 7, 2018	Winter Storm	0
January 12, 2018	Winter Storm	0
December 17, 2016	Ice Storm	0
December 13, 2016	Winter Weather	0
April 8, 2016	Winter Weather	0

Table 4.3.11-1 **History of Winter Storms in Allegheny County (NCDC 2015 and SHELDUS 2011).**

Date	Type	Property Damage ($)
April 2, 2016	Winter Weather	0
January 22, 2016	Heavy Snow	0
February 24, 2015	Extreme Cold/Wind Chill	0
February 19, 2015	Extreme Cold/Wind Chill	0
February 14, 2015	Extreme Cold/Wind Chill	0
January 3, 2015	Winter Weather	0
December 2, 2014	Winter Weather	0
November 22, 2014	Winter Weather	0
March 2, 2014	Winter Weather	0
February 4, 2014	Winter Storm	0
January 25, 2014	Winter Weather	0
January 2, 2014	Winter Weather	0
November 26, 2013	Winter Weather	0
November 12, 2013	Winter Weather	0
January 25, 2013	Winter Weather	0
January 15, 2013	Winter Weather	0
December 26, 2012	Winter Storm	0
January 20, 2012	Winter Storm	0
February 9, 2010	Winter Storm	0
December 13, 2009	Winter Weather	0
January 27, 2009	Ice Storm, Winter Storm	0
February 29, 2008	Heavy Snow	0
February 12, 2008	Winter Storm	0
February 13, 2007	Heavy Snow, Ice Storm	0
December 15, 2005	Ice Storm	0
March 1, 2005	Heavy Snow	0
January 22, 2005	Ice Storm	14,000
March 16, 2004	Ice Storm	0
February 5. 2004	Ice Storm	0
January 26, 2004	Heavy Snow	0
December 14, 2003	Heavy Snow	0
December 5, 2003	Heavy Snow	0
February 16, 2003	Heavy Snow	0
December 11, 2002	Ice Storm	0
January 20, 2001	Heavy Snow	0
December 13, 2000	Winter Storm	0
March 9, 1999	Heavy Snow	0
January 13, 1999	Winter Storm	0
January 8, 1999	Winter Storm	0
January 2, 1999	Winter Storm	267,000
November 13, 1997	Ice Storm	45,000
January 6, 1996	Heavy Snow	0

Table 4.3.11-1 **History of Winter Storms in Allegheny County (NCDC 2015 and SHELDUS 2011).**

Date	Type	Property Damage ($)
January 2, 1996	Ice Storm	0
December 19, 1995	Ice Storm	9,000
December 11, 1995	Extreme Cold	50,000
November 14, 1995	Heavy Snow	22,000
March 8, 1995	Heavy Snow	0
February 15, 1995	Ice	0
February 3, 1995	Heavy Snow	0
January 7, 1995	Ice	0
January 4, 1995	Heavy Snow	0
March 2, 1994	Heavy Snow, Blizzard, Avalanche	5,007,000
February 8, 1994	Ice	22,000
January 17, 1994	Heavy Snow	501,000
January 14, 1994	Extreme Cold	7,000
January 4, 1994	Heavy Snow	5,007,000
October 31, 1993	Heavy Snow	5,000
March 13, 1993	Blizzard	26,000
December 10, 1992	Heavy Snow	75,000
January 18, 1984	Snow	0
January 17, 1979	Ice	0
January 7, 1979	Ice, Heavy Snow	0
January 26, 1978	Wind, Snow	2,600,000
January 20, 1978	Snow	2,600,000
January 28, 1977	Blizzard	5,000
January 7, 1976	Heavy Snow	1,000
March 14, 1975	Snow, Sleet, Freezing Rain	0
December 1, 1974	Electrical, Heavy Snow	217,000
February 18, 1972	Snow, Wind	1,000
November 25, 1971	Snow	0
April 6, 1971	Snow, Wind	0
January 27, 1971	Snowstorm, Wind	1,000
January 26, 1971	Blizzard, Wind, Lightning	3,000
December 5, 1968	Snow, Wind	1,000
November 12, 1968	Snow, Wind	1,000
January 30, 1966	Blizzard	1,000
January 12, 1964	Snowstorm	7,000
December 29, 1962	Snow, Wind	75,000
December 6, 1962	Snow, Wind	1,000
March 6, 1962	Snow, Wind, Rain	1,000
February 3, 1961	Snowstorm	1,000
January 19, 1961	Snowstorm	1,000
December 11, 1960	Snowstorm	0
December 1, 1960	Snowstorm	0

Table 4.3.11-1 History of Winter Storms in Allegheny County (NCDC 2015 and SHELDUS 2011).		
Date	**Type**	**Property Damage ($)**
March 3, 1960	Snow	0
February 18, 1960	Snow, Wind	0

Finally, the Eastern Region Headquarters of NOAA maintains snowfall records since 1884 for the Pittsburgh weather station:

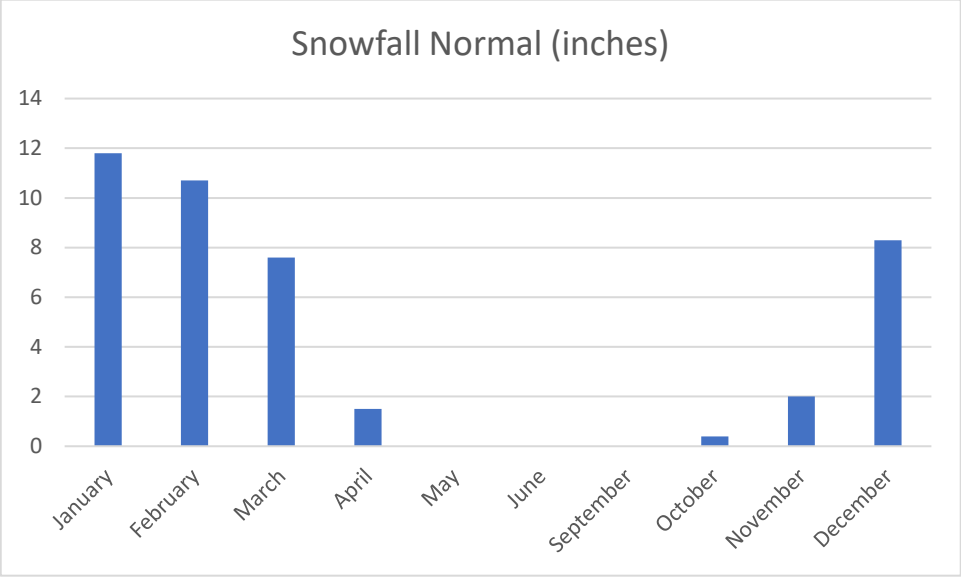
- The largest snowstorm on record was a storm dropping over 27 inches of snow on November 24-26, 1950.
- The greatest single-day snowfall was on March 13, 1993, with 23.6 inches.
- The year with the greatest depth of snow on the ground was on January 22, 1978 with 26 inches. This year also included the longest period with at least one inch of snow on the ground (64 days).

Other snowfall records can be viewed online at: https://www.weather.gov/pbz/tsnow (NOAA, 2020).

4.3.11.4. Future Occurrence

Winter storms are a regular, annual occurrence in Pennsylvania and should be considered highly likely. Based on the 30-year mean from 1981-2010, NOAA provides the following frequencies of heavy snowfalls at the Pittsburgh weather station:

- Snowfalls of 16 inches or more: once in 15 years
- Snowfalls of 13-15 inches or more: once in 5 years
- Snowfalls of 8-12 inches or more: once every two years
- Snowfalls of 5 inches or more: twice a year.



Changing weather patterns have made certain types of disasters more frequent and extreme. Precipitation levels are expected to rise in Allegheny County by more than two times by 2050 (Climate Central, 2019). Further, the number of very cold days annually is increasing each year. Cold temperatures combined with increased precipitation creates conditions conducive for winter weather. As these external conditions continue to change, they may impact the occurrence level of winter storms in the County. The probability of future winter storms can be considered highly likely according to the Risk Factor Methodology (see Table 4.4.1-1).

4.3.11.5. Vulnerability Assessment

Based on the information available, all communities in Allegheny County are essentially equally vulnerable to the direct impacts of winter storms. Snowfall is expected and normal in wintertime. Residents of the mountainous areas of the County may be more susceptible, especially when emergency medical assistance is required. In addition, the more rural areas of the County are susceptible to isolation caused by winter storms. Areas that are heavily wooded can make emergency response to these areas difficult when roadways are blocked by downed trees and wires.

Vulnerability to the effects of winter storms on buildings is also dependent on the age of the building type, construction material used and condition of the structure. In Allegheny County, 58.3% of the occupied housing units were constructed prior to 1960 with 29.7% constructed prior to 1939. These older structures may be more prone to damage with severe winter storm events.

All structures and infrastructure in Allegheny County will be exposed to heavy snow and ice. Yet, because all of Pennsylvania has adopted and enforced the 2015 International Building Code (IBC) under the Uniform Construction Code (UCC), building yet to be constructed will be able to withstand the weight of heavy snow or ice.

Human-Made Hazards

4.3.12. Civil Disturbance

4.3.12.1. Location and Extent

Civil disturbance is a broad term that is typically used by law enforcement to describe one or more forms of disturbance caused by a group of people. Civil disturbances are typically a symptom of, and a form of protest against, major socio-political problems. Civil disturbance hazards include the following:

- **Famine;** involving a widespread scarcity of food leading to malnutrition, increased mortality, and a period of psychosocial instability associated with the scarcity of food, such as riots, theft of food, and the falls of governments caused by political instability borne of an inability to deal with the crisis caused by famine (Brennan, 2014).
- **Economic Collapse, Recession;** Very slow or negative growth (The Economist, 2009).
- **Misinformation;** Erroneous information spread unintentionally (Makkai, 1970).
- **Civil Disturbance, Public Unrest, Mass Hysteria, Riot;** Group acts of violence against property and individuals, for example (18 U.S.C. § 232, 2008).
- **Strike, Labor Dispute;** Controversies related to the terms and conditions of employment, for example (29 U.S.C. § 113, 2008).

Typically, the severity of the action coincides with the level of public outrage. In addition to a form of protest against major socio-political problems, civil disturbances can also arise out of union protest, institutional population uprising, or from large celebrations that become disorderly.

The scale and scope of civil disturbance events varies widely. However, government facilities, landmarks, prisons, and universities are common sites where crowds and mobs may gather. Due to the number of educational institutions, headquarters, specifically within the City of Pittsburgh, and Allegheny County Jail, the area is susceptible to these events.

4.3.12.2. Range of Magnitude

Civil disturbances can take the form of small gatherings or large groups blocking or impeding access to a building or disrupting normal activities by generating noise and intimidating people. They can range from a peaceful sit-in to a full scale riot, in which a mob burns or otherwise destroys property and terrorizes individuals. Even in its more passive forms, a group that blocks roadways, sidewalks, or buildings interferes with public order. Often that which was intended to be a peaceful demonstration to the public and the government can escalate into general chaos. There are two types of large gatherings typically associated with civil disturbances: a crowd and a mob. A crowd may be defined as a casual, temporary collection of people without a strong, cohesive relationship. Crowds can be classified into four categories (Blumer, 1946):

1. **Casual Crowd:** A casual crowd is a group of people who happen to be in the same place at the same time. Violent conduct does not occur.
2. **Cohesive Crowd:** A cohesive crowd consists of members who are involved in some type of unified

3. behavior. Members of this group are involved in some type of common activity, such as worshipping, dancing, or watching a sporting event. They require substantial provocation to arouse group action.
4. **Expressive Crowd:** An expressive crowd is one held together by a common commitment or purpose. Although they may not be formally organized, they are assembled as an expression of common sentiment or frustration. Members wish to be seen as a formidable influence. One of the best examples of this crowd type is a group assembled to protest a cause.
5. **Aggressive Crowd:** An aggressive crowd is comprised of individuals who have assembled and are visibly angry or violent. This crowd often has leaders who attempt to arouse the members or motivate them to action. Members are noisy and threatening and will taunt authorities. They tend to be impulsive and highly emotional, and require only minimal stimulation to arouse them to violence

A mob can be defined as a large disorderly crowd or throng. Mobs are usually emotional, loud, tumultuous, violent and lawless. Similar to crowds, mobs have different levels of commitment and can be classified into four categories (Alvarez and Bachman, 2007):

1. **Aggressive Mob:** An aggressive mob is one that attacks, riots and terrorizes. The object of violence may be a person, property, or both. An aggressive mob is distinguished from an aggressive crowd only by lawless activity. Examples of aggressive mobs are the inmate mobs in prisons and jails, mobs that act out their frustrations after political defeat, or violent mobs at political protests or rallies.
2. **Escape Mob:** An escape mob is attempting to flee from something such as a fire, bomb, flood, or other catastrophe. Members of escape mobs are generally difficult to control can be characterized by unreasonable terror.
3. **Acquisitive Mob:** An acquisitive mob is one motivated by a desire to acquire something. Riots caused by other factors often turn into looting sprees. This mob exploits a lack of control by authorities in safeguarding property.
4. **Expressive Mob:** An expressive mob is one that expresses fervor or revelry following some sporting event, religious activity, or celebration. Members experience a release of pent up emotions in highly charged situations.

The worst case scenario for Allegheny County would be an aggressive crowd or an expressive mob protesting on or within a major thoroughfare, most likely formed near a major educational institution or headquarters.

4.3.12.3. Past Occurrence

Perhaps the most visible recent example of civil disturbance in Allegheny county would be the protesting in Pittsburgh during the 2009 G-20 Summit. The Huffington Post Newspaper reported that on September 24, 2009, police fired canisters of pepper spray and smoke and rubber bullets at marchers protesting the Group of 20 Summit Thursday after anarchists responded to calls to disperse by rolling trash bins, throwing rocks, and breaking windows.

Pittsburgh Police Chief Nate Harper said 17 to 19 protesters were arrested, and Mayor Luke Ravenstahl said swift police decisions resulted in minimal property damage. Officials said there were no reports of injuries. The afternoon march turned chaotic at just about the time that President Barack Obama and first lady Michelle Obama arrived for a meeting with leaders of the world's major economies.

The clashes began after several hundred protesters, many advocating against capitalism, tried to march from an outlying neighborhood toward the convention center where the summit was being held. The protesters clogged streets, banged on drums and chanted, "Ain't no power like the power of the people, 'cause the power of the people don't stop." The marchers included small groups of self-described anarchists, some wearing dark clothes and bandanas and carrying black flags. Others wore helmets and safety goggles.

The impacts of civil disturbance events are contingent upon numerous factors including issues, politics, and method of response. Generally, the impact of civil disturbance events is nominal and short-lived unless acts of sabotage are performed. There may be minor injuries to first responders or participants from physical confrontations, and vandalism may cause minimal damage to property, facilities, and infrastructure. Adequate law enforcement at planned civil disturbance events and around likely target locations like the offices of state agencies minimizes the chances of a small assembly of individuals turning into a significant disturbance.

Another more notable riot event occurred when the residents of the City of Pittsburgh staged a relatively minor riot on February 6, 2006. This is one of many times that the Pittsburgh Steelers won the Super Bowl. Four cars were vandalized and overturned, street signs were torn down, sofas and dumpsters were lit on fire, newspaper stands, and trash cans were vandalized and lit on fire, and trees were uprooted. State troopers, mounted police, and numerous officers in riot gear were needed to break up the melee, which resulted in 34 arrests.

Image from KDKA of Vandalized Business

More recently, on April 10, 2015, 30 people who donned masks ran through Shadyside, smashing windows of more than a half-dozen businesses and an unknown number of automobiles, as seen in Figure 4.3.12-1. The event began as a peaceful march in Bloomfield with individuals holding candles and telling police they were holding a funeral procession for a friend. A few minutes later, there was chaos as the grouped turned a corner. Signs read, “Original Yinsurget… R.I.P. Mike V… Anarchy forever… Forever Anarchy.” As it turned out, self-described anarchist Michael Richard Vesch, of Wilkinsburg, had died. During the war in Iraq, he was a leader at anti-war protests in front of the Army recruiting center in Oakland and in 2011 and 2012, at the Occupy Pittsburgh protests in Mellon Park, Downtown.

Protestors in the City of Pittsburgh and across the country also held events responding to the decision involving police Officer Darren Wilson's fatal shooting of Michael Brown, 18, on August 9, 2014, in Ferguson, Missouri. Two rallies occurred, one in the afternoon of more than 200 people outside of the Moorhead Federal Building, Downtown and another gathering of approximately 200 people at the University of Pittsburgh campus in Oakland. Individuals carried protest signs, chanted slogans and expressed anger; both events lasted more than 90 minutes. The afternoon event concluded on Grant Street with participants drawing chalk outlines of one another. However, the Oakland rally ended around 8:30 p.m. with protestors interrupting traffic and spilling on Forbes and Fifth Avenues, as seen in Figure 4.3.12-2.

Image from Pittsburgh Post-Gazette

The most recently reported on instance of civil disturbance in Allegheny County is fairly small scale. On October 25, 2018 a protest occurred outside Allegheny County Jail. The LGBTQ community protested outside the jail advocating for transgender rights in jail. The protest demonstration was during rush hour and blocked Second Avenue, a major road outside the jail, causing major traffic and significant response. In response the Pittsburgh Police arrested 11 protestors. Some of the officers had on riot gear to respond to the event.

PEIRS report data indicates that there have been other past occurrences. However, PEIRS was discontinued in 2010 and an exact record of the number of incidents is not available. Refer to Table 4.3.12-1 for occurrences from 2002 to 2009.

Table 4.3.12-1 **Civil Disturbance Events Reported to PEIRS, 2002-2009 (PEMA, 2010).**

Count of Incident Type	Year								
Incident Type	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**Grand Total**
LARGE GATHERING	0	2	0	2	7	8	9	7	35
PROTEST	0	1	1	1	3	4	1	0	11
RIOT	0	0	0	0	0	0	1	1	2
Grand Total	0	3	1	3	10	14	11	8	48
*Events totaled through June 2009									

4.3.12.4. Future Occurrence

Civil disturbance is always a possibility as long as there is discrimination or other perceived social or economic injustices. However, it may be possible to recognize the potential for an event to occur in the near-term. For example, an upcoming significant sporting event at one of the colleges or universities in the Commonwealth may result in gathering of large crowds or immediately after significant national news involving political or social debates. Local law enforcement should anticipate these types of events and be prepared to handle a crowd so that peaceful gatherings are prevented from turning into unruly public disturbances.

4.3.12.5. Vulnerability Assessment

The vulnerability of individual jurisdictions is difficult to determine because civil disturbance hazards are tied to the current political and economic climate. A jurisdiction that is very vulnerable one month may be less vulnerable the next. However, in general, Allegheny County may have higher than average vulnerability in Pennsylvania due to higher concentrations of local, state, and federal facilities.

Jurisdictional losses for civil disturbance events are difficult to predict and can vary significantly in range. For example, the State College Riot in July 1998, fueled by alcohol consumption, resulted in approximately $150,000 in damages. Sites previously identified in this section are locations where such events are more likely to occur and therefore should be considered more vulnerable. Adequate law enforcement at these locations minimizes the changes of a small assembly of people turning into a significant disturbance. This will ensure improved response times, optimal communications, and containment of the event; as during these events major roadways can be blocked and disturb traffic and larger events may involve the interruption or removal of communication.

More broadly, in the case of large civil disturbance events, the county may incur losses related to work stoppages in addition to any acts of vandalism that my occur. Failure to pursue a program of civil disturbance awareness may result in increased loss of lives and property.

4.3.13. Dam and Lock Failure

Due to data sensitivity, the Dam and Lock Failure Profile is located in Appendix G.

4.3.14. Environmental Hazards

4.3.14.1. Location and Extent

Environmental hazards in Allegheny County focus mainly on hazardous material release, coal mining and oil and gas well drilling. These hazards result from human activities and industries and can result in injury and death to humans and damage to property.

Additional environmental hazards include superfund facilities, manure spills, and product defect or contamination. These are included in the definition of environmental hazards but were not profiled in the HMP update. Superfund sites are hazards originating from abandoned hazardous waste sites listed on the National Priorities List. The EPA maintains superfund site information which includes hazardous waste sites, potentially hazardous waste sites and remedial activities across the nation, including sites that are on the National Priorities List (NPL) or being considered for the NPL. There are 127 superfund sites in Pennsylvania (EPA, 2020). Manure spills involve the release of stored or transported agricultural waste. Product defect or contamination includes highly flammable or otherwise unsafe consumer products and dangerous foods.

No information on deaths, serious injury, or property damage could be found for superfund sites, manure spills, or product defect or contamination; therefore, these types of environmental hazards were not profiled in this plan.

Hazardous Material Release

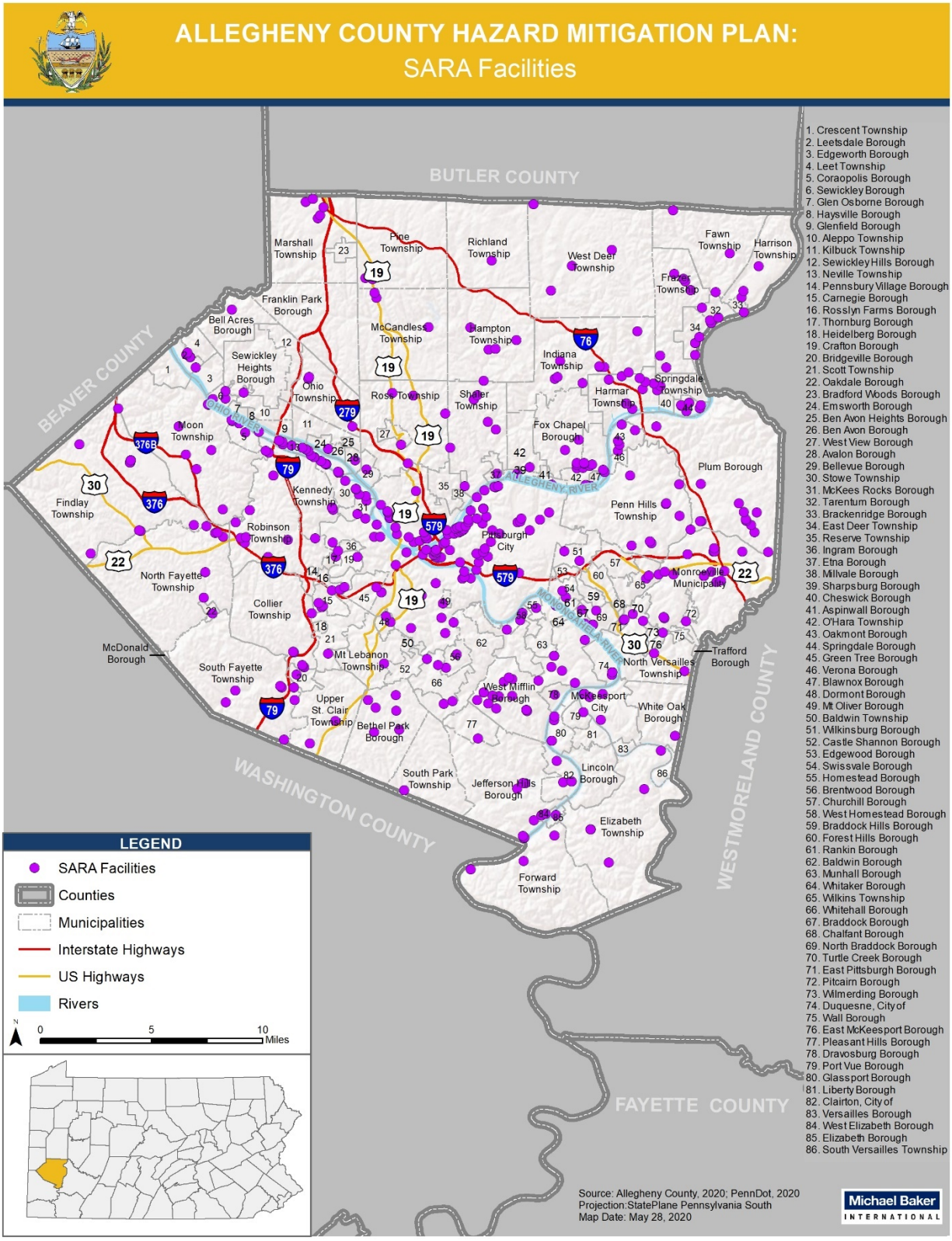
Hazardous material releases pose threats to the natural environment, the built environment, and public safety through the diffusion of harmful substances, materials, or products. Hazardous materials can include toxic chemicals, infectious substances, bio-hazardous waste, and any materials that are explosive, corrosive, flammable, or radioactive (PL 1990-165, §207(e)). Hazardous material releases can occur wherever hazardous materials are manufactured, used, stored, or transported. Such releases can occur along transportation routes or at fixed-site facilities. Hazardous material releases can result in human and wildlife injury, property damage, and contamination of air, water, and soils.

Fixed-site facilities that use, manufacture, or store hazardous materials in Allegheny County pose risk and must comply with both Title III of the federal Superfund Amendments and Reauthorization Act (SARA), also known as the Emergency Planning and Community Right-to-Know Act (EPCRA), and the Commonwealth's reporting requirements under the Hazardous Materials Emergency Planning and Response Act (1990-165), as amended. These legislations require that all owners or operators of facilities that manufacture, produce, use, import, export, store, supply, or distribute any extremely hazardous substance, as defined by the EPA, at or above the threshold planning quantity, as established by EPA, shall report to the county where the facility is located and to the Commonwealth that the facility is subject to the requirement to assist the Local Emergency Planning Committee (LEPC) in the development of an Off-site Emergency Response Plan. The community right-to-know reporting requirements keep communities abreast of the presence and release of chemicals at individual facilities. There are 474 SARA Title III facilities that report to Allegheny County Emergency Services. Of these, 468 are located within the

County's boundaries, shown in Figure 4.3.14-1. Allegheny County does not maintain a separate list of non-SARA hazardous materials facilities; all hazardous material facilities are considered SARA facilities.

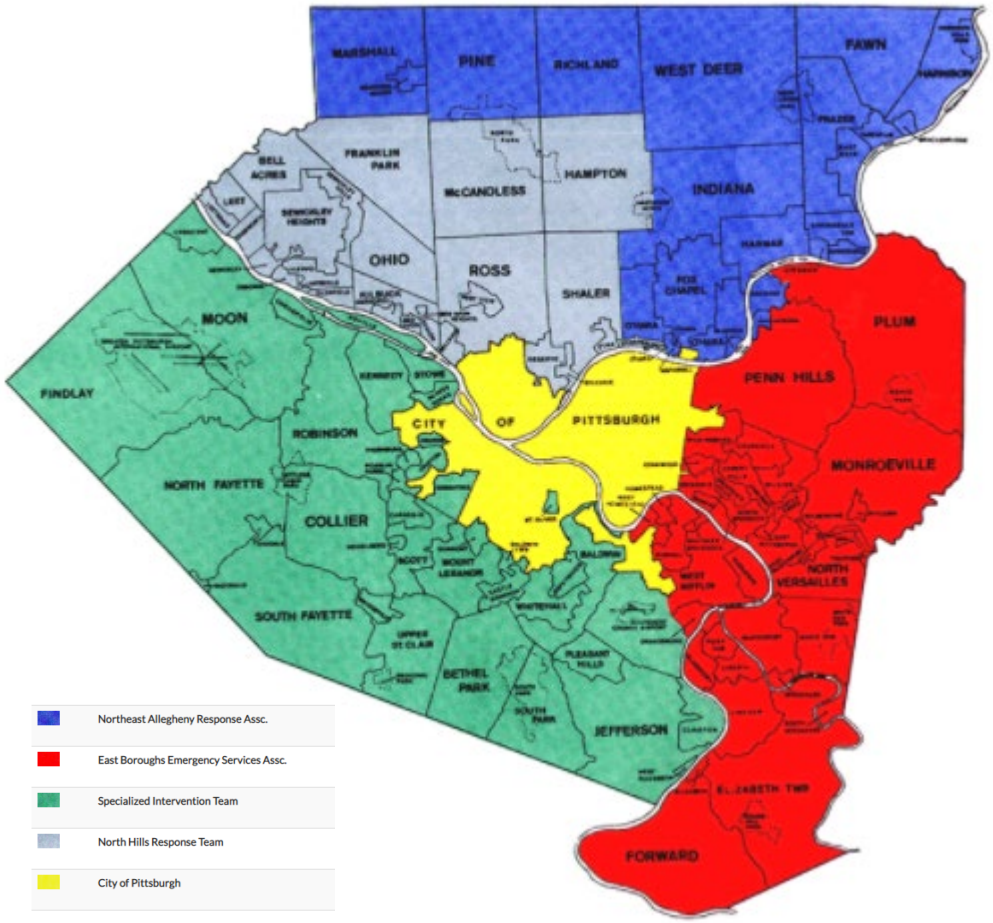
Additional hazardous materials are contained at the military installations within Pennsylvania. Nuclear facilities are another type of fixed-facility that poses risk of hazard material release. For more information about nuclear incidents, reference Section 4.3.16.

Figure 4.3.14-1 Location of Allegheny County SARA Facilities



Allegheny County considers its SARA facilities as critical facilities, so a complete listing of SARA Facilities and their vulnerability to other hazard events can be found in Appendix E. Allegheny County has a number of response teams positioned to respond to hazardous material incidents. Allegheny County regional HAZMAT zones are shown below in Figure 4.3.14-2.

Figure 4.3.14-2 Breakdown of Allegheny County's Regional HAZMAT Zones.



Coal Mining

Section 4.3.8 Subsidence, Sinkhole discussed mining as a major factor that can make an area more susceptible to subsidence. This section will focus on mining how it can potentially act as an environmental hazard.

Mining, including surface, underground, and open-pit operations, was conducted in Pennsylvania before the 1680s and was instrumental in the development of the Commonwealth. As such, Pennsylvania was one of the first states to initiate, promulgate, and enforce environmental regulations related to mining, including mine reclamation. Active mining continues in Allegheny County, which is located over Pennsylvania's main bituminous coal field. Reference figure 4.3.8-1 in the Subsidence section to see a map of active, inactive and reclaimed coal mines in the county. Of the mapped operations, 108 are active, 26 are inactive, and 55 have been reclaimed.

There remains a legacy of abandoned mines, waste piles, and degraded groundwater and surface water in the Commonwealth. The EPA estimates that over 3,000 miles of streams in Pennsylvania have been contaminated by acid mine drainage which occurs when metal sulfides in rock oxidize and generate acidity in water that comes in contact with them. Table 4.3.14-1 shows coal slurry ponds in the County as of 2015 including impoundment name, Mine Safety and Health Administration (MSHA) ID number and the capacity. A slurry pond is an impoundment used to store waste created during coal preparation also known as washing. The waste contained in the impoundment consists of silt, dust, water, coal fines and washing/treatment chemicals. Coal slurry impoundments are considered dams and classified accordingly by the PA DEP.

The greatest hazard associated with coal slurry ponds is impoundment failure due to seepage, embankment weakness and undermining, all of which could result in flooding. Breakthroughs associated with deep mining have also led to flooding of underground mine operations. The slurry holding capacity of impoundments in the Commonwealth ranges from tens of millions to billions of gallons.

Table 4.3.14-1 **Summary of Coal Slurry Impoundments in the Allegheny County (Coal Impoundment LIS 2015).**

Impoundment Name	MSHA ID No.	Maximum Capacity (gallons)
Harmar Refuse Bank Slurry Pond Tailings	1211-PA02-00375-01	14,193,552
Harmar Storage Pond #4 Slurry Impoundment	1211-PA02-00375-04	661,147
Slurry-Bald Knob Prep Plant	1211-PA02-00194-03	203,657,142
Treatment Pond 14-North Impoundment	1211-PA02-00049-05	8,146,286

Oil and Gas Well Incidents

More than 350,000 conventional oil and gas wells have been drilled in Pennsylvania since the first commercial oil well was developed in 1859 (PIOGA, 2020). PA DEP differentiates between conventional and unconventional oil and gas wells. Conventional wells are traditional vertical wells, while unconventional wells are typically horizontally drilled wells commonly associated with the Marcellus Shale, a more recent advancement in drilling technology that has allowed for natural gas extraction from the Marcellus Shale, which exists at a depth of 5,000 to 8,000 feet. This type of extraction presents new and unique challenges and hazards in the Commonwealth.

In Allegheny County, most wells are conventional. There are 513 active, 2 inactive, and 587 abandoned conventional wells in the county. In contrast, there are only 181 active unconventional wells; there are 7 abandoned and 4 inactive wells. In addition, there are 120 unconventional wells with a status of "Operator reported not drilled," meaning the well permit has expired without being drilled or that the permit is not expired but the operator will not seek to drill, and "Proposed, but never materialized," meaning that either a permit application was submitted but not approved, a well was entered erroneously into the database, or the permit was issued but the well was never drilled. There were no unconventional wells drilled in Allegheny County in 2011. In 2015, there were 94 unconventional wells, and the number increased to 312 by 2020. This represents an increasing risk to oil and gas well incidents in the County. Figures 4.3.14.4 and 4.3.14.5 show the locations of these wells.

Private water supplies such as domestic drinking water wells in the vicinity of oil and gas wells are at risk of contamination from brine and other pollutants including methane, which can pose a fire hazard. For more information on public and private water supplies, see Section 4.3.1.5.

Figure 4.3.14-3 Conventional Oil and Gas Well Locations for Allegheny County.

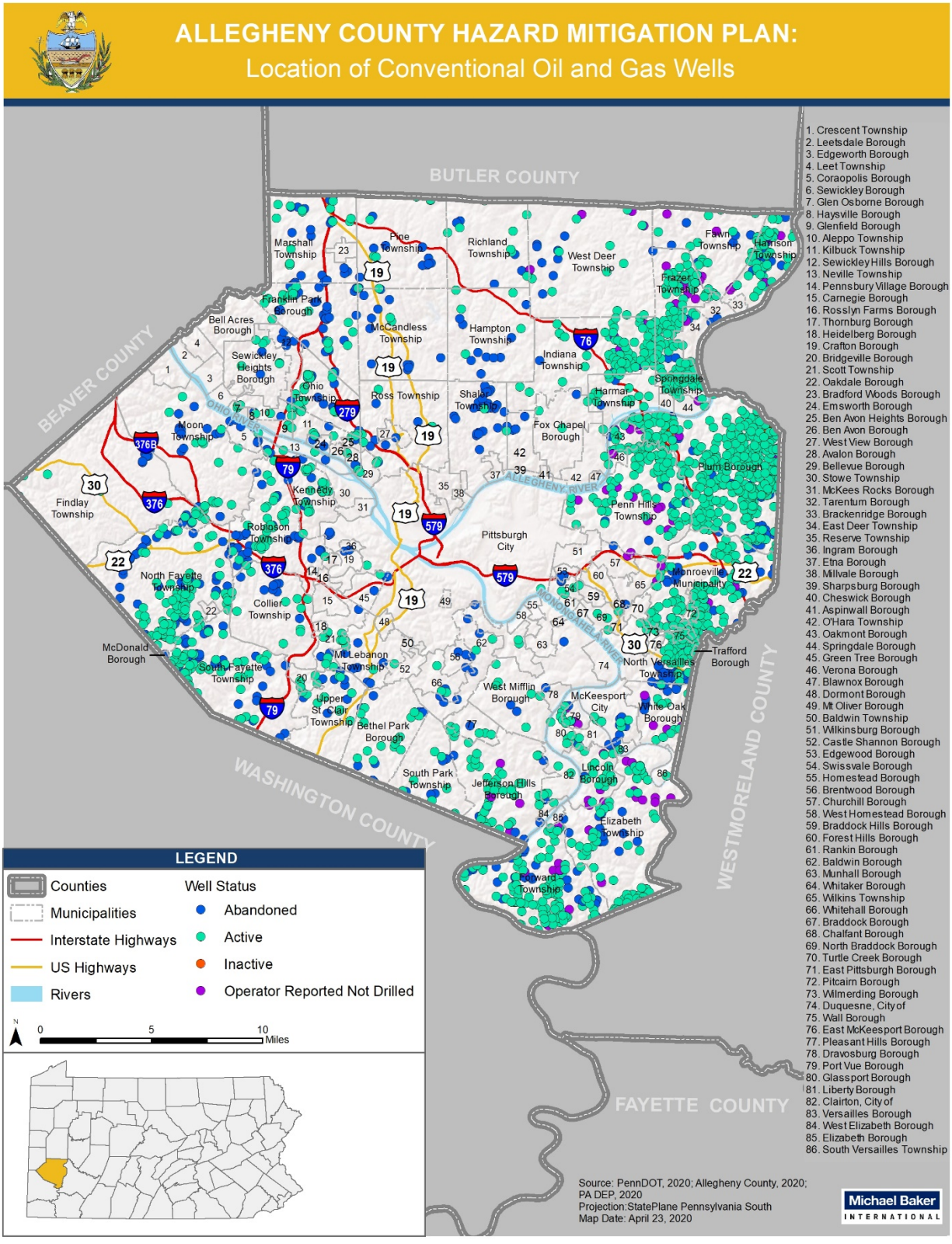
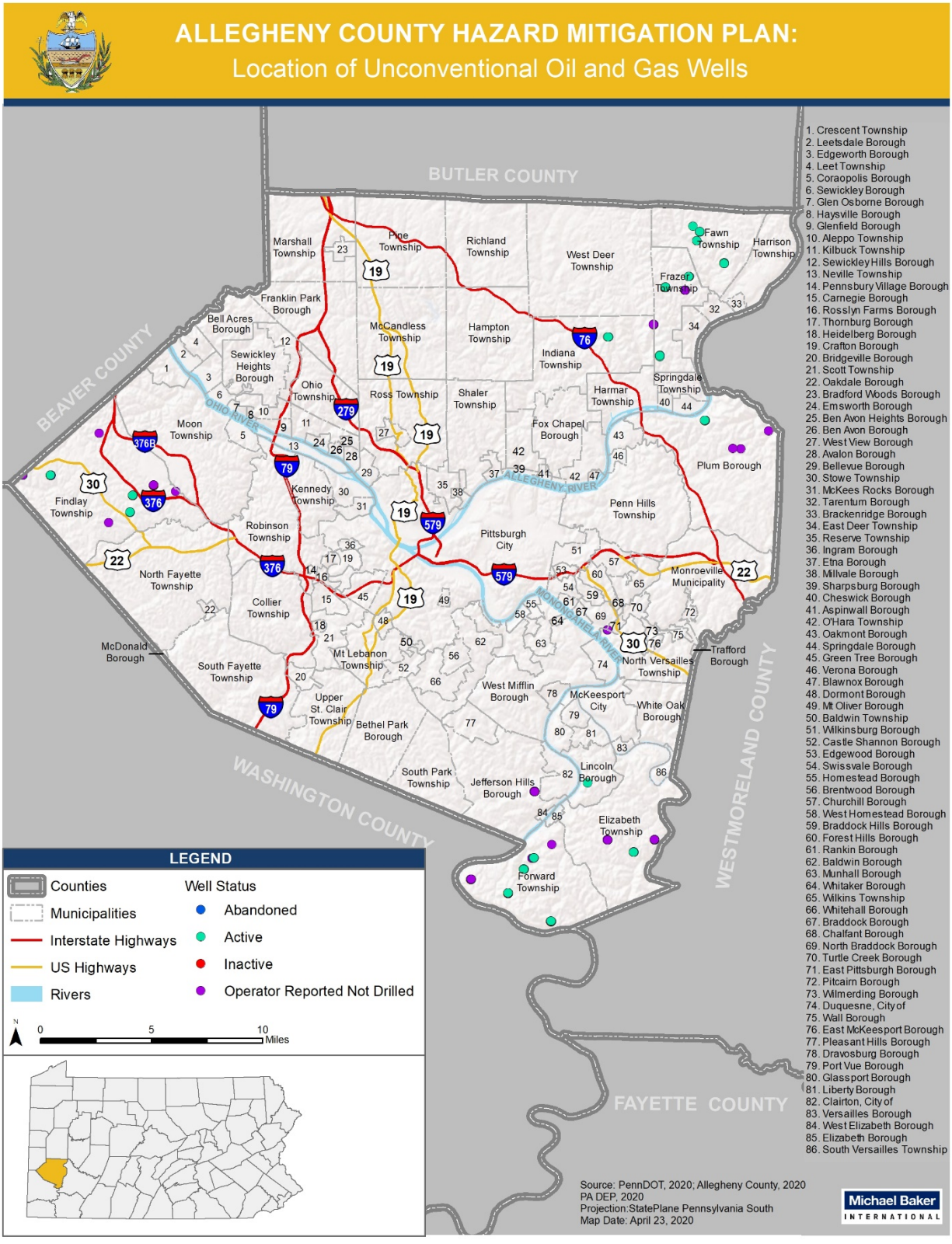


Figure 4.3.14-4 Unconventional Oil and Gas Well Locations.



4.3.14.2. Range of Magnitude

Hazardous Material Release

Hazardous material releases can contaminate air, water and soils, possibly resulting in death and/or injuries. Dispersion can take place rapidly when transported by water and wind. While often accidental, releases can occur as a result of human carelessness, intentional acts, or natural hazards. When caused by natural hazards, these incidents are known as secondary events. Hazardous materials can include toxic chemicals, radioactive materials, infectious substances, and hazardous wastes. Such releases can affect nearby populations and contaminate critical or sensitive environmental areas.

With a hazardous material release, whether accidental or intentional, there are several potentially exacerbating or mitigating circumstances that will affect its severity or impact. Mitigating conditions are precautionary measures taken in advance to reduce the impact of a release on the surrounding environment. Primary and secondary containment or shielding by sheltering-in-place protects people and property from the harmful effects of a hazardous material release. Exacerbating conditions, characteristics that can enhance or magnify the effects of a hazardous material release include:

- Weather conditions: affects how the hazard occurs and develops
- Micro-meteorological effects of buildings and terrain: alters dispersion of hazardous materials
- Non-compliance with applicable codes (e.g. building or fire codes) and maintenance failures (e.g. fire protection and containment features): can substantially increase the damage to the facility itself and to surrounding buildings

The severity of the incident is dependent not only on the circumstances described above, but also with the type of material released and the distance and related response time for emergency response teams. The areas within closest proximity to the releases are generally at greatest risk, yet depending on the agent, a release can travel great distances or remain present in the environment for a long period of time (e.g. centuries to millennia for radioactive materials), resulting in extensive impacts on people and the environment.

A worst case scenario event of a hazardous material release occurred in March 2009 when a tractor trailer overturned spilling 16 tons of toxic hydrofluoric acid near Wind Gap, Pennsylvania, resulting in the evacuation of 5,000 people (Times Herald-Record, 2009). Residents were evacuated because contact with concentrated solutions of the acid can cause severe burns, and inhaling the gas can cause respiratory irritation, severe eye damage, and pulmonary edema.

The environmental impacts of hazardous material releases include:

- Hydrologic effects – surface and groundwater contamination
- Other effects on water quality such as changes in water temperature
- Damage to streams, lakes, ponds, estuaries, and wetland ecosystems
- Air quality effects – pollutants, smoke, and dust
- Loss of quality in landscape

- Reduced soil quality
- Damage to plant communities – loss of biodiversity; damage to vegetation
- Damage to animal species – animal fatalities; degradation of wildlife and aquatic habitat; pollution of drinking water for wildlife; loss of biodiversity; disease.

Coal Mining

Major impacts from mining include surface-elevation changes and subsidence, modification of vegetation, the chemical degradation and flow redistribution of surface water and groundwater, the creation of mine voids and entry openings, adverse aesthetic impacts, and changes in land use.

In addition, active and abandoned mines can also result in injury and loss of human life. This can occur in active mines where workers are injured or killed by mine collapse, entrapment, poisonous gases, inundation, explosions, fires, equipment malfunction, and improper ventilation. Injuries and death, such as All-Terrain Vehicle (ATV) accidents and drowning, can also occur in abandoned mines.

The mineral-waste disposal from coal mining also is a hazard. Past disposal practices have dotted Pennsylvania's landscape with unsightly refuse piles. Many of the refuse piles contain combustible materials that cause long-term air-quality problems if ignited. Burning refuse piles have also been linked to major underground coal fires, such as those at Centralia and Shamokin in the Anthracite region of Pennsylvania.

Also as potentially dangerous are slurry ponds or tailings dams. Mineral byproducts from coal mining are pumped to slurry or tailings dams for removal by sedimentation. If the dams or structures supporting the slurry ponds fail, they pose hazards similar to dam failure (see Appendix G – Dam Failure Profile).

Reject wastes from coal mining that contain sulfide minerals can also degrade groundwater and surface water that comes into contact with them. Coal refuse piles have historically been prolific sources of acid mine drainage which has impaired many streams in Pennsylvania.

Pennsylvania has a long history of mining, and there have been numerous mining accidents. The worst case scenario event in Pennsylvania mining history occurred in 1962 in Centralia, Pennsylvania, when an underground fire began in the coal mines underneath the town. The federal government offered buyouts of homes of residents so they could relocate from Centralia, resulting in a cost of over $40 million to carry this out and demolish homes. In 1992, Pennsylvania claimed eminent domain on all properties in the town and condemned all of the buildings. In 1981 the town had over 1,000 residents, but today only a few remain (Centralia, 2014).

One of the worst mining accidents in the United States since 1950 occurred in nearby West Virginia. On April 5, 2010, twenty-nine miners were killed at the Upper Big Branch Mine by an explosion (Young, 2010).

The environmental impacts of coal mining are many. Mining activities and acid mine drainage can contaminate surface and groundwater, create acid mine drainage, and cause changes in water temperature and damage to streams, lakes, ponds, estuaries, and wetland ecosystems. Mine explosions

or burning refuse piles can cause air quality problems. Although mine reclamation is required for much surface mining activity, there is still a loss of quality in landscape, damage to vegetation, and habitat.

Oil and Gas

As is the case with all natural resource extraction, a variety of potential hazards exist with oil and gas extraction. Abandoned oil and gas wells that are not properly plugged can contaminate groundwater and consequently domestic drinking water wells. Surface waters and soil are sometimes polluted by brine, a salty wastewater product of oil and gas well drilling, and from oil spills occurring at the drilling site or from a pipeline breach. This can spoil public drinking water supplies and be particularly detrimental to vegetation and aquatic animals.

Methane can leak into domestic drinking wells and pose fire and explosion hazards (see Figure 4.3.14-6). In addition, natural gas well fires can occur when natural gas is ignited at the well site. Often, these fires erupt during drilling when a spark from machinery or equipment ignites the gas. The initial explosion and resulting flames have the potential to seriously injure or kill individuals in the immediate area. These fires are often difficult to extinguish due to the intensity of the flame and the abundant fuel source. When methane gas from unplugged gas wells seeps into underground coal mines, miners are at risk of asphyxiation and are subject to impacts of explosion.

Figure 4.3.14-5 Natural Gas well explosion in Indiana Township, July 2010 (WPXI, 2010).

Marcellus Shale play drilling has introduced a new set of hazards to the oil and gas industry in addition to the normal risks associated with the industry. The Marcellus Shale formation exists at a depth normally between 5,000 and 8,000 feet and holds trillions of cubic feet of natural gas. Extraction from this depth was previously not feasible but as drilling technology has improved over the years, recovering natural gas from Marcellus Shale is now possible (USGS, 2019).

This extraction process is different from traditional natural gas extraction in that it often requires horizontal drilling. Horizontal drilling is accomplished by hydraulic fracturing which involves pumping one to eight million gallons of water, mixed with sand and other additives including hydrochloric or muriatic acid, into the shale formation. The fluid or “frac fluid” that is recovered from this process must be properly treated as the water quality is very poor.

Frac fluid is extremely saline and can be three to six times as salty as sea water. Other contaminants can include barium, bromine, lithium strontium, sulfate, ammonium and very high concentrations of total dissolved solids (TDS). There is also some concern about normally occurring radioactive materials (NORMS) present in shale and potentially present in recovered drilling fluid, but there is very little data available on the radioactivity of frac fluid in Pennsylvania (Rowan, Engle, & Kirby, 2010).

Currently there is no known technology to treat water with this level of salinity (Kondash, Albright, & Vengosh, 2017). High levels of total dissolved solids (TDSs), though not harmful to humans, can be extremely harmful to aquatic life and can damage industrial equipment. Often, recovered frac fluid is stored in earthen impoundments and after treatment is taken to a sewage treatment facility. There is concern surrounding the toxic solid waste that remains after frac fluid is treated.

In addition to the traditional hazards associated with oil and gas well drilling, potential impacts from Marcellus Shale gas well drilling include:

- Surface water depletion from high consumptive use with low return rates affecting drinking water supplies, and aquatic ecosystems and organisms.
- Contaminated surface and groundwater resulting from hydraulic fracturing and the recovery of contaminated hydraulic fracturing fluid.
- Mishandling of solid toxic waste.

In 2010 the worst environmental disaster in United States history was realized and can be attributed to oil well drilling and extraction. British Petroleum's (BP) Deepwater Horizon oil rig, located in the Gulf of Mexico off the coast of Louisiana, began leaking millions of gallons of oil into the ocean after an explosion occurred at the site on April 20, 2010, killing 11 workers. The resulting environmental and economic impacts have been devastating to the region (Pallardy, 2020).

Though injury and death have resulted from oil and gas well drilling and extraction, the majority of impacts from this human-made hazard are environmental in nature. Wells that are improperly drilled or plugged can contaminate groundwater resulting in water well contamination or eventually surface water contamination. Drilling additives stored on site can leak and contaminate soil, surface water, and groundwater. Oil leaks at the well site from oil pipelines contaminate soil and surface water and damage aquatic life and ecosystems.

Additional potential environmental impacts of Marcellus Shale play drilling include surface water depletion and the accompanying damage to aquatic ecosystems; and contaminated surface, groundwater, and soil resulting from hydraulic fracturing, the recovery of contaminated hydraulic fracturing fluid and solid toxic waste produced from treatment.

4.3.14.3. Past Occurrence

Hazardous Material Release

Since the passage of SARA Title III, facilities which produce, use, or store hazardous chemicals must notify the public through their county's emergency dispatch center and PEMA, if an accidental release of a hazardous substance meets or exceeds a designated reportable quantity and affects or has the potential

to affect persons and/or the environment outside the plant. SARA Title III and Pennsylvania Hazardous Material Emergency Planning and Response Act (Act 165) also require a written follow-up report to PEMA and to the county where the facility is located. These written follow-up reports include any known or anticipated health risks associated with the release and actions to be taken to mitigate potential future incidents. In addition, Section 204(a)(10) of Act 165 requires PEMA to staff and operate a 24-hour State Emergency Operations Center (EOC) to provide effective emergency response coordination. According to PEMA's Pennsylvania Hazardous Material Emergency Planning and Response Act Annual Reports, Allegheny County's annual number of hazardous material and petroleum incidents includes (PEMA, 2015-2018):

- 178 incidents in 2015
- 107 incidents in 2016
- 313 incidents in 2017
- 122 incidents in 2018

For hazardous materials releases occurring in transit, please see Section 4.3.18.

Coal Mining

Although state and federal (U.S. Department of Labor, EPA, and the Office of Surface Mining and Reclamation) laws require occupational health, safety, and environmental protection in all mining activities, mining accidents still occur. The U.S. Department of Labor Mine Safety and Health Administration tracks mining accidents and injuries. From 2015 to 2019, there were 486 operator and contractor injuries (including 1 death) reported in Pennsylvania resulting from surface and underground coal mining activities (MSHA, 2015-2019). In addition, the PA DEP Bureau of Mine Safety tracks fatalities for both the anthracite and bituminous regions of Pennsylvania. In the bituminous region, which includes Allegheny County, the most recent fatality was in 2019. It is unclear where in the region the fatality occurred, but it was in Southwestern Pennsylvania and illustrates that coal mining accidents still occur. There is no comprehensive database that tracks the data. Beyond operator accidents, there can be incidents that are a result of falls, drowning, electrocution, and ATV crashes.

The DEP Bureau of Mine Safety is required by law to investigate all fatal and serious accidents that occur at underground Commonwealth mines. According to the Bureau, there have been four major mine emergencies in Pennsylvania coal mines. They define a mine emergency as a serious situation or occurrence that happens unexpectedly and demands immediate action or a condition of urgent need for action or assistance such as a state of emergency. Two of these were mine fires and two were inundations (PADEP, 2020).

Oil and Gas

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

While there is no comprehensive list of past occurrences, PA DEP has made oil and gas well safety compliance information available to the public. Since 1990, there have been 451 environmental health and safety violations at oil and gas wells in Allegheny County. Violations occurred at conventional and unconventional well sites. These violations range in severity, from failure to implement protective plans like erosion and sedimentation control plans and encroachment plans to more serious infractions like discharging pollution materials into the waters of the Commonwealth. The most common infractions were (PADEP, 2020):

1. Failure to minimize accelerated erosion, implement Erosion & Sedimentation (E&S) plan, maintain E&S controls, and failure to stabilize site until total site restoration (52 violations).
2. Unpermitted discharge of industrial waste and Stream discharge of industrial waste (includes drill cuttings, oil, brine and/or silt) (46 violations).
3. Prohibition against discharge of industrial wastes, industrial waste discharges, and prohibition against other pollutions (31 violations).

There are limited qualitative details on oil and gas incidents. One known incident in Allegheny County was in July 2010, when a shallow gas well exploded in Indiana Township and killed two workers (WPXI, 2010).

4.3.14.4. Future Occurrence

Hazardous Material Release

While many hazardous material release incidents have occurred in Pennsylvania in the past, they are generally considered difficult to predict. An occurrence is largely dependent upon the accidental or intentional actions of a person or group. Intentional acts are addressed in Section 4.3.17: Terrorism. Risk associated with hazardous materials release is expected to remain moderate.

Coal Mining

It is difficult to forecast the severity and frequency of coal mining accidents and environmental damage in Pennsylvania. Although throughout time, the government has strengthened mining and reclamation operation and environmental regulations, permitting, and inspection criteria, this has not prevented mining accidents and environmental damage from occurring.

Surface subsidence resulting from underground mining continues to be a major concern of those impacted by the mining industry (see Section 4.3.8). Despite the use of deep mine roof-support methods, some subsidence will eventually occur.

It is likely that Pennsylvania will continue to modify its laws to reflect additional environmental awareness. Stricter controls on reclamation, perhaps specifically addressing the disposal of mining residuals, are likely. State and federal laws and programs have historically placed an emphasis on environmental preservation and reclamation. As in the past, it seems likely that Pennsylvania will be at the forefront of these programs and future occurrence will decrease.

Oil and Gas

It is difficult to predict when and where environmental hazards will arise as they are often related to equipment failure and human error. Adequate monitoring through the DEP will reduce the likelihood of

potential impacts to the community and to the environment. Risk associated with oil and gas drilling is expected to remain moderate though based on the short history of past occurrence, Pennsylvania should expect multiple incidences to occur annually or a 100 percent annual probability.

As the number of oil and gas wells increases each year, the probability of occurrence is likely to increase as well.

Overall, the probability of future environmental hazards events is likely as defined by the Risk Factor Methodology (See Section 4.4-1).

4.3.14.5. Vulnerability Assessment

The vulnerability of jurisdictions to environmental hazards differs based on the type of environmental hazard being examined. While explosions or other catastrophic incidents at hazardous material facilities, coal mining operations, or any kind of oil or gas well could cause property damage, the primary concern is the population living near those sites who would potentially need to be evacuated. For hazardous material releases at fixed facilities, vulnerability is defined as populations within 1.5 miles of SARA facilities. For coal mining incidents, vulnerability is defined as populations living within 1.5 miles of active coal mines. For oil and gas well incidents, vulnerability is defined as being located within 1,000 yards of an unconventional oil or gas well. This buffer is what DEP uses as its “zone of culpability” for oil and gas well incidents. Table 4.3.14-2 provides this vulnerability information by community. Looking across all kinds of environmental hazards, the highest population is at risk to fixed-facility hazardous material releases because of the high number of SARA facilities in densely populated areas. Vulnerability is lowest for unconventional oil and gas wells since there are so few in the county. The vulnerability of SARA facilities to each identified hazard in the HMP is included in Appendix E.

Table 4.3.14-2 **Population Vulnerable to Environmental Hazards**

Municipality	2018 Population	Estimated Population Within 1.5 Miles of a SARA Facility	Percent Population Within 1.5 Miles of a SARA Facility	Estimated Population Within 1000 Yards of a Conventional Well	Percent Population Within 1000 Yards of a Conventional Well	Estimated Population Within 1000 Yards of an Unconventional Well	Percent Population Within 1000 Yards of an Unconventional Well	Estimated Population Within 1.5 Miles of an Active Coal Mine	Percent Population Within 1.5 Miles of an Active Coal Mine
Aleppo Township	300	0	0%	300	100%	0	0%	0	0%
Aspinwall Borough	280	0	0%	0	0%	0	0%	0	0%
Avalon Borough	410	90	22%	410	100%	0	0%	0	0%
Baldwin Borough	1410	60	4%	1,410	100%	0	0%	590	42%
Baldwin Township	200	0	0%	0	0%	0	0%	200	100%
Bell Acres Borough	400	400	100%	400	100%	0	0%	0	0%
Bellevue Borough	790	60	8%	790	100%	0	0%	0	0%
Ben Avon Borough	500	0	0%	500	100%	0	0%	0	0%
Ben Avon Heights Borough	200	0	0%	200	100%	0	0%	0	0%
Bethel Park, Municipality of	3,040	930	31%	3,040	100%	0	0%	340	11%
Blawnox Borough	250	250	100%	250	100%	0	0%	0	0%
Brackenridge Borough	290	130	45%	290	100%	0	0%	290	100%
Braddock Borough	200	200	100%	180	90%	0	0%	0	0%
Braddock Hills Borough	250	0	0%	250	100%	0	0%	0	0%
Bradford Woods Borough	350	0	0%	350	100%	0	0%	0	0%
Brentwood Borough	580	250	43%	580	100%	0	0%	580	100%
Bridgeville Borough	600	100	17%	600	100%	0	0%	370	62%
Carnegie Borough	790	360	46%	550	70%	0	0%	790	100%
Castle Shannon Borough	530	70	13%	500	94%	0	0%	240	45%
Chalfant Borough	200	0	0%	200	100%	0	0%	0	0%
Cheswick Borough	450	150	33%	450	100%	0	0%	150	33%
Churchill Borough	160	0	0%	160	100%	0	0%	0	0%

Table 4.3.14-2 **Population Vulnerable to Environmental Hazards**

Municipality	2018 Population	Estimated Population Within 1.5 Miles of a SARA Facility	Percent Population Within 1.5 Miles of a SARA Facility	Estimated Population Within 1000 Yards of a Conventional Well	Percent Population Within 1000 Yards of a Conventional Well	Estimated Population Within 1000 Yards of an Unconventional Well	Percent Population Within 1000 Yards of an Unconventional Well	Estimated Population Within 1.5 Miles of an Active Coal Mine	Percent Population Within 1.5 Miles of an Active Coal Mine
Clairton, City of	170	90	53%	170	100%	0	0%	170	100%
Collier Township	690	210	30%	690	100%	40	6%	690	100%
Coraopolis Borough	500	140	28%	500	100%	0	0%	0	0%
Crafton Borough	580	150	26%	580	100%	0	0%	280	48%
Crescent Township	450	0	0%	450	100%	0	0%	0	0%
Dormont Borough	910	270	30%	0	0%	0	0%	0	0%
Dravosburg Borough	250	150	60%	250	100%	0	0%	0	0%
Duquesne, City of	490	60	12%	100	20%	0	0%	0	0%
East Deer Township	350	350	100%	350	100%	0	0%	350	100%
East McKeesport Borough	250	150	60%	250	100%	0	0%	0	0%
East Pittsburgh Borough	180	0	0%	180	100%	180	100%	0	0%
Edgewood Borough	550	0	0%	550	100%	0	0%	0	0%
Edgeworth Borough	600	200	33%	200	33%	0	0%	0	0%
Elizabeth Borough	350	350	100%	350	100%	0	0%	350	100%
Elizabeth Township	1020	370	36%	1,020	100%	150	15%	1,020	100%
Emsworth Borough	400	150	38%	400	100%	0	0%	0	0%
Etna Borough	300	60	20%	240	80%	0	0%	230	77%
Fawn Township	350	250	71%	350	100%	250	71%	350	100%
Findlay Township	310	310	100%	310	100%	100	32%	310	100%
Forest Hills Borough	710	0	0%	350	49%	0	0%	0	0%
Forward Township	250	150	60%	250	100%	150	60%	250	100%
Fox Chapel Borough	280	50	18%	230	82%	0	0%	230	82%
Franklin Park Borough	1050	0	0%	1,050	100%	0	0%	0	0%

Table 4.3.14-2 **Population Vulnerable to Environmental Hazards**

Municipality	2018 Population	Estimated Population Within 1.5 Miles of a SARA Facility	Percent Population Within 1.5 Miles of a SARA Facility	Estimated Population Within 1000 Yards of a Conventional Well	Percent Population Within 1000 Yards of a Conventional Well	Estimated Population Within 1000 Yards of an Unconventional Well	Percent Population Within 1000 Yards of an Unconventional Well	Estimated Population Within 1.5 Miles of an Active Coal Mine	Percent Population Within 1.5 Miles of an Active Coal Mine
Frazer Township	250	250	100%	250	100%	150	60%	250	100%
Glassport Borough	420	140	33%	420	100%	0	0%	420	100%
Glen Osborne Borough	200	0	0%	200	100%	0	0%	0	0%
Glenfield Borough	100	0	0%	100	100%	0	0%	0	0%
Green Tree Borough	440	340	77%	440	100%	0	0%	0	0%
Hampton Township	1160	590	51%	1,160	100%	0	0%	780	67%
Harmar Township	330	330	100%	330	100%	0	0%	330	100%
Harrison Township	800	160	20%	800	100%	0	0%	420	53%
Haysville Borough	40	0	0%	40	100%	0	0%	0	0%
Heidelberg Borough	350	0	0%	350	100%	0	0%	350	100%
Homestead Borough	220	90	41%	90	41%	0	0%	220	100%
Indiana Township	840	640	76%	840	100%	0	0%	640	76%
Ingram Borough	270	0	0%	270	100%	0	0%	170	63%
Jefferson Hills Borough	850	650	76%	850	100%	0	0%	850	100%
Kennedy Township	770	300	39%	770	100%	0	0%	770	100%
Kilbuck Township	250	0	0%	250	100%	0	0%	0	0%
Leet Township	450	0	0%	0	0%	0	0%	0	0%
Leetsdale Borough	300	300	100%	0	0%	0	0%	0	0%
Liberty Borough	450	0	0%	450	100%	0	0%	250	56%
Lincoln Borough	250	0	0%	250	100%	250	100%	250	100%
Marshall Township	500	350	70%	500	100%	0	0%	350	70%
McCandless, Town of	2450	250	10%	2,450	100%	0	0%	450	18%
McDonald Borough	70	0	0%	70	100%	0	0%	70	100%

Table 4.3.14-2 **Population Vulnerable to Environmental Hazards**

Municipality	2018 Population	Estimated Population Within 1.5 Miles of a SARA Facility	Percent Population Within 1.5 Miles of a SARA Facility	Estimated Population Within 1000 Yards of a Conventional Well	Percent Population Within 1000 Yards of a Conventional Well	Estimated Population Within 1000 Yards of an Unconventional Well	Percent Population Within 1000 Yards of an Unconventional Well	Estimated Population Within 1.5 Miles of an Active Coal Mine	Percent Population Within 1.5 Miles of an Active Coal Mine
McKees Rocks Borough	430	130	30%	0	0%	0	0%	100	23%
McKeesport, City of	1,600	270	17%	1,230	77%	0	0%	0	0%
Millvale Borough	260	100	38%	0	0%	0	0%	260	100%
Monroeville, Municipality of	2080	1,090	52%	2,080	100%	0	0%	350	17%
Moon Township	1970	1,170	59%	1,920	97%	0	0%	350	18%
Mount Lebanon, Municipality of	2,800	0	0%	2,670	95%	0	0%	520	19%
Mount Oliver Borough	250	100	40%	0	0%	0	0%	150	60%
Munhall Borough	760	250	33%	470	62%	0	0%	720	95%
Neville Township	250	250	100%	250	100%	0	0%	0	0%
North Braddock Borough	450	150	33%	450	100%	70	16%	0	0%
North Fayette Township	1,010	500	50%	1,010	100%	0	0%	1,010	100%
North Versailles Township	530	120	23%	420	79%	0	0%	0	0%
Oakdale Borough	450	450	100%	450	100%	0	0%	450	100%
Oakmont Borough	840	590	70%	840	100%	0	0%	840	100%
O'Hara Township	910	380	42%	780	86%	0	0%	300	33%
Ohio Township	350	350	100%	350	100%	0	0%	0	0%
Penn Hills, Municipality of	2,680	730	27%	2,680	100%	0	0%	510	19%
Pennsbury Village Borough	200	0	0%	200	100%	0	0%	200	100%
Pine Township	510	80	16%	510	100%	0	0%	430	84%
Pitcairn Borough	230	0	0%	230	100%	0	0%	0	0%

Table 4.3.14-2 **Population Vulnerable to Environmental Hazards**

Municipality	2018 Population	Estimated Population Within 1.5 Miles of a SARA Facility	Percent Population Within 1.5 Miles of a SARA Facility	Estimated Population Within 1000 Yards of a Conventional Well	Percent Population Within 1000 Yards of a Conventional Well	Estimated Population Within 1000 Yards of an Unconventional Well	Percent Population Within 1000 Yards of an Unconventional Well	Estimated Population Within 1.5 Miles of an Active Coal Mine	Percent Population Within 1.5 Miles of an Active Coal Mine
Pittsburgh, City of	28,800	6,730	23%	4,100	14%	0	0%	5,710	20%
Pleasant Hills Borough	710	150	21%	710	100%	0	0%	390	55%
Plum Borough	1,970	990	50%	1,970	100%	0	0%	1,600	81%
Port Vue Borough	310	100	32%	310	100%	0	0%	110	35%
Rankin Borough	210	150	71%	210	100%	0	0%	0	0%
Reserve Township	500	0	0%	0	0%	0	0%	500	100%
Richland Township	710	100	14%	710	100%	0	0%	550	77%
Robinson Township	1,050	800	76%	1,050	100%	0	0%	1,050	100%
Ross Township	2,690	570	21%	2,370	88%	0	0%	200	7%
Rosslyn Farms Borough	250	0	0%	250	100%	0	0%	250	100%
Scott Township	1,470	250	17%	1,410	96%	0	0%	980	67%
Sewickley Borough	350	350	100%	200	57%	0	0%	0	0%
Sewickley Heights	250	0	0%	250	100%	0	0%	0	0%
Sewickley Hills Borough	250	0	0%	250	100%	0	0%	0	0%
Shaler Township	1,680	480	29%	1,240	74%	0	0%	470	28%
Sharpsburg Borough	280	70	25%	0	0%	0	0%	0	0%
South Fayette Township	1,220	900	74%	1,220	100%	0	0%	1,070	88%
South Park Township	1,220	40	3%	1,220	100%	0	0%	870	71%
South Versailles Township	200	0	0%	200	100%	0	0%	200	100%
Springdale Borough	590	350	59%	590	100%	0	0%	0	0%
Springdale Township	300	150	50%	300	100%	0	0%	0	0%
Stowe Township	420	40	10%	330	79%	0	0%	180	43%
Swissvale Borough	800	150	19%	800	100%	0	0%	0	0%

Table 4.3.14-2 **Population Vulnerable to Environmental Hazards**

Municipality	2018 Population	Estimated Population Within 1.5 Miles of a SARA Facility	Percent Population Within 1.5 Miles of a SARA Facility	Estimated Population Within 1000 Yards of a Conventional Well	Percent Population Within 1000 Yards of a Conventional Well	Estimated Population Within 1000 Yards of an Unconventional Well	Percent Population Within 1000 Yards of an Unconventional Well	Estimated Population Within 1.5 Miles of an Active Coal Mine	Percent Population Within 1.5 Miles of an Active Coal Mine
Tarentum Borough	250	100	40%	250	100%	0	0%	250	100%
Thornburg Borough	300	300	100%	300	100%	0	0%	300	100%
Trafford Borough	150	0	0%	150	100%	0	0%	0	0%
Turtle Creek Borough	280	110	39%	280	100%	0	0%	0	0%
Upper St. Clair Township	2,130	500	23%	1,800	85%	0	0%	980	46%
Verona Borough	400	150	38%	400	100%	0	0%	0	0%
Versailles Borough	400	0	0%	400	100%	0	0%	400	100%
Wall Borough	200	200	100%	200	100%	0	0%	0	0%
West Deer Township	690	350	51%	690	100%	0	0%	690	100%
West Elizabeth Borough	150	150	100%	150	100%	0	0%	150	100%
West Homestead Borough	300	300	100%	300	100%	0	0%	300	100%
West Mifflin Borough	1,770	1,140	64%	1,540	87%	0	0%	1,090	62%
West View Borough	560	200	36%	560	100%	0	0%	0	0%
Whitaker Borough	250	0	0%	0	0%	0	0%	250	100%
White Oak Borough	480	80	17%	480	100%	0	0%	250	52%
Whitehall Borough	1,360	360	26%	1,210	89%	0	0%	520	38%
Wilkins Township	540	150	28%	460	85%	0	0%	0	0%
Wilkinsburg Borough	1,180	160	14%	290	25%	0	0%	0	0%
Wilmerding Borough	250	100	40%	250	100%	0	0%	0	0%
Grand Total	111,360		0%		0%		0%	39,850	36%

4.3.15. Levee Failure

4.3.15.1. Location and Extent

A levee is a man-made structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control, or divert the flow of water to reduce the risk from temporary flooding (FEMA, 2016). Breaches of these structures occur when they are overtopped or physically incapable of containing the pressure exerted by the floodwaters. If a levee breaks, many properties may be quickly submerged in floodwaters and residents may become trapped by this rapidly rising water. The failure of levees has the potential to result in loss of life, property damage, and substantial economic impacts (for example from damage to infrastructure or agriculture).

According to the USACE National Levee Database (NLD), there are eight major levee systems in Allegheny County. They are all scattered throughout the County along tributaries of the three major rivers in the region. Levee systems can be Federal or Non-Federal projects. Federal projects are congressionally authorized projects that are generally planned, designed and constructed by USACE and a cost-sharing levee sponsor. Levees require maintenance to continue to provide the level of protection for which they were designed and built. Maintenance and operational responsibilities, referred to as sponsorship, belong to a variety of entities including levee districts, water management districts, local governments, state governments, and tribal governments. Table 4.3.15-1 shows the entity responsible for constructing, operating, and maintaining the major levee systems in Allegheny County. This information was obtained from the NLD. The County has 29 levee structures that encompass a total of about 2 miles of levee systems, and the average age of the levees is 33 years old. Figure 4.3.15-1 shows the location of the levees and levee-impacted areas.

FEMA plays an important role in helping local officials and community members understand the risk of flooding in levee-impacted areas. While levees can reduce the risk of flooding, they do not eliminate it. Levees do not “protect” lives or property from flooding. Rather, they reduce risk. The primary way that FEMA communicates flood risk in levee-impacted areas is through its Flood Insurance Rate Maps (FIRMs). These maps show the areas with low, moderate, and high risk of flooding during a 1-percent-annual-chance flood, or a flood that has a one-percent chance of happening in any given year.

In the event of a levee failure, flood waters will ultimately inundate the protected area landward of the levee. The extent of inundation is dependent on the flooding intensity. Failure of a levee during a 1% annual chance flood will inundate the approximate 100-year flood plain previously protected by the levee. Residential and commercial buildings located nearest the levee overtopping or breach location will suffer the most damage from the initial embankment failure flood wave. Landward buildings will be damaged by inundation.

Municipalities that have either a levee system or a floodwall within their jurisdiction are Bethel Park, Etna Borough, Crafton Borough, City of McKeesport, Shaler Township, and Thornburg Borough. Figures 4.3.15-1 through 4.3.15-3 show the locations of some of these levee and floodwall systems. More specific information about these levee systems can be found in Table 4.3.15-1.

Table 4.3.15-1 **Levee and Floodwall Information for Allegheny County.**

Levee System Name	Sponsor	Length	USACE Rehabilitation Status	Authorization Category
Bethel Park Spoil Levee	Unknown	0.11 mi.	Not Enrolled	Non-Federal Levee, Locally Constructed, Operated, and Maintained
Etna, PA – Left Bank	Borough of Etna	0.4 mi.	Active	Federally Authorized, Locally Operated and Maintained
Fulton, PA – Left Bank Chartiers Creek	Chartiers Valley District Flood Control Authority	0.65 mi.	Active	Federally Authorized, Locally Operated and Maintained
Fulton, PA – Right Bank Chartiers Creek	Chartiers Valley District Flood Control Authority	0.45 mi.	Active	Federally Authorized, Locally Operated and Maintained
Fulton, PA – North Whiskey Run Right Bank	Unknown	0.11 mi.	Not Enrolled	Non-Federal Levee, Locally Constructed, Operated, and Maintained
McKeesport – Right Bank Long Run	City of McKeesport	0.33 mi.	Active	Federally Authorized, Locally Operated and Maintained
Shaler - Pine Creek Levee System (Upstream)	Township of Shaler	0.1 mi.	Not Enrolled	Non-Federal Levee, Locally Constructed, Operated, and Maintained
Shaler – Left Bank Pine Creek	Township of Shaler	0.13 mi.	Active	Non-Federal Levee, Locally Constructed, Operated, and Maintained
Millvale	Unknown	1.17	Unknown	Unknown
Pittsburgh	Unknown	0.84	Unknown	Unknown
Tarentum	Unknown	0.71	Unknown	Unknown
Turtle Creek	Unknown	6.98	Unknown	Unknown

Figure 4.3.15-1 Pittsburgh and Fulton Levee Systems

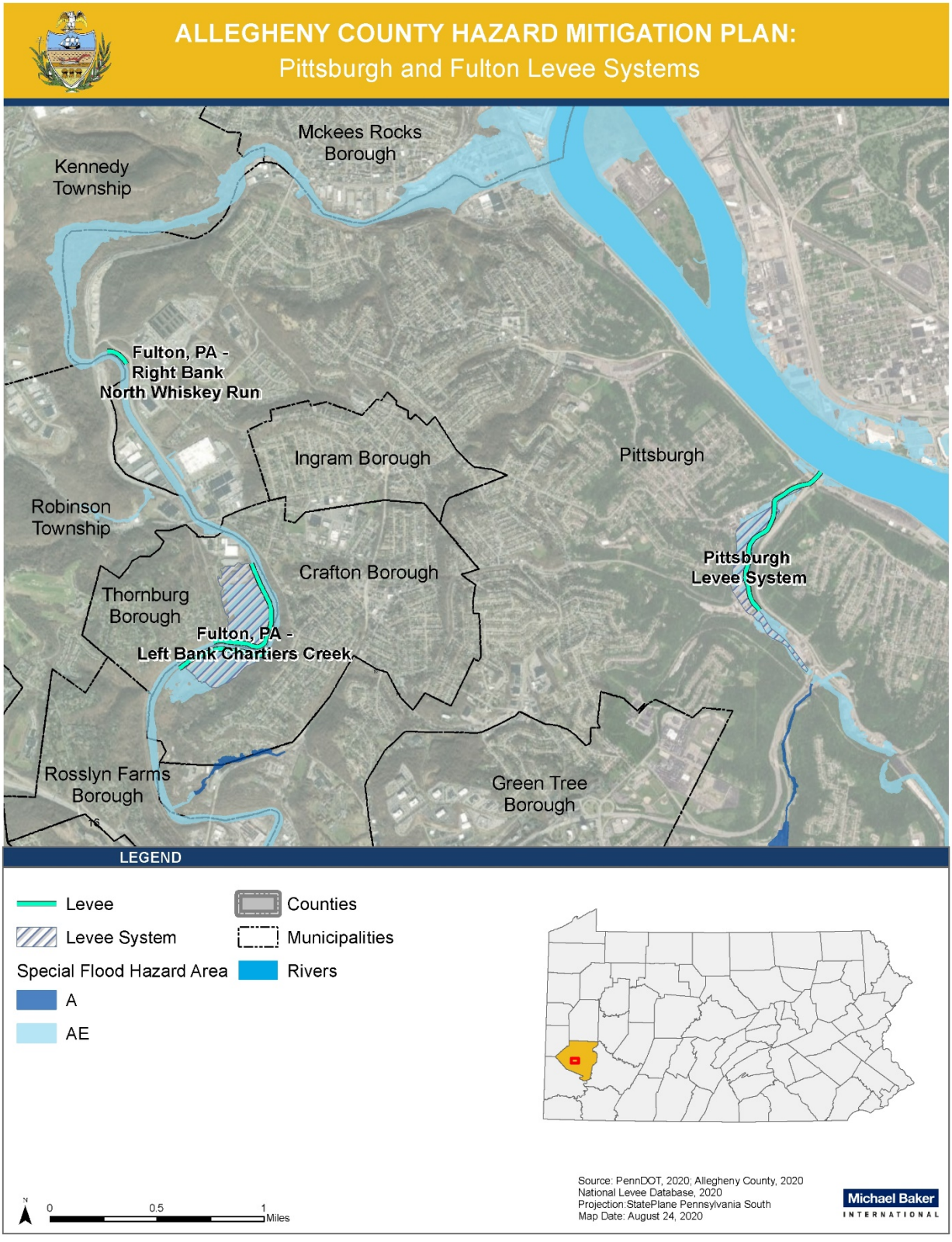


Figure 4.3.15-2 Etna, Shaler and Millvale Levee Systems

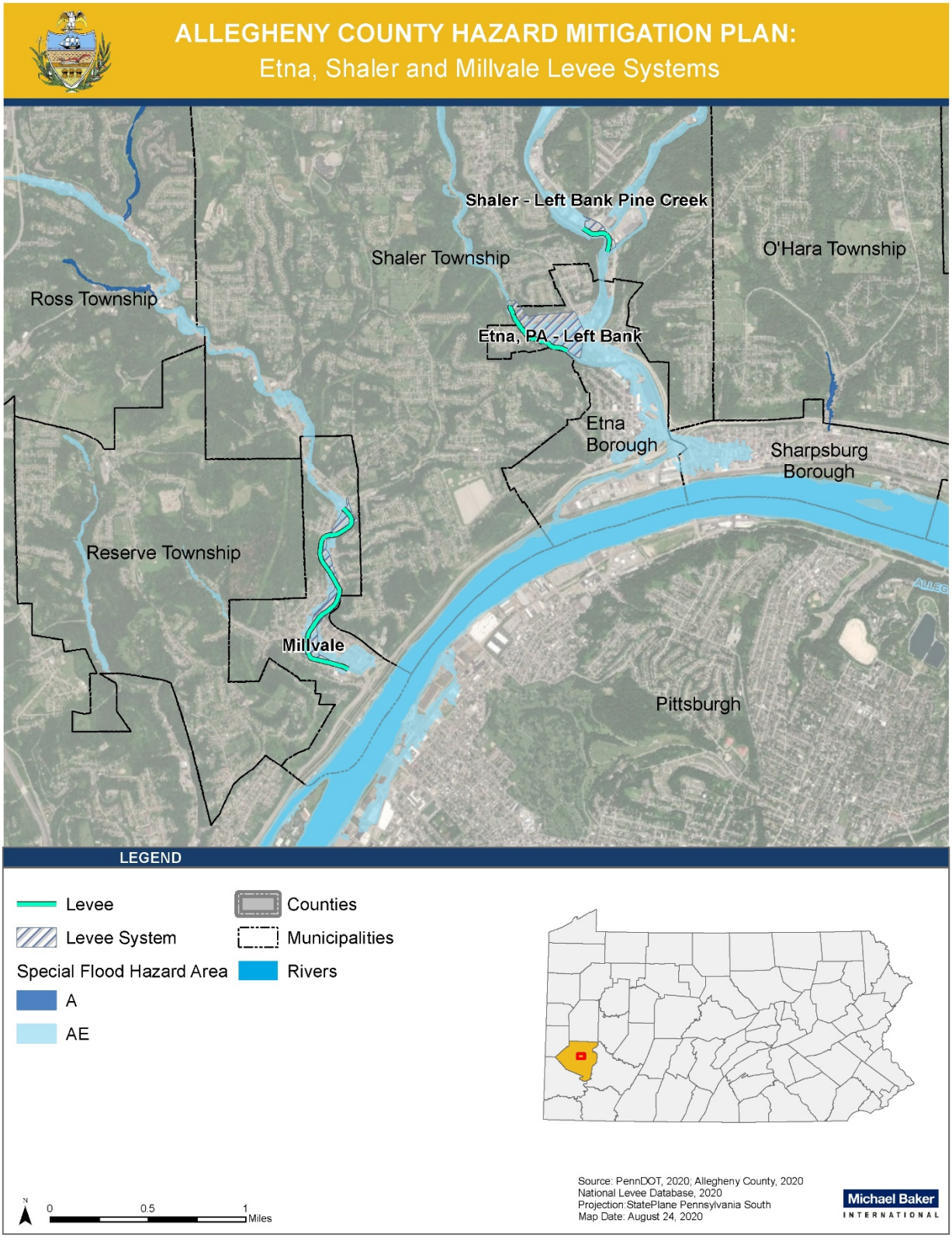
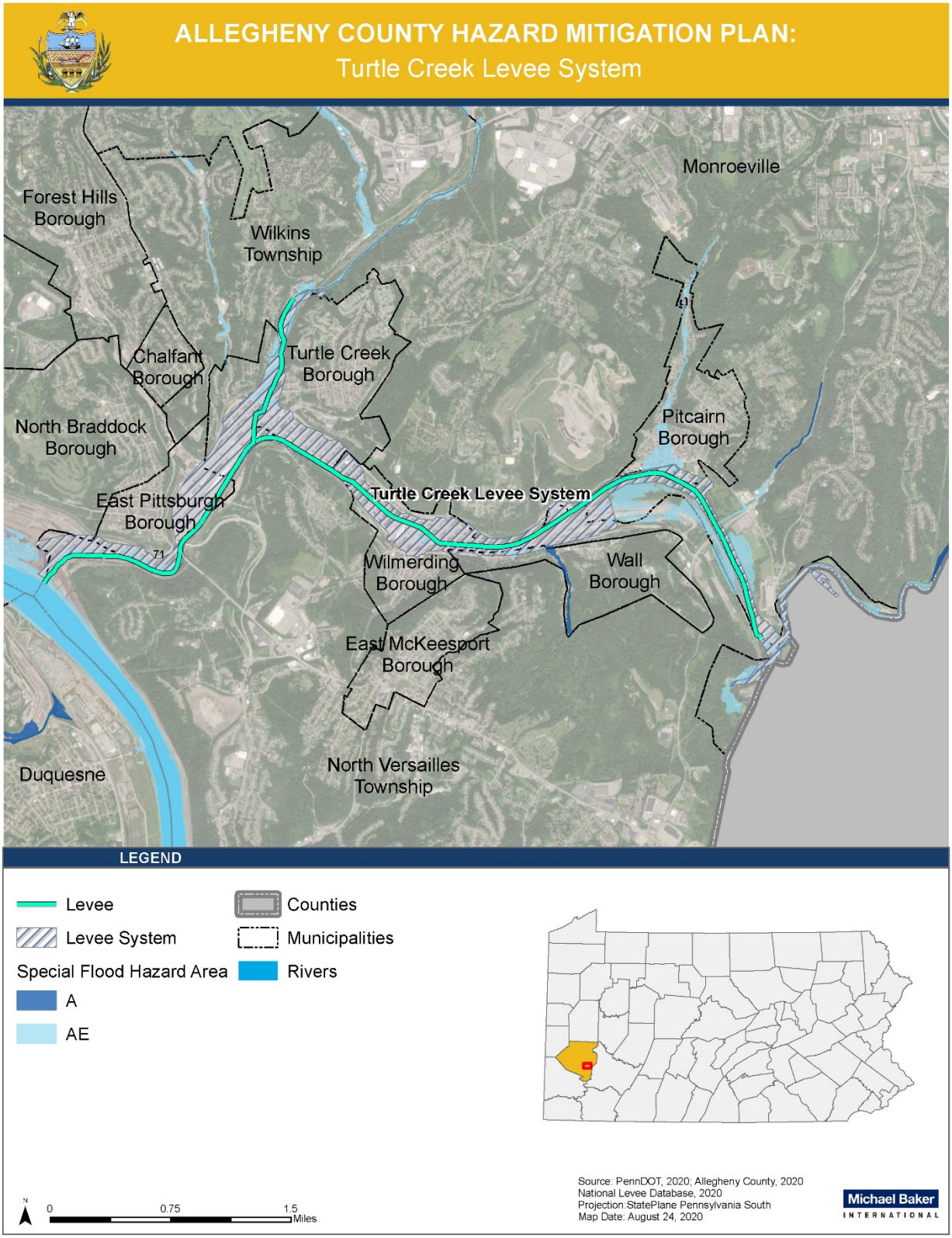


Figure 4.3.15-3 Turtle Creek Levee System



4.3.15.2. Range of Magnitude

Flood-related hazards due to levee failures range in magnitude including overtopping, when the water-level rises over the top of the levee; back-ending, when water flows around the back of the levee, outside of the edge of the levee system; and total failure as seen during Hurricane Katrina. Levees are typically designed with three feet of freeboard to prevent overtopping, but older levees were not built to that standard (FEMA, 2016).

A levee failure of breach causes flooding in landward areas adjacent to the structure. The failure of a levee or other flood protection structure could be devastating depending on the level of flooding for which the structure is designed and the amount of landward development present. In some instances, the magnitude of flooding could be more severe under a levee failure event compared to a normal flooding event. If an abrupt failure occurs, the rushing waters of a flood wave could result in catastrophic losses.

Properties located in the area of reduced risk landward of a levee system are not subject to the mandatory flood insurance purchase requirement of the National Flood Insurance Program. Thus, regardless of whether a levee is accredited, there is concern that properties in these areas lack flood insurance. In the event of a failure, it is like that inundated properties will not be insured.

The environmental impacts of a levee failure result in significant water quality and debris disposal issues. Flood waters will back up sanitary sewer systems and inundate wastewater treatment plants, causing raw sewage to contaminate residential and commercial buildings and the flooding waterway. The contents of unsecured containers of oil, fertilizers, pesticides, and other chemicals get added to flood waters. Water supplies and water treatment could be off-line for weeks. After the flood waters subside, contaminated and flood damaged building materials and contents must be properly disposed. Contaminated sediment must be removed from buildings, yards, and properties.

The worst-case levee failure is one which occurs abruptly with little warning and results in deep, fast-moving flood waters through a developed or populated area. The potential for significant impact from a levee failure to occur in Allegheny County is possible because all levees in Allegheny County are located within densely populated areas.

4.3.15.3. Past Occurrence

There are no known significant historic levee failures in Allegheny County.

4.3.15.4. Future Occurrence

Given certain circumstances, a levee failure can occur at any time. However, the probability of future occurrence can be reduced through proper design, construction, and maintenance measures. The age of the levee can increase the potential for failures if not maintained. In Pennsylvania, the average age of the federally authorized levee systems is nearing 50 years, the typical lifespan of a levee. The average age of the non-federally authorized systems is 48 years (ASCE, 2014)

Most levees are designed to operate safely at specified levels of flooding. While FEMA focuses on mapping levees that will reduce the risk of a 1% annual chance flood, other levees may be designed to protect against smaller or larger floods. Design specifications provide information on the percent-annual-chance

flood a structure is expected to withstand, given that it has been adequately constructed and maintained. Levee failure is also influenced by the frequency and severity of flood events. Changing weather patterns have made the occurrence of heavy rainfall more frequent and extreme. Expected increases in precipitation in the region may lead to increased flooding and flash flooding (Climate Central, 2019). Continued maintenance and upgrades to levee systems are necessary towards reducing risk of inundation in unknown future conditions. For more information on the future occurrence of flood events, please see Section 4.3.3. Overall, the probability of future levee failures can be considered unlikely according to the Risk Factor Methodology.

4.3.15.5. Vulnerability Assessment

With the exception of the Little Pine Creek West Floodwall, no levees in Allegheny County provide protection to the 1%-annual-chance event. At the same time, though, even a non-accredited levee may provide some measure of protection during a lesser storm. To account for this fact, the HMP identifies the structures and critical facilities that are within the levee system in Tables 4.3.15-2 and 4.3.15-3. This should be considered a broad estimate of structures potentially vulnerable to levee failures.

Table 4.3.15-2 **Table 4.1.1-1 Structures and critical facilities vulnerable to Levees**

Municipality	Total Structures	Total Structures Vulnerable to Levee Failure	Percent Structures Vulnerable to Levee Failure	Total Critical Facilities	Critical Facilities Vulnerable to Levee Failure	Percent Critical Facilities Vulnerable to Levee Failure
Aleppo Township	904	0	0%	7	0	0%
Aspinwall Borough	1,256	0	0%	6	0	0%
Avalon Borough	2,359	0	0%	8	0	0%
Baldwin Borough	9,159	0	0%	18	0	0%
Baldwin Township	946	0	0%	3	0	0%
Bell Acres Borough	625	0	0%	8	0	0%
Bellevue Borough	3,005	0	0%	15	0	0%
Ben Avon Borough	759	0	0%	3	0	0%
Ben Avon Heights Borough	144	0	0%	1	0	0%
Bethel Park, Municipality of	13,201	715	5%	34	0	0%
Blawnox Borough	694	0	0%	7	0	0%
Brackenridge Borough	1,538	0	0%	9	0	0%
Braddock Borough	1,244	0	0%	9	0	0%
Braddock Hills Borough	868	0	0%	5	0	0%

Table 4.3.15-2 **Table 4.1.1-1 Structures and critical facilities vulnerable to Levees**

Municipality	Total Structures	Total Structures Vulnerable to Levee Failure	Percent Structures Vulnerable to Levee Failure	Total Critical Facilities	Critical Facilities Vulnerable to Levee Failure	Percent Critical Facilities Vulnerable to Levee Failure
Bradford Woods Borough	507	0	0%	4	0	0%
Brentwood Borough	4,263	0	0%	14	0	0%
Bridgeville Borough	2,277	0	0%	6	0	0%
Carnegie Borough	3,748	0	0%	13	0	0%
Castle Shannon Borough	3,698	0	0%	8	0	0%
Chalfant Borough	417	0	0%	2	0	0%
Cheswick Borough	904	0	0%	6	0	0%
Churchill Borough	1,500	0	0%	6	0	0%
Clairton, City of	4,008	0	0%	15	0	0%
Collier Township	4,512	0	0%	23	0	0%
Coraopolis Borough	2,666	0	0%	13	0	0%
Crafton Borough	2,547	975	38%	6	0	0%
Crescent Township	1,165	0	0%	3	0	0%
Dormont Borough	3,481	0	0%	7	0	0%
Dravosburg Borough	1,043	0	0%	5	0	0%
Duquesne, City of	3,158	0	0%	14	0	0%
East Deer Township	792	0	0%	11	0	0%
East McKeesport Borough	1,034	0	0%	4	0	0%
East Pittsburgh Borough	874	5	1%	4	0	0%
Edgewood Borough	1,444	0	0%	5	0	0%
Edgeworth Borough	673	0	0%	6	0	0%
Elizabeth Borough	704	0	0%	6	0	0%
Elizabeth Township	6,119	1	0%	29	0	0%
Emsworth Borough	1,023	0	0%	8	0	0%
Etna Borough	1,638	965	59%	8	0	0%
Fawn Township	1,068	0	0%	13	0	0%
Findlay Township	3,382	0	0%	27	0	0%
Forest Hills Borough	3,198	0	0%	9	0	0%
Forward Township	1,636	0	0%	17	0	0%

Table 4.3.15-2 **Table 4.1.1-1 Structures and critical facilities vulnerable to Levees**

Municipality	Total Structures	Total Structures Vulnerable to Levee Failure	Percent Structures Vulnerable to Levee Failure	Total Critical Facilities	Critical Facilities Vulnerable to Levee Failure	Percent Critical Facilities Vulnerable to Levee Failure
Fox Chapel Borough	1,972	0	0%	14	0	0%
Franklin Park Borough	5,675	0	0%	14	0	0%
Frazer Township	627	0	0%	14	0	0%
Glassport Borough	2,147	0	0%	12	0	0%
Glen Osborne Borough	243	0	0%	3	0	0%
Glenfield Borough	108	0	0%	1	0	0%
Green Tree Borough	2,516	0	0%	7	0	0%
Hampton Township	7,273	0	0%	39	0	0%
Harmar Township	1,850	0	0%	24	0	0%
Harrison Township	5,428	0	0%	18	0	0%
Haysville Borough	51	0	0%	1	0	0%
Heidelberg Borough	643	0	0%	5	0	0%
Homestead Borough	1,561	0	0%	10	0	0%
Indiana Township	3,496	0	0%	31	0	0%
Ingram Borough	1,313	46	4%	5	0	0%
Jefferson Hills Borough	5,372	0	0%	30	0	0%
Kennedy Township	3,899	1	0%	20	0	0%
Kilbuck Township	368	0	0%	1	0	0%
Leet Township	652	0	0%	5	0	0%
Leetsdale Borough	676	0	0%	13	0	0%
Liberty Borough	1,156	0	0%	7	0	0%
Lincoln Borough	528	0	0%	4	0	0%
Marshall Township	4,312	0	0%	20	0	0%
McCandless, Town of	12,640	0	0%	38	0	0%
McDonald Borough	187	0	0%	0	0	0
McKees Rocks Borough	3,069	0	0%	7	0	0%
McKeesport, City of	9,965	139	1%	47	0	0%
Millvale Borough	1,839	231	13%	9	0	0%
Monroeville, Municipality of	11,943	9	0%	71	1	1%
Moon Township	11,002	0	0%	53	0	0%

Table 4.3.15-2 **Table 4.1.1-1 Structures and critical facilities vulnerable to Levees**

Municipality	Total Structures	Total Structures Vulnerable to Levee Failure	Percent Structures Vulnerable to Levee Failure	Total Critical Facilities	Critical Facilities Vulnerable to Levee Failure	Percent Critical Facilities Vulnerable to Levee Failure
Mount Lebanon, Municipality of	11,685	0	0%	42	0	0%
Mount Oliver Borough	1,508	0	0%	4	0	0%
Munhall Borough	5,161	0	0%	20	0	0%
Neville Township	753	0	0%	22	0	0%
North Braddock Borough	2,657	0	0%	10	0	0%
North Fayette Township	7,950	0	0%	28	0	0%
North Versailles Township	4,996	10	0%	15	0	0%
Oakdale Borough	675	0	0%	27	0	0%
Oakmont Borough	3,140	0	0%	3	0	0%
O'Hara Township	4,311	0	0%	18	0	0%
Ohio Township	3,249	0	0%	17	0	0%
Penn Hills, Municipality of	19,869	0	0%	52	0	0%
Pennsbury Village Borough	503	0	0%	4	0	0%
Pine Township	5,834	0	0%	23	0	0%
Pitcairn Borough	1,421	1	0%	6	1	17%
Pittsburgh, City of	124,624	146	0%	539	2	0%
Pleasant Hills Borough	3,480	0	0%	8	0	0%
Plum Borough	12,099	0	0%	51	0	0%
Port Vue Borough	1,816	0	0%	5	0	0%
Rankin Borough	987	0	0%	4	0	0%
Reserve Township	1,561	0	0%	7	0	0%
Richland Township	4,660	0	0%	19	0	0%
Robinson Township	7,446	9	0%	33	0	0%
Ross Township	15,167	0	0%	45	0	0%
Rosslyn Farms Borough	216	0	0%	3	0	0%
Scott Township	6,899	0	0%	21	0	0%
Sewickley Borough	1,628	0	0%	16	0	0%

Table 4.3.15-2 **Table 4.1.1-1 Structures and critical facilities vulnerable to Levees**

Municipality	Total Structures	Total Structures Vulnerable to Levee Failure	Percent Structures Vulnerable to Levee Failure	Total Critical Facilities	Critical Facilities Vulnerable to Levee Failure	Percent Critical Facilities Vulnerable to Levee Failure
Sewickley Heights	421	0	0%	3	0	0%
Sewickley Hills Borough	276	0	0%	2	0	0%
Shaler Township	12,786	1,141	9%	29	0	0%
Sharpsburg Borough	1,563	0	0%	9	0	0%
South Fayette Township	7,098	0	0%	29	0	0%
South Park Township	5,805	0	0%	15	0	0%
South Versailles Township	168	0	0%	2	0	0%
Springdale Borough	1,728	0	0%	14	0	0%
Springdale Township	859	0	0%	7	0	0%
Stowe Township	3,171	0	0%	13	0	0%
Swissvale Borough	4,107	0	0%	8	0	0%
Tarentum Borough	2,153	18	1%	19	0	0%
Thornburg Borough	190	150	79%	3	0	0%
Trafford Borough	52	18	35%	1	0	0%
Turtle Creek Borough	2,646	453	17%	13	9	69%
Upper St. Clair Township	7,841	0	0%	28	0	0%
Verona Borough	1,364	0	0%	7	0	0%
Versailles Borough	673	20	3%	3	0	0%
Wall Borough	357	14	4%	2	0	0%
West Deer Township	5,665	0	0%	24	0	0%
West Elizabeth Borough	284	0	0%	7	0	0%
West Homestead Borough	1,114	0	0%	6	0	0%
West Mifflin Borough	9,910	0	0%	54	0	0%
West View Borough	2,668	0	0%	12	0	0%
Whitaker Borough	632	0	0%	2	0	0%
White Oak Borough	3,804	58	2%	12	0	0%
Whitehall Borough	5,771	0	0%	19	0	0%

Table 4.3.15-2 **Table 4.1.1-1 Structures and critical facilities vulnerable to Levees**

Municipality	Total Structures	Total Structures Vulnerable to Levee Failure	Percent Structures Vulnerable to Levee Failure	Total Critical Facilities	Critical Facilities Vulnerable to Levee Failure	Percent Critical Facilities Vulnerable to Levee Failure
Wilkins Township	2,771	2	0%	11	0	0%
Wilkinsburg Borough	6,994	0	0%	28	0	0%
Wilmerding Borough	916	381	42%	6	1	17%
Grand Total	**550,774**	**4,239**	**1%**	**2,379**	**12**	**1%**

Table 4.3.15-3 **Structures vulnerable to Levee Failure by Generalized Land Use Type**

Municipality	Total Structures	Agriculture	Commercial	Government	Industrial	Other	Residential	Utilities	Unknown	Grand Total
Aleppo Township	904	0	0	0	0	0	0	0	0	0
Aspinwall Borough	1,256	0	0	0	0	0	0	0	0	0
Avalon Borough	2,359	0	0	0	0	0	0	0	0	0
Baldwin Borough	9,159	0	0	0	0	0	0	0	0	0
Baldwin Township	946	0	0	0	0	0	0	0	0	0
Bell Acres Borough	625	0	0	0	0	0	0	0	0	0
Bellevue Borough	3,005	0	0	0	0	0	0	0	0	0
Ben Avon Borough	759	0	0	0	0	0	0	0	0	0
Ben Avon Heights Borough	144	0	0	0	0	0	0	0	0	0
Bethel Park, Municipality of	13,201	2	10	6	2	0	348	0	0	715
Blawnox Borough	694	0	0	0	0	0	0	0	0	0
Brackenridge Borough	1,538	0	0	0	0	0	0	0	0	0
Braddock Borough	1,244	0	0	0	0	0	0	0	0	0
Braddock Hills Borough	868	0	0	0	0	0	0	0	0	0
Bradford Woods Borough	507	0	0	0	0	0	0	0	0	0
Brentwood Borough	4,263	0	0	0	0	0	0	0	0	0
Bridgeville Borough	2,277	0	0	0	0	0	0	0	0	0
Carnegie Borough	3,748	0	0	0	0	0		0	0	0
Castle Shannon Borough	3,698	0	0	0	0	0	0	0	0	0
Chalfant Borough	417	0	0	0	0	0	0	0	0	0
Cheswick Borough	904	0	0	0	0	0	0	0	0	0
Churchill Borough	1,500	0	0	0	0	0	0	0	0	0
Clairton, City of	4,008	0	0	0	0	0	0	0	0	0
Collier Township	4,512	0	0	0	0	0	0	0	0	0

Table 4.3.15-3 **Structures vulnerable to Levee Failure by Generalized Land Use Type**

Municipality	Total Structures	Agriculture	Commercial	Government	Industrial	Other	Residential	Utilities	Unknown	Grand Total
Coraopolis Borough	2,666	0	0	0	0	0	0	0	0	0
Crafton Borough	2,547	0	0	0	0	0		0	15	975
Crescent Township	1,165	0	0	0	0	0	0	0	0	0
Dormont Borough	3,481	0	0	0	0	0		0	0	0
Dravosburg Borough	1,043	0	0	0	0	0	0	0	0	0
Duquesne, City of	3,158	0	0	0	0	0	0	0	0	0
East Deer Township	792	0	0	0	0	0	0	0	0	0
East McKeesport Borough	1,034	0	0	0	0	0	0	0	0	0
East Pittsburgh Borough	874	0	0	0	0	0	2	0	3	5
Edgewood Borough	1,444	0	0	0	0	0	0	0	0	0
Edgeworth Borough	673	0	0	0	0	0	0	0	0	0
Elizabeth Borough	704	0	0	0	0	0	0	0	0	0
Elizabeth Township	6,119	0	1	0	0	0	0	0	0	1
Emsworth Borough	1,023	0	0	0	0	0	0	0	0	0
Etna Borough	1,638	13	18	7	0	0	925	0	0	965
Fawn Township	1,068	0	0	0	0	0	0	0	0	0
Findlay Township	3,382	0	0	0	0	0	0	0	0	0
Forest Hills Borough	3,198	0	0	0	0	0	0	0	0	0
Forward Township	1,636	0	0	0	0	0	0	0	0	0
Fox Chapel Borough	1,972	0	0	0	0	0	0	0	0	0
Franklin Park Borough	5,675	0	0	0	0	0	0	0	0	0
Frazer Township	627	0	0	0	0	0	0	0	0	0
Glassport Borough	2,147	0	0	0	0	0	0	0	0	0
Glen Osborne Borough	243	0	0	0	0	0	0	0	0	0
Glenfield Borough	108	0	0	0	0	0	0	0	0	0

Table 4.3.15-3 **Structures vulnerable to Levee Failure by Generalized Land Use Type**

Municipality	Total Structures	Agriculture	Commercial	Government	Industrial	Other	Residential	Utilities	Unknown	Grand Total
Green Tree Borough	2,516	0	0	0	0	0		0	0	0
Hampton Township	7,273	0	0	0	0	0	0	0	0	0
Harmar Township	1,850	0	0	0	0	0	0	0	0	0
Harrison Township	5,428	0	0	0	0	0	0	0	0	0
Haysville Borough	51	0	0	0	0	0	0	0	0	0
Heidelberg Borough	643	0	0	0	0	0		0	0	0
Homestead Borough	1,561	0	0	0	0	0		0	0	0
Indiana Township	3,496	0	0	0	0	0	0	0	0	0
Ingram Borough	1,313	0	0	0	0	0		0	1	46
Jefferson Hills Borough	5,372	0	0	0	0	0	0	0	0	0
Kennedy Township	3,899	0	0	0	0	0	0	0	0	1
Kilbuck Township	368	0	0	0	0	0	0	0	0	0
Leet Township	652	0	0	0	0	0	0	0	0	0
Leetsdale Borough	676	0	0	0	0	0	0	0	0	0
Liberty Borough	1,156	0	0	0	0	0	0	0	0	0
Lincoln Borough	528	0	0	0	0	0	0	0	0	0
Marshall Township	4,312	0	0	0	0	0	0	0	0	0
McCandless, Town of	12,640	0	0	0	0	0	0	0	0	0
McDonald Borough	187	0	0	0	0	0	0	0	0	0
McKees Rocks Borough	3,069	0	0	0	0	0		0	0	0
McKeesport, City of	9,965	0	29	0	0	0	52	1	0	139
Millvale Borough	1,839	0	0	0	0	0	0	0	231	231
Monroeville, Municipality of	11,943	0	6	0	0	0	3	0	0	9
Moon Township	11,002	0	0	0	0	0	0	0	0	0

Table 4.3.15-3 **Structures vulnerable to Levee Failure by Generalized Land Use Type**

Municipality	Total Structures	Agriculture	Commercial	Government	Industrial	Other	Residential	Utilities	Unknown	Grand Total
Mount Lebanon, Municipality of	11,685	0	0	0	0	0	0	0	0	0
Mount Oliver Borough	1,508	0	0	0	0	0		0	0	0
Munhall Borough	5,161	0	0	0	0	0	0	0	0	0
Neville Township	753	0	0	0	0	0	0	0	0	0
North Braddock Borough	2,657	0	0	0	0	0	0	0	0	0
North Fayette Township	7,950	0	0	0	0	0	0	0	0	0
North Versailles Township	4,996	0	1	0	8	0	1	0	0	10
Oakdale Borough	675	0	0	0	0	0	0	0	0	0
Oakmont Borough	3,140	0	0	0	0	0	0	0	0	0
O'Hara Township	4,311	0	0	0	0	0	0	0	0	0
Ohio Township	3,249	0	0	0	0	0	0	0	0	0
Penn Hills, Municipality of	19,869	0	0	0	0	0	0	0	0	0
Pennsbury Village Borough	503	0	0	0	0	0		0	0	0
Pine Township	5,834	0	0	0	0	0	0	0	0	0
Pitcairn Borough	1,421	0	1	0	0	0	0	0	0	1
Pittsburgh, City of	124,624	0	0	0	0	0	0	0	129	146
Pleasant Hills Borough	3,480	0	0	0	0	0	0	0	0	0
Plum Borough	12,099	0	0	0	0	0	0	0	0	0
Port Vue Borough	1,816	0	0	0	0	0	0	0	0	0
Rankin Borough	987	0	0	0	0	0	0	0	0	0
Reserve Township	1,561	0	0	0	0	0	0	0	0	0
Richland Township	4,660	0	0	0	0	0	0	0	0	0
Robinson Township	7,446	0	0	0	0	0	0	0	0	9
Ross Township	15,167	0	0	0	0	0	0	0	0	0

Table 4.3.15-3 **Structures vulnerable to Levee Failure by Generalized Land Use Type**

Municipality	Total Structures	Agriculture	Commercial	Government	Industrial	Other	Residential	Utilities	Unknown	Grand Total
Rosslyn Farms Borough	216	0	0	0	0	0		0	0	0
Scott Township	6,899	0	0	0	0	0	0	0	0	0
Sewickley Borough	1,628	0	0	0	0	0	0	0	0	0
Sewickley Heights	421	0	0	0	0	0	0	0	0	0
Sewickley Hills Borough	276	0	0	0	0	0	0	0	0	0
Shaler Township	12,786	4	5	3	0	0	963	0	0	1,141
Sharpsburg Borough	1,563	0	0	0	0	0	0	0	0	0
South Fayette Township	7,098	0	0	0	0	0	0	0	0	0
South Park Township	5,805	0	0	0	0	0	0	0	0	0
South Versailles Township	168	0	0	0	0	0	0	0	0	0
Springdale Borough	1,728	0	0	0	0	0	0	0	0	0
Springdale Township	859	0	0	0	0	0	0	0	0	0
Stowe Township	3,171	0	0	0	0	0	0	0	0	0
Swissvale Borough	4,107	0	0	0	0	0	0	0	0	0
Tarentum Borough	2,153	0	0	1	0	0	17	0	0	18
Thornburg Borough	190	0	0	0	0	0		0	1	150
Trafford Borough	52	0	1	0	0	0	17	0	0	18
Turtle Creek Borough	2,646	6	1	0	0	0	446	0	0	453
Upper St. Clair Township	7,841	0	0	0	0	0	0	0	0	0
Verona Borough	1,364	0	0	0	0	0	0	0	0	0
Versailles Borough	673	0	0	1	0	0	19	0	0	20
Wall Borough	357	0	3	0	2	0	9	0	0	14
West Deer Township	5,665	0	0	0	0	0	0	0	0	0
West Elizabeth Borough	284	0	0	0	0	0	0	0	0	0
West Homestead Borough	1,114	0	0	0	0	0		0	0	0

Table 4.3.15-3 **Structures vulnerable to Levee Failure by Generalized Land Use Type**

Municipality	Total Structures	Agriculture	Commercial	Government	Industrial	Other	Residential	Utilities	Unknown	Grand Total
West Mifflin Borough	9,910	0	0	0	0	0	0	0	0	0
West View Borough	2,668	0	0	0	0	0	0	0	0	0
Whitaker Borough	632	0	0	0	0	0	0	0	0	0
White Oak Borough	3,804	0	13	0	0	0	41	0	0	58
Whitehall Borough	5,771	0	0	0	0	0	0	0	0	0
Wilkins Township	2,771	0	0	0	0	0	2	0	0	2
Wilkinsburg Borough	6,994	0	0	0	0	0	0	0	0	0
Wilmerding Borough	916	0	51	0	7	0	323	0	7	381
Grand Total	**550,774**	**25**	**140**	**18**	**19**	**0**	**3,168**	**1**	**387**	**5,508**

4.3.16. Nuclear Incidents

4.3.16.1. Location and Extent

Through a Memorandum of Understanding (MOU), the Nuclear Regulatory Commission (NRC) and FEMA share federal oversight for nuclear/radiological emergency response planning matters for licensed nuclear power plants. Their mutual efforts will be directed toward more effective plans and related preparedness measures at and in the vicinity of nuclear reactors and fuel cycle facilities. The MOU between the agencies was signed on January 14, 1980, in response to the president's decision of December 7, 1979, stating that FEMA will coordinate all federal planning for the off-site impact of nuclear/radiological emergencies; take the lead for assessing off-site nuclear/radiological emergency response plans and preparedness; make findings and determinations as to the adequacy and capability of implementing off-site plans; and communicate those findings and determinations to the NRC. The NRC reviews those FEMA findings and determinations, in conjunction with the NRC's on-site findings, to determine the overall state of emergency preparedness.

A separate MOU, dated October 22, 1980, deals with NRC and FEMA cooperation and responsibilities in response to an actual or potential nuclear/radiological emergency. Operations Response Procedures have been developed that implement the provisions of the Incident Response MOU. These documents are intended to be consistent with the Federal Radiological Emergency Response Plan, which describes the relationships, roles, and responsibilities of federal agencies for responding to accidents involving peacetime nuclear/radiological emergencies.

Only a very small portion of Allegheny County is within the 10-Mile Emergency Planning Zone for Beaver Valley, located in Beaver County. However, the entire county is within the 50-mile EPZ of the plant. Pennsylvania's four other nuclear power plants are more than 50 miles away from Allegheny County; this distance exceeds the Plume-Exposure and Ingestion Exposure Pathway EPZs for nuclear emergencies, so these other facilities are considered a minimal threat to the County. Figure 4.3.16-1 illustrates the location of the nuclear facilities in the Commonwealth and their associated EPZs.

The NRC encourages the use of Probabilistic Risk Assessments (PRAs) to estimate quantitatively the potential risk to public health and safety when considering the design, operations, and maintenance practices at nuclear power plants. PRAs typically focus on accidents that can severely damage the core and that may challenge containment. FEMA, PEMA, and county governments have formulated Radiological Emergency Response Plans (RERPs) to prepare for nuclear/radiological emergencies at the five nuclear power-generating facilities in the Commonwealth of Pennsylvania. These plans include the following:

- A Plume Exposure Pathway EPZ within a radius of 10 miles from each power plant
- An Ingestion Exposure Pathway EPZ within a radius of 50 miles from each plant

Plume Exposure Pathway refers to whole-body external exposure to gamma radiation from the plume and from deposited materials and inhalation exposure from the passing radioactive plume. The duration of

primary exposures could range in length from hours to days. The Ingestion Exposure Pathway refers to exposure primarily from ingestion of water or foods such as milk and fresh vegetables that have been contaminated with radiation. The exact size and configuration of the EPZ may vary in relation to local emergency response capabilities, topography, road networks, and political boundaries.

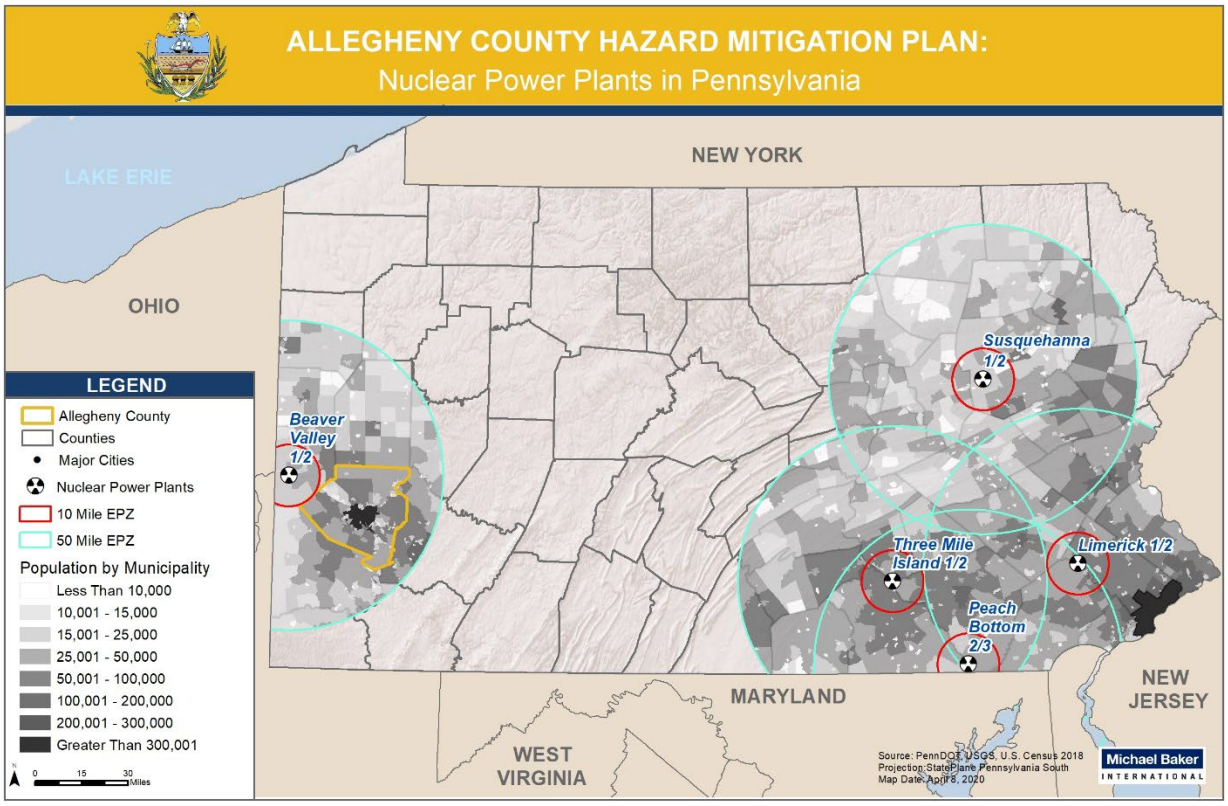
The County RERPs, which are part of the County Emergency Operations Plan, also include the following:

- Preventive and emergency protective actions
- Response levels and associated protective action guides (PAGs) for food
- Recommended PAGs within an Ingestion Exposure Pathway EPZ
- Information for farmers to assist in protection of their livestock and crops from radioactive contamination

Nuclear facilities must notify the appropriate authorities in the event of an accident. The federally recognized classification levels are Unusual Event, Alert, Site Area Emergency, and General Emergency. After a nuclear/radiological incident, the main concern is the effect on the health of the population near the incident. External radiation, inhalation, and ingestion of radioactive isotopes can cause acute health effects (death, severe health impairment), chronic health effects (cancers), and psychological effects that can affect health. Additional considerations include the long-term effects to the environment and agriculture.

At the time of this update, PEMA is in the process of updating their Nuclear Evacuation plan in order to effectively target response to a nuclear incident. Through this method, the state will transition from an “all go/no go” approach to evacuation or shelter to a keyhole approach where only sub areas that are directly impacted by a nuclear incident would have to evacuate or shelter. This new method will allow for focused resources and attempt to minimize unnecessary strain on emergency services. While this plan is still being developed, it will impact how and when Allegheny will respond to a nuclear incident.

Figure 4.3.16-1 Location of Allegheny County in Relation to Pennsylvania Nuclear Power Stations, their Emergency Planning Zones (EPZs), and the Population Density of Affected Municipalities (PEMA, 2009 and Census, 2018).



4.3.16.2. Range of Magnitude

Beaver Valley is the closest nuclear power plant, approximately 10 miles from Allegheny County; all other nuclear power plants in the state are over 150 miles away. The entire county lies within the 50-mile Ingestion Exposure Pathway EPZ designated for nuclear/radiological emergencies. The magnitude of a nuclear incident differs for those within the Plume Exposure Pathway EPZ and those within the Ingestion Exposure Pathway EPZ. The Plume Exposure Pathway refers to whole-body external exposure to gamma radiation from a radioactive plume and from deposited materials and inhalation exposure from the passing radioactive plume. The duration of primary exposures could range in length from hours to days. The Ingestion Exposure Pathway refers to exposure primarily from ingestion of water or foods such as milk and fresh vegetables that have been contaminated with radiation.

Nuclear accidents themselves are classified into three categories:

- **Criticality accidents:** Involves loss of control of nuclear assemblies or power reactors.
- **Loss-of-coolant accidents:** Occurs whenever a reactor coolant system experiences a break or opening large enough so that the coolant inventory in the system cannot be maintained by the normally operating make-up system.

- **Loss-of-containment accidents:** Involves the release of radioactivity from materials such as tritium, fission products, plutonium, and natural, depleted, or enriched uranium. Points of release have been containment vessels at fixed facilities or damaged packages during transportation accidents.

Nuclear facilities must notify the appropriate authorities in the event of an accident. The Nuclear Regulatory Commission uses four classification levels for nuclear incidents (Nuclear Regulatory Commission, 2008):

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

The accident at the Three Mile Island Generating Station in March 1979 remains the nation's only nuclear incident at the General Emergency level and remains the worst nuclear incident on record in the Commonwealth and the nation. During this incident, equipment malfunctions, design-related problems, and worker errors led to a partial meltdown of the TMI Unit 2 reactor core at TMI.

The worst-case radiological release event would be a major release of radioactive material from the Beaver Valley Nuclear Generating Station. This event could generate a great deal of fear for residents of western Pennsylvania. In addition, as a neighboring county, Allegheny County would be impacted by large numbers of evacuees dramatically increasing the volume of traffic the county's transportation networks. Finally, there is the potential for radioactive contamination to reach Allegheny County, leading to the possibility of evacuations from portions of the county. Specific impacts depend on the extent of the spread of the contamination.

The nuclear industry has adopted pre-determined, site-specific Emergency Action Levels (EALs). The EALs provide the framework and guidance to observe, address, and classify the severity of site-specific events and conditions that are communicated to off-site emergency response organizations (Nuclear Regulatory Commission, 2008). There are additional EALs that specifically deal with issues of security, such as threats

of airborne attack, hostile action within the facility, or facility attack. These EALs ensure that appropriate notifications for the security threat are made in a timely manner. Each facility is also equipped with a public alerting system, which includes a number of sirens to alert the public located in the Plume Ingestion Pathway EPZ. This alerting system is activated by the counties of each specific EPZ. Emergency notifications and instructions are communicated to the public via the Emergency Alert System as activated by the Commonwealth of Pennsylvania Emergency Operations Center. State officials also have the capability to send emergency messages as text messages to mobile devices.

4.3.16.3. Past Occurrence

Nuclear incidents rarely occur, but the incident at Three Mile Island is the worst fixed-nuclear facility accident in U.S. history. The resulting contamination and state of the reactor core led to the development of a fourteen-year cleanup and scientific effort. Additionally, the President's Commission on the Accident at Three Mile Island examined the costs of the accident, concluding, "The accident at Three Mile Island on March 28, 1979, generated considerable economic disturbance. Some of the impacts were short term, occurring during the first days of the accident. Many of the impacts were experienced by the local community; others will be felt at the regional and national levels." The report concluded: "It appears clear that the major costs of the TMI Unit 2 accident are associated with the emergency management replacement power and the plant refurbishment or replacement. The minimum cost estimate of nearly $1 billion supports the argument that considerable additional resources can be cost effective if spent to guard against future accidents."

Despite the severity of the damage, no injuries due to radiation exposure occurred. However, numerous studies were conducted to determine the measurable health effects related to radiation and/or stress. More than a dozen epidemiological and stress related studies conducted to date have found no discernible direct health effects to the population in the vicinity of the plant. However, one study conducted by the PA Department of Health's Three Mile Island Health Research Program did find evidence of psychological stress (National Energy Institute, 2010).

The accident at Three Mile Island had a profound effect on the residents, emergency management community, government officials and nuclear industry, not only in Pennsylvania, but nationwide. There were minimal requirements for off-site emergency planning for nuclear power stations prior to this accident. Afterwards, comprehensive, coordinated, and exercised plans were developed for the state, counties, school districts, special facilities (hospitals, nursing homes and detention facilities) and municipalities to assure the safety of the population. Costs associated with an event at one of the Commonwealth's nuclear facilities, be it real or perceived, are significant. The mitigation efforts put in place immediately following the 1979 continue until today. The Commonwealth Nuclear/Radiological plan which is a successor of the original "Annex E" is a result of the Commonwealth's efforts to address the many components of mitigation planning. The comprehensive planning involved with the five nuclear facilities is an ongoing effort. Plans are reviewed and amended on an annual basis. Recent amendments to various planning documents and station procedures include the efforts to enhance station security measures and the means to bolster communications and response in the event of terrorist activities.

In April 2015, there was an emergency shutdown because a pump malfunctioned in Unit 1, but there was no radioactivity released. There have been no significant nuclear incidents at Beaver Valley since the last plan update.

4.3.16.4. Future Occurrence

Pennsylvania is home to the only nuclear power plant General Emergency in the nation. Since the Three Mile Island incident, nuclear power has become significantly safer and is one of the most heavily regulated industries in the nation. Despite the knowledge gained since then, there is still the potential for a similar accident to occur again at one of the five nuclear generating facilities in the Commonwealth. The Nuclear Energy Agency of the Organization for Economic Co-Operation and Development notes that studies estimate the chance of protective barriers in a modern nuclear facility at less than one in 100,000 per year (Nuclear Energy Agency 2005). In addition, FirstEnergy, the owner of the facility, has begun rolling out additional safety-related recommendations stemming from the Fukushima nuclear incident, which should further reduce future nuclear incidents that are secondary to natural hazard events. Nuclear incident occurrences may also occur as a result of intentional actions; these acts are addressed under Section 4.3.16: Terrorism.

The Beaver Valley Nuclear Generating station was scheduled to close in 2021, which would have significantly reduced the risk of a nuclear incident in Allegheny County. However, in early 2020 the decision to close the plant was rescinded. This decision was driven by the efforts of Governor Wolf's administration to join the Regional Greenhouse Gas Initiative (RGGI), which may be implemented in early 2022. While the decision to close Beaver Valley has been stopped for now, it may be put back on the table if the RGGI does not get implemented as planned.

The probability of future nuclear incidents is unlikely, as defined by the Risk Factor probability criteria (see Table 4.4-1). However, if an event were to occur, Allegheny County would likely be adversely affected. It could see the arrival of displaced persons and all municipalities, including the City of Pittsburgh, could see immediate economic impacts as the entire county is within the 50-mile EPZ.

4.3.16.5. Vulnerability Assessment

The effects and impacts of a nuclear/radiological threat depend on the type of radiation released, the duration of the release, the volume of the release, and the existing weather conditions, such as wind speed and direction. As previously stated, Allegheny County is located within the 50-mile ingestion zone for the Beaver Valley facility.

The County's primary vulnerability to nuclear incidents comes in the form of food, soil, and water contamination. Soil contamination would have an impact on the county's agriculture. Time of year also impacts the vulnerability and losses estimated for a nuclear incident; an incident that occurs during the prime growing and harvesting season will have a larger impact on the County, while off-season events would result in much lower losses. Water contamination is also a concern in nuclear incidents. The public water systems and many of the county's drinking water wells are all vulnerable to the effects of a nuclear incident. For a listing of these facilities, see Section 4.3.1.5.

4.3.17. Opioid Addiction and Response

4.3.17.1. Location and Extent

Opioid addiction occurs when an individual becomes physically dependent on opioid, a class of drugs that reduces pain. Opioid is used as a broad term and includes opiates, which are drugs naturally extracted from certain types of poppy plants, and narcotics. Opioids can also be synthetically made to emulate opium.

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

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

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

Heroin: An illegal natural opioid process from morphine and is also becoming more commonly used in the United States.

Opioids are highly addictive. They block the body's ability to feel pain and can create a sense of euphoria. Additionally, individuals often build a tolerance to opioids, which can lead to misuse and overdose. Fentanyl and fentanyl-related substances are hazardous materials and should be treated as such. Contact with fentanyl can impact first responders and family and friends of opioid users. Depending on the potency of the drug, it can take as a little as the equivalent of a few grams of table salt to cause health complications (DEA, 2017a).

Opioid addiction impacts the entire Commonwealth. Nationally, Pennsylvania is among four of the hardest hit states from opioid-related deaths, along with West Virginia, Ohio, and New Hampshire. The CDC estimates that nearly 38 out of every 100,000 Pennsylvania residents died from opioid-related overdoses in 2016, higher than the national rate of opioid-related deaths of approximately 20 out of 100,000 people. While overdose-related deaths decreased by 4% between 2017 and 2018, still more than 67,000 people died from drug overdoses in 2018. Unfortunately, this made drug overdoses the leading cause of injury-related death in the United States. In Pennsylvania, overdoses caused by opioids have become the leading cause of accidental death, surpassing automobile accidents (CDC, 2020).

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

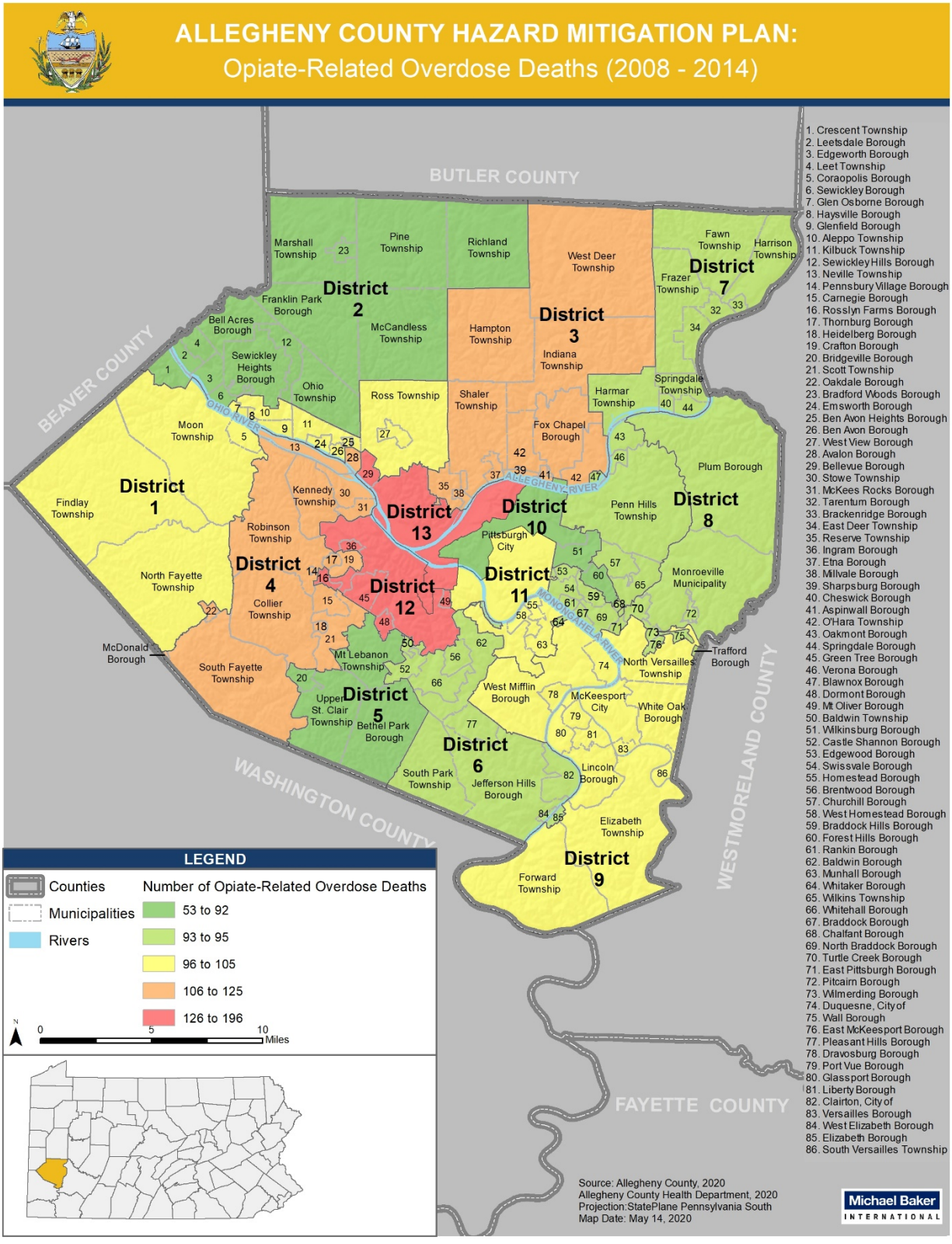
According to a recent study, environmental scientists at the Cary Institute of New York found traces of opioid and other drugs in streams, rivers, and lakes. These traces came from human urine and feces, and medications that have been flushed down the toilet. However, the ecological and environmental impacts are unknown. The United Stated 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, 2010).

The Allegheny County Health Department (ACHD) collects data on opioid use and overdose under its Opioid and Overdose Prevention initiative. The following map displays the number of opioid-related overdoses in Allegheny County from 2008-2014 (ACHD, 2020b). The greatest number of opioid-related overdoses were seen in the central portions of the County. However, the entire county is at risk to opioid use and overdose.

Table 4.3.17-1 **Opioid-Related Overdoses by Allegheny County Council District: 2008-2014 (ACHD, 2020b)**

Council District	Number of Deaths	Rate Per 1,000 Population
1	98	1.03
2	53	0..58
3	109	1.13
4	125	1.30
5	63	0.70
6	93	0.98
7	94	0.99
8	95	0.99
9	100	1.04
10	92	0.99
11	105	1.14
12	197	2.03
13	175	1.91

Figure 4.3.17-1 Opioid-Related Overdoses by Allegheny County Council District: 2008-2014 (ACHD, 2020b)



4.3.17.2. Range of Magnitude

Opioid addiction can lead to overdose, which can be fatal. The most dangerous side effect of an opioid overdose is depressed breathing. The lack of oxygen to the brain causes permanent brain damage, leading to organ failure, and eventually, death. Signs and symptoms include respiratory depression, drowsiness, disorientation, pinpoint pupils, and clammy skin.

Opioid addiction can also be passed from mother to child in the womb. This condition, known as neonatal abstinence syndrome, has increased five-fold from 2004 to 2014, according to the National Institute of Drug Abuse (NIDA). In 2014, there were an estimated 32,000 babies born with this condition (NIDA, 2019).

First responders – paramedics, police officers, and fire fighters, are also affected by Pennsylvania's opioid addiction crisis. In addition to the crisis consuming time and resources, first responders also face exposure risk, particularly to synthetic fentanyl. According to the DEA, it takes two to three milligrams of fentanyl to induce respiratory depression, arrest, and possibly death. Since fentanyl is indistinguishable from several other narcotics and powdered substances, first responders must take extra precaution when dealing with calls related to drug abuse (DEA, 2017b).

4.3.17.3. Past Occurrence

The CDC found that opioids are the main cause of drug-related overdoses and deaths, being responsible for nearly seventy-five percent of drug-related deaths nationally in 2017. Of the more than 4,600 drug-related deaths in Pennsylvania in 2016, nearly 84 percent were attributed to two or more drugs. Therefore, drug-related overdose and death statistics account for all drug types, however, as noted above, the majority of drug-related deaths involve opioids.

The following table shows the number of opioid-related overdoses in Allegheny County from 2008 through 2019. In 2017, there was an unprecedented number of overdose-related deaths in Allegheny County. Of the 737 overdoses, 623 were due to opioid use. However, there was a 40% decrease in fatal overdoses in 2018. Deaths decreased to 423, 366 being related to opioid use (ACHD, 2020a).

Table 4.3.17-2 **Number of Opioid-Related Overdoses in Allegheny County 2008-2019 (OverdoseFreePA, 2020).**

Year	Number of Deaths	Year	Number of Deaths
2008	234	2014	306
2009	225	2015	424
2010	227	2016	650
2011	262	2017	737
2012	290	2018	432
2013	276	2019	448

Though an opioid addiction crisis is complex and unprecedented, it is widely acknowledged that the opioid crisis began in the late 1990s when pharmaceutical companies introduced opioid-based pain medication, such as OxyContin, Percocet, and Vicodin. As these drugs become more frequently prescribed, misuse and overdose increased and it became clear that prescription opioids were highly addictive (NIDA, 2020).

4.3.17.4. Future Occurrence

Pennsylvania has seen a steady rise in opioid related deaths over the last several years, with drug-related death rates increasing 102 percent between 2014 and 2017. If opioid related deaths continue to increase at this pace, then the Commonwealth could experience an estimated 10,000 drug-related deaths in the year 2020.

However, future occurrences of opioid addiction and misuse, overdose, and fatalities are unclear as the state moves forward with overdose prevention initiatives. In January 2018, Governor Tom Wolf declared Pennsylvania's opioid addictions epidemic a disaster emergency. This declaration should enhance coordination and data collection between state and local responders, improve tools for families and first responders, and expand treatment access. The declaration also improves access to naloxone, a lifesaving drug that reverses the effects of a drug-overdose. In addition, a new Opioid Coordination Group is housed within the Pennsylvania Emergency Management Agency (PA DOH, 2018).

The ACHD is working with government and community partners to address the opioid epidemic head-on. The department received an Overdose Data to Action grand from the CDC allowing for staff increases. Greater capacity has enabled the ACHD to conduct surveillance for overdoses in addition to increasing outreach to community partners. The ACHD offers a few key programs to prevent overdose related deaths. The department started offering drug take-back opportunities in high risk communities. Additionally, naloxone distribution has been expanded to the county jail, through all first responders, and in for pick up in pharmacies without prescription (ACHD, 2020a).

Overall, the probability of future opioid overdose and death is *likely* as defined by the Risk Factor Methodology (see Section 4.4.1).

4.3.17.5. Vulnerability Assessment

County facilities are not at risk to the opioid crisis, but there are some occupation-specific risks that may make some employees more vulnerable. Employees working in direct patient care are vulnerable to fentanyl exposure. Since fentanyl can be ingested orally, inhaled through the nose or mouth, or absorbed through the skin or eyes, any substance suspected to contain fentanyl should be handled with extreme caution. Exposure to a small amount of fentanyl can lead to respiratory depression or death. Fentanyl-related substances have been found in powders, pills, capsules, liquids, and on blotter paper. The DEA recommends that all first responders carry a Personal Protective Equipment (PPE) kit that includes: nitrile gloves, N-95 dust masks, sturdy eye protection, paper coveralls and show protection, and naloxone injectors. The DEA also suggests using extreme caution when using police dogs, as they are at serious risks to health complications from inhaling fentanyl and fentanyl-related substances (DEA, 2017b).

Additionally, absenteeism from jobs associated with an opioid addiction in high-risk areas could lead to economic loss through lost productivity and increased medical costs.

In general, jurisdictions that are more densely populated are more vulnerable to opioid addiction threats as access to the drugs increases. However, as stated above, rural communities have experienced larger per-capita opioid-related deaths.

Jurisdictional losses in the opioid addiction crisis stem from lost wages, productivity, and resources rather than losses to buildings or land. Locally, many Pennsylvania counties have seen an increase of time and resources devoted to the opioid epidemic as overdose and response increases, however there is no comprehensive tracking mechanism to record total local losses associated with the opioid crisis.

Impacts including total costs to jurisdictions are only beginning to be understood, researched, and tracked. There is no comprehensive database currently tracking monetary losses at the local level. However, the American Enterprise Institute (AEI), using national data from the CDC and White House Council of Economic Advisors, calculated a total cost per capita ($1,799), of the opioid epidemic for Pennsylvania. Using this per capita estimate in combination with county population estimates, losses can be estimated for Allegheny County. It is important to note that this methodology assumes equal per capita opioid misuse and fatalities across all counties, however, based on reported drug overdoses and drug related deaths, it is known that some counties, including those in the southwestern region, are more vulnerable and more likely to experience higher per capita costs while counties in central and north central Pennsylvania tent to be less vulnerable and likely have lesser costs per capita. Another important caveat regarding this methodology is that a portion of the costs will have been state losses rather than County or jurisdictional, but the ratio of state to local cost burden is unknown at this time. It is estimated that Allegheny County has had a total per capita cost of $2,204,784,239.

4.3.18. Terrorism

4.3.18.1. Location and Extent

The term “terrorism” refers to intentional, criminal, malicious acts, but the functional definition of terrorism can be interpreted in many ways. Officially, terrorism is defined in the Code of Federal Regulations as “the unlawful use of force and violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives” (28 CFR §0.85).

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

Terrorism refers to the use of weapons of mass destruction (WMD), including, biological, chemical, radiological, and nuclear weapons; arson, incendiary, explosive, and armed attacks; industrial sabotage and agriterrorism; intentional hazardous materials releases; and cyber-terrorism.

Terrorism is a threat everywhere, but there are a number of important considerations in evaluating terrorism hazards, such as the existence of facilities, landmarks, or other buildings of international, national, or regional importance. High-risk targets for acts of terrorism include military and civilian government facilities, international airports, large cities, and high-profile landmarks. Terrorists might also target large public gatherings, water and food supplies, utilities, and corporate centers. Furthermore, terrorists are capable of spreading fear by sending explosives or chemical and biological agents through the mail (FEMA, April 2009). Additionally, terrorists use threats to create fear, to try to convince citizens

of the powerlessness of their government, and/or to get publicity for their cause. Nonetheless, terrorism can take many forms and terrorists have a wide range of personal, political, or cultural agendas.

The probability of terrorism cannot be quantified with as great a level of accuracy as that of many natural hazards. Furthermore, these incidents generally occur at a specific location, such as a government building, rather than encompassing an area such as a floodplain. This type of attack could take place at any facility or public or private location in the County. Allegheny County has many high profile and public places that could be considered targets, including, but not limited to, business centers, especially in downtown Pittsburgh which has a high daytime workforce population; educational centers, including University of Pittsburgh; cultural centers, including Allegheny Center and the Cultural District in Pittsburgh; arenas and stadiums, including PNC Park, Heinz Field, and CONSOL Energy Center; and the hazardous material sites detailed in Section 4.3.14.

4.3.18.2. Range of Magnitude

The severity of terrorist incidents depends upon the type of method used, the proximity of the attack to people, animals, or other assets, and the duration of exposure to the incident or to a device (in the case of chemical, radiological, or biological agent attacks). For example, chemical agents are poisonous gases, liquids, or solids that have toxic effects on people, animals, or plants. Many chemical agents can cause serious injuries or death. In this case, severity of injuries depends on the type and amount of the chemical agent used and the duration of exposure.

Biological agents are organisms or toxins that have illness-producing effects on people, livestock, and crops. Some biological agents cannot be easily detected and may take time to develop. Therefore, it can be difficult to know that a biological attack has occurred until victims display symptoms. In other cases, the effects are immediate. Those affected by a biological agent require the immediate attention of professional medical personnel. Some agents are contagious which may result in the need for victims to be quarantined.

An evolving type of terrorist threat is Complex Coordinated Terrorist Attacks (CCTAs). CCTAs are acts of terrorism that involve synchronized and independent team(s) at multiple locations, sequentially or in close succession, initiated with little or no warning, and employing one or more weapon systems which could include firearms, explosives, fire as a weapon, and other nontraditional attack methodologies that are intended to result in large numbers of casualties (FEMA, 2019). The dynamic of CCTAs cause the threat to be unknown, which is a shift from the traditional symbolic and highly planned attacks. CCTAs could occur anywhere, at any time, with the potential for mass casualties and infrastructure damage.

Depending on the type of terrorist attack, there may be significant loss of life for humans and animals as well as economic losses. Additionally, the impact of the attack itself may be exacerbated by the fact that human services agencies like community support programs, health and medical services, public assistance programs, and social services can experience physical damage to facilities, supplies, and equipment and disruption of emergency communications. There may also be ancillary effects of terrorism such as urban fires or, in the case of a radiological device, radioactive fallout that can multiply the impact of a terrorist event.

A worst-case scenario of a terrorism event in Allegheny County would be if multiple "dirty bomb" devices – or explosive devices with radiological material – were set to explode in quick succession near the Allegheny and North Side transit stations and in the Allegheny Commons Park on a weekend afternoon in the fall when a pre-season Steelers game and a Pirates game are both being held and the tourist population at the museums are high. This type of event would cause casualties and fatalities across all demographics, and depending on the time of recovery, would cause severe economic losses. In addition to the physical injuries, there will be high emotional and behavioral impacts on the population who was near the attack, as well as the residents of Allegheny County who were not near the attack.

4.3.18.3. Past Occurrence

There has been a high consciousness of terrorist activity in the press with few catastrophic events. The most significant terrorist attack on US soil occurred on September 11, 2001; Flight 93, the fourth hijacked aircraft in the attack, crashed in Somerset County, Pennsylvania.

While there have not been any catastrophic terrorist attacks in Allegheny County, the most notable attack was an active shooter incident at a Monroeville Mall in February 2015. There have been a number of shooting threats reported. As a recent example, in March 2019 a local man threatened to shoot up a local high school on social media, but he was found an arrested removing the threat. Additionally, there have been a number of reported bomb threats in different institutions in Allegheny County, especially at Pittsburgh University. Anecdotally, Allegheny County is also vigilant in checking all reported unattended packages and bags to ensure that they do not pose a threat to the nearby population.

4.3.18.4. Future Occurrence

An important consideration in estimating the likelihood of a terrorist incident is the existence of facilities, landmarks, or other buildings of national or regional importance. As previously noted, Allegheny County has many high profile and public places that could be considered terrorist targets, and the county hosts many special events annually, from sporting events, to concerts, to festivals. Additionally, the county has multiple hazardous material sites which could be targeted for attack that could impact the surrounding area. Based on historical events, Allegheny County can expect to experience multiple reports of suspicious activities and bomb threats each year, but these have not historically manifested in terrorism events.

Although previous events have not resulted in what are considered significant terrorist attacks, the severity of a future incident cannot be predicted with a sufficient level of certainty. Prediction of terrorist attacks is almost impossible because terrorism is a result of human factors. As long as fringe groups maintain radically different ideas than that of the government or general population, terrorism is a possibility. The likelihood of a terrorist attack is considered unlikely, as defined by the Risk Factor Methodology (see Table 4.4-1).

4.3.18.5. Vulnerability Assessment

Since the probability of terrorism occurring cannot be quantified in the same way as that of many natural hazards, it is not possible to assess vulnerability in terms of likelihood of occurrence. Instead, vulnerability is assessed in terms of specific assets. By identifying potentially at-risk terrorist targets in Allegheny County, planning efforts can be put in place to reduce the risk of attack. FEMA's Integrating Manmade Hazards into Mitigation Planning (2003) encourages site-specific assessments that should be based on the

relative importance of a particular site to the surrounding community or population, threats that are known to exist, and vulnerabilities including:

- Inherent vulnerability:
    - Visibility – How aware is the public of the existence of the facility?
    - Utility – How valuable might the place be in meeting the objectives of a potential terrorist?
    - Accessibility – How accessible is the place to the public?
    - Asset mobility – is the asset's location fixed or mobile?
    - Presence of hazardous materials – Are flammable, explosive, biological, chemical and/or radiological materials present on site? If so, are they well secured?
    - Potential for collateral damage – What are the potential consequences for the surrounding area if the asset is attacked or damaged?
    - Occupancy – What is the potential for mass casualties based on the maximum number of individuals on site at a given time?
- Tactical vulnerability:
    - Site Perimeter
        - Site planning and Landscape Design – Is the facility designed with security in mind – both site-specific and with regard to adjacent land uses?
        - Parking Security – Are vehicle access and parking managed in a way that separates vehicles and structures?
    - Building Envelope
        - Structural Engineering – Is the building's envelope designed to be blast-resistant? Does it provide collective protection against chemical, biological, and radiological contaminants?
    - Facility Interior
        - Architectural and Interior Space Planning – Does security screening cover all public and private areas?
        - Mechanical Engineering – Are utilities and Heating, Ventilating and Air Conditioning (HVAC) systems protected and/or backed up with redundant systems?
        - Electrical Engineering – Are emergency power and telecommunications available? Are alarm systems operational? Is lightning sufficient?
        - Fire Protection Engineering – Are the building's water supply and fire suppression systems adequate, code-compliant, and protected? Are on-site personnel trained appropriately? Are local first responders aware of the nature of the operations at the facility?
        - Electronic and Organized Security – Are systems and personnel in place to monitor and protect the facility?

4.3.19. Transportation Accidents

4.3.19.1. Location and Extent

For the purposes of this plan, transportation accidents are defined as incidents involving highway, air, and rail travel. Figure 4.3.19-1 shows the major highways, rail lines, and airports located throughout Allegheny County.

Traffic accidents and rail accidents can occur anywhere along their respective corridors in Allegheny County. Aviation accidents typically occur within 5 miles of take-off or landing but can occur countywide. Table 4.3.19-1 lists the different types of identified traffic and rail accidents.

Table 4.3.19-1 **Identified Types of Traffic and Rail Accidents (PennDOT, 2018a; Federal Railway Administration, 2020).**

Mode	Type of Accident	Description
Traffic	Non-collision	A harmful event that does not involve a collision, such as a fire, explosion, or overturn.
	Angle	A crash in which two vehicles on opposite roadways collide at an intersection, driveway, or ramp.
	Rear-end	A crash in which vehicles traveling in the same direction on the same road collide.
	Head-on	A crash in which vehicles traveling in opposite directions, on the same road collide.
	Sideswipe	A crash between two vehicles in which the sides of the vehicles engage.
	Hit fixed object	A collision in which a vehicle hits a stationary object on or adjacent to the roadway.
	Hit pedestrian	A collision between a motor vehicle and any person not in or upon the vehicle.
Rail	Derailment	An accident on a railway in which a train leaves the rails.
	Collision	An accident in which a train strikes something such as another train or highway motor vehicle.
	Other	Accidents caused by other circumstances like obstructions on rails, fire, or explosion.

Figure 4.3.19-2 shows the traffic volume along major highways and roadways in Allegheny County. Major Interstate Routes are 79, 279, 579, 76, and 376. Other heavily traveled highways are U.S. Route 19, 22, and 30.

Figure 4.3.19-1 Allegheny County Traffic Transportation Systems.

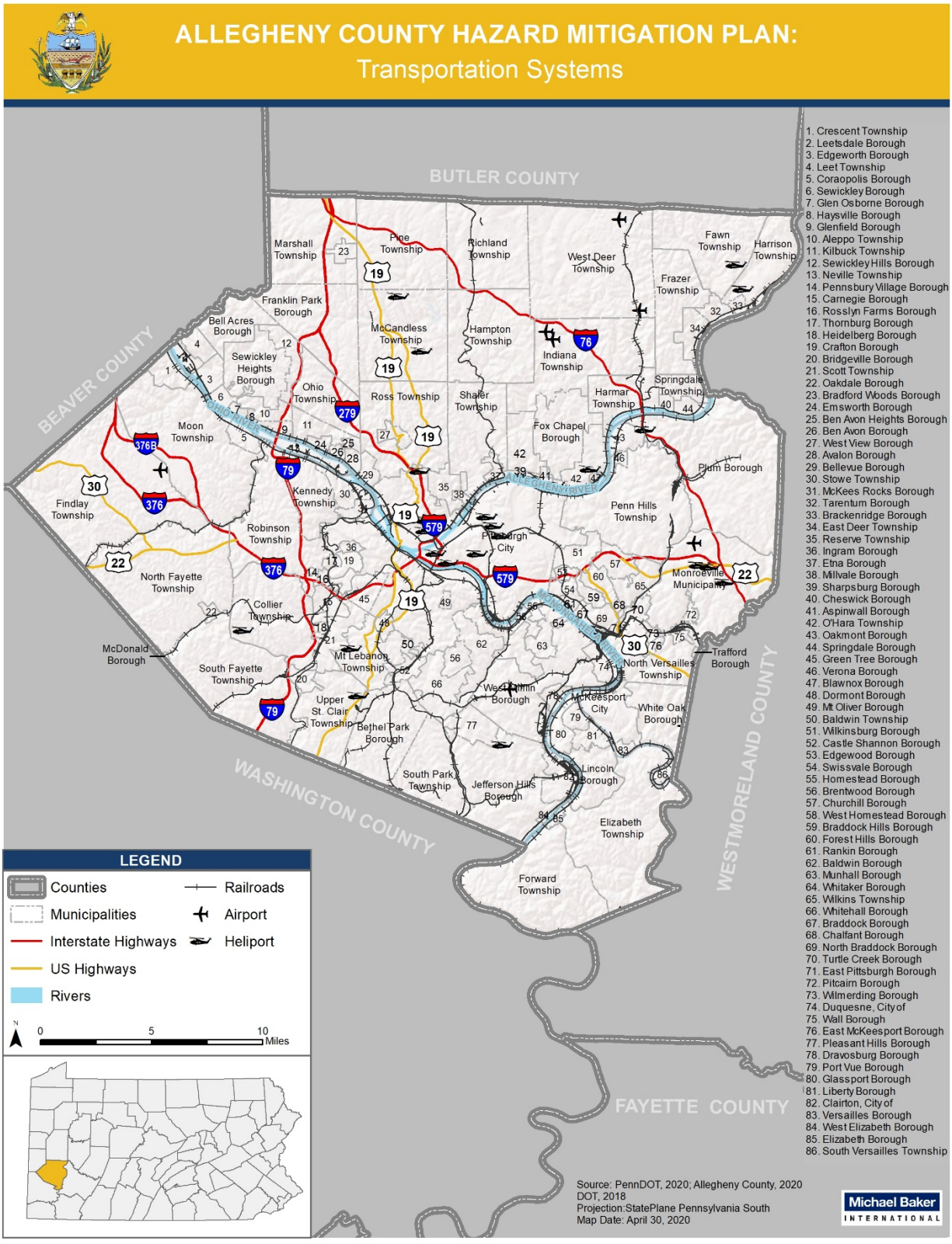


Figure 4.3.19-2 Allegheny County Traffic Volume on Key Roadways.

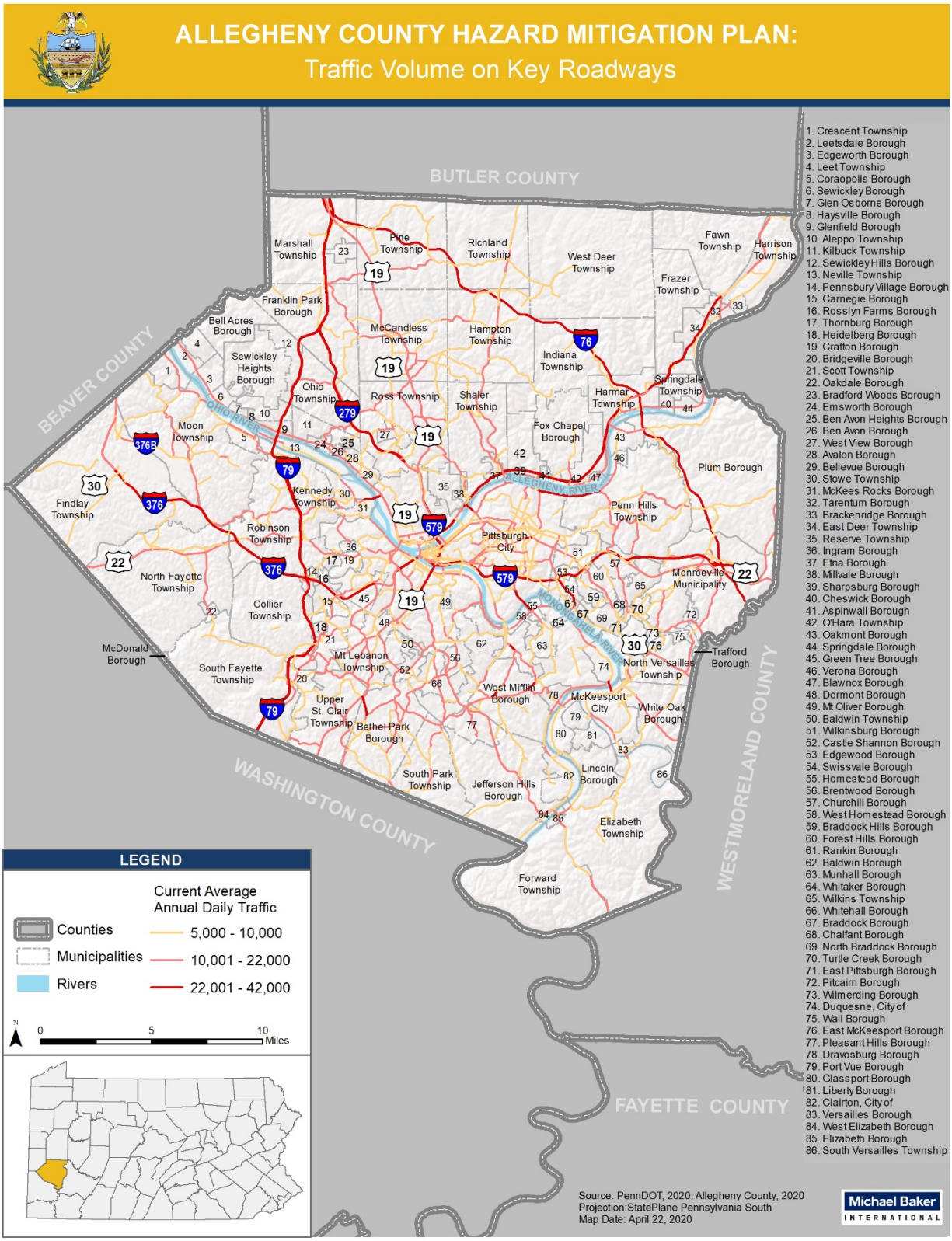


Figure 4.3.19-3 Allegheny County Transportation Accident Density (2004-2018)

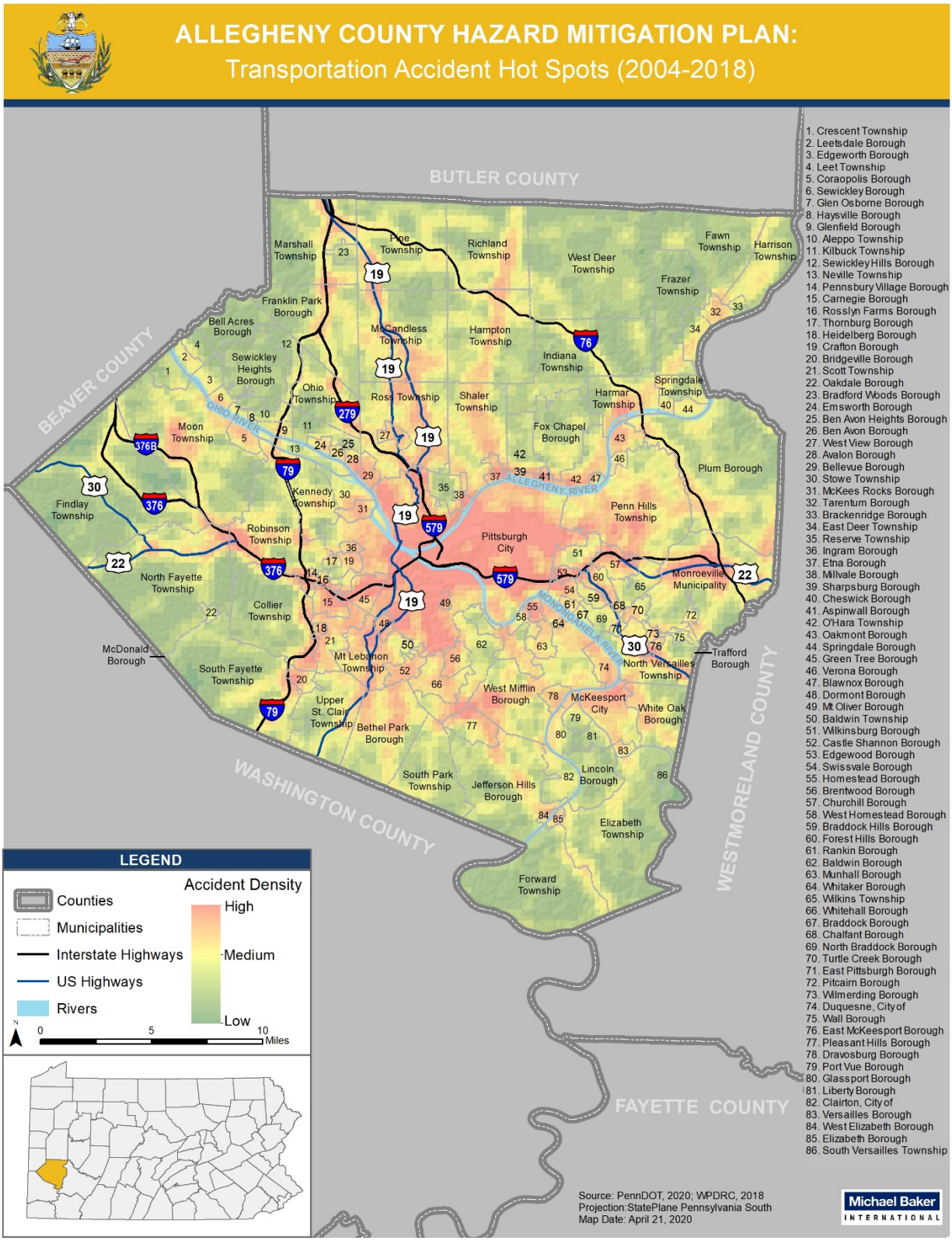


Figure 4.3.19-3 shows the density of vehicle accidents from 2004-2018 throughout Allegheny County. The highest concentration of crashes has occurred in the central part of Allegheny county, specifically in and around the City of Pittsburgh. Higher concentrations of crashes are also seen along major highways and roadways.

Transportation of hazardous materials on highways involves tanker trucks or trailers which are responsible for the greatest number of hazard material release incidents. There are over 120,000 miles of highway in the state and many of those are used to transport hazardous materials (PennDOT, 2018b). These roads also cross rivers and streams at many points and have the potential to pollute watersheds that serve as domestic water supplies for parts of the state.

Potential also exists for hazardous material releases to occur along rail lines as collisions and derailments of train cars can result in large spills. A number of severe rail events have reportedly occurred in Pennsylvania. In addition, many of Allegheny County's rail lines lie in its valleys next to stream beds, compounding the impact of rail-related releases and increasing the possibility of water contamination during a release.

Pipelines can also transport hazardous liquids and flammable substances such as natural gas. Incidents can occur when pipes corrode, when they are damaged during excavation, incorrectly operated, or damaged by other forces. There are approximately 151 miles of liquid pipeline and 284 miles of gas pipeline in Allegheny County (PA SHMP, 2018). In addition, hazardous materials can be transported by aircraft or by watercraft. Crashes, spills of materials, and fires on these vessels can pose a hazard.

4.3.19.2. Range of Magnitude

Significant passenger vehicle, air, and rail transportation accidents can result in a wide range of outcomes from damage solely to property to serious injury or death. The most serious transportation accidents include a release of hazardous material. As described in Section 4.3.14, weather conditions, micro-meteorological effects of buildings and terrain, and non-compliance with applicable codes can exacerbate these releases. Response time and quantity and type of material release also impact the severity of an accident.

Most air incidents are non-fatal and cause minor injuries or property damage. The majority of motor vehicle crashes are non-fatal in Pennsylvania, but PennDOT estimates that every hour nine people are injured in a car crash, and every seven hours someone dies as a result of a car crash (PennDOT, 2018a). Most fatal crashes occur in the summer months of June, July, and August.

Railway and roadway accidents in particular have the potential to result in hazardous materials release. Transportation accidents can also result in broader infrastructure damage. Like the range of magnitude, the environmental impacts of transportation accidents can vary greatly. In the case of a simple motor vehicle crash, train derailment, or aviation accident, the environmental impact is minimal. However, if the accident involves any type of vehicle moving chemicals or other hazardous materials, the impact will be considerably larger and may include an explosion or the release of potentially hazardous material. For a complete discussion of the environmental impacts of hazardous materials releases, see Section 4.3.14.

A worst-case scenario for transportation accidents in Allegheny County would be if a Bakken crude oil train was to derail and explode near Pittsburgh in the middle of the workday, when an increased number of people would be downtown. The transportation of crude oil by rail increased exponentially between the 2011 and 2015 HMP updates, and this growing concern was echoed by municipal officials at every meeting in 2015. While this was not brought up during the 2020 update, it is still a concern to the county. This kind of event, like the Lac-Megantic train derailment in Quebec in July 2013, would have no warning time (NASA, 2013). There would be the potential for serious loss of life and loss of property in the event of an explosion. The rail infrastructure would be damaged, and mass evacuations would be needed to reduce exposure to chemicals. An accident of this nature would not only cause environmental harm and endanger human health, but it would also cause a disruption of the economy in Allegheny County during recovery.

4.3.19.3. Past Occurrence

The most common transportation accidents in Allegheny County involve highway incidents involving motor vehicles. Vehicular transportation accidents like this are a daily occurrence throughout Pennsylvania. Table 4.3.19-2 shows the number of vehicle accidents in Allegheny County between 2010 and 2018, as well as the break down by fatal crashes, crashes that cause injuries, and the crashes that result only in property damage. The table shows that the number of crashes, and the amount of crashes by type, has remained relatively constant throughout this nine-year period.

Table 4.3.19-2 **Total Number of Crashes and Crashes Causing Fatalities, Injuries, and Property Damage in Allegheny County (PennDOT, 2014-2018a).**

Year	Total Crashes	Total Fatal CRASHES	Total Injury Crashes	Total Property Damage only Crashes
2010	11,234	64	5,345	5,825
2011	12,115	57	5,567	6,491
2012	12,109	64	5,573	6,472
2013	11,952	61	5,285	6,606
2014	12,154	57	5,460	6,637
2015	12,666	49	5,354	7,262
2016	12,858	67	5,434	7,357
2017	12,470	62	5,324	7,084
2018	12,369	67	5,012	7,290

During the 2015 plan update it was established that Allegheny County conducted a number of Commodity Flow Studies to look at the movement of hazardous chemicals through the county. The 2012 Study found that there had been 150 railroad accidents/incidents in Allegheny County from 2003-2012. In addition, the 2014 Addendum to the Commodity Flow Study found that over the planning period from 2011-2014, total truck traffic had increased, as had the number of hazmat placards on trucks. In 2014, 10.8% of all trucks bore some kind of placard, up from 8.4% in 2011-12.

In 2013, Allegheny County conducted a Pipeline Commodity Flow Study. The study found that the primary commodity transported via pipeline is natural gas, and petroleum products in general dominate pipeline shipping. This study provides a list of significant pipeline incidents in Allegheny County from 2002-2013. There have been 21 incidents in that time frame; these incidents have caused 3 deaths and 15 injuries. Because this report is For Official Use Only, those events are not listed here.

In 2018 a freight train derailed near Station Square in Pittsburgh. Seven rail cars dumped piles of Pampers diapers, cat food, Hanover Snyder snacks, detergent and mouthwash. The cleanup from the derailment took three days and appears that no hazardous materials were released from the event (Pittsburgh Post-Gazette, 2018).

Fuel spillages due to an accident with a tanker truck or rupture of fuel tanks are the main causes of transportation-related hazardous materials incidents in Allegheny County. However, there have been two major train derailments in Allegheny County that resulted in extensive emergency response actions. On April 11, 1987, there was a derailment of 33 railcars in the City of Pittsburgh, which caused the release of phosphorus oxychloride, resulting in the evacuation of 16,000 residents (Barker, 1987). On August 22, 1987, there was a derailment of 16 railcars in McKeesport, which caused the release of butane, sodium hydrochloride, and hydrochloric acid and forced the evacuation of 700 residents, including patients at the Kane Regional Center and the Riverside Nursing Center (UPI, 1987). More recently in 2014, a train derailed in McKeesport. Ten of 88 cars derailed, including three that hung over the Youghiogheny River while the crash was being fixed. Luckily, there were no chemicals spilled, as most cars were empty or carrying scrap metal (Togneri, 2014). This incident shows that there is still a risk that these unexpected crashes will occur. While this derailment did not result in any environmental hazards there was potential for water contamination if the bridge had been further damaged.

Transportation-related hazardous material release incidents are tracked by the federal government. The U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration (PHMSA) maintains information on hazardous material releases by highway, freight, air, and rail incidents. PHSMA reports that there have been 2,520 release incidents between 1971 and June 2020. Table 4.3.19-3 lists the number of release incidents which have occurred by year along with their method of release. The majority of the releases were highway releases. The highest number of releases occurred in the mid- to late 1970s, but there have been multiple highway releases every year since tracking began.

Table 4.3.19-3 **Total Number of Hazardous Material Release Incidents and Method of Release in Allegheny County PHMSA, 2020**

Year	Total Number of Releases	Method of Release			
		Air	Freight Forwarder	Highway	Rail
1971	11	0	0	9	2
1972	29	0	0	28	1
1973	44	2	0	41	1
1974	79	1	0	78	0
1975	139	2	0	134	3

Table 4.3.19-3 **Total Number of Hazardous Material Release Incidents and Method of Release in Allegheny County PHMSA, 2020**

Year	Total Number of Releases	Method of Release			
		Air	Freight Forwarder	Highway	Rail
1976	157	3	0	148	6
1977	187	2	0	182	3
1978	150	2	0	144	4
1979	101	1	0	94	6
1980	67	1	0	65	1
1981	40	0	1	36	3
1982	31	2	0	28	1
1983	25	0	0	23	2
1984	19	3	0	14	2
1985	24	0	3	20	1
1986	18	0	0	13	5
1987	24	0	1	19	4
1988	23	0	0	17	6
1989	19	1	2	13	3
1990	14	0	0	14	0
1991	23	0	0	22	1
1992	22	0	0	22	0
1993	24	2	0	22	0
1994	38	2	0	35	1
1995	20	1	0	17	2
1996	36	4	0	31	1
1997	47	2	0	44	1
1998	61	2	0	55	4
1999	117	5	0	111	1
2000	88	4	0	83	1
2001	89	2	0	86	1
2002	74	2	0	72	0
2003	50	0	0	50	0
2004	60	0	0	60	0
2005	60	0	0	58	2
2006	57	1	0	55	1
2007	46	3	0	42	1
2008	41	0	0	40	1
2009	38	1	0	36	1
2010	42	3	0	37	2

Table 4.3.19-3 **Total Number of Hazardous Material Release Incidents and Method of Release in Allegheny County PHMSA, 2020**

Year	Total Number of Releases	Method of Release			
		Air	Freight Forwarder	Highway	Rail
2011	30	3	0	24	3
2012	36	6	0	26	4
2013	32	1	0	29	2
2014	43	2	0	38	3
2015	17	3	0	14	0
2016	28	2	0	24	2
2017	38	4	0	34	0
2018	34	5	0	28	1
2019	17	1	0	16	0
2020	11	0	0	9	2
Grand Total	**2,520**	**81**	**7**	**2,340**	**92**

*Reported incidents through June 12, 2020

4.3.19.4. Future Occurrence

Transportation accidents have little to no warning time and are nearly impossible to predict. However, as Tables 4.3.19-2 and 4.3.19-3 show, the amount of traffic accidents and hazardous material releases have remained constant in recent years. Additionally, the trucking industry is expected to continue to grow increasing the number of long haul trucks operating in the County on a daily basis. The increase in Bakken crude oil transportation by rail represents an increase in risk to future transportation accidents by rail. Based on all of these factors, the probability of transportation accidents is characterized as highly likely according to the Risk Factor Methodology (See Table 4.4-1).

4.3.19.5. Vulnerability Assessment

A transportation related accident can occur on any stretch of road or railway in Allegheny County. However, severe accidents are more likely along highways such as U.S. Routes 30 and 22 as well as the Interstate Routes, which experience heavier traffic volumes including heavy freight vehicles. The combination of high traffic volume, severe winter weather in the County, and large numbers of hazardous materials haulers increase the chances of traffic accidents occurring.

Like highway incidents, rail incidents can impact populations living near rail lines. Crude oil shipping across the United States has grown by a factor of seventeen in the last five years, increasing the risk for a derailment or rail accident to involve this material. Additionally, recent rail incidents from 2013 to 2015 have shown a high risk for trains carrying crude oil to explode upon derailment (FracTracker, 2015). The average rate of aviation accidents nation-wide is 8.47 accidents per 100,000 flight hours. Therefore, the likelihood of a serious aviation incident in the County is considered low.

Utilizing Census Block data and proximity to modes of transportation, Tables 4.3.19-4 and 4.3.19-5 identify the population and critical facilities respectively within a half-mile of a major highway and rail line. This half-mile buffer represents the recommended evacuation zone around a highway or rail line in the event of a hazardous material release in transit.

Table 4.3.19-4 **Population vulnerable to Transportation**

Municipality	2018 Population	Estimated Population Within .5 Miles of a Major Highway	Percent Population Within .5 Miles of a Major Highway	Estimated Population Within .5 Miles of an Active Rail Line	Percent Population Within 0.5 Miles of an Active Rail Line
Aleppo Township	300	300	100%	300	100%
Aspinwall Borough	280	0	0%	280	100%
Avalon Borough	410	0	0%	410	100%
Baldwin Borough	1,410	0	0%	1180	84%
Baldwin Township	200	0	0%	200	100%
Bell Acres Borough	400	0	0%	0	0%
Bellevue Borough	790	250	32%	540	68%
Ben Avon Borough	500	0	0%	500	100%
Ben Avon Heights Borough	200	200	100%	200	100%
Bethel Park, Municipality of	3040	530	17%	3040	100%
Blawnox Borough	250	0	0%	250	100%
Brackenridge Borough	290	0	0%	290	100%
Braddock Borough	200	0	0%	200	100%
Braddock Hills Borough	250	250	100%	250	100%
Bradford Woods Borough	350	350	100%	0	0%
Brentwood Borough	580	0	0%	0	0%
Bridgeville Borough	600	520	87%	600	100%
Carnegie Borough	790	790	100%	790	100%
Castle Shannon Borough	530	0	0%	530	100%
Chalfant Borough	200	200	100%	200	100%
Cheswick Borough	450	150	33%	450	100%
Churchill Borough	160	160	100%	0	0%
Clairton, City of	170	0	0%	170	100%
Collier Township	690	220	32%	690	100%
Coraopolis Borough	500	150	30%	500	100%

Table 4.3.19-4 **Population vulnerable to Transportation**

Municipality	2018 Population	Estimated Population Within .5 Miles of a Major Highway	Percent Population Within .5 Miles of a Major Highway	Estimated Population Within .5 Miles of an Active Rail Line	Percent Population Within 0.5 Miles of an Active Rail Line
Crafton Borough	580	90	16%	580	100%
Crescent Township	450	0	0%	450	100%
Dormont Borough	910	910	100%	910	100%
Dravosburg Borough	250	0	0%	250	100%
Duquesne, City of	490	0	0%	490	100%
East Deer Township	350	0	0%	350	100%
East McKeesport Borough	250	250	100%	250	100%
East Pittsburgh Borough	180	180	100%	180	100%
Edgewood Borough	550	550	100%	550	100%
Edgeworth Borough	600	0	0%	600	100%
Elizabeth Borough	350	0	0%	350	100%
Elizabeth Township	1,020	0	0%	870	85%
Emsworth Borough	400	0	0%	400	100%
Etna Borough	300	0	0%	300	100%
Fawn Township	350	0	0%	250	71%
Findlay Township	310	310	100%	270	87%
Forest Hills Borough	710	710	100%	0	0%
Forward Township	250	0	0%	250	100%
Fox Chapel Borough	280	0	0%	130	46%
Franklin Park Borough	1,050	1050	100%	0	0%
Frazer Township	250	0	0%	100	40%
Glassport Borough	420	0	0%	420	100%
Glen Osborne Borough	200	0	0%	200	100%
Glenfield Borough	100	100	100%	100	100%
Green Tree Borough	440	440	100%	440	100%

Table 4.3.19-4 **Population vulnerable to Transportation**

Municipality	2018 Population	Estimated Population Within .5 Miles of a Major Highway	Percent Population Within .5 Miles of a Major Highway	Estimated Population Within .5 Miles of an Active Rail Line	Percent Population Within 0.5 Miles of an Active Rail Line
Hampton Township	1,160	650	56%	810	70%
Harmar Township	330	330	100%	330	100%
Harrison Township	800	0	0%	690	86%
Haysville Borough	40	0	0%	40	100%
Heidelberg Borough	350	350	100%	350	100%
Homestead Borough	220	0	0%	220	100%
Indiana Township	840	640	76%	200	24%
Ingram Borough	270	0	0%	270	100%
Jefferson Hills Borough	850	0	0%	850	100%
Kennedy Township	770	770	100%	700	91%
Kilbuck Township	250	250	100%	250	100%
Leet Township	450	0	0%	450	100%
Leetsdale Borough	300	0	0%	300	100%
Liberty Borough	450	0	0%	450	100%
Lincoln Borough	250	0	0%	250	100%
Marshall Township	500	500	100%	0	0%
McCandless, Town of	2,450	1580	64%	700	29%
McDonald Borough	70	0	0%	70	100%
McKees Rocks Borough	430	0	0%	430	100%
McKeesport, City of	1,600	0	0%	1,360	85%
Millvale Borough	260	0	0%	260	100%
Monroeville, Municipality of	2,080	1,850	89%	1,410	68%
Moon Township	1,970	1,380	70%	840	43%
Mount Lebanon, Municipality of	2,800	2,450	88%	2,220	79%

Table 4.3.19-4 **Population vulnerable to Transportation**

Municipality	2018 Population	Estimated Population Within .5 Miles of a Major Highway	Percent Population Within .5 Miles of a Major Highway	Estimated Population Within .5 Miles of an Active Rail Line	Percent Population Within 0.5 Miles of an Active Rail Line
Mount Oliver Borough	250	0	0%	100	40%
Munhall Borough	760	0	0%	260	34%
Neville Township	250	250	100%	250	100%
North Braddock Borough	450	320	71%	450	100%
North Fayette Township	1,010	860	85%	900	89%
North Versailles Township	530	530	100%	340	64%
Oakdale Borough	450	0	0%	450	100%
Oakmont Borough	840	600	71%	840	100%
O'Hara Township	910	0	0%	810	89%
Ohio Township	350	350	100%	0	0%
Penn Hills, Municipality of	2,680	870	32%	1,240	46%
Pennsbury Village Borough	200	200	100%	0	0%
Pine Township	510	510	100%	200	39%
Pitcairn Borough	230	0	0%	230	100%
Pittsburgh, City of	28,800	12,300	43%	24,700	86%
Pleasant Hills Borough	710	0	0%	710	100%
Plum Borough	1,970	950	48%	1,140	58%
Port Vue Borough	310	0	0%	310	100%
Rankin Borough	210	0	0%	210	100%
Reserve Township	500	250	50%	160	32%
Richland Township	710	550	77%	400	56%
Robinson Township	1,050	850	81%	650	62%
Ross Township	2,690	2,590	96%	80	3%
Rosslyn Farms Borough	250	250	100%	250	100%
Scott Township	1,470	1,160	79%	1,210	82%

Table 4.3.19-4 **Population vulnerable to Transportation**

Municipality	2018 Population	Estimated Population Within .5 Miles of a Major Highway	Percent Population Within .5 Miles of a Major Highway	Estimated Population Within .5 Miles of an Active Rail Line	Percent Population Within 0.5 Miles of an Active Rail Line
Sewickley Borough	350	0	0%	350	100%
Sewickley Heights	250	250	100%	0	0%
Sewickley Hills Borough	250	250	100%	0	0%
Shaler Township	1,680	0	0%	1,420	85%
Sharpsburg Borough	280	0	0%	280	100%
South Fayette Township	1,220	1,020	84%	1,220	100%
South Park Township	1,220	0	0%	1,220	100%
South Versailles Township	200	0	0%	200	100%
Springdale Borough	590	0	0%	590	100%
Springdale Township	300	0	0%	300	100%
Stowe Township	420	0	0%	300	71%
Swissvale Borough	800	800	100%	800	100%
Tarentum Borough	250	0	0%	250	100%
Thornburg Borough	300	0	0%	300	100%
Trafford Borough	150	0	0%	150	100%
Turtle Creek Borough	280	50	18%	280	100%
Upper St. Clair Township	2,130	1980	93%	2,130	100%
Verona Borough	400	0	0%	400	100%
Versailles Borough	400	0	0%	400	100%
Wall Borough	200	0	0%	200	100%
West Deer Township	690	250	36%	490	71%
West Elizabeth Borough	150	0	0%	150	100%
West Homestead Borough	300	0	0%	300	100%
West Mifflin Borough	1,770	0	0%	1,420	80%
West View Borough	560	560	100%	0	0%

Table 4.3.19-4 **Population vulnerable to Transportation**

Municipality	2018 Population	Estimated Population Within .5 Miles of a Major Highway	Percent Population Within .5 Miles of a Major Highway	Estimated Population Within .5 Miles of an Active Rail Line	Percent Population Within 0.5 Miles of an Active Rail Line
Whitaker Borough	250	0	0%	250	100%
White Oak Borough	480	80	17%	260	54%
Whitehall Borough	1,360	0	0%	1,120	82%
Wilkins Township	540	540	100%	460	85%
Wilkinsburg Borough	1,180	640	54%	860	73%
Wilmerding Borough	250	150	60%	250	100%
Grand Total	**111,360**		**0%**		**0%**

Table 4.3.19-5 **Critical facilities vulnerable to Transportation Incidents**

Municipality	Total Critical Facilities	Critical Facilities within .5 mi of a Major Highway	Percent Critical Facilities within .5 mi of a Major Highway	Critical Facilities within .5 mi of an Active Rail Line	Percent Critical Facilities within .5 mi of an Active Rail Line
Aleppo Township	7	2	29%	2	29%
Aspinwall Borough	6	0	0%	6	100%
Avalon Borough	8	0	0%	7	88%
Baldwin Borough	18	0	0%	12	67%
Baldwin Township	3	0	0%	0	0%
Bell Acres Borough	8	0	0%	0	0%
Bellevue Borough	15	1	7%	9	60%
Ben Avon Borough	3	0	0%	3	100%
Ben Avon Heights Borough	1	0	0%	0	0%
Bethel Park, Municipality of	34	4	12%	30	88%
Blawnox Borough	7	0	0%	7	100%
Brackenridge Borough	9	0	0%	9	100%
Braddock Borough	9	0	0%	9	100%
Braddock Hills Borough	5	3	60%	2	40%
Bradford Woods Borough	4	1	25%	0	0%
Brentwood Borough	14	0	0%	0	0%
Bridgeville Borough	6	5	83%	6	100%
Carnegie Borough	13	4	31%	13	100%
Castle Shannon Borough	8	0	0%	8	100%
Chalfant Borough	2	2	100%	2	100%
Cheswick Borough	6	0	0%	6	100%
Churchill Borough	6	6	100%	0	0%
Clairton, City of	15	0	0%	15	100%
Collier Township	23	14	61%	16	70%
Coraopolis Borough	13	0	0%	12	92%

Table 4.3.19-5 **Critical facilities vulnerable to Transportation Incidents**

Municipality	Total Critical Facilities	Critical Facilities within .5 mi of a Major Highway	Percent Critical Facilities within .5 mi of a Major Highway	Critical Facilities within .5 mi of an Active Rail Line	Percent Critical Facilities within .5 mi of an Active Rail Line
Crafton Borough	6	0	0%	6	100%
Crescent Township	3	0	0%	3	100%
Dormont Borough	7	7	100%	7	100%
Dravosburg Borough	5	0	0%	5	100%
Duquesne, City of	14	0	0%	14	100%
East Deer Township	11	0	0%	11	100%
East McKeesport Borough	4	3	75%	1	25%
East Pittsburgh Borough	4	4	100%	4	100%
Edgewood Borough	5	5	100%	5	100%
Edgeworth Borough	6	0	0%	6	100%
Elizabeth Borough	6	0	0%	6	100%
Elizabeth Township	29	0	0%	12	41%
Emsworth Borough	8	0	0%	8	100%
Etna Borough	8	0	0%	8	100%
Fawn Township	13	0	0%	0	0%
Findlay Township	27	10	37%	6	22%
Forest Hills Borough	9	9	100%	0	0%
Forward Township	17	0	0%	10	59%
Fox Chapel Borough	14	0	0%	0	0%
Franklin Park Borough	14	5	36%	0	0%
Frazer Township	14	0	0%	0	0%
Glassport Borough	12	0	0%	10	83%
Glen Osborne Borough	3	0	0%	3	100%
Glenfield Borough	1	1	100%	1	100%
Green Tree Borough	7	7	100%	7	100%

Table 4.3.19-5 **Critical facilities vulnerable to Transportation Incidents**

Municipality	Total Critical Facilities	Critical Facilities within .5 mi of a Major Highway	Percent Critical Facilities within .5 mi of a Major Highway	Critical Facilities within .5 mi of an Active Rail Line	Percent Critical Facilities within .5 mi of an Active Rail Line
Hampton Township	39	6	15%	13	33%
Harmar Township	24	11	46%	23	96%
Harrison Township	18	0	0%	11	61%
Haysville Borough	1	0	0%	1	100%
Heidelberg Borough	5	0	0%	5	100%
Homestead Borough	10	0	0%	8	80%
Indiana Township	31	8	26%	3	10%
Ingram Borough	5	0	0%	2	40%
Jefferson Hills Borough	30	0	0%	15	50%
Kennedy Township	20	6	30%	7	35%
Kilbuck Township	1	0	0%	0	0%
Leet Township	5	0	0%	0	0%
Leetsdale Borough	13	0	0%	13	100%
Liberty Borough	7	0	0%	5	71%
Lincoln Borough	4	0	0%	1	25%
Marshall Township	20	12	60%	0	0%
McCandless, Town of	38	18	47%	3	8%
McDonald Borough	0	0	0%	0	0%
McKees Rocks Borough	7	0	0%	7	100%
McKeesport, City of	47	0	0%	33	70%
Millvale Borough	9	0	0%	6	67%
Monroeville, Municipality of	71	49	69%	4	6%
Moon Township	53	13	25%	12	23%
Mount Lebanon, Municipality of	42	27	64%	16	38%
Mount Oliver Borough	4	0	0%	3	75%

Table 4.3.19-5 **Critical facilities vulnerable to Transportation Incidents**

Municipality	Total Critical Facilities	Critical Facilities within .5 mi of a Major Highway	Percent Critical Facilities within .5 mi of a Major Highway	Critical Facilities within .5 mi of an Active Rail Line	Percent Critical Facilities within .5 mi of an Active Rail Line
Munhall Borough	20	0	0%	5	25%
Neville Township	22	5	23%	22	100%
North Braddock Borough	10	1	10%	9	90%
North Fayette Township	28	14	50%	8	29%
North Versailles Township	15	12	80%	4	27%
Oakdale Borough	27	0	0%	10	37%
Oakmont Borough	3	0	0%	3	100%
O'Hara Township	18	4	22%	17	94%
Ohio Township	17	9	53%	0	0%
Penn Hills, Municipality of	52	6	11%	17	34%
Pennsbury Village Borough	4	4	100%	0	0%
Pine Township	23	15	65%	0	0%
Pitcairn Borough	6	0	0%	6	100%
Pittsburgh, City of	539	220	41%	416	77%
Pleasant Hills Borough	8	0	0%	2	25%
Plum Borough	51	14	27%	19	37%
Port Vue Borough	5	0	0%	4	80%
Rankin Borough	4	0	0%	4	100%
Reserve Township	7	0	0%	3	43%
Richland Township	19	2	11%	7	37%
Robinson Township	33	23	70%	6	18%
Ross Township	45	34	76%	0	0%
Rosslyn Farms Borough	3	3	100%	3	100%
Scott Township	21	5	24%	15	71%
Sewickley Borough	16	0	0%	12	75%

Table 4.3.19-5 **Critical facilities vulnerable to Transportation Incidents**

Municipality	Total Critical Facilities	Critical Facilities within .5 mi of a Major Highway	Percent Critical Facilities within .5 mi of a Major Highway	Critical Facilities within .5 mi of an Active Rail Line	Percent Critical Facilities within .5 mi of an Active Rail Line
Sewickley Heights	3	0	0%	0	0%
Sewickley Hills Borough	2	2	100%	0	0%
Shaler Township	29	0	0%	17	59%
Sharpsburg Borough	9	0	0%	9	100%
South Fayette Township	29	12	41%	17	59%
South Park Township	15	0	0%	12	80%
South Versailles Township	2	0	0%	2	100%
Springdale Borough	14	0	0%	12	86%
Springdale Township	7	0	0%	6	86%
Stowe Township	13	0	0%	11	85%
Swissvale Borough	8	3	38%	8	100%
Tarentum Borough	19	0	0%	15	79%
Thornburg Borough	3	0	0%	3	100%
Trafford Borough	1	0	0%	1	100%
Turtle Creek Borough	13	3	23%	13	100%
Upper St. Clair Township	28	17	61%	9	32%
Verona Borough	7	0	0%	7	100%
Versailles Borough	3	0	0%	3	100%
Wall Borough	2	0	0%	2	100%
West Deer Township	24	2	8%	7	29%
West Elizabeth Borough	7	0	0%	7	100%
West Homestead Borough	6	0	0%	6	100%
West Mifflin Borough	54	0	0%	38	70%
West View Borough	12	12	100%	0	0%
Whitaker Borough	2	0	0%	2	100%

Table 4.3.19-5 **Critical facilities vulnerable to Transportation Incidents**

Municipality	Total Critical Facilities	Critical Facilities within .5 mi of a Major Highway	Percent Critical Facilities within .5 mi of a Major Highway	Critical Facilities within .5 mi of an Active Rail Line	Percent Critical Facilities within .5 mi of an Active Rail Line
White Oak Borough	12	0	0%	1	8%
Whitehall Borough	19	0	0%	10	53%
Wilkins Township	11	8	73%	7	64%
Wilkinsburg Borough	28	5	18%	18	64%
Wilmerding Borough	6	0	0%	6	100%
Grand Total	**2,379**	**678**	**28%**	**1,340**	**56%**

4.3.20. Urban Fire and Explosion

4.3.20.1. Location and Extent

Urban fire and explosion hazards incorporate vehicle and building/structure fires as well as overpressure rupture, overheat, or other explosions. Statewide, this hazard occurs in the denser, more urbanized areas and occurs most often in residential structures (US Fire Administration, 2009). Urban fires can more easily spread from building to building in these denser areas.

Urban fires and explosions often begin as a result of other hazards, particularly severe storms, drought, transportation accidents, hazardous material releases, criminal activity such as arson, and terrorism. Urban fires have the potential to cause extensive damage to residential, commercial, or public property. Damage ranges from minor smoke and/or water damage to the destruction of buildings. People are often displaced for several months to years depending on the magnitude of the event. Urban fires and explosions can also cause injuries and death; in Pennsylvania, the fire mortality rate is approximately 13.9 deaths per million residents, or about 180 fire-related deaths per year. This is the 21st highest fire mortality rate in the nation and is higher than the national average of 11.2 deaths per million residents (US Fire Administration, 2017). In Allegheny County, many communities have an abundance of wood-frame homes densely built, which is conducive to urban fires. In addition, nearly 40% of housing units in the County are attached, making it easier for fires to spread.

In the most serious urban fire events, the extreme heat of a fire event can damage the underlying infrastructure. For example, in 1996, an eight-alarm tire fire ignited in Philadelphia under Interstate 95. The extreme heat of the fire caused the bridge to buckle and forced two months of repairs to the bridge. The governor declared this event a disaster shortly after it occurred.

4.3.20.2. Range of Magnitude

The impacts of urban fire and explosion events vary based on the size of the incident and the population and structure density where it occurs. There may be environmental impacts related to hazardous materials when a fire event or explosion releases dangerous materials.

There are additional economic consequences related to this hazard. Urban fires and explosions may result in lost wages due to temporarily or permanently closed businesses, destruction and damage involving business and personal assets, loss of tax base, recovery costs, and lost investments in destroyed property.

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

While urban fires are a regular occurrence in Allegheny County, one of the worst events was an 11- alarm fire on Ormsby Avenue in Mount Oliver in June 2014. During the event, which started with a cigarette, seven to eight houses were destroyed. Additional houses ignited when high winds blew embers as far as

two streets away. About 100 firefighters from four communities worked to manage the blaze, which left 50 people homeless.

4.3.20.3. Past Occurrence

Allegheny County experiences a number of urban fire and explosion events each year, most of which are small and affect a limited number of structures. The Allegheny County Department of Emergency Services (ACDES) has tracked urban fire occurrences since 2015. ACDES uses Uniform Crime Reporting (UCR) Classifications to measure the types of urban fires that occur. 50-60% of urban fires occur in single occupancy residences like rowhomes and townhouses. The following table lists the number of urban fires and resulting fatalities from 2015-2019 in Allegheny County.

Table 4.3.20-1 **Allegheny County Urban Fire Events 2015-2019 (ACDES, 2015-2019)**

Year	Number of Urban Fires	Number of Fatalities
2019	335	3
2018	412	15
2017	361	13
2016	425	15
2015	426	13

The Allegheny County Fire Marshal determines the cause of urban fires. Over 56% of urban fires were accidentally caused, however over 25% were incendiary, meaning that they were intentionally lit. The Fire Marshal is not always able to determine the cause of an urban fire, resulting in around 20% of unknown urban fires. Accidental fires can be broken down into six categories; heating, electric, smoking, cooking, juvenile (those caused by children), and miscellaneous. Most accidental fires are caused by electric (22%), smoking (20.6%), and cooking (15.6%). However, around 30% of accidental fires fall under the miscellaneous category. Figure 4.3.20-1 shows the cause of urban fires in Allegheny County from 2015-2019. Figure 4.3.20-2 shows the breakdown of accidental urban fires in Allegheny County for this same time period.

Figure 4.3.20-1 Cause of Urban Fires in Allegheny County from 2015-2019 (ACDES 2015-2019)

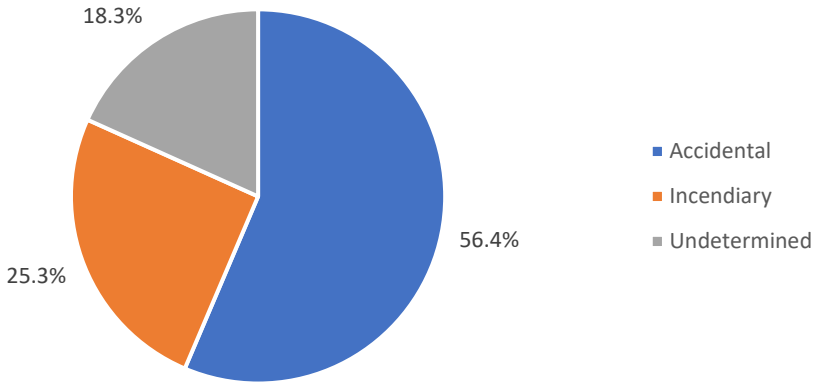
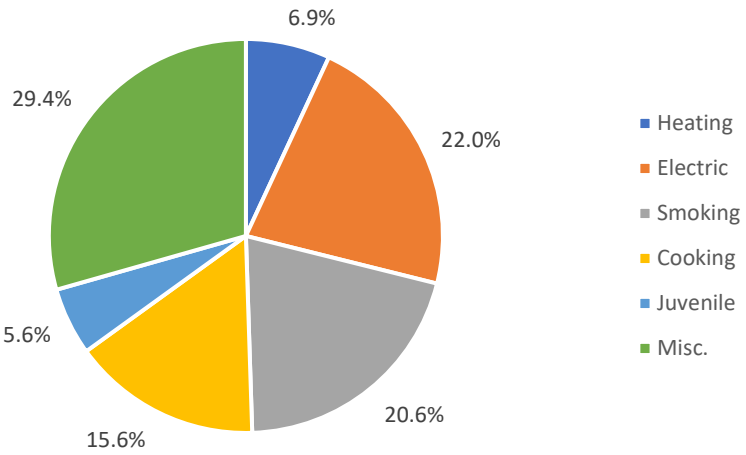


Figure 4.3.20-2 Cause of Accidental Urban Fires in Allegheny County from 2015-2019 (ACDES, 2015-2019).



4.3.20.4. Future Occurrence

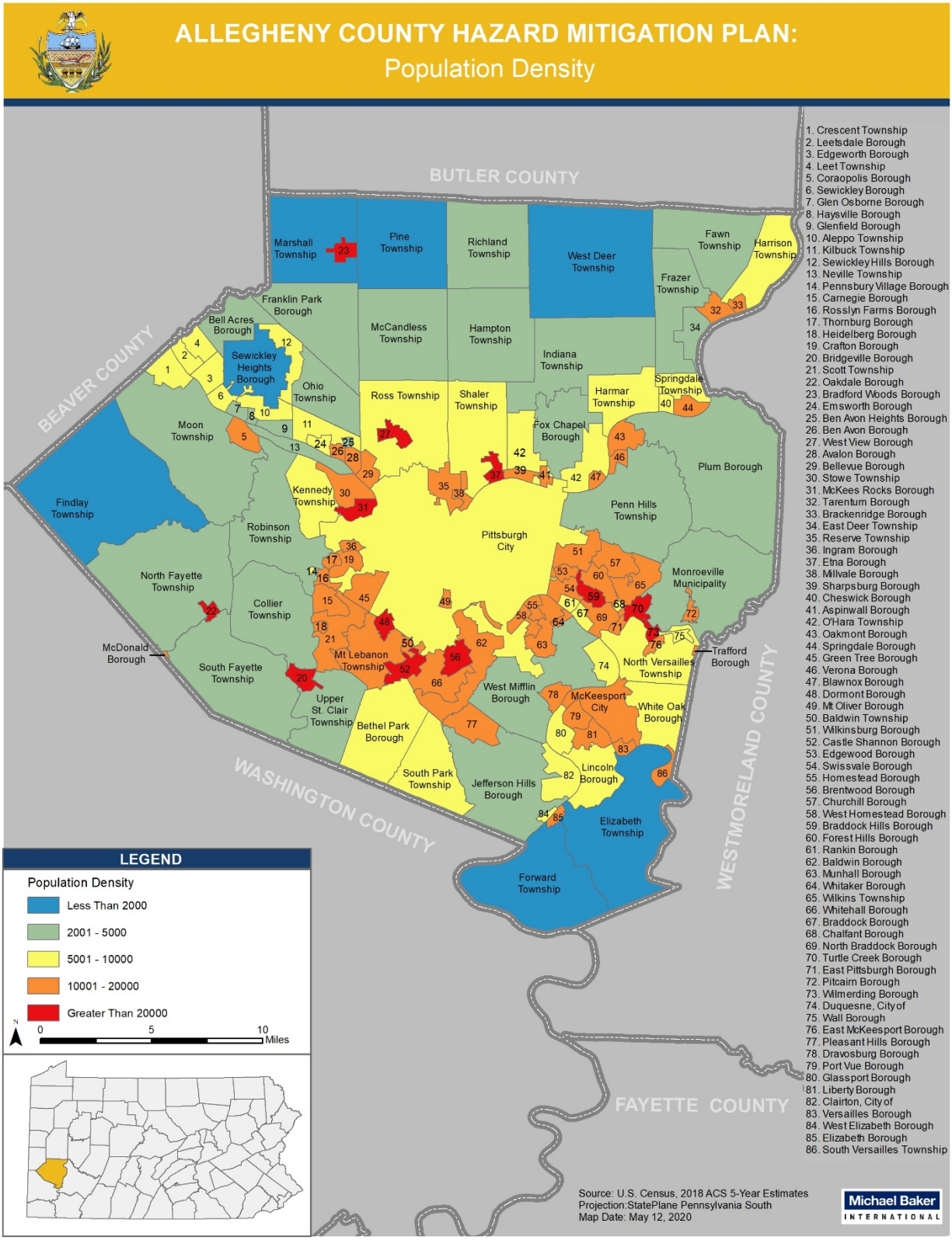
Urban fire and explosion events can be considered possible, with minor events happening more frequently than major fires or explosions in the future. The greatest urban fire and explosion threats in Allegheny County are industrial fires. While residential fires are more common, industrial fires have a potentially higher risk because of the possibility of there being flammable chemicals and a sustained fuel source at industrial sites. While small fires may be more frequent, overall, the probability of future urban fire and explosion events that cause significant damage is considered possible, according to the Risk Factor Methodology (see Table 4.4-1).

There is also a growing threat of natural gas, particularly methane, migration into homes and sparking fires and explosions. These events could occur more frequently moving forward if natural gas extraction grows in the County.

4.3.20.5. Vulnerability Assessment

Areas where large buildings are located or development is closely spaced should be considered more vulnerable to urban fire and explosion events; population density is mapped in Figure 4.3.20-3.

Figure 4.3.20-3 Allegheny County Population Density by Community.



While population density is an indicator of urban fire and explosion, in order to adequately assess vulnerability to urban fires and explosions, detailed information on the design specifications on the design specifications, specifically fire codes, used for the construction of individual buildings as required. As of December 31, 2006, all communities in Pennsylvania are required to comply with the Uniform Construction Codes. This includes requirements to comply with both the International Fire Code and the International Wildland Urban Interface Code. The adoption and enforcement of these codes will hopefully decrease the overall vulnerability of structures in Allegheny County. However, these regulations will only affect new construction, as well as additions and renovations to existing structures. Older buildings that do not meet the criteria established in these modern fire codes will continue to remain vulnerable to urban fire and explosion events, as will vacant and unmaintained structures of nearly any age. Additionally, homes that are located in proximity to natural gas drilling operations may have an added vulnerability to fires and explosions.

4.3.21. Utility Interruption

4.3.21.1. Location and Extent

Utility interruptions include any impairment of the functioning of telecommunication, gas, electric, water, or waste networks. Interruptions or outages occur because of geomagnetic storms, fuel or resources shortage, electromagnetic pulses, information technology failures, transmission facility or linear utility accident, and major energy, power, or utility failure. The focus of utility interruptions as a hazard lies in fuel, energy, or utility failure. These kinds of interruptions rarely spontaneously occur on their own; this hazard is often secondary to other natural hazard event, particularly transportation crashes and incidents, lightning strikes, extreme heat or cold events, and coastal and winter storms.

Utility interruptions in Allegheny County occur regularly but are usually small-scale, localized incidents. Utility interruptions are possible anywhere there is utility service. Table 4.3.21-1 lists the major Pittsburgh-area utility companies. Water authorities are listed and discussed in Section 4.3.1.

Table 4.3.21-1 **Major Utility Companies in Allegheny County (WXPI, 2017)**

Company name	Type of Utility
Duquesne Light	Electric
Penn Power	
Allegheny Power	
Armstrong Cable	Telecom
AT&T Broadband	
Comcast Cable	
Sprint	
Verizon	
Columbia Gas	Gas
Dominion People's	
Equitable Gas	

According to the 2018 5-year American Community Survey, in Allegheny County, 83.8% of housing units use utility gas as their heat source, followed by 13.8% of homes using electric heat (ACS 2014-2018). As a result, an interruption in either of those utilities could affect a significant number of residents. In addition, an increasing reliance on internet access and telecommunications could also impact a large number of residents at any given time.

4.3.21.2. Range of Magnitude

The most severe utility interruptions will be regional or widespread power and telecommunications outages. With the loss of power, electrically powered equipment and systems will not be operational. Examples may include: lighting; HVAC and ancillary support equipment; communication (i.e. public address systems, telephone, computer servers, and peripherals); ventilation systems; fire and security systems; refrigerators, sterilizers, trash compactors, office equipment; and medical equipment. This can cause food spoilage, loss of heat or air conditioning, basement flooding (sump pump failure), lack of light, loss of water (well pump failure), lack of phone service, or lack of internet service. However, this is most often a short-term nuisance rather than a catastrophic hazard.

The severity of a utility interruption can be compounded with extreme weather events, especially winter weather events. Interruptions can also be more severe for special needs populations that are dependent on electronic medical equipment. Utility interruptions can significantly hamper first responders in their efforts to provide aid in a compound disaster situation, especially with losses of telecommunications and wireless capabilities. Telecommunications interruptions will also hinder first responders' efforts. Additionally, an internet outage could be crippling to the economy, as many companies and government entities process payments and invoices electronically rather than with physical checks.

In a possible worst-case scenario, a winter storm event causes widespread power outages, leaving citizens without heat in the midst of subzero temperatures. The power outage also means that elderly populations or others at risk of health problems due to the lack of heat are unable to call for assistance or leave their homes. Power lines are unable to be repaired because of the magnitude of the storm, and the power outage lasts for several days.

4.3.21.3. Past Occurrence

Power outages in Allegheny County have been caused by winter storms, wind, vehicle accidents, and other factors. Utility interruptions are largely minor, routine events, but there have been Presidential and Gubernatorial Disaster Declarations in which a utility interruption was a major component of a disaster. For example, heavy snow in December 1974 led to widespread power outages in the Southwestern Counties, leading to a Gubernatorial Disaster Declaration. Additionally, the nation's gas shortage coupled with severe winter weather in January 1977 led to a President's Declaration of Emergency.

4.3.21.4. Future Occurrence

Utility interruptions will continue to occur annually with minimal impact. Widespread utility interruption events usually occur approximately once every five years, usually as a secondary effect of an extreme weather event. These interruptions should be anticipated, and first responders should be prepared during severe weather events. Research by the National Oceanic and Atmospheric Administration (NOAA) suggests that climate change may cause more extreme storms in Pennsylvania (Frankson et. al., 2017).

Allegheny County is expected to see large increases in precipitation and numbers of very hot and very cold days (Climate Central, 2019). These factors can increase the occurrence of hazards such as flooding, hurricanes and tropical storms, landslides, tornados and windstorms, wildfires, and winter storms. Impacts from any of these hazards can lead to utility interruption on a range of scales. Overall, the future probability of utility interruptions can be considered likely according to the Risk Factor Methodology (See Table 4.4-1).

Aging infrastructure also brings risk in the form of potential utility interruptions, particularly for places like Allegheny County with aging infrastructure. In many utility systems, significant portions of the equipment and facilities date from the growth periods of the 1950s and 1960s that followed World War II. As this equipment ages, it deteriorates from the constant wear and tear of service. Eventually the equipment reaches a point at which it will either fail on its own or as a result of outside forces (storms, loads it was designed to handle but no longer can, etc.). These failures cause service interruptions and can require expensive emergency repairs. In addition, as repairs have taken place along transmission routes, there is often a mix of new and old equipment along the line, as repair and not replacement is generally the choice made to resolve an issue. At the same time, though, the City of Pittsburgh is reinvesting in its power grid and other public facilities; the city is undertaking a grid security project to both cut water and energy consumption by 2030 and create redundant systems that would be more resilient in a disaster situation (City of Pittsburgh, 2017).

The wholesale replacement of a system is not a feasible solution for utility companies. This would require the interruption of services while the replacement occurs, as well as accessing the existing system (which may lay under roads, private property, or other inconvenient places). Utility companies face the challenge of managing the issue of the aging infrastructure. They are tasked with reducing the effects of aging equipment while also controlling the deterioration of the existing system as much as possible. This balance will be tenuous as transmission equipment continues to age and break down. These breakdowns will likely lead to more frequent utility disruptions as time goes by.

4.3.21.5. Vulnerability Assessment

All jurisdictions are vulnerable on some level to utility interruptions, but because this hazard often occurs in conjunction with other hazards, jurisdictions that have been identified as more vulnerable to winter storms, windstorms, tornado, flooding, and other natural hazard events may be more vulnerable to a utility interruption.

Utility outages pose the greatest threat to special needs population in Allegheny County. Resources such as electricity, communications, gas, and water supply are critical to ensure the health, safety, and general welfare of the citizenry. All critical infrastructure is vulnerable to the effects of a power outage. The special needs population can be vulnerable to loss of heat or air conditioning during extreme heat; likewise, they can be vulnerable to periods of severe cold if they use electric heat and there is a power outage.

4.4. Hazard Vulnerability Summary

4.4.1. Methodology

Ranking hazards helps communities set goals and priorities for mitigation based on their vulnerabilities. A risk factor (RF) is a tool used to measure the degree of risk for identified hazards in a particular planning area. The RF can also assist local community officials in ranking and prioritizing hazards that pose the most significant threat to a planning area based on a variety of factors deemed important by the planning team and other stakeholders involved in the hazard mitigation planning process. The RF system relies mainly on historical data, local knowledge, general consensus from the planning team, and information collected through development of the hazard profiles included in Section 4.3. The RF approach produces numerical values that allow identified hazards to be ranked against one another; the higher the RF value, the greater the hazard risk.

RF values were obtained by assigning varying degrees of risk to five categories for each of the hazards profiled in the HMP update. Those categories include probability, impact, spatial extent, warning time, and duration. Each degree of risk was assigned a value ranging from one to four. The weighting factor agreed upon by the planning team is shown in Table 4.4-1. To calculate the RF value for a given hazard, the assigned risk value for each category was multiplied by the weighting factor. The sum of all five categories equals the final RF value, as demonstrated in the following example equation:

Risk Factor Value = [(Probability x .30) + (Impact x .30) +
(Spatial Extent x .20) + (Warning Time x .10) + (Duration x .10)]

Table 4.4-1 summarizes each of the five categories used for calculating a RF for each hazard. According to the weighting scheme applied, the highest possible RF value is 4.0.

Table 4.4.1-1 **Summary of Risk Factor (RF) Approach.**

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 PROBABILITY	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	

Table 4.4.1-1 **Summary of Risk Factor (RF) Approach.**

Risk Assessment Category	Degree of Risk				Weight Value
	Level	Criteria		Index	
WARNING TIME Is there usually some lead time associated with the hazard event? Have warning measures been implemented?	MORE THAN 24 HRS 12 TO 24 HRS 6 TO 12 HRS LESS THAN 6 HRS	SELF-DEFINED SELF-DEFINED SELF-DEFINED SELF-DEFINED	(NOTE: Levels of warning time and criteria that define them may be adjusted based on hazard addressed.)	1 2 3 4	10%
DURATION How long does the hazard event usually last?	LESS THAN 6 HRS LESS THAN 24 HRS LESS THAN 1 WEEK MORE THAN 1 WEEK	SELF-DEFINED SELF-DEFINED SELF-DEFINED SELF-DEFINED	(NOTE: Levels of warning time and criteria that define them may be adjusted based on hazard addressed.)	1 2 3 4	10%

4.4.2. Ranking Results

Using the methodology described in Section 4.4.1, Table 4.4-2 lists the Countywide Risk Factor calculated for each of the 19 potential hazards identified in the 2015 Hazard Mitigation Plan Update. Hazards identified as high risk have risk factors greater than 2.5. Risk Factors ranging from 2.0 to 2.4 were deemed moderate risk hazards. Hazards with Risk Factors 1.9 and less are considered low risk. Allegheny County has seven high risk hazards, six moderate risk hazards, and seven low risk hazards for a total of 21 hazards.

Table 4.4.2-1 **Countywide Ranking of Hazard Types Based on Risk Factor (RF) Methodology.**

Hazard Risk	Hazard	Risk Assessment Category					Risk Factor
		Probability	Impact	Spatial Extent	Warning Time	Duration	
High	Flood, Flash Flood, Ice Jam	4	3	3	3	3	3.3
	Winter Storm	4	2	4	1	3	3
	Environmental Hazards	3	2	3	4	2	2.7
	Tornado, Windstorm	3	3	2	4	1	2.7
	Landslide	3	3	1	4	2	2.6
	Subsidence, Sinkhole	3	3	1	3	2	2.5
	Transportation Accidents	4	2	1	4	1	2.5
Moderate	Utility Interruption	3	1	4	3	1	2.4
	Dam and Lock Failure	1	3	3	4	1	2.3
	Terrorism	1	3	2	4	2	2.2

Table 4.4.2-1 **Countywide Ranking of Hazard Types Based on Risk Factor (RF) Methodology.**

Hazard Risk	Hazard	Risk Assessment Category					Risk Factor
		Probability	Impact	Spatial Extent	Warning Time	Duration	
	Civil Disturbance	3	2	1	4	1	2.2
	Opioid Addiction and Response	4	2	1	1	1	2.2
	Drought	2	1	3	1	4	2.0
	Levee Failure	1	3	1	4	2	2.0
Low	Urban Fire and Explosion	2	2	1	4	1	1.9
	Nuclear Incidents	1	2	2	4	2	1.9
	Wildfire	1	2	2	2	2	1.7
	Pandemic	2	1	1	1	4	1.6
	Hurricane, Tropical Storm, Nor'easter	2	1	2	1	2	1.6
	Radon Exposure	2	1	1	1	2	1.4
	Earthquake	1	1	1	4	1	1.3

Table 4.4-3 shows the different municipalities in Allegheny County and whether their risk is greater than (>), less than (<), or equal to (=) the risk factor assigned to the County as a whole.

Table 4.4.2-2 **Jurisdictional Risk Evaluation**

Municipality	Flood, Flash Flood, Ice Jam	Winter storm	Environmental Hazards	Tornado, Windstorm	Landslide	Subsidence, Sinkhole	Transportation Accidents	Utility Interruption	Dam and Lock Failure	Terrorism	Civil Disturbance	Opioid Addiction and Response	Drought	Levee failure	Urban Fire and explosion	Nuclear Incidents	Wildfire	Pandemic	Hurricane, Tropical Storm, Nor'easter	Radon Exposure	Earthquake
Aleppo Township	>	=	=	=	>	=	=	=	<	=	=	=	=	<	=	=	=	=	=	=	=
Aspinwall Borough	>	=	=	=	=	=	=	=	=	=	=	>	=	<	>	=	=	>	=	=	=
Avalon Borough	=	=	=	=	=	<	=	=	=	=	>	>	=	<	>	=	=	>	=	=	=
Baldwin Borough	>	<	=	=	>	>	=	=	=	=	>	=	<	<	=	=	=	=	=	<	=
Baldwin Township	>	<	=	=	>	>	=	>	<	=	=	=	=	<	=	=	=	=	=	<	=
Bell Acres Borough	>	=	>	>	>	<	=	=	<	=	=	=	=	<	=	=	=	=	=	=	=
Bellevue Borough	=	=	=	=	=	<	=	=	=	=	=	>	=	<	>	=	=	>	=	=	=
Ben Avon Borough	=	=	=	=	=	<	=	>	=	=	=	=	=	<	>	=	=	>	=	=	=
Ben Avon Heights Borough	<	=	>	=	>	=	=	>	<	=	=	=	=	<	=	=	=	=	=	=	=
Bethel Park, Municipality of	>	=	=	=	>	=	>	>	<	=	>	=	=	<	<	=	=	=	=	=	=
Blawnox Borough	=	=	>	=	=	<	=	=	=	=	=	=	=	<	=	=	=	=	=	=	=
Brackenridge Borough	=	<	=	=	=	>	=	=	=	=	=	=	=	<	>	=	=	>	=	=	=
Braddock Borough	=	=	>	=	=	<	=	=	=	=	=	=	=	<	=	=	=	=	=	=	=
Braddock Hills Borough	<	=	>	=	=	<	=	=	>	=	=	=	=	<	>	=	=	=	=	=	=
Bradford Woods Borough	=	=	=	>	=	<	=	=	<	=	=	=	=	<	=	=	=	=	=	=	=
Brentwood Borough	=	=	=	=	=	=	>	>	<	=	=	=	=	<	>	=	=	=	=	<	=
Bridgeville Borough	>	=	=	=	=	=	=	=	<	=	=	=	=	<	>	=	=	>	=	=	=
Carnegie Borough	>	=	>	=	>	>	>	=	<	=	>	>	=	<	>	=	=	>	=	=	=

Table 4.4.2-2 **Jurisdictional Risk Evaluation**

Municipality	Flood, Flash Flood, Ice Jam	Winter storm	Environmental Hazards	Tornado, Windstorm	Landslide	Subsidence, Sinkhole	Transportation Accidents	Utility Interruption	Dam and Lock Failure	Terrorism	Civil Disturbance	Opioid Addiction and Response	Drought	Levee failure	Urban Fire and explosion	Nuclear Incidents	Wildfire	Pandemic	Hurricane, Tropical Storm, Nor'easter	Radon Exposure	Earthquake
Castle Shannon Borough	>	<	=	=	>	>	=	>	<	=	=	=	=	<	>	=	=	>	=	<	=
Chalfant Borough	<	=	=	=	=	<	=	=	>	=	=	=	=	<	>	=	=	>	=	=	=
Cheswick Borough	=	=	=	=	=	=	=	=	=	=	=	=	=	<	=	=	=	=	=	>	=
Churchill Borough	=	<	=	>	=	=	>	>	<	=	>	=	>	<	>	=	=	=	=	=	=
Clairton, City of	=	=	=	=	=	<	=	=	=	=	=	>	=	=	=	=	<	=	=	=	=
Collier Township	>	<	=	=	>	=	>	=	=	=	=	=	=	<	=	=	=	=	=	=	=
Coraopolis Borough	>	<	=	=	>	=	=	=	=	=	=	=	=	<	=	=	=	=	=	=	=
Crafton Borough	>	=	=	=	=	=	=	=	<	=	=	>	=	>	>	=	=	>	=	=	=
Crescent Township	=	=	=	=	=	<	=	=	=	=	=	=	=	<	=	=	=	=	=	>	=
Dormont Borough	=	<	=	>	=	=	=	>	<	=	=	>	<	<	>	=	=	>	=	<	=
Dravosburg Borough	=	=	=	=	>	=	=	>	=	=	=	=	=	<	=	=	=	=	=	=	=
Duquesne, City of	=	=	=	=	=	<	>	>	=	=	=	>	=	=	=	=	<	=	=	=	=
East Deer Township	=	=	=	=	=	=	=	=	=	=	=	=	=	<	=	=	>	=	=	>	=
East McKeesport Borough	=	>	>	=	>	=	>	>	<	=	=	=	=	<	>	=	=	>	=	=	=
East Pittsburgh Borough	=	=	=	=	>	<	=	>	<	=	=	=	=	=	>	=	=	>	=	=	=
Edgewood Borough	<	=	=	=	=	<	=	=	<	=	=	=	=	<	>	=	=	>	=	=	=
Edgeworth Borough	>	=	=	=	>	<	=	>	=	=	=	=	=	<	=	=	=	=	=	=	=
Elizabeth Borough	=	=	=	=	=	<	=	=	=	=	=	=	=	<	>	=	=	=	=	=	=

Table 4.4.2-2 **Jurisdictional Risk Evaluation**

Municipality	Flood, Flash Flood, Ice Jam	Winter storm	Environmental Hazards	Tornado, Windstorm	Landslide	Subsidence, Sinkhole	Transportation Accidents	Utility Interruption	Dam and Lock Failure	Terrorism	Civil Disturbance	Opioid Addiction and Response	Drought	Levee failure	Urban Fire and explosion	Nuclear Incidents	Wildfire	Pandemic	Hurricane, Tropical Storm, Nor'easter	Radon Exposure	Earthquake
Elizabeth Township	>	=	=	=	>	>	=	=	=	=	=	=	=	<	=	=	=	=	=	=	=
Emsworth Borough	>	=	=	=	>	<	=	=	=	=	=	=	=	<	=	=	=	=	=	=	=
Etna Borough	=	<	=	=	>	=	=	>	=	=	=	>	=	=	>	=	=	>	=	=	=
Fawn Township	=	=	=	=	=	=	=	=	<	=	=	=	=	<	=	=	=	=	=	>	=
Findlay Township	=	=	=	=	=	=	=	=	=	=	=	=	=	<	=	>	=	=	=	>	=
Forest Hills Borough	<	=	=	=	=	=	=	=	=	=	=	=	=	<	>	=	=	>	=	>	=
Forward Township	=	=	=	>	=	=	=	=	=	=	=	=	=	<	=	=	=	=	=	>	=
Fox Chapel Borough	>	=	=	=	>	>	=	=	=	=	=	>	=	<	=	=	=	=	=	=	=
Franklin Park Borough	>	=	>	=	>	=	>	>	>	=	=	=	=	<	=	=	=	>	=	=	=
Frazer Township	=	=	=	=	=	=	=	=	<	=	=	=	=	<	=	=	=	>	=	=	=
Glassport Borough	=	=	=	=	>	=	=	=	=	=	=	=	=	<	=	=	=	=	=	=	=
Glen Osborne Borough	>	=	>	>	>	=	>	>	=	=	=	=	<	<	=	=	=	=	=	=	=
Glenfield Borough	=	=	=	=	=	<	=	=	=	=	=	=	=	<	=	=	=	=	=	>	=
Green Tree Borough	=	<	=	=	>	>	=	=	<	=	=	>	=	<	=	=	=	=	=	=	=
Hampton Township	>	<	=	=	>	>	=	>	=	=	=	>	<	<	=	=	=	=	=	=	=
Harmar Township	=	=	=	=	=	=	=	=	=	=	=	=	=	<	=	=	=	=	=	>	=
Harrison Township	=	=	=	=	=	=	=	=	=	=	=	=	=	<	=	=	=	=	=	>	=
Haysville Borough	=	=	=	=	=	<	>	=	=	=	=	=	=	<	=	=	=	=	=	=	=

Table 4.4.2-2 **Jurisdictional Risk Evaluation**

Municipality	Flood, Flash Flood, Ice Jam	Winter storm	Environmental Hazards	Tornado, Windstorm	Landslide	Subsidence, Sinkhole	Transportation Accidents	Utility Interruption	Dam and Lock Failure	Terrorism	Civil Disturbance	Opioid Addiction and Response	Drought	Levee failure	Urban Fire and explosion	Nuclear Incidents	Wildfire	Pandemic	Hurricane, Tropical Storm, Nor'easter	Radon Exposure	Earthquake
Heidelberg Borough	=	>	=	=	>	=	>	>	=	>	>	>	=	<	>	=	=	>	=	=	=
Homestead Borough	=	=	=	=	=	<	=	=	=	=	=	=	=	<	>	=	=	>	=	=	=
Indiana Township	>	=	=	=	>	=	=	=	=	=	=	>	=	<	=	=	=	=	=	=	=
Ingram Borough	=	=	=	=	=	<	=	=	<	=	=	>	=	<	>	=	=	>	=	=	=
Jefferson Hills Borough	>	=	=	=	>	=	<	>	=	=	=	=	=	<	=	=	=	=	=	=	=
Kennedy Township	>	=	=	=	>	=	=	=	=	=	=	>	<	<	=	=	=	=	=	=	=
Kilbuck Township	=	>	>	=	>	=	=	>	=	=	=	=	=	<	=	=	=	=	=	=	=
Leet Township	>	=	=	=	>	<	>	=	<	=	=	=	=	<	=	=	=	=	>	=	=
Leetsdale Borough	<	<	=	=	=	<	=	=	=	=	=	=	=	<	=	<	=	=	=	<	=
Liberty Borough	=	=	=	=	=	<	=	=	=	=	=	=	=	<	=	=	=	=	=	=	=
Lincoln Borough	=	=	=	=	=	=	=	=	=	=	=	=	=	<	=	=	=	=	=	=	=
Marshall Township	=	=	=	=	>	<	>	=	=	=	=	=	=	<	=	=	=	=	=	=	=
McCandless, Town of	>	=	=	=	=	=	>	=	=	=	>	=	=	<	=	=	=	=	=	=	=
McDonald Borough	=	=	=	=	=	=	=	=	<	=	=	=	=	<	=	=	=	=	=	>	=
McKees Rocks Borough	=	=	=	=	>	<	=	=	=	=	=	>	=	<	>	=	=	>	=	=	=
McKeesport, City of	>	=	=	=	>	>	=	=	=	=	=	=	<	<	=	=	<	=	=	=	=
Millvale Borough	>	<	=	>	>	=	=	>	=	=	=	>	=	=	>	=	=	>	=	=	=
Monroeville, Municipality of	>	=	=	>	>	>	=	=	=	=	>	=	=	=	=	=	=	=	=	=	=

Table 4.4.2-2 **Jurisdictional Risk Evaluation**

Municipality	Flood, Flash Flood, Ice Jam	Winter storm	Environmental Hazards	Tornado, Windstorm	Landslide	Subsidence, Sinkhole	Transportation Accidents	Utility Interruption	Dam and Lock Failure	Terrorism	Civil Disturbance	Opioid Addiction and Response	Drought	Levee failure	Urban Fire and explosion	Nuclear Incidents	Wildfire	Pandemic	Hurricane, Tropical Storm, Nor'easter	Radon Exposure	Earthquake
Moon Township	>	=	=	=	>	=	=	=	=	=	=	=	=	<	=	=	=	=	=	=	=
Mount Lebanon, Municipality of	>	<	=	=	=	=	<	>	<	>	>	=	=	<	>	=	=	>	=	=	=
Mount Oliver Borough	=	=	=	>	>	>	=	>	<	=	=	>	=	<	>	=	=	>	=	=	=
Munhall Borough	>	<	=	=	>	>	=	=	=	=	=	=	=	<	>	=	=	>	=	>	=
Neville Township	=	=	=	=	=	<	>	=	>	=	=	>	=	<	=	=	=	=	=	<	=
North Braddock Borough	=	=	=	=	=	<	=	=	=	=	=	=	=	<	=	=	=	=	=	>	=
North Fayette Township	>	=	>	>	>	>	>	>	=	=	=	=	=	<	=	=	=	=	=	=	=
North Versailles Township	>	=	<	>	>	=	=	>	<	=	=	=	=	=	=	=	=	=	=	=	=
Oakdale Borough	=	=	=	=	=	<	=	=	<	=	=	>	=	<	=	=	=	=	=	=	=
Oakmont Borough	>	=	>	=	>	<	=	=	=	=	=	=	=	<	=	=	=	=	=	=	=
O'Hara Township	>	<	=	>	>	=	=	>	=	=	=	>	=	<	=	=	<	=	=	=	=
Ohio Township	>	=	=	=	>	=	>	>	<	=	=	=	=	<	=	=	=	=	=	=	=
Penn Hills, Municipality of	>	=	=	=	>	>	>	=	=	=	>	=	=	<	>	=	>	=	=	=	=
Pennsbury Village Borough	<	=	=	=	=	<	=	>	<	=	=	>	=	<	>	=	=	>	=	=	=
Pine Township	=	=	=	=	=	<	=	=	=	=	=	=	=	<	=	=	=	=	=	=	=
Pitcairn Borough	=	=	=	=	=	<	=	=	<	=	=	=	=	=	>	=	=	>	=	=	=
Pittsburgh, City of	=	=	=	=	=	=	=	=	<	>	>	>	=	=	>	=	<	>	=	=	=
Pleasant Hills Borough	>	=	=	=	>	=	=	=	<	=	=	=	=	<	=	=	=	=	>	=	=

Table 4.4.2-2 **Jurisdictional Risk Evaluation**

Municipality	Flood, Flash Flood, Ice Jam	Winter storm	Environmental Hazards	Tornado, Windstorm	Landslide	Subsidence, Sinkhole	Transportation Accidents	Utility Interruption	Dam and Lock Failure	Terrorism	Civil Disturbance	Opioid Addiction and Response	Drought	Levee failure	Urban Fire and explosion	Nuclear Incidents	Wildfire	Pandemic	Hurricane, Tropical Storm, Nor'easter	Radon Exposure	Earthquake
Plum Borough	>	<	=	=	>	>	=	>	=	=	=	=	=	<	=	=	=	=	=	=	=
Port Vue Borough	>	<	=	=	>	=	=	>	=	=	=	=	=	<	=	=	=	=	=	=	=
Rankin Borough	>	=	=	=	=	<	=	=	=	=	=	=	=	<	>	=	=	>	=	=	=
Reserve Township	=	=	=	=	=	<	=	=	<	=	=	>	=	<	=	=	=	=	=	=	=
Richland Township	>	=	=	=	=	<	=	>	=	=	=	=	=	<	=	=	=	=	=	=	=
Robinson Township	>	=	=	=	>	>	>	=	>	=	=	>	=	<	=	=	=	=	=	=	=
Ross Township	>	=	=	=	>	=	=	=	<	=	=	=	=	<	=	=	=	=	=	=	=
Rosslyn Farms Borough	=	=	=	=	=	<	=	=	<	=	=	>	=	<	=	=	=	=	=	=	=
Scott Township	>	<	=	=	>	>	=	=	<	=	=	>	=	<	>	=	=	>	=	=	=
Sewickley Borough	>	=	=	=	=	<	=	=	=	=	=	=	=	<	=	=	=	=	=	>	=
Sewickley Heights	>	>	=	=	>	=	=	>	<	=	=	=	=	<	=	=	=	=	=	=	=
Sewickley Hills Borough	>	>	>	=	=	=	=	>	<	=	=	=	=	<	=	=	=	=	=	=	=
Shaler Township	>	=	=	=	>	=	=	=	=	=	>	>	=	=	=	=	=	=	=	=	=
Sharpsburg Borough	>	=	=	=	=	<	=	=	=	=	=	=	=	<	>	=	=	>	=	=	=
South Fayette Township	=	<	=	=	>	=	=	>	<	=	=	>	=	<	=	=	=	=	=	=	=
South Park Township	>	<	<	=	>	=	=	=	<	=	=	=	=	<	=	=	=	=	=	=	=
South Versailles Township	>	=	=	=	=	<	=	=	=	=	=	=	=	<	=	=	=	=	=	>	=
Springdale Borough	>	=	=	>	=	>	>	>	=	=	=	=	=	<	=	=	=	>	=	=	=

Table 4.4.2-2 **Jurisdictional Risk Evaluation**

Municipality	Flood, Flash Flood, Ice Jam	Winter storm	Environmental Hazards	Tornado, Windstorm	Landslide	Subsidence, Sinkhole	Transportation Accidents	Utility Interruption	Dam and Lock Failure	Terrorism	Civil Disturbance	Opioid Addiction and Response	Drought	Levee failure	Urban Fire and explosion	Nuclear Incidents	Wildfire	Pandemic	Hurricane, Tropical Storm, Nor'easter	Radon Exposure	Earthquake
Springdale Township	>	=	=	=	=	>	=	=	=	=	=	=	=	<	=	=	=	=	=	=	=
Stowe Township	>	=	=	=	>	<	=	=	=	=	=	>	=	<	=	=	=	=	=	=	=
Swissvale Borough	<	=	=	=	>	<	=	=	=	=	=	=	=	<	>	=	=	>	=	=	=
Tarentum Borough	=	=	=	=	=	>	=	=	=	=	=	=	=	<	=	=	=	=	=	=	=
Thornburg Borough	=	<	=	=	>	=	=	=	<	=	=	>	=	=	=	=	=	=	=	=	=
Trafford Borough	=	=	=	=	=	<	=	=	<	=	=	=	=	<	=	=	=	=	=	=	=
Turtle Creek Borough	>	=	=	=	>	=	=	>	<	=	=	=	=	=	>	=	=	>	=	=	=
Upper St. Clair Township	>	<	=	>	>	=	=	>	<	=	=	=	=	<	=	=	=	=	=	=	=
Verona Borough	>	=	=	=	=	=	<	=	=	=	=	=	=	<	>	=	<	>	=	<	=
Versailles Borough	>	=	=	=	=	=	=	=	=	=	=	=	=	<	=	=	=	=	=	=	=
Wall Borough	>	=	=	=	=	<	=	=	<	=	=	=	=	<	=	=	=	=	=	=	=
West Deer Township	>	=	<	>	>	=	=	=	=	=	=	>	=	<	=	=	=	=	=	=	=
West Elizabeth Borough	=	=	=	>	=	=	=	=	=	=	=	=	=	<	=	=	=	=	=	=	=
West Homestead Borough	>	<	=	<	>	<	<	<	=	<	>	=	=	<	<	<	=	=	=	>	=
West Mifflin Borough	=	<	=	=	=	=	=	=	=	=	=	=	=	<	=	=	=	=	=	=	=
West View Borough	<	<	=	=	=	<	=	=	<	=	=	=	=	<	>	=	=	>	=	=	=
Whitaker Borough	>	=	=	=	=	<	=	=	=	=	=	=	=	<	=	=	=	=	=	=	=
White Oak Borough	>	=	=	=	>	=	=	>	=	=	=	=	=	<	=	=	=	>	=	=	=

Table 4.4.2-2 **Jurisdictional Risk Evaluation**

Municipality	Flood, Flash Flood, Ice Jam	Winter storm	Environmental Hazards	Tornado, Windstorm	Landslide	Subsidence, Sinkhole	Transportation Accidents	Utility Interruption	Dam and Lock Failure	Terrorism	Civil Disturbance	Opioid Addiction and Response	Drought	Levee failure	Urban Fire and explosion	Nuclear Incidents	Wildfire	Pandemic	Hurricane, Tropical Storm, Nor'easter	Radon Exposure	Earthquake
Whitehall Borough	>	=	=	=	>	>	=	=	<	=	=	=	=	<	>	=	=	>	=	<	=
Wilkins Township	>	=	=	=	>	=	=	=	<	=	=	=	=	<	=	=	=	=	=	=	=
Wilkinsburg Borough	=	<	>	=	>	>	=	>	<	=	>	=	=	<	>	=	=	>	=	=	=
Wilmerding Borough	=	=	=	=	=	<	=	=	<	=	=	=	=	=	>	=	=	>	=	=	=

4.4.3. Potential Loss Estimates

Estimates provided in this section are based geospatial analysis via Hazus and previous events as reported to NCDC or SHELDUS in order to provide a comprehensive range of potential losses. NCDC and SHELDUS losses provide actual, on-the-ground losses associated with individual flood events with a range of return periods and are useful to indicate the range of possible losses with different flood events. Hazus shows predictive, 1% annual chance losses. These are losses associated with a base flood assuming current development and hydrologic patterns. Estimates are considered potential in that they generally represent losses that could occur in a countywide hazard scenario. In events that are localized, losses may be lower, while regional events could yield higher losses.

Potential loss estimates have four basic components, including:

- Replacement Value: Current cost of returning an asset to its pre-damaged condition, using present-day cost of labor and materials.
- Content Loss: Value of building's contents, typically measured as a percentage of the building replacement value.
- Functional Loss: The value of a building's use or function that would be lost if it were damaged or closed.
- Displacement Cost: The dollar amount required for relocation of the function (business or service) to another structure following a hazard event.

FEMA has calculated the Total Exposure in Floodplain 1.0 (TEIF) as a potential flood risk estimation. TEIF 1.0 data provides an approximate value of economic losses and a relative comparison of potential flood loss. This data highlights which communities have the highest exposure in the floodplain and provides a statewide comparison. In Allegheny County, the City of Pittsburgh and Sharpsburg Borough both rank in the top 20 communities in Pennsylvania for highest potential losses (ranked fourth and 13th, respectively). Table 4.4-4 provides the TEIF 1.0 data for all communities in Allegheny County.

Table 4.4.3-1 **Total Exposure in Floodplain (FEMA, 2014).**

Municipality	Total Exposure In Floodplain	County Ranking	State Ranking
Aleppo Township	$525,210	116	2,382
Aspinwall Borough	$4,114,074	100	1,951
Avalon Borough	$7,552,900	88	1,599
Baldwin Borough	$31,803,638	45	604
Baldwin Township	$6,755,499	90	1,679
Bell Acres Borough	$6,685,065	91	1,684
Bellevue Borough	$10,653,490	82	1,375
Ben Avon Borough	$5,682,015	95	1,788
Ben Avon Heights Borough	$0	N/A	N/A
Bethel Park, Municipality of	$24,909,267	51	741
Blawnox Borough	$14,818,089	72	1,110

Table 4.4.3-1 **Total Exposure in Floodplain (FEMA, 2014).**

Municipality	Total Exposure In Floodplain	County Ranking	State Ranking
Brackenridge Borough	$24,986,617	50	737
Braddock Borough	$49,808,967	28	404
Braddock Hills Borough	$0	N/A	N/A
Bradford Woods Borough	$241,391	118	2,412
Brentwood Borough	$395,130	117	2,398
Bridgeville Borough	$54,986,021	23	361
Carnegie Borough	$41,012,673	32	476
Castle Shannon Borough	$24,176,106	52	769
Chalfant Borough	$0	N/A	N/A
Cheswick Borough	$5,905,065	94	1,764
Churchill Borough	$4,887,334	98	1,862
Clairton, City of	$17,521,696	63	976
Collier Township	$52,836,614	25	374
Coraopolis Borough	$100,734,542	13	156
Crafton Borough	$3,869,261	102	1,988
Crescent Township	$9,860,048	85	1,433
Dormont Borough	$0	N/A	N/A
Dravosburg Borough	$15,630,156	68	1,062
Duquesne, City of	$21,257,129	54	838
East Deer Township	$21,360,404	53	834
East McKeesport Borough	$0	N/A	N/A
East Pittsburgh Borough	$12,425,641	78	1,243
Edgewood Borough	$15,344,470	70	1,078
Edgeworth Borough	$0	N/A	N/A
Elizabeth Borough	$12,991,611	75	1,209
Elizabeth Township	$108,607,247	11	141
Emsworth Borough	$19,771,209	59	879
Etna Borough	$153,174,896	3	89
Fawn Township	$31,728,595	46	605
Findlay Township	$38,848,268	35	501
Forest Hills Borough	$0	N/A	N/A
Forward Township	$15,569,735	69	1,066
Fox Chapel Borough	$11,335,680	81	1,321
Franklin Park Borough	$32,675,507	43	587
Frazer Township	$1,348,134	113	2,291
Glassport Borough	$14,114,993	73	1,150
Glen Osborne Borough	$3,424,482	104	2,036

Table 4.4.3-1 **Total Exposure in Floodplain (FEMA, 2014).**

Municipality	Total Exposure In Floodplain	County Ranking	State Ranking
Glenfield Borough	$36,714,171	37	529
Green Tree Borough	$2,598,197	108	2,139
Hampton Township	$69,141,022	19	268
Harmar Township	$35,780,824	38	538
Harrison Township	$17,138,896	64	991
Haysville Borough	$2,322,700	110	2,174
Heidelberg Borough	$9,313,796	86	1,469
Homestead Borough	$1,869,438	112	2,233
Indiana Township	$32,764,293	42	585
Ingram Borough	$0	N/A	N/A
Jefferson Hills Borough	$54,608,064	24	365
Kennedy Township	$3,393,161	105	2,045
Kilbuck Township	$4,886,377	99	1,863
Leet Township	$32,024,817	44	600
Leetsdale Borough	$74,075,433	17	242
Liberty Borough	$7,646,538	87	1,589
Lincoln Borough	$3,969,566	101	1,973
Marshall Township	$29,422,083	47	656
McCandless, Town of	$103,602,450	12	150
McDonald Borough	$16,967,595	65	1,002
McKees Rocks Borough	$143,791,941	4	95
McKeesport, City of	$132,658,524	6	105
Millvale Borough	$126,759,974	7	111
Monroeville, Municipality of	$110,985,402	10	138
Moon Township	$89,937,981	15	184
Mount Lebanon, Municipality of	$15,030,027	71	1,097
Mount Oliver Borough	$0	N/A	N/A
Munhall Borough	$19,680,240	60	882
Neville Township	$112,257,823	9	136
North Braddock Borough	$16,028,887	67	1,047
North Fayette Township	$45,702,128	31	429
North Versailles Township	$19,415,500	61	889
Oakdale Borough	$20,116,219	57	870
Oakmont Borough	$34,752,569	40	552
O'Hara Township	$91,104,278	14	181
Ohio Township	$6,644,197	92	1,687
Penn Hills, Municipality of	$36,850,717	36	527

Table 4.4.3-1 **Total Exposure in Floodplain (FEMA, 2014).**

Municipality	Total Exposure In Floodplain	County Ranking	State Ranking
Pennsbury Village Borough	$0	N/A	N/A
Pine Township	$18,481,556	62	930
Pitcairn Borough	$73,367,874	18	245
Pittsburgh, City of	$1,631,622,779	1	4
Pleasant Hills Borough	$604,469	115	2,368
Plum Borough	$64,199,038	20	293
Port Vue Borough	$10,323,397	83	1,393
Rankin Borough	$39,196,062	34	495
Reserve Township	$3,326,175	106	2,054
Richland Township	$29,394,828	48	658
Robinson Township	$58,209,236	21	330
Ross Township	$56,768,489	22	347
Rosslyn Farms Borough	$6,423,995	93	1,708
Scott Township	$49,353,113	29	407
Sewickley Borough	$10,260,165	84	1,399
Sewickley Heights	$2,479,269	109	2,152
Sewickley Hills Borough	$1,116,563	114	2,315
Shaler Township	$125,873,910	8	112
Sharpsburg Borough	$520,085,254	2	13
South Fayette Township	$139,212,315	5	100
South Park Township	$51,058,698	26	392
South Versailles Township	$3,857,786	103	1,989
Springdale Borough	$12,081,465	79	1,264
Springdale Township	$7,533,802	89	1,603
Stowe Township	$16,632,667	66	1,019
Swissvale Borough	$33,091,549	41	579
Tarentum Borough	$25,467,247	49	726
Thornburg Borough	$12,763,161	76	1,220
Trafford Borough	$46,534,902	30	426
Turtle Creek Borough	$51,045,130	27	394
Upper St. Clair Township	$83,311,127	16	206
Verona Borough	$34,834,987	39	549
Versailles Borough	$13,454,145	74	1,182
Wall Borough	$2,758,922	107	2,115
West Deer Township	$39,246,889	33	494
West Elizabeth Borough	$5,531,772	97	1,806
West Homestead Borough	$20,008,920	58	871

Table 4.4.3-1 **Total Exposure in Floodplain (FEMA, 2014).**

Municipality	Total Exposure In Floodplain	County Ranking	State Ranking
West Mifflin Borough	$20,456,405	56	863
West View Borough	$0	N/A	N/A
Whitaker Borough	$1,910,319	111	2,229
White Oak Borough	$11,636,513	80	1,292
Whitehall Borough	$5,608,451	96	1,794
Wilkins Township	$20,856,928	55	850
Wilkinsburg Borough	$0	N/A	N/A
Wilmerding Borough	$12,619,047	77	1,233
GRAND TOTAL	$5,966,884,018	N/A	N/A

Historical losses resulting from hazards in Allegheny County are determined through reports from NCDC and SHELDUS for flooding, tornado and windstorms, and winter storms. As reported in the Flood, Flash Flood, Ice Jam profile, past events have accumulated over $115 million in damages, an average of over $210,000 in property damage per event. Since 1996, flood events have caused 7 deaths in Allegheny County and 93 injuries. Nearly all of those injuries occurred during a single event, the remnants of Ivan; this indicates how high losses can be for a single, catastrophic event. Tornadoes resulted in 2 fatalities, 145 injuries and $296,180,000 in property damages. Windstorms, which tend to be more frequent, resulted in one fatality, 68 injuries, and a cumulative $57.6 million in property damage. Looking just at events with wind speeds of over 50 knots, the average property damage per event was $127,501. Winter storms caused $165,740,000 in property damages. Averaged over the 98 events on record, losses average out to about $170,000 per storm event.

The PHMSA incidence reports for hazardous material releases in transit indicate that losses per event are generally small, around $1,150 per incident. However, damages ranged from $0 to $1.3 million for a single event.

Agricultural production in Allegheny County is highly vulnerable to natural hazard events, particularly drought. Data on agricultural losses are available from the USDA Risk Management Agency. The RMA operates and manages the Federal Crop Insurance Corporation, which provides crop insurance to American farmers. While not all crops are insured through RMA, their records provide strong insight into agricultural losses nationwide and in Allegheny County. All historic insured crop losses in Allegheny County have been due to drought, for a total loss of $78,000. Looking holistically at agricultural production, any portion of Allegheny County's $13.7 million in agricultural products could be lost in a disaster event.

Prior flood losses can indicate future losses. Table 4.4-5 shows the total amount of claims paid in each municipality according to CIS. The City of Pittsburgh has the highest total paid claims and premium and coverage. Thirteen municipalities have never had a claim paid despite having policies in force in the community, while Pennsbury Village does not participate in the NFIP.

Table 4.4.3-2 **NFIP Policies and Claims Information (CIS, 2020).**

Municipality	Total Coverage and Premium	Total Amount of Paid Claims
Aleppo Township	$1,086,875	$2,416
Aspinwall Borough	$1,997,719	$31,932
Avalon Borough	$404,057	$0
Baldwin Borough	$7,052,145	$529,486
Baldwin Township	$694,535	$10,549
Bell Acres Borough	$2,404,076	$1,506,699
Bellevue Borough	$0	$8,191
Ben Avon Borough	$6,389	$21,260
Ben Avon Heights Borough	$1,200,900	$0
Bethel Park, Municipality of	$16,671,773	$1,057,474
Blawnox Borough	$506,407	$11,750
Brackenridge Borough	$3,351,065	$30,327
Braddock Borough	$10,173	$41,963
Braddock Hills Borough	$3,142,000	$28,025
Bradford Woods Borough	$350,421	$0
Brentwood Borough	$1,520,094	$16,673
Bridgeville Borough	$8,249,428	$4,217,787
Carnegie Borough	$25,399,749	$2,809,898
Castle Shannon Borough	$4,028,931	$509,669
Chalfant Borough	$0	$3,618
Cheswick Borough	$367,231	$50,913
Churchill Borough	$3,149,257	$107,517
Clairton, City of	$42,180	$70,349
Collier Township	$10,654,858	$345,953
Coraopolis Borough	$6,623,095	$74,968
Crafton Borough	$1,121,863	$77,715
Crescent Township	$1,363,709	$487
Dormont Borough	$1,401,684	$10,843
Dravosburg Borough	$1,157,712	$68,542
Duquesne, City of	$0	$0
East Deer Township	$7,007,904	$89,297
East McKeesport Borough	$175,333	$0
East Pittsburgh Borough	$1,504,931	$143,139
Edgewood Borough	$392,863	$0
Edgeworth Borough	$1,832,987	$1,319
Elizabeth Borough	$2,613,193	$371,016
Elizabeth Township	$12,846,206	$2,916,909

Table 4.4.3-2 **NFIP Policies and Claims Information (CIS, 2020).**

Municipality	Total Coverage and Premium	Total Amount of Paid Claims
Emsworth Borough	$3,539,807	$305,327
Etna Borough	$23,114,091	$6,012,803
Fawn Township	$4,108,070	$1,085,844
Findlay Township	$3,423,668	$83,579
Forest Hills Borough	$4,728,837	$63,616
Forward Township	$3,810,607	$194,265
Fox Chapel Borough	$7,467,267	$139,639
Franklin Park Borough	$5,469,162	$65,787
Frazer Township	$0	$5,345
Glassport Borough	$1,002,850	$26,076
Glen Osborne Borough	$2,780,248	$127,530
Glenfield Borough	$3,943,047	$275,273
Green Tree Borough	$1,712,830	$53,619
Hampton Township	$12,729,770	$1,650,805
Harmar Township	$6,882,502	$1,172,764
Harrison Township	$1,288,956	$127,575
Haysville Borough	$1,173,677	$3,749
Heidelberg Borough	$8,701,596	$701,823
Homestead Borough	$551,687	$0
Indiana Township	$6,397,800	$136,219
Ingram Borough	$230,802	$10,832
Jefferson Hills Borough	$8,811,925	$710,737
Kennedy Township	$806,093	$0
Kilbuck Township	$1,819,004	$416,976
Leet Township	$4,208,878	$124,237
Leetsdale Borough	$16,782,290	$25,384
Liberty Borough	$0	$0
Lincoln Borough	$410,639	$0
Marshall Township	$8,749,884	$62,478
McCandless, Town of	$18,560,362	$694,591
McDonald Borough	$2,712,412	$309,461
McKees Rocks Borough	$31,824,004	$1,884,165
McKeesport, City of	$7,159,786	$462,356
Millvale Borough	$12,695,628	$4,614,377
Monroeville	$10,544,476	$824,957
Moon Township	$6,857,602	$179,316
Mount Lebanon	$20,085	$93,574

Table 4.4.3-2 **NFIP Policies and Claims Information (CIS, 2020).**

Municipality	Total Coverage and Premium	Total Amount of Paid Claims
Mount Oliver Borough	$14,361,000	$0
Munhall Borough	$721,300	$4,981
Neville Township	$22,677,608	$55,595
North Braddock Borough	$210,370	$0
North Fayette Township	$11,541,644	$1,257,073
North Versailles Township	$2,360,657	$94,668
Oakdale Borough	$31,161,204	$2,577,918
Oakmont Borough	$8,640,947	$642,337
O'Hara Township	$22,596,595	$636,650
Ohio Township	$1,502,671	$51,664
Penn Hills, Municipality of	$16,127,420	$1,857,683
Pennsbury Village Borough	$0	$0
Pine Township	$3,064,578	$22,676
Pitcairn Borough	$6,336,290	$634,373
Pittsburgh, City of	$184,536,154	$8,955,193
Pleasant Hills Borough	$1,233,771	$92,114
Plum Borough	$14,330,934	$2,553,146
Port Vue Borough	$2,157,134	$100,869
Rankin Borough	$783,185	$694
Reserve Township	$956,291	$33,123
Richland Township	$3,238,561	$52,800
Robinson Township	$10,576,868	$2,041,233
Ross Township	$25,880,024	$1,590,922
Rosslyn Farms Borough	$2,157,654	$2,894
Scott Township	$15,183,817	$661,610
Sewickley Borough	$772,560	$81,182
Sewickley Heights	$436,542	$19,147
Sewickley Hills Borough	$5,074,264	$0
Shaler Township	$31,863,036	$3,947,397
Sharpsburg Borough	$13,507,352	$1,582,028
South Fayette Township	$21,064,001	$2,983,681
South Park Township	$6,234,017	$1,822,654
South Versailles Township	$415,686	$17,497
Springdale Borough	$1,002,850	$61,632
Springdale Township	$105,459	$12,382
Stowe Township	$2,231,618	$20,746
Swissvale Borough	$1,465,086	$0

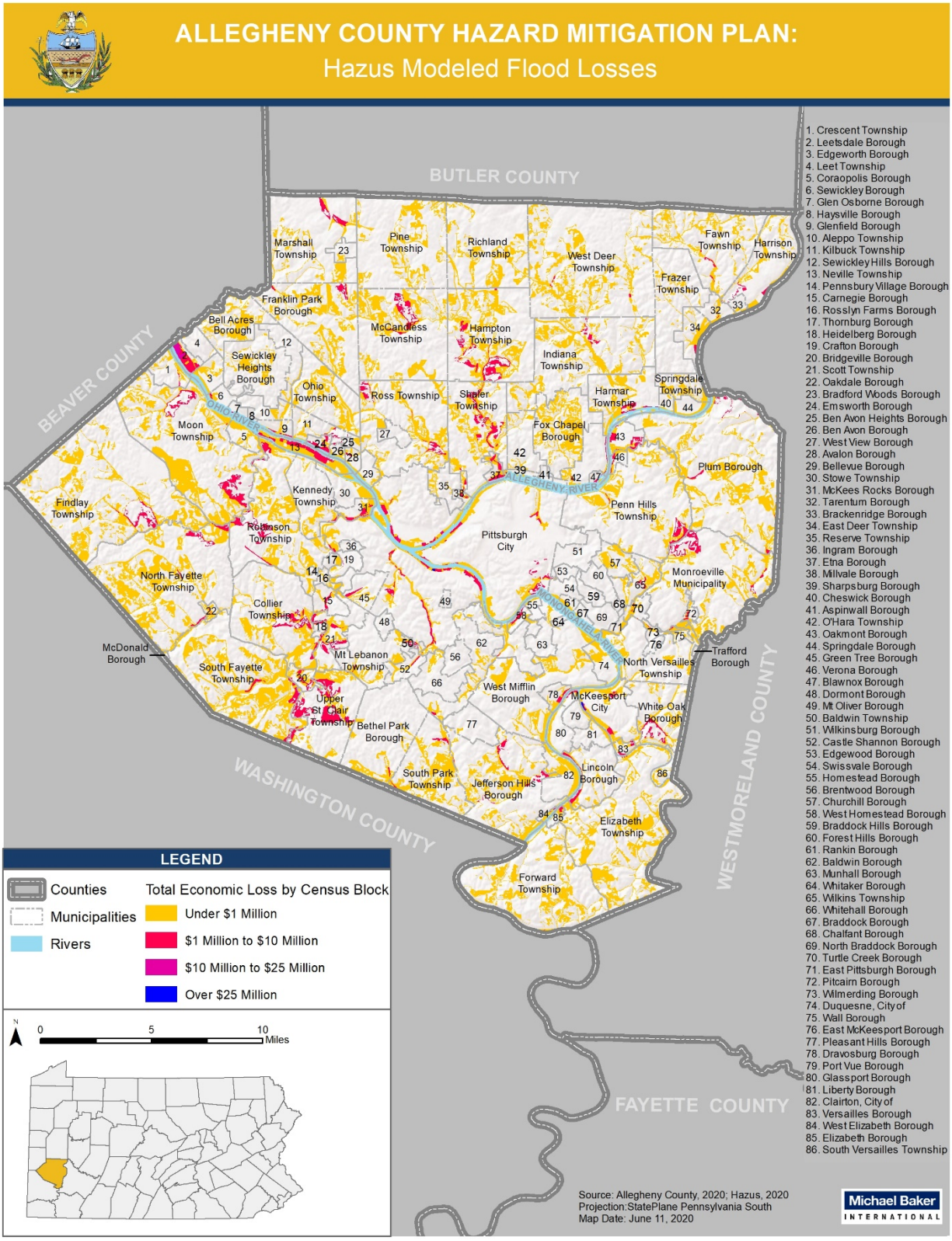
Table 4.4.3-2 **NFIP Policies and Claims Information (CIS, 2020).**

Municipality	Total Coverage and Premium	Total Amount of Paid Claims
Tarentum Borough	$7,283,722	$256,512
Thornburg Borough	$2,559,463	$15,943
Trafford Borough	$3,054,241	$287,928
Turtle Creek Borough	$4,225,980	$1,235,621
Upper St. Clair Township	$26,599,510	$1,094,465
Verona Borough	$5,411,563	$411,662
Versailles Borough	$389,269	$0
Wall Borough	$985,124	$8,997
West Deer Township	$3,527,148	$96,490
West Elizabeth Borough	$570,428	$874,728
West Homestead Borough	$631,076	$382
West Mifflin Borough	$2,982,970	$236,367
West View Borough	$635,447	$5,720
Whitaker Borough	$350,442	$0
White Oak Borough	$3,971,229	$66,609
Whitehall Borough	$4,644,102	$83,342
Wilkins Township	$2,745,193	$896,279
Wilkinsburg Borough	$1,001,368	$4,042
Wilmerding Borough	$2,268,508	$1,353
GRAND TOTAL	**$925,751,957**	**$76,500,734**

In addition to these losses, this plan employed an enhanced Hazus analysis for floods. As opposed to basic analysis using only default data, enhanced analysis incorporates some kind of more recent, up-to-date, or specific data for inclusion in the hazard models. The enhanced data incorporated into this HMP update include updated essential facilities from Allegheny County and FEMA NFHL data. The model also used Hazus's dasymetric general building stock data. For more details on the methodology used to update the Hazus data and view the Global Summary Report, see Appendix F.

Using these datasets in HAZUS-MH Version 2.2, total economic losses from a 1%-annual-chance flood in Allegheny County are estimated to top $3.2 billion. Residential occupancies make up 60% of the total estimated building-related losses and commercial occupancies make up 30% of the total estimated building-related losses. Figure 4.4-2 shows a distribution of building-related losses by census block across Allegheny County. Losses are spread around the county. In this scenario, an expected 3,000 buildings would be moderately damaged and an estimated 11 of the essential facilities (fire stations, hospitals, police stations, and schools) would be at least moderately damaged.

Figure 4.4.3-2 Hazus Modeled Flood Losses



4.5. Future Development and Vulnerability

Risk and vulnerability to natural and human-made 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. Allegheny County is expected to experience a variety of factors that will, in some areas, increase vulnerability to hazards while in other areas, vulnerability may even be reduced.

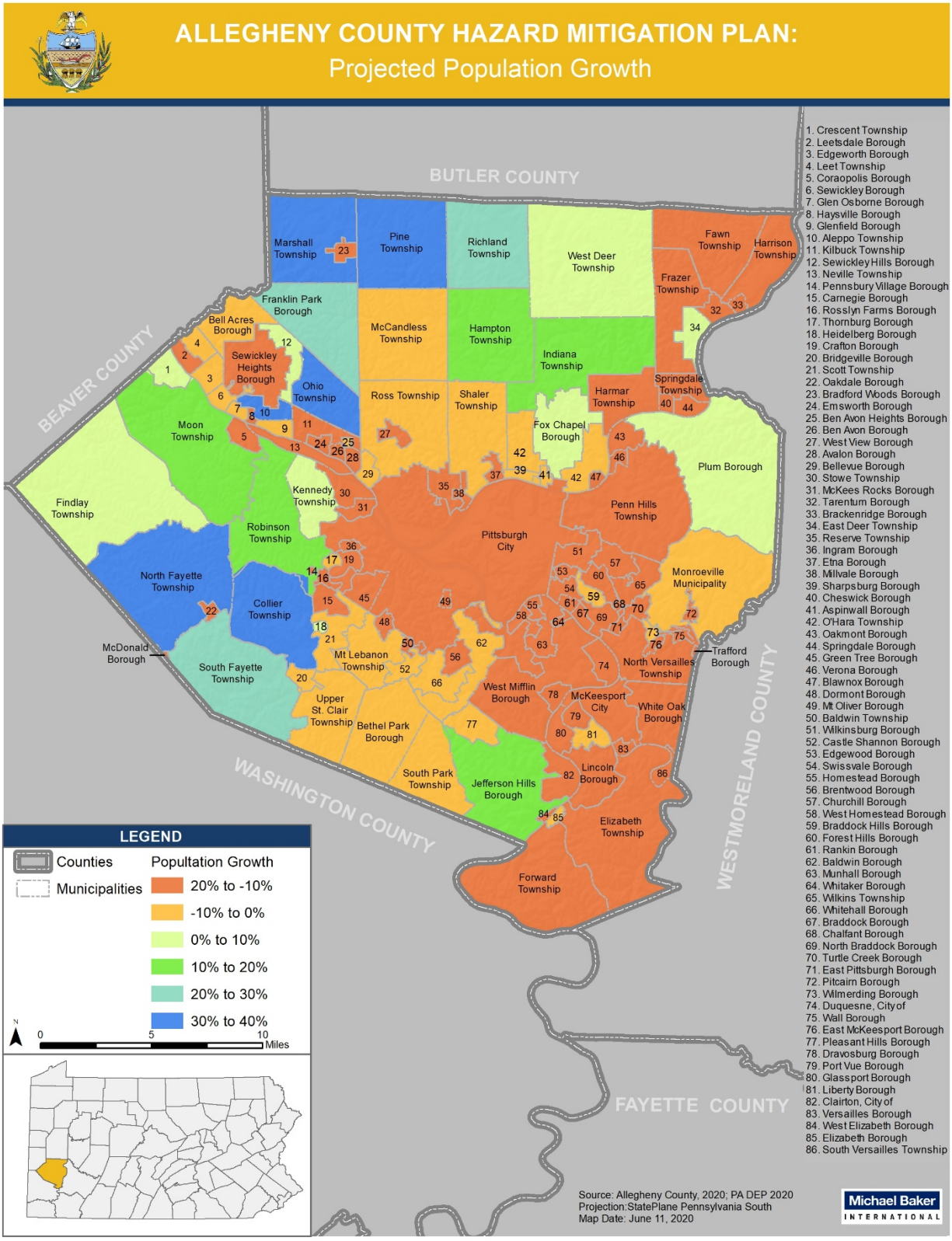
Population change is perhaps the most significant indicator of changes in vulnerability in the future. As discussed in Section 2.3, the total population in Allegheny County decreased between the 2000 and 2010 Census and has only very slightly increased since 2010. However, population projections issued by PA DEP show a declining trend in population loss for the County as a whole, as seen in Table 4.5-1. It is important to note that these population figures are projections only and are derived from birth rates, death rates, and migration information; if there are shifts in these patterns, the projections may change.

Table 4.5-1 **Population Projections for Allegheny County (PADEP, 2020)**

2000 Census	2010 Census	10-year Percent Change	2020 Projected	10-year Percent Change	2030 Projected	10-year Percent Change	2040 Projected	10-year Percent Change
1,281,710	1,223,348	-5	1,179,072	-4	1,155,460	-2	1,136,415	-1.6

Figure 4.5-1 displays the percent of growth or decline in municipal population between years 2010 and 2030 in Allegheny County, as estimated by the PADEP. Although a majority of the most populated municipalities are projected to experience a decrease in population, these areas still maintain the highest density of population in the County. As seen in Figure 2.3-1, the vast majority of the County's population is concentrated around the City of Pittsburgh. As such, hazard vulnerability and loss estimates are higher in this area.

Figure 4.5-2 Projected Population Growth from 2010-2030 in Allegheny County



The Allegheny Future Land Use Plan, within the County Comprehensive Plan Allegheny Places, was developed to serve as a guide for development in the County into the year 2025. The Allegheny Future Land Use Plan describes 8 different types of unique "places" and describes the appropriate type and level of development that would support each place. Most of the identified places include a mix of land uses and build on existing infrastructure. For example, places may include a variety of land use elements such as:

- **Infill Areas:** Provide opportunities for new development and redevelopment on vacant, abandoned or under-utilized properties.
- **Conservation Areas:** Sensitive environmental features, scenic landscapes and cultural resources that are only meant for very limited or no development.
- **Greenway Networks:** interconnected network of natural resource and recreational amenities.
- **River Networks:** major water features in the County.
- **Transportation Networks:** major transportation corridors.

There are not a set of defined growth areas; instead, many of the place-types could support future growth. The intent of developing places for targeted development is to provide an efficient and economical way to allow for both new growth and revitalization, meet a diversity of needs, support transit, reduce consumption of open space, and protect environmentally sensitive resources. There are streams and floodplains, environmentally sensitive areas, steep slopes, and coal mined areas throughout these places, but through enforcement of codes and ordinances at both the local and county level, new growth is funneled away from potential hazard areas.

The 8 places identified in the Allegheny Future Land Use Plan are:

1. **Airport-Industry:** Located in close proximity to Pittsburgh International Airport, and mainly include sites that have been targeted by the County and developers for office and light industrial development.
2. **The Core:** Located in downtown Pittsburgh and Oakland. Much new development in Core Places will be infill development, rehabilitation and reuse of existing buildings, and adaptive reuse of former industrial or warehouse sites and structures.
3. **Corridors:** Have good access to major transportation corridors and highway interchanges. They are relatively intense, mixed-use hubs of office, industrial, commercial and residential uses. Corridor Places can accommodate high-intensity land uses that require large amounts of land such as regional shopping centers, industrial parks, and business parks.
    - Interstate 79
    - Route 28
    - Interstate 279
    - Route 48
    - Future I-376 (Parkway West)
    - Route 50
    - Route 8
    - Route 51

- Route 19
- Route 65
- Route 22
- Mon/Fayette Expressway

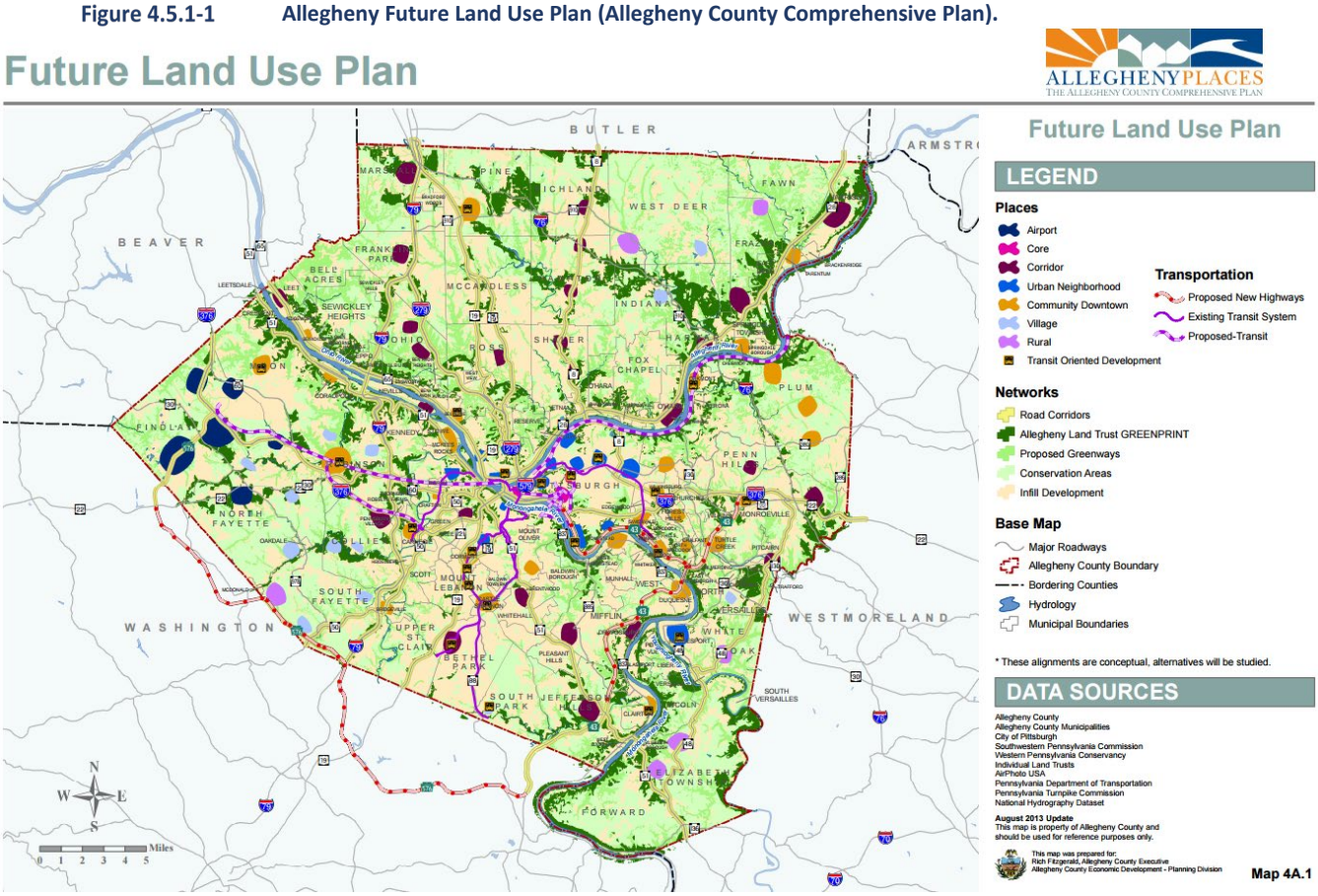
4. **Urban Neighborhoods:** Located within urban areas like the cities of Pittsburgh and McKeesport. They build on existing business districts and mixed-used areas in older, densely developed neighborhoods, and include more regionally-oriented services with a mix of housing types in a walkable setting.
5. **Community Downtowns:** Similar in character to Urban Neighborhoods but are less densely developed. Most, but not all, Community Downtowns build on the existing business districts and downtowns in older communities.
6. **Villages:** Located in suburban communities throughout the County. Village Places are characterized by a mix of residences and small-scale, low-intensity businesses and services that primarily serve neighborhood needs. Non-residential development should neither generate, nor depend on, large volumes of vehicular traffic.
7. **Rural Places:** Located along the "edges" of the County in municipalities that are less developed. Rural Places are the least densely developed of all the types of Places. They will be primarily residential in nature, with a focus on single-family detached housing. Non-residential development will be limited mainly to recreation and essential supporting services.
8. **Transit-Oriented Developments (TODs):** A mix of relatively dense residential, office and retail uses at transit stations or transit stops, to maximize pedestrian access to transit. TOD is an overlay on selected Places that are located along the existing 'T' line and busways, and on proposed new transit lines. TOD Places will incorporate both infill development, and substantial new development on large parcels when available

Some of the Key Challenges identified in Allegheny County's future land use plan are:

- Sprawl in the northern and western portions of the County
- Declining population, especially in core areas
- Disinvestment in older communities
- Brownfields that have high clean-up costs and hinder river access
- A large number of local governments
- Poor condition of housing stock in older communities and the need for demolition

Figure 4.5-3 shows the map of future land use created for Allegheny County's Comprehensive Plan.

Figure 4.5.1-1 Allegheny Future Land Use Plan (Allegheny County Comprehensive Plan).



As previously discussed, brownfields redevelopment is a key issue for Allegheny County because of its strong industrial legacy. According to the EPA, a brownfield is a property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant. Remediating brownfields is a key economic growth strategy for the Commonwealth, as remediating brownfields both improves environmental quality and returns the property to productive use. However, care must be taken to address remediation in particular for brownfields located in hazard areas, as the hazard could exacerbate the environmental challenges faced by brownfields. Table 4.5-2 lists the communities in Allegheny County that have brownfields redevelopment opportunities as reported by the EPA with their vulnerability to each hazard as defined in each Section 4.3.X.5. Please note that there is no single, comprehensive inventory of brownfields available. Brownfields are often identified when a phase I environmental site assessment indicates that there was potential contamination. The data from the EPA represents the 480 brownfields reported to the EPA through the Assessment, Cleanup, and Redevelopment Exchange System. A detailed listing of the name, address, and vulnerability of each site can be found in Appendix H.

Table 4.5.1-1 **Brownfield Vulnerability**

Community	Total Brownfields	Count of In SFHA	Count of On Steep Slope	Count of In Coal Mined Area	Count of In Wooded Area	Count of Within 1.5 Mi SARA	Count of Within 1000 Yds Conventional Well	Count of Within 1000 Yds Unconvn. Well	Count of Within 1.5 Mi Coal Mine	Count of In Levee System Area	Count of Within .5 Mi Rail	Count of Within .5 Mi Maj. Highway
Ambridge	1	0	0	0	0	1	0	0	0	0	1	0
Aspinwall	8	5	0	0	0	8	0	0	0	0	8	0
Blawnox	3	0	0	0	0	3	0	0	0	0	3	0
Clairton	8	0	0	0	0	8	0	8	0	0	8	0
Coraopolis	5	2	0	0	0	5	0	3	0	0	5	0
Creighton	1	0	0	0	0	1	0	1	0	0	1	0
Duquesne	10	0	0	0	0	10	0	0	0	0	10	0
East Deer	1	0	0	0	0	1	0	1	0	0	1	0
East Deer	1	0	0	1	0	1	0	1	0	0	0	0
East McKeesport	3	0	0	0	0	3	0	0	0	0	0	3
Edgewood	1	0	0	0	0	1	0	1	0	0	1	1
Etna	29	12	0	0	0	29	0	2	0	0	29	0
Glassport	1	0	0	0	0	1	0	1	0	0	1	0
Glenshaw	1	1	0	0	0	1	0	1	0	0	1	0
Homestead	5	0	0	0	0	5	0	0	0	0	5	0
McKees Rocks	59	14	0	6	0	59	0	0	0	0	59	0
McKeesport	13	0	0	4	0	9	0	5	0	0	6	0
Millvale	44	33	0	0	0	40	0	0	0	8	37	0
Munhall	2	0	0	0	0	2	0	0	0	0	2	0
Natrona Heights	5	2	0	0	0	3	0	5	0	0	2	0
Neville	2	0	0	0	0	2	0	2	0	0	2	0
New Kensington	2	0	0	0	0	2	0	0	0	0	2	0
North Braddock	1	0	0	0	0	0	0	0	0	0	0	0
Oakmont	2	0	0	0	0	2	0	2	0	0	2	0
Penn Hills	4	0	0	0	0	4	0	4	0	0	3	1
Pittsburgh	11	0	0	0	0	11	0	0	0	0	11	1

Table 4.5.1-1 **Brownfield Vulnerability**

Community	Total Brownfields	Count of In SFHA	Count of On Steep Slope	Count of In Coal Mined Area	Count of In Wooded Area	Count of Within 1.5 Mi SARA	Count of Within 1000 Yds Conventional Well	Count of Within 1000 Yds Unconvn. Well	Count of Within 1.5 Mi Coal Mine	Count of In Levee System Area	Count of Within .5 Mi Rail	Count of Within .5 Mi Maj. Highway
Pittsburgh	170	7	1	9	0	170	0	16	0	0	151	57
Rankin	1	0	0	0	0	1	0	0	0	0	1	0
Rochester	2	0	0	0	0	0	0	0	0	0	2	0
Shaler	4	0	0	0	0	4	0	4	0	0	4	0
Sharpsburg	65	44	0	0	0	65	0	0	0	0	65	0
Springdale	1	0	0	0	0	1	0	1	0	0	1	0
Stowe	3	0	0	0	0	3	0	0	0	0	1	0
Verona	2	0	0	0	0	2	0	2	0	0	2	0
Versailles	1	0	0	0	0	0	0	1	0	0	1	0
West Muffin & City of Duquesne	2	0	2	0	0	2	0	0	0	0	2	0
White Oak	4	0	0	0	0	4	0	4	0	0	0	0
Wilmerding	2	0	0	0	0	2	0	2	0	0	2	0
Grand Total	**480**	**120**	**3**	**20**	**0**	**466**	**0**	**67**	**0**	**8**	**432**	**63**

In addition to population growth and brownfields redevelopment, historical building permit activity provides insight into ongoing development in the County. The Department of Housing and Urban Development (HUD) maintains data on the number of building permits issued for residential construction by jurisdictions across the U.S., data which is culled from the U.S. Census Bureau's Building Permits Survey. The number of building permits by municipality for Allegheny County was obtained from HUD's State of the Cities Data Systems (SOCDS) database for years 2015 through 2019.

Table 4.5-3 displays the number of residential building permits issued by municipality for Allegheny County over the last five years. Although this is the most complete dataset for building permits available, it is an incomplete list as Allegheny County is not completely covered by permitting systems. Also, municipalities that issued no permits were excluded from the table.

Table 4.5.1-2 **Building Permits Issued in Allegheny County between 2015-2019 (HUD, 2019)**

COMMUNITY	2015	2016	2017	2018	2019	Total Units
Harrison Township	9	20	0	2	3	34
Ohio Township	136	127	108	68	16	469
Penn Hills Township	0	0	2	0	0	2
Pine Township	109	117	125	189	109	649
Pittsburgh, City of	1,270	436	476	649	660	3,491
Pleasant Hills Borough	4	0	5	0	0	9
Reserve Township	2	0	0	2	1	5
Ross Township	39	40	47	84	50	260
West Homestead Borough	0	0	0	0	1	1
GRAND TOTAL	**1,569**	**740**	**763**	**994**	**840**	**4,920**

As seen from Table 4.5-3, the greatest share of growth in the County over the last five years has occurred in the City of Pittsburgh – accounting for roughly 70 percent of development in the County. Pine Township accounts for roughly 13 percent of development, Ohio Township accounts for roughly 10 percent and Ross Township for roughly 5 percent.

Making use of the analysis of Allegheny County's current and future population and development trends, it is important to explore how these projected changes may influence the County's future vulnerability to the profiled hazards. Hazard vulnerability and loss potential will be higher in the places of higher density throughout the County, so as areas continue to grow and densify, these communities might become more vulnerable to hazards. For example, population growth and its associated development is likely to create increases in loss potential, as more people may be living in areas prone to hazards.

Although the redevelopment of land is preferable to the conversion of new land parcels for development, an increase in the population density of core urban areas in Allegheny County can increase the County's risk to certain hazards. This development can often place additional critical facilities, businesses, transportation networks, and populations in vulnerable areas. For example, while development occurs most often along transportation networks, because of their access and the increased demand for travel and access to services, this additional development increases the vulnerability to transportation incidents and hazardous material spills. Key hazards that are specific to Allegheny County's growth and development trends include transportation accidents, environmental hazards, and urban fire and explosion.

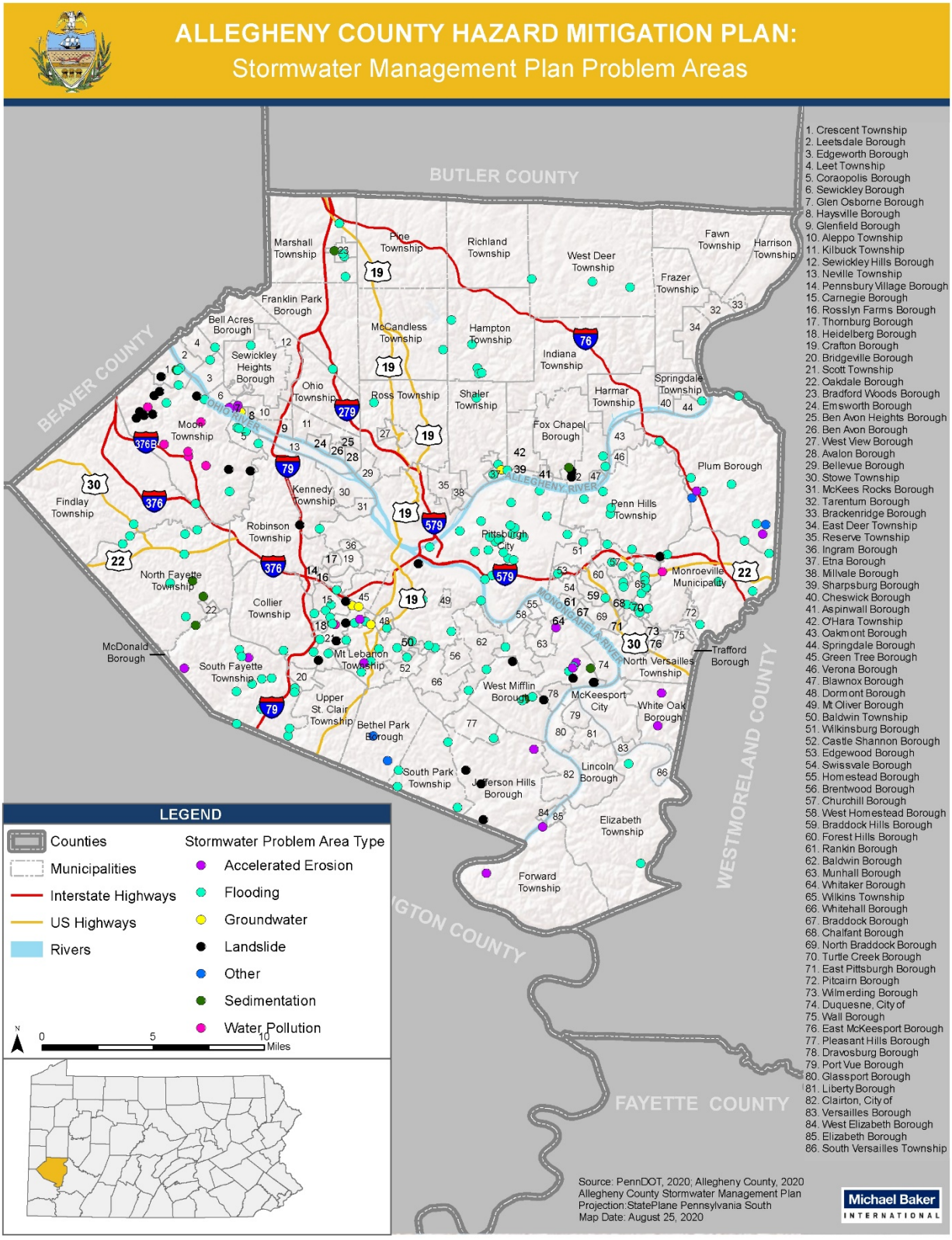
As discussed previously, Allegheny County's comprehensive plan incorporates growth management strategies to protect environmentally sensitive areas and preserve open space, which may help to funnel growth away from hazard-prone areas. In addition, while there may be growth areas that include SFHA or other hazard areas, to comply with state requirements, municipalities have floodplain regulations that limit construction within flood-prone areas and other hazard or environmentally sensitive areas like steep

slopes. These provisions are included within each municipality's and the county's subdivision and land development ordinance. The county subdivision and land development ordinance includes design standards to protect moderately steep and steep slopes, watercourses and wetlands, trees and woodlands, natural areas, air and water quality, and avoidance of hazardous development. Further, through multi-municipal and municipal comprehensive plans, environmentally sensitive areas such as biodiverse areas, floodplains, steep slopes, forested areas, landslide- prone areas, riparian corridors, and wildlife are addressed and appropriate recommendations pertaining to environmentally sensitive areas are provided.

This updated hazard mitigation plan can be used in tandem with the County's land use plan to guide future development because it identifies areas that may be more prone to hazards. Utilizing both the maps associated with the hazard mitigation plan and the future land use plan can assist Allegheny County in accomplishing their goals of development and redevelopment and make them less prone to the negative impacts of hazards.

Another factor that provides insight into the future vulnerability of the County is the findings from the Allegheny County Stormwater Management Plan (SWMP). This plan was completed in 2015 and provides guidance on how the community can move forward in addressing vulnerability through stormwater management. One major part of the SWMP that helps identify future vulnerability is in the identification of key problem areas in relation to erosion, flooding, groundwater, landslides, sedimentation, water pollution and other environmental hazards. Figure 4.5.1-2 shows these problem areas identified in the SWMP by type of problem. The points identified on this map show areas of the County that are most prone to future vulnerability. While many areas are identified, showing that there is a high potential for vulnerability, the County could use this information to take action. This information can be used to minimize future vulnerability by targeting mitigation actions towards addressing these identified areas.

Figure 4.5.1-2 Allegheny County SWMP Identified Problem Areas



5. Capability Assessment

5.1. Update Process Summary

Allegheny County has a number of resources it can access to implement hazard mitigation initiatives including emergency response measures, local planning and regulatory tools, administrative assistance and technical expertise, fiscal capabilities, and participation in local, regional, state, and federal programs. The presence of these resources enables community resiliency through actions taken before, during, and after a hazard event.

The 2015 HMP update included a capability assessment survey developed based on FEMA and PEMA guidance and shortened from the 2011 HMP capability assessment survey to collect the most essential capability information. The survey asked about the most common plans, tools, and programs found in Allegheny County communities; about staff and personnel resources; and ended with a self-assessment of capabilities. Municipalities were asked to complete the information to the best of their ability and Allegheny County Economic Development also provided information about land use, plans, and ordinances available in each community.

For the 2020 HMP update, the capability assessment survey was developed based on the most recent FEMA and PEMA guidance, and similar to the 2015 capability assessment survey asked about the common plans and programs; staff and personnel resources; and a self-assessment of capabilities. To augment municipal responses, Allegheny County Economic Development provided information about the land use, plans, and ordinances in each community.

To aid municipalities in completing the 2020 Capability Assessment Survey, a copy of their 2015 Capability Assessment Survey was provided if a survey was completed. If a municipality did not complete a survey for the 2015 HMP Update, they were provided with a blank survey. The Capability Assessment Survey was provided in both hard copy (at meetings) and electronic format (via e-mail and the project website) to each municipality. In addition, Allegheny County Emergency Services and Allegheny County Economic Development identified county-level capabilities.

The capability assessment is a good tool to identify local capabilities and to recognize gaps and weaknesses that can be addressed through future mitigation actions. The results of the capability assessment provide useful information for developing an effective mitigation strategy.

5.2. Capability Assessment Findings

Within Pennsylvania, no county-level capability assessment would be complete without considering the constituent municipalities. Local municipalities have their own governing body, enforce their own rules and regulations, purchase their own equipment, maintain their own infrastructure, and manage their own resources. In many ways, the County is only as good as the capabilities of its constituent municipalities. Therefore, the capability assessment does not consider Allegheny County as a lone entity but evaluates it considering the various characteristics and differences of and between its municipalities.

Allegheny County's 130 municipalities carry out daily operations and provide various community services according to local needs and limitations. Some of the municipalities have formed cooperative agreements and work jointly with their neighboring municipalities to provide services such as police protection, fire and emergency response, wastewater treatment, water supply management, and planning, while others choose to operate independently. Allegheny County's municipalities vary in staff size, resource availability, fiscal status, service provision, municipal population, overall size, and vulnerability to the profiled hazards. More information on planning and emergency services cooperative agreements are in Section 5.2.1, and a list of shared water suppliers is in Section 4.3.1.

In general, Allegheny County municipalities with fewer residents usually have less staff resulting in limited supply of available resources compared to those municipalities with a greater number of residents. Therefore, areas with limited resources to address hazard mitigation may require a more unified or coordinated approach and/or more efficient utilization of a limited supply of available resources (e.g., financial, technical, and human).

5.2.1. Planning and Regulatory Capability

Pennsylvania municipalities have the authority to govern more restrictively than state and federal minimum requirements provided they comply with criteria established in the Pennsylvania Municipalities Planning Code (MPC). Municipalities can develop their own policies and programs and implement their own rules and regulations to protect and serve their local residents. Allegheny County and municipalities have used, and could continue to use, planning and regulatory tools to support the goals of this hazard mitigation plan and to provide opportunities for further mitigating the potentially negative effects of hazards.

Municipalities implement land use controls via the adoption and enforcement of zoning, subdivision and land development ordinances, building codes, building permit ordinances, floodplain, and stormwater management ordinances. When effectively prepared and administered, these regulations can lead to hazard mitigation. For example, the adoption of the NFIP and the Pennsylvania Floodplain Management Act (Act 166 of 1978) established minimum floodplain management criteria. A municipality must adopt and enforce these minimum criteria to be eligible for participation in the NFIP. Municipalities have the option of adopting a single-purpose ordinance or incorporating these provisions into their zoning and/or subdivision and land development ordinances, or building codes, thereby mitigating the potential impacts of local flooding.

5.2.1.1. Plans and Regulations

The subsections below provide details on the types of major plans and ordinances that Allegheny County and local municipalities use to support the goals of this hazard mitigation plan and provide opportunities for further mitigating the potentially negative effects of natural hazards through regulation.

Table 5.2-1 includes the planning and regulatory capabilities identified by municipalities during the planning process and through review of Allegheny County records.

Table 5.2-1 **Planning and Regulatory Capabilities**

Municipality	Comprehensive Plan	Zoning Regulations	Subdivision Regulations	Floodplain Management Ordinance	Stormwater Management Plan or Ordinance	Building Codes
Allegheny County	X	X	X	X	X	X
Aleppo Township	X	X	X	X	X	X
Aspinwall Borough	X	X	X	X	X	X
Avalon Borough	X	X	X	X	X	X
Baldwin Borough	X	X	X			X
Baldwin Township	X	X	X	X	X	X
Bell Acres Borough	X	X	X	X	X	X
Bellevue Borough	X		X	X	X	X
Ben Avon Borough	X	X				X
Ben Avon Heights Borough	X	X				X
Bethel Park, Municipality of	X	X	X	X	X	X
Blawnox Borough		X			X	
Brackenridge Borough		X		X		
Braddock Borough	X	X	X	X	X	X
Braddock Hills Borough	X	X	X	X	X	X
Bradford Woods Borough	X	X	X	X	X	X
Brentwood Borough	X	X	X		X	X
Bridgeville Borough	X	X	X	X	X	X
Carnegie Borough	X	X	X	X	X	X
Castle Shannon Borough	X	X	X			
Chalfant Borough	X	X	X	X	X	X
Cheswick Borough	X	X	X	X	X	X
Churchill Borough	X	X	X	X	X	X
Clairton, City of	X	X	X	X		X
Collier Township	X	X	X	X	X	X
Coraopolis Borough		X		X	X	X
Crafton Borough	X	X	X	X	X	X
Crescent Township	X	X	X		X	X
Dormont Borough	X	X	X		X	X
Dravosburg Borough		X			X	
Duquesne, City of	X	X	X			X
East Deer Township		X	X			

Table 5.2-1 **Planning and Regulatory Capabilities**

Municipality	Comprehensive Plan	Zoning Regulations	Subdivision Regulations	Floodplain Management Ordinance	Stormwater Management Plan or Ordinance	Building Codes
East McKeesport Borough		X		X	X	X
East Pittsburgh Borough	X	X	X	X	X	X
Edgewood Borough	X	X	X	X	X	X
Edgeworth Borough	X	X	X	X	X	X
Elizabeth Borough	X	X	X			X
Elizabeth Township	X	X	X	X	X	X
Emsworth Borough	X	X	X	X	X	X
Etna Borough	X	X	X	X	X	X
Fawn Township	X	X	X	X		X
Findlay Township	X	X	X	X	X	X
Forest Hills Borough	X	X	X	X	X	X
Forward Township	X	X	X			X
Fox Chapel Borough	X	X	X	X	X	X
Franklin Park Borough	X	X	X	X	X	X
Frazer Township	X	X	X	X	X	X
Glassport Borough	X	X	X			X
Glen Osborne Borough	X	X				X
Glenfield Borough		X	X	X		X
Green Tree Borough	X	X	X			X
Hampton Township	X	X	X	X	X	X
Harmar Township	X	X	X	X	X	X
Harrison Township	X	X	X		X	X
Haysville Borough						X
Heidelberg Borough	X	X		X	X	X
Homestead Borough	X	X	X			X
Indiana Township	X	X	X	X	X	X
Ingram Borough		X	X			X
Jefferson Hills Borough	X	X	X	X	X	X
Kennedy Township		X	X		X	X
Kilbuck Township	X	X	X			
Leet Township		X	X			X
Leetsdale Borough	X	X	X	X	X	X
Liberty Borough	X	X	X			X

Table 5.2-1 **Planning and Regulatory Capabilities**

Municipality	Comprehensive Plan	Zoning Regulations	Subdivision Regulations	Floodplain Management Ordinance	Stormwater Management Plan or Ordinance	Building Codes
Lincoln Borough	X	X	X			X
Marshall Township	X	X	X	X	X	X
McCandless, Town of	X	X	X	X	X	X
McDonald Borough		X	X			X
McKees Rocks Borough		X	X	X	X	X
McKeesport, City of	X	X	X			X
Millvale Borough	X	X	X	X	X	X
Monroeville, Municipality of	X	X	X			X
Moon Township	X	X	X	X	X	X
Mount Lebanon, Municipality of	X	X	X	X	X	X
Mount Oliver Borough	X	X	X		X	X
Munhall Borough		X		X	X	X
Neville Township	X	X	X	X	X	X
North Braddock Borough	X	X	X	X	X	X
North Fayette Township	X	X	X	X	X	X
North Versailles Township		X	X	X	X	X
Oakdale Borough		X		X	X	X
Oakmont Borough	X	X	X	X	X	X
O'Hara Township	X	X	X	X	X	X
Ohio Township	X	X	X			X
Penn Hills, Municipality of	X	X	X	X	X	X
Pennsbury Village Borough					X	X
Pine Township	X	X	X	X	X	X
Pitcairn Borough	X	X	X	X	X	X
Pittsburgh, City of	X	X	X	X	X	X
Pleasant Hills Borough		X		X	X	X
Plum Borough	X	X	X		X	X
Port Vue Borough		X	X	X	X	X
Rankin Borough	X	X	X	X	X	X

Table 5.2-1 **Planning and Regulatory Capabilities**

Municipality	Comprehensive Plan	Zoning Regulations	Subdivision Regulations	Floodplain Management Ordinance	Stormwater Management Plan or Ordinance	Building Codes
Reserve Township	X	X	X	X	X	X
Richland Township	X	X	X	X	X	X
Robinson Township	X	X	X	X		X
Ross Township	X	X	X	X	X	X
Rosslyn Farms Borough	X	X	X			
Scott Township	X	X	X	X	X	X
Sewickley Borough	X	X	X	X	X	X
Sewickley Heights Borough	X	X	X	X	X	X
Sewickley Hills Borough	X	X	X		X	X
Shaler Township		X	X	X	X	X
Sharpsburg Borough	X	X	X	X	X	X
South Fayette Township	X	X	X			X
South Park Township	X	X	X	X	X	X
South Versailles Township	X	X	X	X	X	X
Springdale Borough	X	X	X	X	X	X
Springdale Township	X	X	X			X
Stowe Township	X	X	X	X	X	X
Swissvale Borough	X	X	X	X	X	X
Tarentum Borough		X	X	X	X	X
Thornburg Borough	X	X	X			X
Trafford Borough	X	X	X	X	X	X
Turtle Creek Borough	X	X	X	X	X	X
Upper St. Clair Township	X	X	X	X	X	X
Verona Borough		X	X	X	X	X
Versailles Borough	X	X				X
Wall Borough	X	X	X			
West Deer Township	X	X	X	X	X	X
West Elizabeth Borough				X	X	X
West Homestead Borough		X	X	X	X	X
West Mifflin Borough	X	X	X	X		X
West View Borough	X	X	X			

Table 5.2-1 **Planning and Regulatory Capabilities**

Municipality	Comprehensive Plan	Zoning Regulations	Subdivision Regulations	Floodplain Management Ordinance	Stormwater Management Plan or Ordinance	Building Codes
Whitaker Borough	X	X	X	X	X	X
White Oak Borough	X	X	X	X		X
Whitehall Borough		X	X	X	X	X
Wilkins Township	X	X	X	X	X	X
Wilkinsburg Borough	X	X	X		X	X
Wilmerding Borough	X	X	X	X	X	X

Comprehensive Plans

A comprehensive plan is a policy document that states objectives and guides the future growth and physical development of a municipality. The comprehensive plan is a blueprint for housing, transportation, community facilities, utilities, and land use. It examines how the past led to the present and charts the community's future path. Pennsylvania's MPC (Act 247 of 1968), as reauthorized and amended, requires counties to prepare and maintain a county comprehensive plan and to update it every 10 years. Local municipalities may prepare, but are not required by the MPC to prepare, a comprehensive plan.

With regard to hazard mitigation planning, Section 301(a)2 of the MPC requires comprehensive plans to include a plan for land use, which, among other provisions, suggests that the Plan give consideration to floodplains and other areas of special hazards and other similar uses. The MPC also requires comprehensive plans to include a plan for community facilities and services and recommends considering storm drainage and floodplain management.

Allegheny County adopted its comprehensive plan, Allegheny Places, in 2008 and updated the plan in 2014. The plan is an award-winning comprehensive land use plan focused on building a sustainable future for Allegheny County. A key push in Allegheny Places was to improve coordinated planning between the county and local levels. To accomplish this, the county instituted checklists to evaluate local plans, ordinances, grant applications, and development plans to ensure consistency with the comprehensive plan. In addition, the planning process generated model ordinances for community use.

Allegheny County is preparing an update to Allegheny Places. The update will provide the opportunity to cross share information with the County's HMP update to demonstrate continued integration between the county's planning documents.

Many municipalities participated in regional comprehensive planning efforts for Allegheny Places, designed to address specific issues and characteristics in a region of Allegheny County that affect multiple municipalities. However, because land use authority in Pennsylvania is delegated to the local municipality,

communities are empowered to complete local or multi-municipal comprehensive plans. One hundred six of the municipalities reported having, or Allegheny County has record of them having, a comprehensive plan or joint comprehensive plan. Four (4) municipalities report they are in the process of developing a comprehensive plan: McKees Rocks Borough, Tarentum Borough, Verona Borough, and West Homestead Borough.

Zoning Ordinances

Zoning ordinances allow for local municipalities to regulate the use of land to protect the interest and safety of the general public. In Pennsylvania, the MPC establishes authority to for communities to zone. Zoning ordinances can be designed to address unique conditions or concerns within a given community but must be based in maintaining public health and safety in a community. They may be used to create buffers between structures and high-risk areas, limit the type or density of development, and/or require land development to consider specific hazard vulnerabilities. All but three municipalities in Allegheny County – Haysville Borough, Pennsbury Village Borough, and West Elizabeth Borough – have zoning ordinances. Haysville Borough reports it is in the process of developing zoning regulations.

Cooperative Comprehensive Plans and Ordinances

Several Allegheny County communities conduct multi-municipal comprehensive planning to ensure consistency in land use and development strategies. These joint planning efforts coordinate development and redevelopment decisions and planning initiatives that directly impact all the communities included, and leverage resources in typically small communities. In addition, there are three joint land use ordinances (two zoning, one SALDO) to direct development. Table 5.2-2 details current joint plans and zoning ordinances in effect in Allegheny County including two joint comprehensive plans developed in partnership with municipalities in neighboring Beaver and Butler counties.

Table 5.2-2 **Joint Comprehensive Plans and Ordinances in Allegheny County**

Coordinating Communities	Plan and/or ordinance Name
Aleppo Township, Glen Osborne Borough, Sewickley Borough	ASO Joint Comprehensive Plan
Avalon Borough, Bellevue Borough, Ben Avon Borough	Avalon-Bellevue-Ben Avon Joint Zoning Ordinance
Avalon Borough, Bellevue Borough, Ben Avon Borough, Ben Avon Heights Borough	Joint Comprehensive Plan for the Boroughs of Avalon, Bellevue, Ben Avon and Ben Avon Heights
Carnegie Borough, Heidelberg Borough, Scott Township	Heidelberg, Carnegie, and Scott Township Joint Comprehensive Plan
Churchill Borough, Municipality of Monroeville, Wilkins Township	Multimunicipal Implementable Comprehensive Plan for the Energetic East
Springdale Township, Harmar Township, Cheswick Borough, Springdale Borough	Allegheny Valley Regional Planning Commission Long Range Development Plan
Crafton Borough, Ingram Borough	Crafton-Ingram Implementable Comprehensive Plan

Table 5.2-2 **Joint Comprehensive Plans and Ordinances in Allegheny County**

Coordinating Communities	Plan and/or ordinance Name
Crafton Borough, Rosslyn Farms Borough, Thornburg Borough	CRT Joint Comprehensive Plan
East McKeesport Borough, North Versailles Township, Wall Borough	East Allegheny Joint Comprehensive Plan East Allegheny Joint Zoning District Multi-municipal SALDO
East Pittsburgh Borough, North Braddock Borough	East Pittsburgh Borough and North Braddock Borough Joint Comprehensive Plan
Edgewood Borough, Swissvale Borough, Rankin Borough	Edgewood-Swissvale-Rankin Joint Comprehensive Plan
Elizabeth Borough, Elizabeth Township, Forward Township, Glassport Borough, Liberty Borough, Lincoln Borough, Madison Borough, McKeesport City, Port Vue Borough, South Versailles Township, Versailles Borough, West Mifflin Borough, West Newton Borough, White Oak Borough	Twin Rivers Council of Governments Regional Comprehensive Plan
Etna Borough, Millvale Borough, Sharpsburg Borough	Etna-Millvale-Sharpsburg Joint Municipal Comprehensive Plan
Indiana Township, West Deer Township	Indiana & West Deer Townships Joint Comprehensive Plan
Leetsdale Borough, Economy Borough (Beaver County)	SHALE Multi-Municipal Comprehensive Plan
McKees Rocks Borough, Neville Township, Stowe Township	Char-West Multi-Municipal Comprehensive Plan
Richland Township, Middlesex Township (Butler County)	Richland-Middlesex Joint Comprehensive Plan
Springdale Township, Springdale Borough, Harmar Township, Cheswick Borough	Allegheny Valley Communities Multi Municipal Comprehensive Plan
Source: Pennsylvania Governor's Center for Local Government Services, eLibrary.	

Subdivision Regulations

Subdivision and land development ordinances (SALDOs) are intended to regulate the development of housing, commercial, industrial, or other uses, including associated public infrastructure, as land is subdivided into buildable lots for sale or future development. Within these ordinances, guidelines on how land will be divided, the placement and size of roads and the location of infrastructure can reduce exposure of development to hazard events. One hundred fourteen (114) municipalities report having, or Allegheny County has record of them having, subdivision regulations. Munhall Borough reports it is in the process of developing subdivision regulations. Municipalities that do not have an adopted SALDO, rely on

ACED as the county planning agency for reviewing and approving proposed subdivisions and development applications.

Floodplain Management Ordinances

Municipalities can help regulate construction in floodplains through floodplain ordinances and floodplain management plans. Floodplain management plans describe how the community will reduce the impact of flood events through preventive and corrective actions. Through administration of floodplain ordinances, municipalities can ensure that all new construction or substantial improvements to existing structures located in a floodplain are flood-proofed, dry-proofed, or built above anticipated flood elevations. The NFIP establishes minimum ordinance requirements which must be met for that community to participate in the program. However, Allegheny County municipalities updated their floodplain ordinances in 2014, nearly all reported using the Pennsylvania Model Ordinance. All communities participating in the NFIP have floodplain management ordinances. Most have standalone ordinances that are a part of the municipal code, but a few, like the City of Pittsburgh and Fox Chapel Borough, include floodplain management regulations as a part of the zoning ordinance.

Stormwater Management Plan or Ordinance

The proper management of stormwater runoff can improve conditions and decrease the chance of flooding. The Pennsylvania legislature enacted the Stormwater Management Act (Act 167 if 1978), commonly called Act 167, requiring counties to develop stormwater management plans for designated watersheds. This planning effort results in sound engineering standards and criteria being incorporated into local codes and ordinances to manage stormwater runoff from new development in a coordinated, watershed-wide approach. Without such planning, stormwater is either not controlled by municipal ordinances, or is addressed on a site-by-site or municipal boundary basis. Municipalities within the same watershed may require different levels of stormwater control. The result is often the total disregard of downstream impacts or the compounding of existing flooding problems.

Act 167 Stormwater Management Plans are intended to improve stormwater management practices, mitigate potential negative impacts from future land uses, and improve the condition of impaired waterways. This type of plan provides local ordinances that incorporate standards and criteria to manage and maintain peak runoff flows throughout the combined watersheds as development occurs. Also, it is not the intent of this plan to solve existing flooding or runoff problems, but to identify for future correction and assure problems do not get worse. More specifically, this plan does not require municipalities to correct existing drainage problems.

Allegheny County completed stormwater planning in two phases. Phase I prepared a Scope of Study to establish procedures used to prepare the Stormwater Management Plan. Phase II completed in 2018 included focusing on development of a model ordinance to be adopted by all municipalities. Phase II also included the analysis of problem areas and significant obstructions and development of conceptual solutions to those problems. The final Phase II Report and model ordinance are considered as Allegheny County's Stormwater Management Plan.

In 2015 65 municipalities in Allegheny County reported having, or Allegheny County had record of them having, a stormwater management plan or stormwater management ordinances. With the completion of the County's Stormwater Management Plan this number increased to 106.

Building Codes

Building codes are important in hazard mitigation as codes are developed specific to hazards present within a given region of the country. Consequently, structures are constructed to applicable codes developed for resistance to many hazards such as strong winds, floods, and earthquakes, and can also help mitigate regional hazards like wildfires. In 2003, the Commonwealth implemented the Uniform Construction Code (UCC) (Act 45 of 1999), a comprehensive building code that establishes minimum regulations for most new construction, including additions and renovations to existing structures.

The UCC applies to almost all buildings, excluding manufactured and industrialized housing (which are covered by other laws), agricultural buildings, and certain utility and miscellaneous buildings. The UCC has many advantages in requiring builders to use materials and methods that have been professionally evaluated for quality and safety, as well as requiring inspections of completed work to ensure compliance.

All municipalities in Allegheny County opt-in to the UCC, meaning they have elected to enforce the UCC. Five (5) municipalities report use of the International Code Council's International Building Code (IBC) for commercial construction and International Residential Code (IRC) for residential construction.

5.2.1.2. Emergency Management

In Allegheny County Emergency Management is a comprehensive, integrated program of mitigation, preparedness, response, and recovery for all types of emergencies and disasters. In Pennsylvania, Emergency Management begins at the municipal level, as required by the PA Emergency Management Service Code. Every county, city, borough, and township in the Commonwealth is required to have an emergency management coordinator selected by the elected officials of the jurisdiction. The ultimate responsibility for Emergency Management always rests with the chief elected officials and governing body; however, the Emergency Management Coordinator's role is to develop plans, conduct training, and coordinate all available resources in the community pre- and post-disaster. All municipalities in Allegheny County, with the exception of Haysville Borough and Tarentum Borough, identified having an Emergency Management Coordinator. There is one regional EMA in the County, Allegheny Valley Regional EMA, covering Cheswick Borough, Springdale Borough, and Harmar Township. Allegheny County runs a quarterly training program for local emergency management coordinators.

Effective partnerships are created in advance of a disaster by the Emergency Management Coordinator through the development of a proactive, comprehensive emergency operations plan and other planning, training, and exercise programs. Allegheny County runs two programs to proactively plan for, and be prepared for, all-hazards: Local Emergency Planning Committee (LEPC) and Citizen Corps Council (CCC). The LEPC was established in 1987 in compliance with SARA Title III (Emergency Planning and Community Right-to-Know Act of 1986). Composed of business leaders, environmental groups, public safety, medical and health, human/social services agencies and departments, the LEPC's primary agenda is to develop plans and programs to mitigate the effects of hazardous material releases in the community. The LEPC

runs quarterly trainings with all the municipal EMCs. The LEPC also functions as the CCC, which was formed to make all municipalities, and therefore the county, safer and better prepared to respond to the threats of terrorism, crime, public health issues, and disasters of all kinds. The group accomplishes this by working with Allegheny County Emergency Management to facilitate education, training, and volunteer service opportunities. CCC programs in Allegheny County include:

Community Emergency Response Teams (CERT) – Groups of volunteers trained in basic emergency skills to help the community's residents, schools and businesses deal with injuries and conditions until professionals can arrive.

- Fire Corps – Community volunteers focused on building emergency capacity with their local fire companies by serving in non-emergency roles.
- Medical Reserve Corps (MRC) – Community volunteers assisting in the event of a medical emergency.
- Neighborhood Watch Program – Community volunteers making their neighborhoods safer by working with local law enforcement to reduce crime and improve their quality of life.
- Volunteers in Police Services (VIPS) – Citizens volunteering their time and skills with their local law enforcement agency.

In addition to these emergency management capabilities, several communities have cooperative agreements and/or contracts to share several key emergency services. Table 5.2-3 lists the communities using joint emergency services organizations, and the type of services shared.

Table 5.2-3 **Shared Emergency Services in Allegheny County**

Provider	Cooperating Jurisdictions	Type of Service
Allegheny County Police	Wilmerding Borough	Police Services
Allegheny Valley Regional Police Department	Cheswick Borough Springdale Township	Police Services
Carnegie Police Department	Carnegie Borough Pennsbury Village Borough	Police Services
Crafton Police Department	Crafton Borough Thornburg Borough	Police Services
East McKeesport Police Department	East McKeesport Borough Wall Borough	Police Services
Elizabeth Borough Police Department	Elizabeth Borough West Elizabeth Borough	Police Services
Forest Hills Police Department	Forest Hills Borough Chalfant Borough	Police Services
McKeesport Police Department	City of McKeesport Dravosburg Borough	Police Services

Table 5.2-3 **Shared Emergency Services in Allegheny County**

Provider	Cooperating Jurisdictions	Type of Service
Northern Regional Police Department	Bradford Woods Borough Marshall Township Pine Township Richland Township	Police Services
Ohio Township Police Department	Aleppo Township Ben Avon Borough Ben Avon Heights Borough Emsworth Borough Kilbuck Township Neville Township Ohio Township Sewickley Hills Borough	Police Services
Pennsylvania State Police – Findlay	Glenfield Borough Haysville Borough	Police Services
Pennsylvania State Police – Troop B	East Pittsburgh Borough	Police Services
Sewickley Borough Police Department	Glen Osborne Borough Sewickley Borough	Police Services
Scott Township Police Department	Scott Township Rossyln Farms Borough	Police Services
White Oak Police Department	South Versailles Township White Oak Borough	Police Services
Baldwin EMS	Baldwin Borough Pleasant Hills Borough West Mifflin Borough Whitaker Borough	Emergency Medical Services
Carnegie Volunteer Fire and Rescue Bureau	Carnegie Borough Pennsbury Village Borough	Emergency Medical Services
City of Pittsburgh, Bureau of EMS	City of Pittsburgh Mount Oliver Borough	Emergency Medical Services
Eastern Area Prehospital Services	East McKeesport Borough Edgewood Borough Swissvale Borough Turtle Creek Borough Wall Borough Wilkinsburg Borough Wilmerding Borough	Emergency Medical Services
East Deer EMS	East Deer Township Frazer Township	Emergency Medical Services

Table 5.2-3 **Shared Emergency Services in Allegheny County**

Provider	Cooperating Jurisdictions	Type of Service
Eureka VFD	Brackenridge Borough Fawn Township Tarentum Borough	Emergency Medical Services
Foxwall EMS	Aspinwall Borough Fox Chapel Borough	Emergency Medical Services
Jefferson Hills EMS	Forward Township Jefferson Hills Borough West Elizabeth Borough	Emergency Medical Services
Kirwan Heights Fire Department	Collier Township Heidelberg Borough	Emergency Medical Services
Lower Valley Ambulance Service	Cheswick Borough Harmar Township Indiana Township Oakmont Borough Springdale Borough Springdale Township	Emergency Medical Services
McKeesport Ambulance Rescue Service	Dravosburg Borough City of Duquesne City of McKeesport Port Vue Borough	Emergency Medical Services
McCandless-Franklin Park Ambulance Authority	Bradford Woods Borough Franklin Park Borough Glassport Borough Marshal Township McCandless Township Pine Township	Emergency Medical Services
Medical Rescue Team South Authority	Baldwin Township Castle Shannon Borough Dormont Borough Greentree Borough Mt. Lebanon Whitehall Borough	Emergency Medical Services
Munhall Area Prehospital Services	Homestead Borough Munhall Borough West Homestead Borough	Emergency Medical Services

Table 5.2-3 **Shared Emergency Services in Allegheny County**

Provider	Cooperating Jurisdictions	Type of Service
Northwest EMS	Avalon Borough Bellevue Borough Ben Avon Borough Ben Avon Heights Borough Emsworth Borough Findlay Township Kennedy Township Kilbuck Township McKees Rocks Borough North Fayette Township Oakdale Borough Stowe Township	Emergency Medical Services
Parkview EMS	Blawnox Borough O'Hara Township	Emergency Medical Services
Priority One EMS	Braddock Borough East Pittsburgh Borough North Braddock Borough Rankin Borough	Emergency Medical Services
Quaker Valley Ambulance Authority	Aleppo Township Bell Acres Borough Edgeworth Borough Glen Osborne Borough Glenfield Borough Haysville Borough Leet Township Leetsdale Borough Sewickely Borough Sewickley Heights Borough Sewickely Hills Borough	Emergency Medical Services
Robinson EMS	Crafton Borough Robinson Township Rosslyn Farms Borough Thornburg Borough	Emergency Medical Services
Ross/West View EMSA	Millvale Borough Ohio Township Reserve Township Ross Township West View Borough	Emergency Medical Services

Table 5.2-3 **Shared Emergency Services in Allegheny County**

Provider	Cooperating Jurisdictions	Type of Service
Seneca Area EMS	Etna Borough Sharpsburg Borough	Emergency Medical Services
Shaler Hampton EMS	Etna Borough Hampton Township Shaler Township	
Southbridge EMS	Bridgeville Borough South Fayette Township	Emergency Medical Services
Southeast Regional EMS	City of Clairton Elizabeth Borough Elizabeth Township Forward Township Jefferson Hills Borough Liberty Borough Lincoln Borough Union Township Versailles Borough West Elizabeth Borough	Emergency medical Services
Tri-Community South EMS	Bethel Park Borough South Park Township Upper St. Clair Township	Emergency Medical Services
Valley Ambulance Authority	Coraopolis Borough Crescent Township Moon Township Neville Township	Emergency Medical Services
Woodland Hills EMS	Braddock Hills Borough Chalfant Borough Forest Hills Borough Wilkins Township	Emergency Medical Services
White Oak EMS	South Versailles Township White Oak Borough	Emergency Medical Services
Aleppo Township VFD	Aleppo Township Sewickley Heights Borough	Fire Department
Allegheny Valley VFD	Harmar Township Springdale Township	Fire Department
Avalon VFD	Avalon Borough Ben Avon Heights Borough	Fire Department
Ben Avon VFD	Ben Avon Borough Kilbuck Township	Fire Department

Table 5.2-3 Shared Emergency Services in Allegheny County		
Provider	**Cooperating Jurisdictions**	**Type of Service**
Castle Shannon VFD	Castle Shannon Borough Baldwin Township	Fire Department
Cochran Hose Company	Edgeworth Borough Glen Osborne Borough Haysville Borough Sewickley Borough	Fire Department
Crafton VFD	Crafton Borough Rosslyn Farms Borough Thornburg Borough	Fire Department
Emsworth VFD	Emsworth Borough Glenfield Borough Kilbuck Township	Fire Department
Ohio Township VFD	Ohio Township Sewickley Hills Borough	Fire Department
Pittsburgh Bureau of Fire	City of Pittsburgh Wilkinsburg Borough	Fire Department
United Fire and Rescue	East McKeesport Borough Wall Borough	Fire Department
Source: Allegheny County, https://www.alleghenycounty.us/emergency-services/police-departments.aspx.		

During a disaster, response and recovery efforts are coordinated from an Emergency Operations Center that is staffed by paid and volunteer personnel and representatives from all emergency service departments and agencies involved in operations. When two or more municipalities are involved in a disaster, the county can assume overall emergency coordination. When two or more counties are involved in a disaster, the state can assume overall coordination. When two or more states are involved in a disaster, the federal government can assume overall coordination. The responsibility and authority for emergency management always lies with the lowest level of government affected, and a unified incident command system is implemented that is all inclusive yet is never meant to usurp local authority.

5.2.1.3. Participation in the NFIP and the Community Rating System

The Pennsylvania Floodplain Management Act (Act 166 of 1978) requires every municipality identified by FEMA to participate in the NFIP and permits all municipalities to adopt floodplain management regulations. It is in the interest of all property owners in the floodplain to keep development and land usage within the scope of the floodplain regulations for their community. This helps keep insurance rates low and makes sure that the risk of flood damage is not increased by property development.

All municipalities except for one, Pennsbury Village Borough located outside the SFHA, participate in the NFIP. Table 5.2-4 includes the participation status and standing of each municipality, as well as the number of policies that are in force and the total amount of premiums and coverage for each municipality.

Table 5.2-4 **Allegheny County NFIP Information by Municipality (CIS, 2020).**

Municipality	Participation Status	Good Standing	Policies in Force	Total Premium and Coverage
Aleppo Township	PARTICIPATING	Yes	4	$1,085,000
Aspinwall Borough	PARTICIPATING	Yes	7	$1,995,000
Avalon Borough	PARTICIPATING	Yes	3	$402,200
Baldwin Borough	PARTICIPATING	Yes	37	$7,019,700
Baldwin Township	PARTICIPATING	Yes	4	$690,000
Bell Acres Borough	PARTICIPATING	Yes	9	$2,394,000
Bellevue Borough	PARTICIPATING	Yes	0	$0
Ben Avon Heights Borough	PARTICIPATING	Yes	0	$0
Ben Avon Borough	PARTICIPATING	Yes	7	$1,200,900
Bethel Park Municipality	PARTICIPATING	Yes	61	$16,640,000
Blawnox Borough	PARTICIPATING	Yes	4	$504,300
Brackenridge Borough	PARTICIPATING	Yes	20	$3,336,800
Braddock Hills Borough	PARTICIPATING	Yes	0	$0
Braddock Borough	PARTICIPATING	Yes	6	$3,142,000
Bradford Woods Borough	PARTICIPATING	Yes	1	$350,000
Brentwood Borough	PARTICIPATING	Yes	6	$1,518,000
Bridgeville Borough	PARTICIPATING	Yes	55	$8,088,100
Carnegie Borough	PARTICIPATING	Yes	94	$25,237,100
Castle Shannon Borough	PARTICIPATING	Yes	20	$4,003,800
Chalfant Borough	PARTICIPATING	Yes	0	$0
Cheswick Borough	PARTICIPATING	Yes	2	$366,000
Churchill Borough	PARTICIPATING	Yes	15	$3,141,000
Clairton, City of	PARTICIPATING	Yes	1	$42,000
Collier Township	PARTICIPATING	Yes	42	$10,592,800
Coraopolis Borough	PARTICIPATING	Yes	38	$6,564,700
Crafton Borough	PARTICIPATING	Yes	4	$1,120,000
Crescent Township	PARTICIPATING	Yes	8	$1,358,600
Dormont Borough	PARTICIPATING	Yes	4	$1,400,000
Dravosburg Borough	PARTICIPATING	Yes	2	$1,153,000
Duquesne, City of	PARTICIPATING	Yes	0	$0
East Deer Township	PARTICIPATING	Yes	44	$6,974,600
East McKeesport Borough	PARTICIPATING	Yes	1	$175,000
East Pittsburgh Borough	PARTICIPATING	Yes	2	$1,500,000

Table 5.2-4 **Allegheny County NFIP Information by Municipality (CIS, 2020).**

Municipality	Participation Status	Good Standing	Policies in Force	Total Premium and Coverage
Edgewood Borough	PARTICIPATING	Yes	3	$392,000
Edgeworth Borough	PARTICIPATING	Yes	6	$1,828,000
Elizabeth Borough	PARTICIPATING	Yes	15	$2,566,000
Elizabeth Township	PARTICIPATING	Yes	94	$12,741,600
Emsworth Borough	PARTICIPATING	Yes	16	$3,524,200
Etna Borough	PARTICIPATING	Yes	173	$22,848,400
Fawn Township	PARTICIPATING	Yes	35	$4,058,800
Findlay Township	PARTICIPATING	Yes	22	$3,400,300
Forest Hills Borough	PARTICIPATING	Yes	14	$4,718,000
Forward Township	PARTICIPATING	Yes	15	$3,799,400
Fox Chapel Borough	PARTICIPATING	Yes	23	$7,453,000
Franklin Park Borough	PARTICIPATING	Yes	20	$5,458,200
Frazer Township	PARTICIPATING	Yes	0	$0
Glassport Borough	PARTICIPATING	Yes	1	$1,000,000
Glen Osborne Borough	PARTICIPATING	Yes	15	$2,756,500
Glenfield Borough	PARTICIPATING	Yes	25	$3,893,300
Green Tree Borough	PARTICIPATING	Yes	7	$1,710,000
Hampton Township	PARTICIPATING	Yes	47	$12,603,700
Harmar Township	PARTICIPATING	Yes	32	$6,846,200
Harrison Township	PARTICIPATING	Yes	7	$1,282,000
Haysville Borough	PARTICIPATING	Yes	5	$1,165,100
Heidelberg Borough	PARTICIPATING	Yes	42	$8,655,200
Homestead Borough	PARTICIPATING	Yes	1	$550,000
Indiana Township	PARTICIPATING	Yes	20	$6,397,800
Ingram Borough	PARTICIPATING	Yes	3	$229,300
Jefferson Hills Borough	PARTICIPATING	Yes	36	$8,737,300
Kennedy Township	PARTICIPATING	Yes	3	$805,000
Kilbuck Township	PARTICIPATING	Yes	9	$1,798,600
Leet Township	PARTICIPATING	Yes	29	$4,183,600
Leetsdale Borough	PARTICIPATING	Yes	41	$16,615,100
Liberty Borough	PARTICIPATING	Yes	0	$0
Lincoln Borough	PARTICIPATING	Yes	3	$409,300
Marshall Township	PARTICIPATING	Yes	26	$8,723,400
McCandless, Town of	PARTICIPATING	Yes	63	$18,505,300
McDonald Borough	PARTICIPATING	Yes	14	$2,699,200
McKees Rocks Borough	PARTICIPATING	Yes	87	$31,485,700
McKeesport City	PARTICIPATING	Yes	18	$7,122,100

Table 5.2-4 **Allegheny County NFIP Information by Municipality (CIS, 2020).**

Municipality	Participation Status	Good Standing	Policies in Force	Total Premium and Coverage
Millvale Borough	PARTICIPATING	Yes	96	$12,529,600
Monroeville Borough	PARTICIPATING	Yes	35	$10,520,600
Moon Township	PARTICIPATING	Yes	28	$6,812,500
Mount Oliver Borough	PARTICIPATING	Yes	0	$0
Mt. Lebanon Township	PARTICIPATING	Yes	52	$14,361,000
Munhall Borough	PARTICIPATING	Yes	6	$718,400
Neville Township	PARTICIPATING	Yes	93	$22,508,000
North Braddock Borough	PARTICIPATING	Yes	1	$210,000
North Fayette Township	PARTICIPATING	Yes	39	$11,480,900
North Versailles Township	PARTICIPATING	Yes	8	$2,353,200
O'Hara Township	PARTICIPATING	Yes	135	$31,099,500
Oakdale Borough	PARTICIPATING	Yes	39	$8,590,700
Oakmont Borough	PARTICIPATING	Yes	91	$22,519,000
Ohio Township	PARTICIPATING	Yes	5	$1,498,000
Penn Hills Township	PARTICIPATING	Yes	54	$16,031,100
Pennsbury Village Borough	NOT PARTICIPATING	N/A	N/A	N/A
Pine Township	PARTICIPATING	Yes	11	$3,057,000
Pitcairn Borough	PARTICIPATING	Yes	48	$6,289,400
Pittsburgh, City of	PARTICIPATING	Yes	529	$183,466,900
Pleasant Hills Borough	PARTICIPATING	Yes	6	$1,229,000
Plum Borough	PARTICIPATING	Yes	55	$14,279,200
Port Vue Borough	PARTICIPATING	Yes	4	$2,118,300
Rankin Borough	PARTICIPATING	Yes	2	$780,000
Reserve Township	PARTICIPATING	Yes	14	$942,700
Richland Township	PARTICIPATING	Yes	14	$3,229,500
Robinson Township	PARTICIPATING	Yes	41	$10,506,000
Ross Township	PARTICIPATING	Yes	88	$25,744,600
Rosslyn Farms Borough	PARTICIPATING	Yes	5	$2,150,000
Scott Township	PARTICIPATING	Yes	42	$15,119,200
Sewickley Heights Borough	PARTICIPATING	Yes	2	$700,000
Sewickley Hills Borough	PARTICIPATING	Yes	3	$435,700
Sewickley Borough	PARTICIPATING	Yes	16	$5,070,900
Shaler Township	PARTICIPATING	Yes	145	$31,594,200
Sharpsburg Borough	PARTICIPATING	Yes	83	$13,351,700
South Fayette Township	PARTICIPATING	Yes	65	$20,949,600
South Park Township	PARTICIPATING	Yes	25	$6,205,500

Table 5.2-4 **Allegheny County NFIP Information by Municipality (CIS, 2020).**

Municipality	Participation Status	Good Standing	Policies in Force	Total Premium and Coverage
South Versailles Township	PARTICIPATING	Yes	5	$413,000
Springdale Borough	PARTICIPATING	Yes	1	$1,000,000
Springdale Township	PARTICIPATING	Yes	1	$105,000
Stowe Township	PARTICIPATING	Yes	5	$2,216,100
Swissvale Borough	PARTICIPATING	Yes	6	$1,463,000
Tarentum Borough	PARTICIPATING	Yes	26	$7,252,300
Thornburg Borough	PARTICIPATING	Yes	5	$2,550,000
Trafford Borough	PARTICIPATING	Yes	11	$3,044,300
Turtle Creek Borough	PARTICIPATING	Yes	32	$4,192,300
Upper St. Clair Township	PARTICIPATING	Yes	86	$26,501,300
Verona Borough	PARTICIPATING	Yes	29	$5,376,100
Versailles Boroughs	PARTICIPATING	Yes	2	$387,100
Wall Boroughs	PARTICIPATING	Yes	10	$977,100
West Deer Township	PARTICIPATING	Yes	21	$3,509,400
West Elizabeth Borough	PARTICIPATING	Yes	6	$558,400
West Homestead Borough	PARTICIPATING	Yes	2	$630,000
West Mifflin Borough	PARTICIPATING	Yes	13	$2,968,000
West View Borough	PARTICIPATING	Yes	5	$634,100
Whitaker Borough	PARTICIPATING	Yes	1	$350,000
White Oak Borough	PARTICIPATING	Yes	18	$3,945,600
Whitehall Borough	PARTICIPATING	Yes	25	$4,630,400
Wilkins Township	PARTICIPATING	Yes	16	$2,720,500
Wilkinsburg Borough	PARTICIPATING	Yes	4	$1,000,000
Wilmerding Borough	PARTICIPATING	Yes	5	$2,259,000
TOTAL			3,686	$920,091,100

Community Rating System

The NFIP's Community Rating System (CRS) provides discounts on flood insurance premiums in those communities that establish floodplain management programs that go beyond NFIP minimum requirements. Under the CRS, communities receive credit for more restrictive regulations; acquisition; relocation, or flood-proofing of flood-prone buildings, preservation of open space; and other measures that reduce flood damage or protect the natural resources and functions of floodplains.

The CRS was implemented in 1990 to recognize and encourage community floodplain management activities that exceed the minimum NFIP standards. Section 541 of the 1994 Act amends Section 1315 of the 1968 Act to codify the CRS in the NFIP and expands the CRS goals to specifically include incentives to reduce the risk of flood-related erosion and to encourage measures that protect natural and beneficial

floodplain functions. These goals have been incorporated into the CRS, and communities now receive credit toward premium reductions for activities that contribute to them.

Under the CRS, flood insurance premium rates are adjusted to reflect the reduced flood risk resulting from community activities that meet a minimum of three of the following CRS goals:

- Reduce flood losses
- Reduce damage to property
- Protect public health and safety
- Prevent increases in flood damage from new construction
- Reduce the risk of erosion damage
- Protect natural and beneficial floodplain functions
- Facilitate accurate insurance rating
- Promote the awareness of flood insurance

There are 10 CRS classes that provide varied reduction in insurance premiums for property owners in both the SFHA and non-SFHA. 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.

Table 5.2-5 includes the municipalities in Allegheny County who currently participate in CRS, and their CRS class.

Table 5.2-5 **Allegheny County Municipality CRS Participation (CIS, 2020).**

Municipality	CRS Class	Discount
Etna Borough	7	15%
Shaler Township	8	10%
Upper St. Clair Township	7	15%

5.2.2. Administrative and Technical Capability

Administrative capability is described by an adequacy of departmental and personnel resources for the

Administrative capability is described by an adequacy of departmental and personnel resources for the implementation of mitigation-related activities. Technical capability relates to an adequacy of knowledge and technical expertise of local government employees or the ability to contract outside resources for this expertise to effectively execute mitigation activities. Common examples of skill sets and technical personnel needed for hazard mitigation include: planners with knowledge of land development/management practices, engineers or professionals trained in construction practices related to buildings and/or infrastructure (e.g. building inspectors), planners or engineers with an understanding of natural and/or human caused hazards, emergency managers, floodplain managers, land surveyors, scientists familiar with hazards in the community, staff with the education or expertise to assess

community vulnerability to hazards, personnel skilled in geographic information systems, resource development staff or grant writers, fiscal staff to handle complex grant application processes.

Based on assessment results, municipalities in Allegheny County report moderate-high administrative and technical staff needed to conduct hazard mitigation-activities. There seems to be sufficient emergency management staff across the County. A majority of municipalities contract for engineering capabilities retaining consulting firms such as Gateway Engineers; Glenn Engineering; Senate Engineering; and Lennon, Smith, and Souleret Engineering.

Three municipalities, Springdale and Cheswick Boroughs and Harmar Township, take a multi-municipal approach to address emergency management by sharing an emergency management coordinator. Wilkinsburg Borough currently uses the City of Pittsburgh's emergency management services. Glenfield Borough and Versailles Township currently contract with White Oak Borough Police for law enforcement services.

The majority of responding municipalities, nearly 73 percent, reported an individual responsible for floodplain management. In some municipalities floodplain management duties are a component of a current job rather than a separate position. For Allegheny County, it is not out of the ordinary for a municipal official to hold more than one title. Those municipalities that noted having a floodplain manager often listed their municipal engineer or contracted engineering firm, code enforcement officer, or municipal manager as responsible.

A substantial number of the municipalities, 81 percent, have in-house grant-writing or other fiscal staff or contract services from outside sources. Compared to the 2015 HMP when municipalities reported a common lack of personnel with Geographic Information System (GIS) skills and/or a lack of personnel with solid planning knowledge or background, the majority of municipalities responded these skills were in place for the 2020 HMP update. This corresponds to the relatively small percentage of municipalities reporting limited planning and regulatory capability, only 15 percent.

One of the most difficult capabilities to evaluate involves the political will of a jurisdiction to enact meaningful policies and projects designed to mitigate hazard events. The adoption of hazard mitigation measures may be viewed as an impediment to growth and economic development. In many cases, mitigation may not generate interest among local officials when compared with competing priorities. Therefore, the local political climate must be considered when designing mitigation strategies, as it could be the most difficult hurdle to overcome in accomplishing the adoption or implementation of specific actions. The Capability Assessment Survey was used as means to record how municipalities rated community political capability. Nearly half of responding municipalities ranked themselves moderately capable, with 23 percent reporting limited and 28 percent high.

Within Allegheny County, administrative and technical capability varies widely between the municipalities due mainly to population size and resources. Even neighboring municipalities may exhibit extreme variations in technical capability. Overall, 14 percent of municipalities reported limited administrative and technical capability, with 46 percent reporting moderate and 41 percent high.

In general, the more financial resources a municipality has, the more technically capable it will be from a resource availability perspective. This is not necessarily the case, however when analyzing technical capability from a knowledge/skill level perspective. As such, technical capability must be analyzed by each municipality prior to implementing any hazard mitigation activity. It is important to note; however, that much like fiscal capability, shortfalls in technical capability may be overcome by cooperative arrangements, coordinated efforts, and/or resource efficiency.

Outside of municipal administrative and technical capabilities, Allegheny County's seven Council of Governments (COGs) are an important administrative and technical capability available to member municipalities. COGs are authorized in Pennsylvania under the first Intergovernmental Cooperation Act of 1972. Generally, COGs are voluntary coalitions that act as a forum for addressing regional challenges and improving intergovernmental cooperation. Common COG activities include data collection and analysis, code enforcement, grants application, technical assistance, purchasing program assistance, blight management, and Community Development Block Grant administration. Table 5.2-6 lists Allegheny County COGS, member municipalities, and services provided by each COG (Allegheny County, 2020).

Table 5.2-6 **COG Membership and Services**

COG Name	Member Municipalities	Services
Allegheny Valley North	Aspinwall Borough Blawnox Borough Brackenridge Borough Cheswick Borough East Deer Township Fawn Township Frazer Township Harmar Township Harrison Township Springdale Borough Springdale Township Tarentum Borough Verona Borough West Deer Township	Grant solicitation/administration (federal, state, and county) Joint Purchasing, which includes Spring and Fall Commodities, Police Vehicles, Public Works Vehicles, Police Ammunition and Rock Salt. Economic Development Programs like the Alle-Kiski Coalition and Hydroelectric Power Project Shared Equipment Program, including sewer cleaning and Maintenance and Highways programs Shared services for code enforcement and drug and alcohol testing Employee training programs General consultant services

Table 5.2-6 **COG Membership and Services**

COG Name	Member Municipalities	Services
Char-West	Bridgeville Borough Carnegie Borough Collier Township Coraopolis Borough Crafton Borough Crescent Township Findlay Township Ingram Borough Kennedy Township McKees Rocks Borough Moon Township Neville Township North Fayette Township Oakdale Borough Pennsbury Village Borough Robinson Township Rosslyn Farms Borough South Fayette Township Stowe Township Thornburg Borough	Community Development Block Grant Program Administration Joint Purchasing, which includes Spring and Fall Commodities, Police Vehicles, Public Works Vehicles, Police Ammunition and Rock Salt. Multi-Municipal Police Training and School Safety Multi-Municipal Fire Chiefs Training Multi-Municipal Planning Sewer Vactor Program to assist with obstructed sanitary sewer lines Cable Franchise Renewal Negotiations Annual Membership Booklet Federal Credit Union

Table 5.2-6 **COG Membership and Services**

COG Name	Member Municipalities	Services
North Hills	Bradford Woods Borough Etna Borough Fox Chapel Borough Franklin Park Borough Hampton Township Indiana Township Marshall Township Town of McCandless Millvale Borough O'Hara Township Ohio Township Pine Township Reserve Township Richland Township Ross Township Shaler Township Sharpsburg Borough West Deer Township West View Borough	Community Development Block Grant administration Gypsy Moth Aerial Spraying Household Hazardous Waste Collection Leaf Composting Administration of Agricultural Security Area Sewer Vactor program to assist with obstructed sanitary sewer lines Represents member communities in the 3 Rivers Wet Weather Committee Solid Waste disposal and recycling Joint Purchasing Program Regional cooperation, including municipal directory, Cable TV rate review, electric choice, equipment sharing, municipal forum coordination, and survey requests and compilation Uniform Code of Construction Board of Appeals CDL drug and alcohol testing
Quaker Valley	Aleppo Township Avalon Borough Bell Acres Borough Bellevue Borough Ben Avon Borough Edgeworth Borough Emsworth Borough Glen Osborne Borough Glenfield Borough Haysville Borough Kilbuck Township Leet Township Leetsdale Borough Sewickley Borough	Community Development Block Grant administration Joint Purchasing, which includes Spring and Fall Commodities, Police Vehicles, Public Works Vehicles, Police Ammunition and Rock Salt. Joint refuse contract with Waste Management Joint cable contract with Comcast Joint cable contract with Verizon Joint Uniform Construction Code Appeals Board Monthly meetings for member municipalities' managers/secretaries and quarterly police meetings to collaborate on and/or resolve issues Local Technical Assistance (LTAP) Programs Other workshops and trainings for municipal officials and police chiefs Annual recycling day

Table 5.2-6 **COG Membership and Services**

COG Name	Member Municipalities	Services
South Hills Area	Baldwin Borough Baldwin Township Bethel Park Municipality Brentwood Borough Castle Shannon Borough Dormont Borough Elizabeth Township Findlay Township Heidelberg Borough Jefferson Hills Borough Moon Township Mount Lebanon, Municipality of Mount Oliver Borough Peters Township Pleasant Hills Borough Scott Township South Park Township Upper St. Clair Township West Mifflin Borough Whitehall Borough	Annual member information book Cable TV rate review Community Development Block Grant administration SHACOG Credit Union and associated services under an independently run Board of Directors Limited training programs Sewer Vactor truck and camera program to assist with obstructed sanitary sewer lines Solid waste collection and recycling Telecommunications franchising authority InterCOG purchasing alliance cooperative purchasing to achieve savings in commodities

Table 5.2-6 **COG Membership and Services**

COG Name	Member Municipalities	Services
Steel Rivers	Braddock Hills Borough City of Clairton Dravosburg Borough City of Duquesne Elizabeth Borough Forward Township Glassport Borough Homestead Borough Liberty Borough Lincoln Borough City of McKeesport Munhall Borough Port Vue Borough South Versailles Township Versailles Township West Elizabeth Borough West Homestead Borough West Newton Borough (Westmoreland County) Whitaker Borough White Oak Borough	Community Development Block Grant administration Blight remediation with Turtle Creek Valley Brownfields grants with Turtle Creek Valley Land Bank administration designed to fight vacancy, abandonment, and foreclosures Blight Busters forum InterCOG purchasing alliance cooperative purchasing to achieve savings in commodities

Table 5.2-6 **COG Membership and Services**

COG Name	Member Municipalities	Services
Turtle Creek Valley	Braddock Borough Chalfant Borough Churchill Borough East McKeesport Borough East Pittsburgh Borough Edgewood Borough Forest Hills Borough Municipality of Monroeville Pitcairn Borough Plum Borough Rankin Borough Swissvale Borough Turtle Creek Borough North Braddock Borough North Versailles Township Municipality of Penn Hills Wall Borough Wilkins Township Wilkinsburg Borough Wilmerding Borough	Community Development Block Grant administration Utility and refuse billing account management and customer service Conflict resolution services Blight remediation with Steel Rivers Brownfields grants with Steel Rivers Land Bank administration designed to fight vacancy, abandonment, and foreclosures Joint Public Works department for Rankin and Braddock Boroughs Accounts payable services for municipalities Real estate tax billing assistance Rodent abatement Community Investment and Tourism Fund grant administration Delinquent sewage fee collection InterCOG purchasing alliance cooperative purchasing to achieve savings in commodities Multi-municipal planning administration Uniform Code of Construction Board of Appeals Sewer Vactor truck to assist with obstructed sanitary sewer lines

Some local organizations that could act as partners include the Allegheny County Conservation District, the Penn State Cooperative Extension, Allegheny County Economic Development, environmental advocacy groups, and watershed associations.

State agencies which can provide technical assistance for mitigation activities include, but are not limited to:

- Pennsylvania Department of Community and Economic Development;
- Pennsylvania Department of Conservation and Natural Resources;
- Pennsylvania Department of Environmental Protection; and
- Pennsylvania Department of Transportation.

Federal agencies which can provide technical assistance for mitigation activities include, but are not limited to:

- Army Corp of Engineers (USACE);
- Department of Housing and Urban Development (HUD);
- Department of Agriculture (USDA);
- Economic Development Administration (EDA);
- Emergency Management Institute (EMI);
- Environmental Protection Agency (EPA);
- FEMA; and
- Small Business Administration (SBA).

5.2.3. Financial Capability

Financial capability is important to the implementation of hazard mitigation activities. Every jurisdiction must operate within the constraints of limited financial resources. During the 1960s and 1970s, state and federal grants-in-aid were available to finance many programs, including street improvements, water and sewer facilities, airports, and parks and playgrounds. During the early 1980s, there was a significant change in federal policy, based on rising deficits and a political philosophy that encouraged states and local governments to raise their own revenues for capital programs, resulting in the need to identify alternate means to augment revenue. After the COVID-19 pandemic, communities across the country will face new challenges in balancing community economic recovery while also implementing hazard mitigation.

Capital Improvement Program

Based on Capability Assessment Survey responses, fiscal capabilities of Allegheny County local municipalities vary greatly from community-to-community. Compared to 2015 when only 19 percent felt their fiscal capability was limited, 34 percent reported limited fiscal capability in 2020. Fiscal capability was ranked moderate by 41 percent of municipalities and high by 26 percent.

The most common fiscal tool available to communities was the Capital Improvement Program (CIP). A CIP is a community planning and fiscal management tool used to coordinate the timing and financing of capital improvements over a multi-year period. A CIP includes a prioritized list of improvements to roads, parks, and other facilities that the community plans to undertake in a given period. Typically, a CIP is a five-year plan, though many communities in Allegheny County indicated they reviewed the CIP annually. Nearly 41 percent of municipalities report having a CIP in place with nearly 23 percent reporting a plan is in development.

Impact Fees from Unconventional Gas Drilling

The Pennsylvania Act 13 Impact Fee funded through unconventional oil and gas well drilling activities provides a fiscal mechanism available to Pennsylvania communities. The Oil and Gas Act (Act 13 of 2012) presented major changes to the oil and gas industry in Pennsylvania, including the authorization for local governments to adopt an impact fee and the provision of stronger environmental protections. The impact fees are allocated to county conservation districts, the Pennsylvania Fish and Boat Commission, the Pennsylvania Public Utility Commission, the Pennsylvania Department of Environmental Protection, the PEMA, the Pennsylvania Office of State Fire Commissioner, and the Pennsylvania Department of Transportation to address statewide issues. A portion of the impact fees are also allocated to local

municipalities to address water, wastewater, and road infrastructure maintenance and improvements; emergency preparedness; environmental programs; tax reductions; increased safe/affordable housing; employee training; or planning initiatives.

The disbursement amount fluctuates based on well drilling activity. In 2018 a total of $251.8 million in Act 13 impact fees were disbursed throughout Pennsylvania. Of that amount, over $1.9 million was dispersed to Allegheny County and all 130 municipalities. The funding was used for public infrastructure construction, stormwater and sewer systems, emergency preparedness and public safety, environmental programs, information technology, and investments in capital reserve funds (PUC, 2020).

Community Development Block Grants

Allegheny County is also eligible for Community Development Block Grant (CDBG) funding from the US Department of Housing and Urban Development (HUD). The program is designed to assist vulnerable populations within the community by ensuring affordable housing, creating jobs, and providing direct services. The amount of each grant is determined by a formula that accounts for the community's need, poverty, population, housing, and comparison to other areas. The annual appropriation is divided among the states and local jurisdictions (referred to as "non-entitlement communities" and "entitlement communities"). The majority of CDBG funds are required to be spent to benefit low- and moderate-income citizens. In addition, the program includes a set of national objectives for the program, including addressing existing conditions that pose a threat to the health and welfare of the community (e.g., low-income housing in a floodplain). Allegheny County Economic Development oversees the CDBG program.

Water and Sewer Authority Fees

Water authorities are multi-purpose authorities with water projects, many of which operate both water and sewer systems. The financing of water systems for lease back to a municipality is among the principal activities of the local government facilities' financing authorities. An operating water authority issues bonds to purchase existing facilities or to construct, extend, or improve a system. The primary source of revenue is user fees based on metered usage. The cost of constructing or extending water supply lines can be funded by special assessments against abutting property owners. Tapping fees also help fund water system capital costs. Water utilities are directly operated by municipal governments and by privately owned public utilities regulated by the Pennsylvania Public Utility Commission (PUC). The Commonwealth Financing Authority, through DCED, operates the PA Small Water and Sewer Program with consolidation of small individual water systems to make system upgrades more cost effective.

Sewer authorities include multipurpose authorities with sewer projects. The authorities issue bonds to finance acquisition of existing systems or to finance construction, extension, and improvements. Sewer authority operating revenues originate from user fees. The fee frequently is based on the amount of water consumed, and payment is enforced by the ability to terminate service or the imposition of liens against real estate. There are 78 public water supply systems and 31 sewer authorities in Allegheny County. The largest sewer authority in the County is the Allegheny County Sanitary Authority (ALCOSAN), which serves 83 communities. The water and sewer authority fees in Allegheny County usually apply to flood mitigation via stormwater management and water quality improvement projects, as large areas of the county use a combined sewer overflow system.

State and Federal Financial Resources and Grant Programs

The decision and capacity to implement mitigation-related activities is often strongly dependent on availability of local financial resources. While some mitigation actions are less costly than others, it is important that money is available locally to implement policies and projects. Financial resources are particularly important if communities are trying to leverage state or federal mitigation grant funding opportunities that require local-match contributions.

State funding sources that may be available for hazard mitigation planning activities at the time the HMP update was prepared include but are not limited to the following (DCED, 2020).

- CFA/DCED Abandoned Mine Drainage Abatement and Treatment Program
- CFA/DCED Baseline Water Quality Data Program
- CFA/DCED First Industries Fund
- CFA/DCED Flood Mitigation Program
- CFA/DCED H2O PA Flood Control Projects
- CFA/DCED H2O PA High Hazard Unsafe Dam Projects
- CFA/DCED H2O PA Water Supply, Sanitary Sewer and Storm Water Projects
- CFA/DCED Orphan or Abandoned Well Plugging Program
- CFA/DCED PA Small Water and Sewer
- CFA/DCED Sewage Facilities Program
- CFA/DCED Watershed Restoration Protection Program
- DCED Business Financing Programs
- DCED Keystone Communities Program
- DCED Local Government Capital Project Loan Program
- DCED Municipal Assistance Program
- DCED/DEP Coal Refuse Energy and Reclamation Tax Credit Program
- DCED/DEP Private Dam Financial Assurance Program
- DCNR Community Conservation Partnerships Program
- DEP Growing Greener Plus Grants Program
- PennDOT Pennsylvania Infrastructure Bank (PIB) Loan
- Pennsylvania Infrastructure Investment Authority (PENNVEST)
- Pennsylvania Redevelopment Assistance Capital Program (RACP)

Federal funding sources that may be available for hazard mitigation planning activities at the time the HMP update was prepared include but are not limited to the following.

- Appalachian Regional Commission (ARC) POWER Initiative Grant Program
- Department of Commerce (DOC)/Economic Development Authority (EDA) Construction Grant Program
- EDA Construction Grant Post Approval Process Tool for Grant Recipients (Version 5.0)
- https://www.eda.gov/tools/grantee-information/
- Department of Energy Weatherization Assistance Program
- Department of Homeland Security Grant Program (HSGP)

- Department of Transportation/Federal Highway Administration Emergency Relief Program
- DOC/EDA Planning Grants
- DOC/EDA Technical Assistance Grants FY 2016 – FY 2019 EDA PLANNING PROGRAM AND LOCAL TECHNICAL ASSISTANCE PROGRAM
- DOC/EDA Revolving Loan Fund (ACEDC RLF recipient)
- FEMA Community Assistance Program – State Support Services Element (CAP-SSSE)
- FEMA Community Disaster Loan Program
- FEMA NFIP Community Rating System
- FEMA Emergency Management Performance Grants (EMPG)
- FEMA Environmental Planning and Historic Preservation Program (EHP)
- FEMA Flood Mitigation Assistance Program
- FEMA Hazard Mitigation Grant Program (HMGP)
- FEMA Individuals and Households Program (IHP)
- FEMA National Dam Safety Program
- FEMA National Flood Insurance Program
- FEMA Pre-Disaster Mitigation Program (PDM)
- FEMA Public Assistance Program (PA)
- FEMA Regional Catastrophic Preparedness Grant Program
- Housing and Urban Development (HUD) 5(H) Homeownership Program
- HUD Community Development Block Grant (CDBG)
- HUD Disaster Housing Assistance Program (DHAP)
- HUD/Federal Housing Administration (FHA) Title I Property Improvement Loans
- HUD/FHA Section 203(h) Mortgage Insurance for Disaster Victims
- HUD/FHA Section 203(k) Rehabilitation Mortgage Insurance
- HUD Partnership for Advancing Technology in Housing
- HUD Section 108 Loan Guarantee Programs
- Internal Revenue Service Casualty Loss-Special Disaster Provisions
- NOAA National Weather Service StormReady® Program
- USDA Natural Resources Conservation Service (NRCS) Easement Programs
- Small Business Administration Disaster Loan Programs
- United States Army Corps of Engineers (USACE) General Investigation (GI)
- USACE Continuing Authorities Program
- USACE Flood Plain Management Services Program (FPMS)
- USACE Inspection of Completed Works Program (ICW)
- USACE National Levee Safety Program
- USACE Planning Assistance to States
- USACE Rehabilitation and Inspection Program (RIP)
- United States Department of Agriculture (USDA)/Farm Service Agency (FSA) Emergency Conservation Program
- USDA/FSA Emergency Farm Loans
- USDA/Emergency Forest Restoration Program (EFRP)
- USDA Non-insured Crop Disaster Assistance Program (NAP)

- USDA/NRCS Emergency Watershed Protection Program
- USDA/NRCS Watershed Protection and Flood Prevention Program
- USDA Home Renovation Loans
- USDA/Rural Housing Service (RHS) Community Facilities Loans and Grants
- USDA/RHS Rural Housing Assistance
- USDA/RHS Section 502 Single-Family Housing Direct and Guaranteed Loans
- USDA/RHS Single Family Housing Repair Loans & Grants
- USDA/RHS Mutual Self-Help Housing Technical Assistance Grants
- USDA/Risk Management Agency Federal Crop Insurance Program
- USDA/Rural Development Business & Industry Loan Guarantees

5.2.4. Education and Outreach Capability

Education and outreach programs and methods are used to implement mitigation activities and communicate hazard-related information. Examples include fire safety programs that fire departments deliver to students at local schools; participation in community programs such as Firewise USA® or StormReady® and activities conducted as part of hazard awareness campaigns, such as Tornado or Flood Awareness Month. Some communities have their own public information or communications office to handle outreach initiatives. Overall, programs not relating to certification are not common within the County.

The National Fire Protection Association (NFPA) administers the Firewise USA® Program to encourage local solutions for safety by involving homeowners in taking individual responsibility for preparing their homes from the risk of wildfire. The program provides resources to help homeowners learn how to adapt to living with wildfire and encourages neighbors to work together to take action to prevent losses. The national Firewise USA® Recognition Program has nearly 1,000 active member communities in 40 states, as well as a participation retention rate of 80 percent over the past decade. The program, aimed at homeowners, provides specific criteria for communities regarding wildfire preparedness, and offers national recognition for their work. According to the PA DCNR, Firewise USA® has replaced Firewise Communities which was discontinued in 2019. Only 4 Pennsylvania communities participate in NFPA Firewise USA, none are in Allegheny County. Fifteen (15) municipalities report Firewise Communities designation and 6 report they are in the process of obtaining designation. As a mitigation action, Allegheny County may want to consider municipal outreach to discuss requirements for obtaining Firewise USA® designation.

StormReady® is an education and outreach program that helps arm communities with the communication and safety skills needed to save lives and property before, during, and after an event. All of Pennsylvania's 67 counties meet enrollment criteria. In addition to Allegheny County, Pittsburgh, Carnegie Mellon University, and the University of Pittsburgh meet the requirements of and are enrolled in StormReady®. Locations that do not meet StormReady® criteria can demonstrate their support for weather safety by joining the StormReady® Supporter program. Mount Lebanon is a StormReady® Supporter per the National Weather Service (NWS). Twenty-two (22) municipalities report StormReady® enrollment and 11 indicate they are in the process of meeting enrollment criteria. As a mitigation action, Allegheny County may want to consider municipal outreach to discuss criteria for enrolling in StormReady®.

Several municipalities report they continue to provide local law enforcement training on responding to civil disturbances. Specific types of training noted included South Hills Area Council of Governments (SHACOG) crowd control team training in response to court verdicts, active shooter training with McCandless and Northern Regional Police, and civil disturbance response as part of annual update training for all officers. Tarentum Borough inquired about the county and state providing additional training.

Several municipalities report attending the county LEPC and Quarterly Trainings to distribute all-hazards education and preparedness materials to communities; however, Ingram Borough notes they are unsure of accessing materials to proceed with education. Moon Township will include citizen pandemic response resources as part of future distribution of education and preparedness materials.

Aspinwall Borough, Avalon Borough, Ben Avon Borough, Churchill Borough, Forest Hills Borough and McKees Rock Borough, and Richland Township provide community outreach and education about flooding, flood insurance, and training through Savvy Citizen, a community calendar and notification system. Municipal websites and newsletters are used well.

5.2.5. Plan Integration

Plan integration recognizes that hazard mitigation is most effective when it works in concert with other plans, regulations, and programs. Per FEMA, plan integration is described as the regular consideration and management of hazard risks in a community's existing planning framework. Plan integration is the process by which communities critically analyze their existing planning framework and align efforts to build a safer, smarter community. Plan integration involves a two-way exchange of information and incorporation of ideas and concepts between hazard mitigation plans (state and local) and other community plans. Specifically, plan integration involves the incorporation of hazard mitigation principles and actions into community plans and community planning mechanisms into hazard mitigation plans (FEMA, 2015).

In Pennsylvania, integrating hazard mitigation into planning tools is afforded through the Municipalities Planning Code in that protecting and promoting safety and health is a purpose of the code. Further, a purpose of the Municipalities Planning Code is "to minimize such problems as may presently exist or which may be foreseen," which is the focus of hazard mitigation planning.

When developing the HMP, the County Comprehensive Plan, EOP, and various land use ordinances and regulations provided key information. These documents are referenced where appropriate throughout the plan and links to the documents are included in Appendix A: Bibliography.

Moving forward, each of these documents should not be treated as unrelated and updated separately. The County and each participating municipality are responsible for incorporating the specific mitigation actions recommended in this Plan into the necessary planning documents, including the appropriate comprehensive plan, the County EOP, and any land use ordinances and regulations.

For example, zoning and other land use regulations can be amended to reflect the newly identified hazard areas, to ensure that development in those areas is minimized or at least conducted in a way that otherwise mitigates against the effects of hazards (e.g., requiring structures built in the floodplain to be elevated). As proposed changes to building codes are presented, their potential for mitigating damage

due to hazards will be examined, and the changes will only be adopted if they are shown to lower risk. Changes to stormwater management plans will incorporate identified mitigation actions and will encourage increased participation in the NFIP.

Plan integration is not only accomplished through the MPC and planning tools such as comprehensive plans and zoning ordinances, but through capital improvement planning, area plans such as highway corridors and downtown plans, functional plans like stormwater and open space plans, and public and stakeholder outreach and education. This section highlights key opportunities for plan integration in Allegheny County.

Allegheny Places, the County Comprehensive Plan

Article III of the Pennsylvania Municipalities Planning Code (Act 247 of 1968, as reenacted and amended) requires all Pennsylvania counties (except Philadelphia) to adopt a comprehensive plan and update it at least every 10 years. Coupling this requirement with the DMA 2000-required five-year update cycle for HMPs, when possible, will allow the County to better integrate the County Comprehensive Plan and Multi-Jurisdictional HMP planning processes and strengthen public participation for both efforts. However, since the planning cycles for the HMP and Comprehensive Plan are currently not in sync, at the least, recommendations from the HMP can be incorporated into the updated Comprehensive Plan, especially in updates to the Environmental Resources Plan, which discusses and defines environmentally sensitive and high-risk areas.

The implementation strategy for Allegheny Places includes several objectives and actions that align with hazards identified as identified in the following table. Each planning document can be used to mutually support integrated content as identified in the following table.

Table 5.2-7 **Plan Integration: Allegheny County Comprehensive Plan and Allegheny County HMP**

Comprehensive Plan Element	Comprehensive Plan Objective	Corresponding HMP Hazard(s)
Parks, Recreation, Open Space, and Greenways	B. Implement a strategy to establish greenways that encourage protection of bio-diverse areas, floodplains, steep slopes, forested areas, landslide prone areas, riparian corridors and wildlife corridors.	Flood, Flash Flood, Ice Jam Landslide
Resource Extraction	A. Mitigate the negative effects of resource extraction.	Environmental Hazards
	B. Identify areas of potential mine subsidence.	Subsidence, Sinkhole
Community Facilities	B. Provide efficient emergency response services	All Hazards
Utilities	A. Protect and enhance the quality and quantity of water resources.	Drought

Table 5.2-7 Plan Integration: Allegheny County Comprehensive Plan and Allegheny County HMP		
Comprehensive Plan Element	**Comprehensive Plan Objective**	**Corresponding HMP Hazard(s)**
		Environmental Hazards Flood, Flash Flood, Ice Jam Levee Failure
Environmental Resources	B. Improve quality of surface water and groundwater resources	Environmental Hazards Flood, Flash Flood, Ice Jam Levee Failure
	C. Identify and protect ecologically sensitive areas such as wooded steep slopes, stream headwaters, woodlands, and wildlife corridors.	Flood, Flash Flood, Ice Jam Landslide
	E. Protect and restore critical stream valleys, floodplains and wetlands to preserve their functions for floodwater storage, water supply and groundwater recharge.	Environmental Hazards Flood, Flash Flood, Ice Jam
	F. Eliminate urban, agricultural and industrial pollution runoff to protect streams and watersheds	Environmental Hazards Flood, Flash Flood, Ice Jam

Source: Michael Baker International.

The HMP's risk assessment and Future Development and Vulnerability discussions will provide information for the update of the County Comprehensive Plan and any local comprehensive plans by making available specific risk and vulnerability information for the entire county and more specifically the potential areas of growth.

Allegheny Places established voluntary consistency reviews, which helps Allegheny County Economic Development facilitate the integration of and consistency between the county comprehensive plan and other plans, ordinances, grants, permits, and development projects. Checklists developed for consistency reviews include specific reference to hazard mitigation planning. The following table demonstrates components of the consistency review checklists that pertain to hazard mitigation planning. The table documents the substantial progress Allegheny County has made in identifying opportunities to integrate hazard mitigation planning into its review of plans and projects.

Table 5.2-8 Hazard Mitigation Planning Related Components on Allegheny Places Consistency Review Checklists	
Allegheny Places Consistency Review Checklist	Hazard Mitigation Planning Related Checklist Questions/Items
County & Municipal Comprehensive Plan	Does the municipal plan: • Promote sustainable development? • Protect environmental resources? • Direct development away from hazardous areas? • Provide for greenway connectivity? Are any of the "problem types" identified on the Allegheny Places Abandoned Mines and Affected Streams map located in the municipal planning area? If yes, does the municipal plan include any goals, objectives, or actions to address the problem? If there are any AMD-affected streams in the municipal planning area, does the plan specifically identify them and call for remediation? If there are any subsidence-prone or deep-mined areas with less than 100' of overburden in the municipal planning area, does the plan call for the areas to be identified as part of the development review process? Do the municipalities in the planning area have an adopted a hazard mitigation plan that complies with the most recent edition of the Allegheny County Hazard Mitigation Plan? Does the municipal plan call for any of the following measures to protect and improve air quality: • Use of energy efficient technologies, especially in municipal and other publicly-funded projects? • Use of alternative energy such as wind, solar geothermal, especially in municipal and other publicly-funded projects? • Transit, pedestrian, and bicycle-friendly development patterns? Does the municipal plan call for any of the following measures to protect and improve water quality: • Remediation of abandoned mine drainage? • Protecting/restoring riparian buffers along river and streams? • Protecting wetlands? • Protecting vulnerable headwater streams?

Table 5.2-8	Hazard Mitigation Planning Related Components on Allegheny Places Consistency Review Checklists
	• Protecting steep, wooded slopes that drain to rivers and streams? Does the municipal plan call for any of the following measures to prevent hazardous development by protecting sensitive natural features: • Directing development and redevelopment to Places and Infill areas? • Limiting disturbance of landslide-prone slopes and very steep slopes? • Limiting development in flood-prone areas, and especially in special flood hazard areas?
Park, Recreation, and Open Space Projects	Will the project conserve or help to protect any of the following: • Surface water and groundwater resources? • Ecologically sensitive areas? • Critical environmental functions?
Utility Infrastructure & Infrastructure Projects	Does the municipality have an adopted stormwater management plan that complies with the 2018 Allegheny County Act 167 Stormwater Management Plan? Does the municipality have an adopted Hazard Mitigation Plan that complies with the most recent version of the Allegheny County Hazard Mitigation Plan? Is the project a streambank stabilization project? • If Yes, is the stream identified as flood-prone in the County Hazard Mitigation Plan? • If Yes, is the stream identified as an impaired stream? Will the project provide, protect, or restore floodplains, stream valleys, riparian buffers, wetlands or groundwater recharge areas? Is the project an abandoned mine remediation project? • If Yes, what watershed is the project located in? Is the project a slope stabilization project? • If Yes, does the municipality have any steep slope controls in effect?
Source: Michael Baker International.	

Integration Recommendation

In Allegheny County both the HMP and comprehensive plan are currently used to mutually support integrated content. HMP data is available to update the county and local comprehensive plans and the

consistency reviews established through Allegheny Places ensures hazard mitigation elements are considered in planning documents, ordinances, and funded development projects.

Allegheny County should continue to make hazard data available when the 2020 HMP update is complete. The updated hazard data can be used to help update the county and local comprehensive plans and other planning documents. Additionally, hazard related data from consistency reviews should be transmitted annually to be used as part of the county's annual HMP review. This data can be used to help track plans and projects not only for the annual HMP review but for the 2025 HMP update.

Allegheny County Emergency Operations Plan

The Pennsylvania Emergency Management Services Code (35 PA C.S. Sections 7701-7707, as amended) requires each county and municipality to prepare, maintain, and keep current an Emergency Operations Plan (EOP). Allegheny County Emergency Services is responsible for preparing and maintaining the County EOP. The risk assessment information presented in the existing 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.

The EOP is reviewed at least biennially. Whenever portions of the plan are implemented in an emergency event or training exercise, a review is performed, and changes are made where necessary. It would be beneficial to sync the EOP review and the annual HMP review to ensure that any changes to one plan are captured in the other.

Plan for a Healthier Allegheny

The Plan for a Healthier Allegheny was released by the Allegheny County Health Department in May 2015 and updated in April 2017. The focus on the plan is on comprehensive community health planning to measurably improve the health of residents. The document has a direct connection to the HMP in its third priority area, which is environmental health. The goal for this priority area is to "enhance quality of life by reducing pollution and other environmental hazards using coordinated, data-driven interventions." This element includes objectives and strategies to encourage responsible oil and gas well drilling, protecting and improving county water quality, attaining and maintaining national air quality standards, reducing local emissions, and encouraging a county-wide Climate Action Plan to reduce greenhouse gas emissions. While ACHD is approaching these two hazards from a human health perspective, there are strong connections to the risk reductions discussed in this HMP. The HMP would be a good source of the most current information on the location of unconventional oil and gas wells. Any future climate action planning and resilience planning should be incorporated into future updates of the HMP, especially in the discussion of changing future hazard conditions. Climate action planning would reduce overall hazard risk in the future, not just risk to environmental hazards.

Allegheny County Stormwater Management Plan and Pine Creek Watershed Implementation Plan

A specific opportunity for plan integration includes addressing consistency between the HMP and stormwater management planning. By ensuring integration and consistency between the 2020 HMP update, the Allegheny County Stormwater Management Plan, and the Pine Creek Watershed

Implementation Plan, the existing planning documents can be aligned to mitigate flood impacts and improve water quality, improving overall community health and safety.

Background – Allegheny County Stormwater Management Plan

The Allegheny County Stormwater Management Plan was completed under the guidance of Pennsylvania's Act 167 in December 2014. The purpose of the plan is to provide an accurate and consistent implementation strategy for comprehensive, countywide stormwater management and to eliminate the variability in municipal-level stormwater management. The Stormwater Management Plan allowed communities to self-identify areas of stormwater concern, including areas that flood and areas with past landslides. This data was used in the Risk Assessment portion of this HMP in the flood and landslide profiles. In addition, during preparation of the Stormwater Management Plan municipalities were asked to provide information on the kind of planning mechanisms were in place, which was used in this capability assessment to supplement municipal survey replies.

As noted earlier in the Capability Assessment, Allegheny County completed its Act 167 Stormwater Management Plan in two phases. Phase I included a Scope of Study to establish procedures used to prepare the Stormwater Management Plan. Phase II, completed in May 2018, included development of a model ordinance to be adopted by all Allegheny County municipalities. Phase II also included the analysis of problem areas and significant obstructions and development of conceptual solutions to those problems. The final Phase II Report and model ordinance are considered as Allegheny County's Act 167 plan.

Objectives and Strategies of Allegheny County's Act 167 plan include the following:

1. Develop a Stormwater Management Plan and Ordinance. The Ordinance is to be adopted by all municipalities within the County, thus providing consistent regulations and requirements throughout the County in agreement with the NPDES and MS-4.
    a. Provide for consistent regulations and requirements across the County's municipalities (model stormwater management ordinance)
2. Protect and improve stream water quality and reduce runoff pollutants through encouraging the use of best management practices (BMPs).
    a. Encourage the use of effective stormwater management BMPs
    b. Describe the value of buffers and volume controls to improve water quality and pollutant reduction
    c. Understand the causes of stream pollution
3. Preserve to the maximum extent practicable the natural stormwater runoff regimes and natural course, current, cross-section, and flood carrying capacity of water of the Commonwealth.
    a. Provide for consistent regulations and requirements across the County's municipalities (model stormwater management ordinance).
4. Protect and conserve groundwater and groundwater recharge through encouraging use of green solutions.
    a. Discuss the relationship between site development stormwater and groundwater recharge

b. Describe the value of green solutions in the recharge of the County's groundwater
c. Require infiltration for development projects using standardized methodologies (Model Ordinance).

5. Address problem areas identified by the WPAC
   a. Provide general solutions using BMPs
   b. Demonstrate the solution process by providing specific solutions to select problem areas

Background – Pine Creek Watershed Implementation Plan

The Pine Creek Watershed Implementation Plan (WIP) was developed in 2009 and is currently being updated. The Pine Creek Watershed includes 14 of 19 North Hill COG member municipalities. The watershed is part of a larger watershed draining into the Allegheny River.

PA DEP received technical assistance from US EPA to support the Nonpoint Source Program and the Pine Creek watershed was selected as one of three watersheds to receive technical support. The implementation plan provided the opportunity to combine resources with flood hazard mitigation efforts. The update to the WIP is required to meet US EPA requirements for funding through Section 319 of the Federal Clean Water Act and provide a current update on the watershed.

EPA's section 319 Nonpoint Source Clean Water Act grant guidelines identify 9 minimum elements of successful watershed projects. These elements are required for watershed-based plans developed and implemented with section 319 funds.[2] The following table identifies each of these elements and how the 2009 Pine Creek WIP has met each of these elements.

Table 5.2-9 **Project Evaluation: 2009 Pine Creek WIP**

US EPA Minimum Element		2009 Pine Creek WIP
Element a	Identification of causes and sources of impairment or other issue identified	Partially met
Element b	An estimate of the load reductions expected from management measures	Partially met
Element c	A description of the nonpoint source management measures that will need to be implemented to achieve load reductions and critical areas in which those measures will be needed	Partially met
Element d	Estimate of the amounts of technical and financial	Partially met

[2] US EPA. Accessed 8/27/20 at: https://cfpub.epa.gov/watertrain/moduleFrame.cfm?parent_object_id=2868&object_id=2873#2873.

Table 5.2-9 **Project Evaluation: 2009 Pine Creek WIP**

US EPA Minimum Element		2009 Pine Creek WIP
	assistance needed, associated costs, and/or the sources and authorities that will be relied upon	
Element e	An information and education component	Partially met
Element f	Schedule for implementing the nonpoint source management measures.	Fully met (now 10 years old)
Element g	A description of interim measurable milestones for determining whether nonpoint source management measures or other control actions are being implemented	Partially met
Element h	A set of criteria that can be used to determine whether loading reductions are being achieved over time and substantial progress is being made toward attaining water quality standards	Partially met
Element i	Monitoring component to evaluate the effectiveness of the implementation efforts over time, measured against the criteria established	Partially met

Source: Tetra Tech, June 2020.

Major needs for the 2020 Pine Creek WIP were identified by the Tetra Tech consultant team and include the following:

- The plan is over 10 years old, requiring updates to information needed.
- More specificity of critical area selection (2 to 3 targeted subwatersheds)
- Clear connection between impairment, proposed best management practice, load reduction, and water quality standards
- Interim water quality targets in addition to implementation schedule
- Expanded monitoring plan
- Expanded civic engagement plan

Plan Integration

The approach to plan integration for the three plans – the 2020 Allegheny County HMP, the Allegheny County Stormwater Management Plan, and the 2020 Pine Creek WIP - included assessing gaps and identifying recommendations to share data and information among the three plans.

As the major needs (or gaps) for the 2020 Pine Creek WIP have already been identified, these gaps were used as the basis to evaluate how Allegheny County's Act 167 stormwater management plan and 2020 HMP update could be used to support update of the Pine Creek WIP and vice versa. Each plan contains technical information mutually beneficial to the other documents; therefore, ensuring data is made available to share between documents will maximize opportunities for plan integration.

Table 5.2-10 **Plan Integration: Pine Creek WIP, Allegheny County Stormwater Management Plan, 2020 Allegheny County HMP Update**

	Opportunities to Address Gaps and Integrate Plans	
Pine Creek WIP Gaps	Allegheny County Act 167 Stormwater Management Plan	Allegheny County 2020 HMP Update
Updated data required	For Pine Creek WIP Update: Incorporate Act 167 Pine Creek watershed data into the WIP including problem areas and obstructions (Table 5.1, Act 167 plan, Phase 2), impaired stream miles (Table 6.1), TMDLs (Table 6.3), levee and floodwall information (Table 7.3), and designated water uses (Table 10.5). For Act 167 Update: Incorporate updated HMP risk analysis data into the next update of the Act 167 plan.	For Pine Creek WIP Update: Utilize updated HMP risk analysis data pertaining to water quality: drought, flood, environmental hazards (hazardous material release, coal mining, oil and gas), levees in the WIP update. For HMP Update: Identify data sets used in the Pine Creek WIP in the HMP to demonstrate data sharing.
Specific critical area selection	An objective of the Act 167 plan is to address problem areas identified by the Water Planning Advisory Committee (WPAC) established for the plan's development. These problem areas should assist in critical area selection for the WIP update. For Pine Creek WIP Update: Assess problem areas and	For Pine Cree WIP Update: In addition to updated HMP risk analysis data over the past 5 years, assess dam and lock failure and levees within the Pine Creek watershed as incidents would result in potential water quality impairment. Consider updated data pertaining to populations

Table 5.2-10 **Plan Integration: Pine Creek WIP, Allegheny County Stormwater Management Plan, 2020 Allegheny County HMP Update**

	Opportunities to Address Gaps and Integrate Plans	
Pine Creek WIP Gaps	Allegheny County Act 167 Stormwater Management Plan	Allegheny County 2020 HMP Update
	obstructions specific to the Pine Creek watershed. Incorporate regional detention basin analysis and recommendations into updates of both the WIP and 2020 HMP update. For Act 167 Update: Incorporate locations of critical area selection from the update WIP into the Act 167 Plan.	vulnerable to hazards within the Pine Creek watershed. For HMP Update: Incorporate locations of critical area selection from the updated WIP into the HMP.
Clear connection between impairment, proposed BMP, load reduction, and water quality standards	An objective of the Act 167 plan is to protect and improve stream water quality and reduce runoff pollutants through encouraging the use of BMPs. This objective is consistent with the need to clearly connect the selected BMP to impairment, load reduction, and water quality standards as identified in the Pine Creek WIP. For Pine Creek WIP Update: Ensure the Allegheny County Model Stormwater Management ordinance is being implemented in Pine Creek watershed municipalities. Reference the model ordinance in the WIP update as a tool to effectively use BMPs to reduce impairment, effectuate load reduction, and improve water quality. For Act 167 Update: Reference the incorporation of the model	For Pine Creek WIP Update: Utilize updated HMP risk analysis information to assess potential locations for water quality issues within the Pine Creek Watershed. For HMP Update: Incorporate BMPs into the HMP to catalog mitigation actions and document the impact of BMPs over time.

Table 5.2-10 **Plan Integration: Pine Creek WIP, Allegheny County Stormwater Management Plan, 2020 Allegheny County HMP Update**

Pine Creek WIP Gaps	Opportunities to Address Gaps and Integrate Plans	
	Allegheny County Act 167 Stormwater Management Plan	Allegheny County 2020 HMP Update
	ordinance into the WIP update as a tool to improve effective BMP implementation.	
Interim water quality targets/ schedule	For Act 167 Update: Incorporate list of WIP water quality targets and schedule into Act 167 plan to identify specific progress on achieving Act 167 plan objectives.	For HMP Update: Incorporate list of WIP water quality targets and schedule into HMP to demonstrate efforts to reduce the impacts of water quality related hazards.
Expanded monitoring plan	For Pine Creek WIP Update: The Act 167 plan identified a specific process for plan monitoring. As part of the WIP update, the Act 167 plan monitoring requirements should be evaluated, and a recommendation made to conduct consistent monitoring.	For HMP Update: Incorporate the expanded monitoring plan into the HMP to demonstrate efforts to reduce the impacts of water quality related hazards.
Expanded civic engagement plan	The Pine Creek WIP, Allegheny County Act 167 Plan, and Allegheny County HMP each include specific public outreach and involvement requirements. Leveraging public outreach required for each plan by discussing pertinent elements of each in public messaging will help facilitate plan integration.	

Source: Tetra Tech, Michael Baker International.

6. Mitigation Strategy

6.1. Update Process Summary

6.1.1. Mitigation Goals and Objectives Review

Mitigation goals are general guidelines that explain what the County wants to achieve. Goals are usually expressed as broad policy statements representing desired long-term results. Mitigation objectives describe strategies or implementation steps to attain the identified goals. Objectives are more specific statements than goals; the described steps are usually measurable and can have a defined completion date.

Based on results of the goals and objectives evaluation exercise and input from the County, a list of goals and corresponding objectives was developed for the 2015 plan. Table 6.1-1 details the mitigation goals and objectives established for the 2015 HMP. Goal 4 was a new goal for the 2015 HMP, as were Objectives 1E, 1H, 4B, and 4C.

Table 6.1-1 **2015 Mitigation Goals and Objectives.**

GOAL 1	**Reduce possibility of damage and loss to existing community assets including addressable structures, critical facilities, and infrastructure due to all hazards that affect Allegheny County.**
Objective 1A	Develop a comprehensive approach to reducing the possibility of damage to addressable structures, loss of function to critical facilities, and injuries/loss of life due to all hazards that affect Allegheny County.
Objective 1B	Protect existing assets with the highest relative vulnerability to the hazards identified in the HMP.
Objective 1C	Encourage the use of flood and mine subsidence insurance purchases to protect and educate residents about flood and subsidence risk.
Objective 1D	Expand the conventional thinking on floodplain management to include storm/septic systems and short duration floods.
Objective 1E	Protect and maintain county and local infrastructure.
Objective 1F	Identify building-related data required to more fully assess the vulnerability of structures to identified hazards and plan to capture detailed data.
Objective 1G	Leverage existing relationships and develop new ones to increase coordination and mitigate hazardous materials incidents and transportation accidents.
Objective 1H	Use structural flood mitigation techniques to reduce future loss of life and property, including acquisition, elevation, and relocation for residential structures and wet and dry floodproofing for non-residential structures.
GOAL 2	**Promote disaster-resistant future development to reduce and eliminate risk from all hazards.**
Objective 2A	Encourage and facilitate the development or revision of comprehensive plans and zoning ordinances to limit new development in high hazard areas.

Table 6.1-1	**2015 Mitigation Goals and Objectives.**
Objective 2B	Encourage and facilitate the adoption of building codes that provide protection for new construction and substantial renovations from the effects of identified hazards.
Objective 2C	Provide adequate and consistent enforcement of ordinances and codes within and between jurisdictions.
Objective 2D	Discourage activities that exacerbate existing hazardous conditions.
Objective 2E	Address identified data limitations regarding lack of detailed information about development build-out potential in high hazard areas.
Objective 2F	Require geologic studies, on-site monitoring, and site legislation for large new developments.
GOAL 3	**Promote hazard mitigation as a public value that ensures safer, more sustainable communities.**
Objective 3A	Provide public education that reinforces the connections between sustainability, safety, and risk reduction for all hazards identified that could impact Allegheny County.
Objective 3B	Promote partnerships between the municipalities and the County to continue to develop a County-wide approach to identifying and implementing mitigation actions for all hazards.
Objective 3C	Promote disaster resistance in the business community from all hazards.
Objective 3D	Monitor and publicize the effectiveness of mitigation initiatives implemented in the community.
Goal 4	**Protect natural resources within hazard areas and use them to reduce risk and losses.**
Objective 4A	Address legal issues with stream restoration.
Objective 4B	Leverage the technical skills and knowledge of non-profit and non-governmental entities involved in natural resources protection.
Objective 4C	Protect the natural function of waterways.

6.1.2. Mitigation Progress and Successes

For the plan update, Allegheny County Department of Emergency Services and individual municipalities provided progress on mitigation actions and success that were accomplished since 2015. This section reflects progress and successes as of June 2020.

In 2014 Allegheny County's Risk MAP process was completed. Throughout the Risk MAP process, communities were able to get a better understanding of their flood risk, and all communities updated their floodplain ordinances. Many noted that the 2014 ordinances were stricter than previous ordinances. All communities reporting this progress via the NFIP compliance form note that the PA model ordinance

was used. In addition, the non-regulatory Risk MAP products are used in a number of communities to communicate risk. While this does not necessarily represent a permanent risk reduction, the awareness can help build community understanding of risk. In the County, 129 of 130 communities participate in the NFIP.

Stormwater management and storm sewer system maintenance and upgrades are another area of mitigation success since 2015. The Allegheny County Stormwater Management Plan used an online mapping platform allowing municipal officials to catalog stormwater and flooding-related issues. This mapping effort has helped communities and the county understand where flooding is an issue, particularly outside the SFHA. Municipalities have also been taking action on stormwater management. Baldwin Borough passed a robust stormwater management ordinance that requires any additional pervious area to be runoff-neutral, meaning that runoff must be treated on-site and released at a rate that does not affect downstream communities. The City of Pittsburgh continues to focus on stormwater management in many of its planning efforts. Many other communities are beginning to audit their stormwater regulations to ensure they comply with PA DEP and, where applicable, MS4 regulations. For example, Fox Chapel Borough passed a 2019 DEP audit; MS4 protocols are now in place for flood mitigation and response. Marshall Township has also completed an MS4 report. Frazer Township adopted a new stormwater management ordinance in 2018. Bethel Park updated Ordinance 8-13-18A in 2018 to include restrictions on developing in landslide prone areas.

Dormont Borough formed a Stormwater Authority and is conducting ongoing work to assess target flood hazard areas. Major improvements were made in the most critical area in Fall 2019. Franklin Park Borough has removed debris from stream along McAlder Road. The Borough completed engineering studies for flooding along Montgomery Road, White Oak Court, and Dalton/Nevin Drive. Heidelberg Borough is continuing to clear Chartiers Creek banks of saplings, brush, and other plan matter to reduce flooding instances. Oakmont Borough plans to begin stream bank rehabilitation on Plum Creek Stream in Q3 of 2020. This will restore the natural ecology and help reduce flooding. Castle Shannon Borough has completed additional catch basins and is working with Baldwin Township to address run off issues. The Borough conducts stream clean ups twice annually through MS4 programming. Scott Township is working with the Chartiers Creek Flood Authority to enhance the resiliency of critical facilities in the floodplain. Hampton Township is continuing its 5-year maintenance program for existing flood retention and detention ponds. Also, a cooperative effort was launched between East Deer Township Emergency Management and the PPG Credit Union which resulted in mitigation of the flood hazard that had the potential to adversely affect additional properties during future high water events along Baily's Run. During the mitigation process, a large portion of the retaining wall was replaced with more substantial components than previously installed and the debris was removed from the creek restoring its natural flow path. No disruption of the creek bed took place.

In terms of structural mitigation efforts, regular maintenance is ongoing on drainage systems to reduce flooding and control runoff in Baldwin Township and Oakdale Borough. Edgewood Borough is working to increase the capacity of the storm sewer system to reduce flooding in Greendale. West Elizabeth Borough is installing duck bills on storm sewers to prevent backflow onto Water Street and into cellars. Pleasant Hills Borough is in need of sanitary sewer upgrades estimating $4 million. The Borough installed a sanitary

sewage overflow tank, and the new sewage lift station is under construction. Millvale Borough is working with ACOE on a project in 2020 to repair Girtys Run walls and floor. Girtys Run is typically cleared of debris twice a year, but further improvements will help reduce flood issues. In 2019, Etna Borough acquired and demolished a repetitive loss property in the floodplain, turning it into a permanent greenspace. Wilkins Township continues to purchase and demolish flood-prone homes along Larimer Avenue and Wilbur Avenue. The City of Pittsburgh is implementing the Grid Security Project in the 2030 Districts Downtown and in Oakland to reduce energy use and to create utility resilience through the use of microgrid security projects. The City of Pittsburgh also continues to implement green infrastructure projects to improve water quality and reduce flooding. Ben Avon Borough conducts ongoing work to stabilize hillsides along Cambridge Road through the installation of retaining wall segments.

Several communities noted advances in their communication systems and education capabilities. Aspinwall Borough has conducted an education and awareness campaign about the Borough's emergency management policies and procedures through the municipal website and Emergency Response Plan updates. Avalon Borough developed a public outreach program on the importance of stormwater management with students and parents. Castle Shannon Borough distributes EMC resources through the borough website. Dormont Borough works with schools and additional stakeholders to distribute hazard preparedness materials. Etna Borough conducts annual mailings on hazard preparedness to all property owners, seniors, and businesses. Oakmont Borough provides hazard presentations several times a year to residents and distributes materials at events. Aspinwall Borough provides updates on flooding through the municipal website. Several municipalities report using Savvy Citizen, including Aspinwall Borough and Richland Township. Brentwood Borough continues to educate citizens and borough organizations on evacuation routes. Avalon Borough has plans to add citizen notification system as a new method of communication in 2020. East Deer Township is developing an educational program to inform citizens on local hazards, with a focus on floodplain locations and floodplain vs. homeowner's insurance.

Finally, the City of Pittsburgh was named one of the Rockefeller Foundation's 100 Resilient Cities in its second cohort (December 2014). The program is intended to help cities around the world become more resilient to the physical, social, and economic challenges of the 21st century. Pittsburgh joins US cities like New York, New Orleans, and Oakland and international hubs like Sydney, Singapore, London, and Milan in its designation. Pittsburgh was selected in part because the city has been using innovation as the primary approach to address the post-industrial landscape, meet air and water quality requirements, and spur 'green' job creation. The 100 Resilient Cities framework supports looking not only at the traditional hazards discussed in this plan, like flooding and hazardous material releases/pollution, but also the chronic stressors that exacerbate hazards like aging infrastructure. While focused on the City of Pittsburgh, there will likely be applicability to other Allegheny County communities as the City moves forward with understanding and mitigating its hazards and stressors.

The City of Pittsburgh and key stakeholders engage in planning activities through this program. On December 7, 2016, a workshop was held by the City of Pittsburgh to plan around watershed resilience. Participants included agencies with the City and County, 100 Resilient Cities, USACE, ALCOSAN, and local groups like Parks Conservancy, Homewood Children's Village, and 3 Rivers Wet Weather. Main findings from the workshop involve water resource management. By discussing challenges with case studies, the

group identified best practices and steps forwards for water management in the region. For example, participants recognize the need to manage stormwater systems at a watershed level. The City intends to pursue a mix of small, internally-funded green infrastructure with large corridor projects for a robust and effective implementation plan and funding approach. A policy approach will also be taken to develop a uniform green policy that will lower demands on the local stormwater drainage system (ARCADIS, 2016). On July 31, 2019 the existing 100 Resilience Cities organization concluded. The Rockefeller Foundation announced an $8 million commitment to continue supporting the work of Chief Resilience Officers and member cities withing the 100 Resilience Cities Network. This funding will enable a new project to continue supporting the implementation of resilience initiatives incubated through the work of 100 Resilient Cities.

Table 6.1-2 captures progress on all actions since 2015. Many of the outreach, education, and training actions are considered ongoing.

Table 6.1-2 **Review of Previous Mitigation Actions**

Community	Action #	Hazard(s) Addressed	Mitigation Action	Status			
				Completed	Canceled	Deferred	Ongoing
Harrison Township and Mt. Lebanon Township	1	All hazards	Provide an annual table-top training for emergency management staff.	X			X
Mt. Lebanon Township	2	All hazards	Develop a continuity plan for municipal services and buildings.				X
Churchill Borough	3	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter; Tornado, Windstorm; Utility Interruption	Equip the pump station with a surge protector.				X
Aspinwall Borough, Churchill Borough and McKees Rocks Borough	4	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Provide community outreach and education about flooding.	X			X
Carnegie Borough, North Fayette Township, Rosslyn Farms Borough and Turtle Creek Borough	5	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Identify properties in the community at high risk of flooding for purposes of property protection.				X
Frazer Township	6	Terrorism	Conduct Active Shooter Training with Frazer Township Police Department and Mutual Aid Police Departments to prepare for potential mall shootings, bombings, or other types of emergencies within the Pittsburgh Mill Mall and surrounding businesses.	X			X
Oakdale Borough and West Elizabeth Borough	7	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Establish a flood warning system and install stream gauges.				X

Table 6.1-2 **Review of Previous Mitigation Actions**

Community	Action #	Hazard(s) Addressed	Mitigation Action	Status			
				Completed	Canceled	Deferred	Ongoing
North Fayette Township	8	Winter Storms	Coordinate with PennDOT, Allegheny County Maintenance, and North Fayette Township Transportation on winter storm response.	X			X
Carnegie Borough	9	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter; Tornado, Windstorm	Participate in the StormReady program.				X
Dormont Borough	10	Environmental Hazards; Terrorism; Transportation Accidents	Monitor storage of public pool chemicals and Port Authority subway tunnel.	X			X
East McKeesport Borough	11	Winter Storms	Upgrade or replace equipment.				X
Avalon Borough, Ben Avon Borough, Forest Hills Borough and Richland Township	12	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Use website and newsletter to encourage residents in low lying areas to consider flood insurance.				X
Upper St. Clair Township	13	Transportation Accidents	Review zoning regulations pertaining to airports.	X			
Jefferson Hills Borough	14	Landslide	Identify and correct critical road drainage concerns in landslide-prone areas.				X
Blawnox Borough	15	All hazards	Identify hazards within the Borough and correct said hazards through the enforcement of building codes.				X
Etna Borough	16	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Provide elevation and flood-proofing projects to homes in hazard areas.				X

Table 6.1-2 **Review of Previous Mitigation Actions**

Community	Action #	Hazard(s) Addressed	Mitigation Action	Status			
				Completed	Canceled	Deferred	Ongoing
Kennedy Township	17	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Obtain equipment and crew necessary to clear debris from water detention facility.				X
Oakdale Borough	18	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Establish a legal means to keep waterways open and continue to remove silt from streams.				X
Hampton Township	19	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Conduct Phase 2 of the Lower Allison Park flood retention project.				X
Pleasant Hills Borough	20	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Remedy basement flooding and sanitary sewer overflows using green infrastructure.				X
Harrison Township	21	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Promote storm water management and provide NFIP information to the public.	X			
North Versailles Township	22	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Implement stormwater projects.				X
North Braddock Borough and Wall Borough	23	Winter Storms; Urban Fire and Explosion	Demolish vacant structures through the Safe Neighborhood Demolition Program.				X
South Park Township	24	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Clear riverbanks per Commonwealth regulations for 100 yards above and below established bridges and replace with proper foliage.				X

Table 6.1-2 **Review of Previous Mitigation Actions**

Community	Action #	Hazard(s) Addressed	Mitigation Action	Status			
				Completed	Canceled	Deferred	Ongoing
Port Vue Borough	25	Landslide	Continue to structurally address landslide hazard on Arlington Avenue in Port Vue and educate residents about the landslide hazard.				X
Collier Township and Whitaker Borough	26	Landslide; Subsidence, Sinkhole	Continue to conduct subdivision reviews to ensure new development is not in high hazard landslide/mine subsidence areas.	X			X
Edgewood Borough	27	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Reduce flooding in Greendale by increasing the capacity of the storm sewer system.				X
Shaler Township and West Elizabeth Borough	28	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Demolish houses in floodprone areas identified in the HMP.				X
Millvale Borough	29	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Repair Girtys Run walls and floor.				X
Wilkins Township	30	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Purchase flood-prone homes along Larimer Avenue and Wilbur Avenue.	X			
McCandless Town	31	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Remove obstructions in floodplains as properties redevelop.				X
Pitcairn Borough	32	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Continue Dirty Camp Run Flood Control Project to completion, improve/replace related infrastructure, and conduct stream restoration to support project.				X

Table 6.1-2 **Review of Previous Mitigation Actions**

Community	Action #	Hazard(s) Addressed	Mitigation Action	Status			
				Completed	Canceled	Deferred	Ongoing
Penn Hills Township	33	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Clean bank and bed areas, dredge bed and under bridge, and reconstruct bridge base to reduce flooding at/near bridges, reduce erosion of banks, and prevent blockage of roads.				X
Bethel Park	34	Flood, Flash Flood, Ice Jam; Landslide	Revise storm water management ordinance to meet state requirements and revise ordinances addressing landslides to limit development in landslide prone areas.	X			
West Homestead Borough	35	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Maintain West Run channel and remove obstructions to prevent flooding.				X
Millvale Borough	36	Urban Fire	Continue blight/abandonment program to demolish abandoned properties.				X
Millvale Borough	37	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Continue program to clean out Girty's Run at least twice a year.				X
Millvale Borough	38	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Coordinate with Girty's Run Authority to separate storm water and sewer lines.				X
All Municipalities	39	Civil Disturbances	Provide training to local law enforcement on responding to civil disturbances.				X
Allegheny County Department of Emergency Services	40	All hazards	Use the County's mitigation action tracking spreadsheet to encourage implementation of actions identified in this hazard mitigation plan update.				X

Table 6.1-2 **Review of Previous Mitigation Actions**

Community	Action #	Hazard(s) Addressed	Mitigation Action	Status			
				Completed	Canceled	Deferred	Ongoing
Allegheny County Department of Emergency Services and All Municipalities	41	All hazards	Use the county LEPC and Quarterly Trainings to distribute all-hazards education and preparedness materials to communities.				X
All Municipalities	42	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Address identified data limitations regarding lack of detailed information about: Individual structures located in the 100-year floodplain; flood probabilities other than the 100-year flood; presence of basements/finished basements/crawl spaces and first floor elevations for priority areas.				X
Aspinwall Borough	43	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Floodproof municipal facilities.	X			
Aspinwall Borough	44	Environmental Hazards; Transportation Accidents	Continue to coordinate with Norfolk Southern about rail traffic, conducting rail exercises, and training municipal staff on how to improve reactions if an incident occurs.				X
Aspinwall Borough	45	All hazards	Conduct an education and awareness campaign about the Borough's emergency management policies, procedures, and reasoning, including providing a resource guide so residents know where to turn for information.	X			X
Baldwin Township, Castle Shannon Borough and Munhall Borough	46	Transportation Accidents; Urban Fire and Explosion	Create response plan for train derailment events and, in Baldwin, for fires in the commercial/industrial district in coordination with surrounding municipalities.				X

Table 6.1-2 **Review of Previous Mitigation Actions**

Community	Action #	Hazard(s) Addressed	Mitigation Action	Status			
				Completed	Canceled	Deferred	Ongoing
Baldwin Township and Oakdale Borough	47	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter; Landslide	Perform regular maintenance on drainage systems with an emphasis on projects with greatest impact on reducing flooding and controlling runoff.				X
Baldwin Township and East McKeesport Borough	48	Subsidence, Sinkhole	Monitor subsidence risk factors, plan for subsidence events, educate residents, and refer new developments to the Mine Subsidence Insurance Program if the development is an area that has been undermined.				X
Baldwin Township	49	Drought	Monitor drought conditions and water supply resources to provide early warning to residents about the need to conserve water.				X
Baldwin Township	50	Tornado, Windstorm	Conduct tornado awareness activities and educate residents on proper sheltering				X
Ben Avon Borough	51	Landslide	Mitigate landslides along Cambridge Road by continuing installation of retaining wall segments to stabilize hillside.	X			
Blawnox Borough	52	Dam and Lock Failure	Review EAPs of dams to conform with DEP standards and include additional information as needed				X
Brentwood Borough	53	All hazards	Continue education to borough organizations on evacuation routes	X			
Bridgeville Borough	54	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Acquire floodprone properties in the Baldwin Street area of the Borough.				X
City of Duquesne	55	All hazards	Update municipal emergency response plan.				X

Table 6.1-2 **Review of Previous Mitigation Actions**

Community	Action #	Hazard(s) Addressed	Mitigation Action	Status			
				Completed	Canceled	Deferred	Ongoing
Elizabeth Borough	56	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Complete the Irwin Street/Fallen Timber Storm Drainage Project to prevent flooding.				X
Etna Borough and Oakdale Borough	57	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Purchase and install flood barriers at the Fire Station			X	
Etna Borough	58	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	As old facilities become vacant, acquire, demolish, and establish stormwater management areas prohibiting redevelopment as established in municipal comprehensive plan.	X			X
Etna Borough	59	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Construct flood wall behind industrial site at Crescent Avenue/Grant Avenue to and past the Butler/Kittanning Street Bridge and purchase Stop Barrier for the Bridge and for Butler Street near Duquesne Electric Company.				X
Forest Hills Borough	60	All hazards	Conduct a comprehensive review and revision, if needed, of zoning ordinances that emphasizes hazard-resistant future development.				X
Fox Chapel Borough, Hampton Township, Marshall Township, Oakmont Borough, Ross Township	61	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Adopt MS4 protocols, plans, and procedures to deal with flooding.	X			
Frazer Township	62	Environmental Hazards; Urban Fire and Explosion	Continue annual public safety meetings concerning gas wells and gas compressor station hazards.	X			X

Table 6.1-2 **Review of Previous Mitigation Actions**

Community	Action #	Hazard(s) Addressed	Mitigation Action	Status			
				Completed	Canceled	Deferred	Ongoing
Frazer Township	63	All hazards	Review the evacuation plan of Pittsburgh Mills as well as the entire township and post the information to the website or include in a newsletter.	X			X
Hampton Township	64	All hazards, emphasis on natural hazard events	Update the township GIS mapping system and program.				X
Hampton Township	65	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Implement a five-year maintenance program for existing flood retention and detention ponds.				X
Kilbuck Township	66	All hazards	Further develop/update the Township's emergency plans, public trainings, and improve all-hazards communication by posting information on website.				X
Liberty Borough	67	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter; Tornado, Windstorm; Utility Interruption; Winter Storm	Mitigate the impact and risks associated with the response and recovery operations during utility outage emergencies by obtaining natural gas generators for the municipal building and the fire station.				X
City of McKeesport	68	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Improve enforcement of building codes in floodplain areas.				X
City of McKeesport	69	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Work with realtors to conduct real estate disclosures related to sales in floodplains.				X

Table 6.1-2 **Review of Previous Mitigation Actions**

Community	Action #	Hazard(s) Addressed	Mitigation Action	Status			
				Completed	Canceled	Deferred	Ongoing
Mount Oliver Borough	70	Subsidence, Sinkhole	Monitor areas at risk to subsidence by remaining aware of changes in groundwater levels, with a focus on areas of Transverse Park that have sunk in the past.				X
Pine Township	71	Drought; Earthquake; Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter; Tornado, Windstorm; Winter Storm	Use municipal newsletter to provide information to residents to help educate them on preparedness, with an emphasis on severe weather-related events.				X
Pitcairn Borough	72	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Because the Borough has a high proportion of renters, engage rental housing owners to floodproof properties and educate tenants about flooding issues.				X
City of Pittsburgh	73	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Implement development of a model that looks at not only hydrology but also social/community development impacts, economics, and hazard mitigation potential to make strategic, directed investments in flood reduction and stormwater management			X	
City of Pittsburgh	74	All hazards, emphasis on Flood, Flash Flood, Ice Jam; Environmental Hazards; and Transportation Accidents	Use Pittsburgh's selection as one of the 100 Resilient Cities named by the Rockefeller Foundation to strengthen integration between planning mechanisms in the city of Pittsburgh and look holistically at risk reductions and improvements in quality of life.			X	
City of Pittsburgh	75	All hazards	Review this HMP and use its data on hazard-prone properties to direct land use planning, zoning updates, and				X

Table 6.1-2 **Review of Previous Mitigation Actions**

Community	Action #	Hazard(s) Addressed	Mitigation Action	Status			
				Completed	Canceled	Deferred	Ongoing
			investment in safe areas as the City prepares its first Comprehensive Plan.				
City of Pittsburgh	76	Environmental Hazards	Develop a Climate Action Plan to address air quality and ensure responsible future development.			X	
City of Pittsburgh	77	Utility Interruption	Implement the Grid Security Project in the 2030 Districts Downtown and in Oakland to not only reduce energy use but also create resilience through microgrid security projects.				X
City of Pittsburgh	78	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Use green infrastructure to improve river water quality, comply with the Clean Water Act, and reduce flooding, especially on city-owned or controlled properties.				X
Sharpsburg Borough	79	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Investigate and prioritize additional floodproofing of municipal facilities.				X
Sharpsburg Borough	80	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Conduct stream restoration to reduce flooding.				X
South Fayette Township	81	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Purchase backup power for the township building and/or relocate building out of the floodplain.				X
Springdale Borough	82	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Purchase generators for Springdale Borough Water Plants, which generate water for 3,400 in the Borough and have emergency interconnects to several surrounding boroughs				X

Table 6.1-2 **Review of Previous Mitigation Actions**

Community	Action #	Hazard(s) Addressed	Mitigation Action	Status			
				Completed	Canceled	Deferred	Ongoing
West Deer Township	83	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Develop a formal procedure for administering an evacuation of homes in danger of flooding.				X
West Elizabeth Borough	84	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Install duck bills on storm sewers to prevent backflow onto Water Street and into cellars.				X
West View Borough	85	All hazards	Create a better emergency notification system, possibly using reverse 911 and the website.				X
Wilmerding Borough	86	All hazards	Continue to monitor evacuation plans to ensure adequacy as the Borough changes and develops.				X
Allegheny County Economic Development	87	All hazards	Consider adding hazard-specific criteria to the County's consistency review checklists for development, plans, ordinances, and grants.				X
All Municipalities	88	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	If funding becomes available, acquire, elevate, or floodproof structures, with an emphasis on mitigating Repetitive Loss and Severe Repetitive Loss properties.				X
Heidelberg Borough	89	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Clear Chartiers Creek banks of saplings, brush, and other plant matter to reduce flooding instances.				X
Oakmont Borough	90	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Complete stream restoration of Plum Creek to restore natural ecology and address flooding				X

Table 6.1-2 **Review of Previous Mitigation Actions**

Community	Action #	Hazard(s) Addressed	Mitigation Action	Status			
				Completed	Canceled	Deferred	Ongoing
O'Hara Township	91	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Separate sewer lines				X
East Deer Township	92	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Create an educational program via newsletter to inform citizens regarding hazards identified in the community and how to mitigate with an immediate focus on conveying the new floodplain locations, followed by information on purchasing insurance (especially the difference between homeowner's and floodplain insurance).				X
Fawn Township	93	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Dredge Bull Creek and clear it of debris.				X

Table 6.1-2 **Review of Previous Mitigation Actions**

Community	Action #	Hazard(s) Addressed	Mitigation Action	Status			
				Completed	Canceled	Deferred	Ongoing
Bell Acres Borough, Brackenridge Borough, Carnegie Borough, Castle Shannon Borough, City of Clairton, City of Duquesne, City of McKeesport, City of Pittsburgh, Collier Township, Coraopolis Borough, Dravosburg Borough, East Deer Township, Elizabeth Borough, Elizabeth Township, Emsworth Borough, Fawn Township, Forward Township, Glassport Borough, Hampton Township, Harmar Township, Indiana Township, Jefferson Hills Borough, Leetsdale Borough, McCandless Township, McKees Rocks Borough, Monroeville Borough, Moon Township, Munhall Borough, Neville Township, North Fayette Township, O'Hara Township, Penn Hills Township, Pitcairn Borough, Plum Borough, Reserve Township, Richland Township, Scott Township, Sewickley Borough, Shaler Township, Sharpsburg Borough, South Fayette Township, South Park Township, South Versailles Township,	94	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter	Reduce possibility of damage and loss of function to community-identified critical facilities in the floodplain.				X

Table 6.1-2 **Review of Previous Mitigation Actions**

Community	Action #	Hazard(s) Addressed	Mitigation Action	Status			
				Completed	Canceled	Deferred	Ongoing
Tarentum Borough, Verona Borough, West Elizabeth Borough and White Oak Borough							

6.2. Mitigation Goals and Objectives

Based on results of the goals and objectives evaluation exercise and input from the County, it was confirmed that the 2015 goals and objectives still align with the County's vision. Table 6.2-1 details the mitigation goals and objectives re-established for the 2020 plan.

Table 6.2-1 **2020 Mitigation Goals and Objectives.**

GOAL 1	**Reduce possibility of damage and loss to existing community assets including addressable structures, critical facilities, and infrastructure due to all hazards that affect Allegheny County.**
Objective 1A	Develop a comprehensive approach to reducing the possibility of damage to addressable structures, loss of function to critical facilities, and injuries/loss of life due to all hazards that affect Allegheny County.
Objective 1B	Protect existing assets with the highest relative vulnerability to the hazards identified in the HMP.
Objective 1C	Encourage the use of flood and mine subsidence insurance purchases to protect and educate residents about flood and subsidence risk.
Objective 1D	Expand the conventional thinking on floodplain management to include storm/septic systems and short duration floods.
Objective 1E	Protect and maintain county and local infrastructure.
Objective 1F	Identify building-related data required to more fully assess the vulnerability of structures to identified hazards and plan to capture detailed data.
Objective 1G	Leverage existing relationships and develop new ones to increase coordination and mitigate hazardous materials incidents and transportation accidents.
Objective 1H	Use structural flood mitigation techniques to reduce future loss of life and property, including acquisition, elevation, and relocation for residential structures and wet and dry floodproofing for non-residential structures.
GOAL 2	**Promote disaster-resistant future development to reduce and eliminate risk from all hazards.**
Objective 2A	Encourage and facilitate the development or revision of comprehensive plans and zoning ordinances to limit new development in high hazard areas.
Objective 2B	Encourage and facilitate the adoption of building codes that provide protection for new construction and substantial renovations from the effects of identified hazards.
Objective 2C	Provide adequate and consistent enforcement of ordinances and codes within and between jurisdictions.
Objective 2D	Discourage activities that exacerbate existing hazardous conditions.
Objective 2E	Address identified data limitations regarding lack of detailed information about development build-out potential in high hazard areas.
Objective 2F	Require geologic studies, on-site monitoring, and site legislation for large new developments.

Table 6.2-1	2020 Mitigation Goals and Objectives.
GOAL 3	**Promote hazard mitigation as a public value that ensures safer, more sustainable communities.**
Objective 3A	Provide public education that reinforces the connections between sustainability, safety, and risk reduction for all hazards identified that could impact Allegheny County.
Objective 3B	Promote partnerships between the municipalities and the County to continue to develop a County-wide approach to identifying and implementing mitigation actions for all hazards.
Objective 3C	Promote disaster resistance in the business community from all hazards.
Objective 3D	Monitor and publicize the effectiveness of mitigation initiatives implemented in the community.
Goal 4	**Protect natural resources within hazard areas and use them to reduce risk and losses.**
Objective 4A	Address legal issues with stream restoration.
Objective 4B	Leverage the technical skills and knowledge of non-profit and non-governmental entities involved in natural resources protection.
Objective 4C	Protect the natural function of waterways.
Goal 5	**Reduce possibility of damage and loss to existing community assets including addressable structures, critical facilities, and infrastructure due to HHPDs.**
Objective 5A	Coordinate with High Hazard Potential Dam owners and affected officials on dam rehabilitation and funding.

6.3. Identification and Analysis of Mitigation Techniques

The mitigation strategy in the updated HMP should include analysis of a comprehensive range of specific techniques or actions. FEMA, through the March 2013 Local Mitigation Handbook, and PEMA, through the October 2013 Standard Operating Guide (SOG), identify four categories of hazard mitigation techniques.

- **Local plans and regulations:** Government authorities, policies, or codes that influence the way land and buildings are developed and built. Examples include, but are not limited to: comprehensive plans, subdivision regulations, building codes and enforcement, and NFIP and CRS.
- **Structure and infrastructure:** Modifying existing structures and infrastructure or constructing new structures to reduce hazard vulnerability. Examples include but are not limited to: acquisition and elevation of structures in flood prone areas, utility undergrounding, structural retrofits, floodwalls and retaining walls, detention and retention structures, and culverts.
- **Natural systems protection:** Actions that minimize damage and losses and also preserve or restore the functions of natural systems. Examples include but are not limited to: sediment and

erosion control, stream corridor restoration, forest management, conservation easements, and wetland restoration and preservation.

- **Education and awareness:** Actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate the hazards and may also include participation in national programs. Examples include but are not limited to: radio or television spots, websites with maps and information, provide information and training, NFIP outreach, StormReady, and Firewise Communities.

Table 6.3-1 identifies mitigation techniques for the hazards identified in the risk assessment. The matrix is used to help identify specific mitigation actions to be included in the mitigation action plan.

Table 6.3-1 **Mitigation techniques used for all hazards in Allegheny County**

Hazard	Mitigation Technique			
	Local Plans and Regulations	Structure and Infrastructure	Natural Systems Protection	Education and Awareness
Drought	X			X
Earthquake	X			X
Flood, Flash Flood, Ice Jam	X	X	X	X
Hurricane, Tropical Storm, Nor'easter	X	X	X	X
Landslide	X	X	X	X
Pandemic	X			X
Radon Exposure	X			X
Subsidence, Sinkhole	X	X	X	X
Tornado, Windstorm	X	X		X
Wildfire	X			X
Winter storm	X	X		X
Civil Disturbance	X			X
Dam and Lock Failure	X			X
Environmental Hazards	X			X
Levee failure	X			X
Nuclear Incidents	X			X
Opioid Addiction and Response	X			X
Terrorism	X			X
Transportation Accidents	X			X
Urban Fire and explosion	X	X		X
Utility Interruption	X	X		X

6.4. Mitigation Action Plan

All municipalities that participated in the plan update process have selected mitigation actions that they would like to accomplish within the next 5 years. Table 6.4-1 lists all the mitigation actions for the 2020 HMP Update. Each mitigation action is intended to address one or more of the goals and objectives identified in Section 6.2. The prioritization of these actions follows in Table 6.4-2.

Table 6.4-1 **Mitigation Action Plan**	
ACTION NO: 1	**Provide an annual table-top training for emergency management staff.**
COMMUNITY: Mount Lebanon; Harrison Township	
Category:	Education and Awareness
Hazard(s) Addressed:	All hazards
Lead Agency/Department:	Mount Lebanon Fire Department/Emergency Management, Harrison Township Commissioners
Implementation Schedule:	Annually
Funding Source:	General emergency management budget line item, staff time
ACTION NO: 2	**Develop a continuity plan for municipal services and buildings.**
COMMUNITY: Mount Lebanon	
Category:	Plans and Regulations
Hazard(s) Addressed:	All hazards
Lead Agency/Department:	Fire Department/Emergency Management
Implementation Schedule:	Within 2 years
Funding Source:	Staff time
ACTION NO: 3	**Equip the pump station with a surge protector.**
COMMUNITY: Churchill Borough	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter; Tornado, Windstorm; Utility Interruption
Lead Agency/Department:	EMC, Borough Council
Implementation Schedule:	Within 5 years
Funding Source:	PennVEST; Community Infrastructure and Tourism Fund Grant
ACTION NO: 4	**Provide community outreach and education about flooding.**
COMMUNITY: Churchill Borough; Aspinwall Borough; McKees Rocks Borough	
Category:	Education and Awareness
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter
Lead Agency/Department:	Municipal EMCs
Implementation Schedule:	Annually
Funding Source:	Staff time

Table 6.4-1 Mitigation Action Plan	
ACTION NO: 5	**Identify properties in the community at high risk of flooding for purposes of property protection.**
COMMUNITY: Rosslyn Farms Borough; North Fayette Township; Carnegie Borough; Turtle Creek Borough	
Category:	Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter
Lead Agency/Department:	Rosslyn Farms Borough EMC, North Fayette Township Administration, Carnegie Borough Police Department, US Army Corps of Engineers
Implementation Schedule:	As funds become available
Funding Source:	FEMA/PEMA
ACTION NO: 6	**Conduct Active Shooter Training with Frazer Township Police Department and Mutual Aid Police Departments to prepare for potential mall shootings, bombings, or other types of emergencies within the Pittsburgh Mill Mall and surrounding businesses.**
COMMUNITY: Frazer Township	
Category:	Education and Awareness
Hazard(s) Addressed:	Terrorism
Lead Agency/Department:	Frazer Township Police Department
Implementation Schedule:	Every other year
Funding Source:	Allegheny County and Township's general fund
ACTION NO: 7	**Establish a flood warning system and install stream gauges.**
COMMUNITY: West Elizabeth Borough; Oakdale Borough	
Category:	Education and Awareness
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter
Lead Agency/Department:	EMC
Implementation Schedule:	Within 3 years
Funding Source:	USGS grants and Borough general fund
ACTION NO: 8	**Coordinate with PennDOT, Allegheny County Maintenance, and North Fayette Township Transportation on winter storm response.**
COMMUNITY: North Fayette Township	
Category:	Plans and Regulation
Hazard(s) Addressed:	Winter Storms
Lead Agency/Department:	PennDOT, Allegheny County Maintenance, North Fayette Township Department of Transportation
Implementation Schedule:	Annually
Funding Source:	Staff time
ACTION NO: 9	**Participate in the StormReady program.**
COMMUNITY: Carnegie Borough	
Category:	Education and Awareness

Table 6.4-1 Mitigation Action Plan	
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter; Tornado, Windstorm
Lead Agency/Department:	Police Department
Implementation Schedule:	Within 2 years
Funding Source:	Staff time
ACTION NO: 10	**Monitor storage of public pool chemicals and Port Authority subway tunnel.**
COMMUNITY: Dormont Borough	
Category:	Education and Awareness
Hazard(s) Addressed:	Environmental Hazards; Terrorism; Transportation Accidents
Lead Agency/Department:	Fire Department, County HAZ-MAT
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 11	**Upgrade or replace equipment.**
COMMUNITY: East McKeesport Borough	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Winter Storms
Lead Agency/Department:	EMC, Public Works
Implementation Schedule:	As funds become available
Funding Source:	General fund
ACTION NO: 12	**Use website and newsletter to encourage residents in low lying areas to consider flood insurance.**
COMMUNITY: Forest Hills Borough; Avalon Borough; Ben Avon Borough; Richland Township	
Category:	Education and Awareness
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter
Lead Agency/Department:	EMC
Implementation Schedule:	Ongoing
Funding Source:	General fund
ACTION NO: 13	**Review zoning regulations pertaining to airports.**
COMMUNITY: Upper Saint Clair Township	
Category:	Plans and Regulations
Hazard(s) Addressed:	Transportation Accidents
Lead Agency/Department:	Community Development Department
Implementation Schedule:	Within 3 years
Funding Source:	Staff time; PennDOT (technical assistance)
ACTION NO: 14	**Identify and correct critical road drainage concerns in landslide-prone areas.**

Table 6.4-1 Mitigation Action Plan	
COMMUNITY: Jefferson Hills Borough	
Category:	Plans and Regulations
Hazard(s) Addressed:	Landslide
Lead Agency/Department:	Local, county, state governments
Implementation Schedule:	As issues arise
Funding Source:	General fund
ACTION NO: 15	**Identify hazards within the Borough and correct said hazards through the enforcement of building codes.**
COMMUNITY: Blawnox Borough	
Category:	Plans and Regulations
Hazard(s) Addressed:	All hazards
Lead Agency/Department:	Borough manager and council
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 16	**Provide elevation and flood-proofing projects to homes in hazard areas.**
COMMUNITY: Etna Borough	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter
Lead Agency/Department:	Borough
Implementation Schedule:	Ongoing, through 2020
Funding Source:	FEMA/PEMA
ACTION NO: 17	**Obtain equipment and crew necessary to clear debris from water detention facility.**
COMMUNITY: Kennedy Township	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter
Lead Agency/Department:	EMC
Implementation Schedule:	As funds become available
Funding Source:	West View Water Authority and general fund
ACTION NO: 18	**Establish a legal means to keep waterways open and continue to remove silt from streams.**
COMMUNITY: Oakdale Borough	
Category:	Natural Systems Protection
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter
Lead Agency/Department:	EMC
Implementation Schedule:	Every other year

Table 6.4-1 Mitigation Action Plan	
Funding Source:	Municipal budget
ACTION NO: 19	**Conduct Phase 2 of the Lower Allison Park flood retention project.**
COMMUNITY: Hampton Township	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter
Lead Agency/Department:	EMC and consultants
Implementation Schedule:	Within 5 years
Funding Source:	PennDOT, DEP, FEMA/PEMA, Allegheny County
ACTION NO: 20	**Remedy basement flooding and sanitary sewer overflows using green infrastructure.**
COMMUNITY: Pleasant Hills Borough	
Category:	Natural Systems Protection
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter
Lead Agency/Department:	Borough
Implementation Schedule:	Ongoing
Funding Source:	PENNVEST and resident surcharge
ACTION NO: 21	**Promote storm water management and provide NFIP information to the public.**
COMMUNITY: Harrison Township	
Category:	Plans and Regulations; Education and Awareness
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter
Lead Agency/Department:	Commissioners
Implementation Schedule:	Within 2 years
Funding Source:	Staff time
ACTION NO: 22	**Implement stormwater projects.**
COMMUNITY: Harrison Township	
Category:	Structure and Infrastructure; Natural Systems Protection
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter
Lead Agency/Department:	Public Safety Department
Implementation Schedule:	Ongoing
Funding Source:	Municipal budget; PA H2O grants
ACTION NO: 23	**Demolish vacant structures through the Safe Neighborhood Demolition Program.**
COMMUNITY: North Versailles Township	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Winter Storms; Urban Fire and Explosion
Lead Agency/Department:	Borough

Table 6.4-1 Mitigation Action Plan	
Implementation Schedule:	Annually
Funding Source:	CDBG funds
ACTION NO: 24	**Clear river banks per Commonwealth regulations for 100 yards above and below established bridges and replace with proper foliage.**
COMMUNITY: South Park Township	
Category:	Natural Systems Protection
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter
Lead Agency/Department:	Township
Implementation Schedule:	As resources become available
Funding Source:	FEMA/PEMA; DEP; municipal budget
ACTION NO: 25	**Continue to structurally address landslide hazard on Arlington Avenue in Port Vue and educate residents about the landslide hazard.**
COMMUNITY: Port Vue Borough	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Landslide
Lead Agency/Department:	Port Vue officials/TRCOG
Implementation Schedule:	Ongoing
Funding Source:	TRCOG; municipal budget
ACTION NO: 26	**Continue to conduct subdivision reviews to ensure new development is not in high hazard landslide/mine subsidence areas.**
COMMUNITY: Whitaker Borough; Collier Township	
Category:	Plans and Regulations
Hazard(s) Addressed:	Landslide; Subsidence, Sinkhole
Lead Agency/Department:	Whitaker Borough Planning Commission; Collier Township Planning Commission, Engineer, Code Officer, and Zoning Officer
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 27	**Reduce flooding in Greendale by increasing the capacity of the storm sewer system.**
COMMUNITY: Edgewood Borough	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter
Lead Agency/Department:	Borough
Implementation Schedule:	As funds become available
Funding Source:	PA H2O; local tax revenue
ACTION NO: 28	**Demolish houses in floodprone areas identified in the HMP.**
COMMUNITY: West Elizabeth Borough; Shaler Township	

Table 6.4-1	Mitigation Action Plan
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter
Lead Agency/Department:	West Elizabeth Borough Code Enforcement Department, Shaler Township EMA
Implementation Schedule:	As funds become available
Funding Source:	CBDG; FEMA/PEMA
ACTION NO: 29	**Repair Girtys Run walls and floor.**
COMMUNITY: Millvale Borough	
Category:	Natural Systems Protection
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter
Lead Agency/Department:	Borough
Implementation Schedule:	Within 3 years
Funding Source:	Municipal budget; PA H2O Program; DEP
ACTION NO: 30	**Remove obstructions in floodplains as properties redevelop.**
COMMUNITY: McCandless Township	
Category:	Structure and Infrastructure; Natural Systems Protection
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter
Lead Agency/Department:	Planning and Building
Implementation Schedule:	Ongoing
Funding Source:	Property owners
ACTION NO: 31	**Continue Dirty Camp Run Flood Control Project to completion, improve/replace related infrastructure, and conduct stream restoration to support project.**
COMMUNITY: Pitcairn Borough	
Category:	Structure and Infrastructure; Natural Systems Protection
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter
Lead Agency/Department:	Borough and DEP
Implementation Schedule:	Within 2 years
Funding Source:	Municipal budget; DEP
ACTION NO: 32	**Clean bank and bed areas, dredge bed and under bridge, and reconstruct bridge base to reduce flooding at/near bridges, reduce erosion of banks, and prevent blockage of roads.**
COMMUNITY: Penn Hills Township	
Category:	Structure and Infrastructure; Natural Systems Protection
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter
Lead Agency/Department:	Public Works and Planning Departments
Implementation Schedule:	Within 5 years
Funding Source:	Municipal budget; PennDOT

Table 6.4-1 Mitigation Action Plan	
ACTION NO: 33	**Revise storm water management ordinance to meet state requirements and revise ordinances addressing landslides to limit development in landslide prone areas.**
COMMUNITY: Bethel Park	
Category:	Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Landslide
Lead Agency/Department:	Engineering and Planning Departments
Implementation Schedule:	Within 5 years
Funding Source:	Municipal budget; Staff time
ACTION NO: 34	**Maintain West Run channel and remove obstructions to prevent flooding.**
COMMUNITY: West Homestead Borough	
Category:	Natural Systems Protection
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter
Lead Agency/Department:	Engineering Department
Implementation Schedule:	Annually
Funding Source:	DEP; Municipal budget
ACTION NO: 35	**Continue blight/abandonment program to demolish abandoned properties.**
COMMUNITY: Millvale Borough	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Urban Fire
Lead Agency/Department:	Borough
Implementation Schedule:	Annually
Funding Source:	CDBG funds
ACTION NO: 36	**Continue program to clean out Girty's Run at least twice a year.**
COMMUNITY: Millvale Borough	
Category:	Natural Systems Protection
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter
Lead Agency/Department:	Borough
Implementation Schedule:	Twice annually
Funding Source:	Municipal budget;
ACTION NO: 37	**Coordinate with Girty's Run Authority to separate storm water and sewer lines.**
COMMUNITY: Millvale Borough	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter
Lead Agency/Department:	Borough
Implementation Schedule:	Within 5 years

Table 6.4-1 Mitigation Action Plan	
Funding Source:	PA H2O; sewer service fees
ACTION NO: 38	**Provide training to local law enforcement on responding to civil disturbances.**
COMMUNITY: All Municipalities in Allegheny County	
Category:	Education and Awareness
Hazard(s) Addressed:	Civil Disturbances
Lead Agency/Department:	County and Local EMCs
Implementation Schedule:	Annually
Funding Source:	Staff time; Allegheny County Police Department
ACTION NO: 39	**Use the County's mitigation action tracking spreadsheet to encourage implementation of actions identified in this hazard mitigation plan update.**
COMMUNITY: Allegheny County Department of Emergency Services	
Category:	All Categories (since it will cover tracking all types of projects)
Hazard(s) Addressed:	All hazards
Lead Agency/Department:	Allegheny County Department of Emergency Services
Implementation Schedule:	Annually
Funding Source:	Staff time
ACTION NO: 40	**Use the county LEPC and Quarterly Trainings to distribute all-hazards education and preparedness materials to communities.**
COMMUNITY: Allegheny County Department of Emergency Services and All Municipalities	
Category:	Education and Awareness
Hazard(s) Addressed:	All hazards
Lead Agency/Department:	Allegheny County Department of Emergency Services
Implementation Schedule:	Within 1 year
Funding Source:	Staff time
ACTION NO: 41	**Address identified data limitations regarding lack of detailed information about: Individual structures located in the 100-year floodplain; flood probabilities other than the 100-year flood; presence of basements/finished basements/crawl spaces and first floor elevations for priority areas.**
COMMUNITY: Allegheny County Department of Emergency Services and All Municipalities	
Category:	Education and Awareness
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter
Lead Agency/Department:	Allegheny County Department of Emergency Services; local EMCs; Allegheny County GIS
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 42	**Continue to coordinate with Norfolk Southern about rail traffic, conducting rail exercises, and training municipal staff on how to improve reactions if an incident occurs.**

Table 6.4-1 Mitigation Action Plan	
COMMUNITY: Aspinwall Borough	
Category:	Education and Awareness; Plans and Regulations
Hazard(s) Addressed:	Environmental Hazards; Transportation Accidents
Lead Agency/Department:	EMC
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 43	**Conduct an education and awareness campaign about the Borough's emergency management policies, procedures, and reasoning, including providing a resource guide so residents know where to turn for information.**
COMMUNITY: Aspinwall Borough	
Category:	Education and Awareness
Hazard(s) Addressed:	All hazards
Lead Agency/Department:	EMC
Implementation Schedule:	Within 2 years
Funding Source:	Staff time
ACTION NO: 44	**Create response plan for train derailment events and, in Baldwin, for fires in the commercial/industrial district in coordination with surrounding municipalities.**
COMMUNITY: Baldwin Township; Castle Shannon Borough; Munhall Borough	
Category:	Plans and Regulations
Hazard(s) Addressed:	Transportation Accidents; Urban Fire and Explosion
Lead Agency/Department:	Municipal Managers and EMCs
Implementation Schedule:	Within 2 years
Funding Source:	Staff Time
ACTION NO: 45	**Perform regular maintenance on drainage systems with an emphasis on projects with greatest impact on reducing flooding and controlling runoff.**
COMMUNITY: Baldwin Township; Oakdale Borough	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter; Landslide
Lead Agency/Department:	Public Works
Implementation Schedule:	Ongoing
Funding Source:	Public Works operations budget
ACTION NO: 46	**Monitor subsidence risk factors, plan for subsidence events, educate residents, and refer new developments to the Mine Subsidence Insurance Program if the development is an area that has been undermined.**
COMMUNITY: Baldwin Township; East McKeesport Borough	
Category:	Education and Awareness; Plans and Regulations

Table 6.4-1 Mitigation Action Plan	
Hazard(s) Addressed:	Subsidence, Sinkhole
Lead Agency/Department:	Public Works, Township Engineer
Implementation Schedule:	Ongoing
Funding Source:	Staff Time
ACTION NO: 47	**Monitor drought conditions and water supply resources to provide early warning to residents about the need to conserve water.**
COMMUNITY: Baldwin Township	
Category:	Education and Awareness
Hazard(s) Addressed:	Drought
Lead Agency/Department:	Municipal Manager partnered with PA American Water and USACE
Implementation Schedule:	As drought conditions warrant
Funding Source:	Staff time
ACTION NO: 48	**Conduct tornado awareness activities and educate residents on proper sheltering.**
COMMUNITY: Baldwin Township	
Category:	Education and Awareness
Hazard(s) Addressed:	Tornado, Windstorm
Lead Agency/Department:	Municipal Manager partnered with PA American Water and USACE
Implementation Schedule:	Within 1 year
Funding Source:	Staff time
ACTION NO: 49	**Mitigate landslides along Cambridge Road by continuing installation of retaining wall segments to stabilize hillside.**
COMMUNITY: Ben Avon Borough	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Landslide
Lead Agency/Department:	Public works
Implementation Schedule:	Within 5 years
Funding Source:	Municipal budget
ACTION NO: 50	**Review EAPs of dams to conform with DEP standards and include additional information as needed.**
COMMUNITY: Blawnox Borough	
Category:	Plans and Regulations
Hazard(s) Addressed:	Dam and Lock Failure
Lead Agency/Department:	EMC
Implementation Schedule:	Within 2 years
Funding Source:	Staff time
ACTION NO: 51	**Continue education to borough organizations on evacuation routes**

Table 6.4-1 Mitigation Action Plan	
COMMUNITY: Brentwood Borough	
Category:	Education and Outreach
Hazard(s) Addressed:	All hazards
Lead Agency/Department:	EMC
Implementation Schedule:	Annually
Funding Source:	Staff time
ACTION NO: 52	**Acquire floodprone properties in the Baldwin Street area of the Borough.**
COMMUNITY: Bridgeville Borough	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter
Lead Agency/Department:	Borough manager and council
Implementation Schedule:	As funds become available
Funding Source:	FEMA/PEMA
ACTION NO: 53	**Update municipal emergency response plan.**
COMMUNITY: City of Duquesne	
Category:	Plans and Regulations; Education and Awareness
Hazard(s) Addressed:	All hazards
Lead Agency/Department:	EMC
Implementation Schedule:	Within 5 years
Funding Source:	Staff time
ACTION NO: 54	**Complete the Irwin Street/Fallen Timber Storm Drainage Project to prevent flooding.**
COMMUNITY: Elizabeth Borough	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter
Lead Agency/Department:	Borough manager; Twin Rivers COG
Implementation Schedule:	Within 5 years
Funding Source:	Municipal budget; Community Infrastructure and Tourism Fund
ACTION NO: 55	**Purchase and install flood barriers at the Fire Station**
COMMUNITY: Etna Borough; Oakdale Borough	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter
Lead Agency/Department:	Borough manager and council
Implementation Schedule:	Within 5 years
Funding Source:	Municipal budget; FEMA/PEMA

Table 6.4-1 Mitigation Action Plan	
ACTION NO: 56	**As old facilities become vacant, acquire, demolish, and establish stormwater management areas prohibiting redevelopment as established in municipal comprehensive plan.**
COMMUNITY: Etna Borough	
Category:	Plans and Regulations; Natural Systems Protection
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter
Lead Agency/Department:	Borough manager and council; Zoning and Occupancy Enforcement Officer
Implementation Schedule:	As facilities become vacant
Funding Source:	Municipal budget; FEMA/PEMA
ACTION NO: 57	**Construct flood wall behind industrial site at Crescent Avenue/Grant Avenue to and past the Butler/Kittanning Street Bridge and purchase Stop Barrier for the Bridge and for Butler Street near Duquesne Electric Company.**
COMMUNITY: Etna Borough	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter
Lead Agency/Department:	Borough manager and council
Implementation Schedule:	As funds become available
Funding Source:	Municipal budget; PennVEST
ACTION NO: 58	**Conduct a comprehensive review and revision, if needed, of zoning ordinances that emphasizes hazard-resistant future development.**
COMMUNITY: Forest Hills Borough	
Category:	Plans and Regulations
Hazard(s) Addressed:	All hazards
Lead Agency/Department:	Borough manager and council
Implementation Schedule:	4-5 years
Funding Source:	Municipal budget
ACTION NO: 59	**Adopt MS4 protocols, plans, and procedures to deal with flooding.**
COMMUNITY: Fox Chapel Borough; Hampton Township; Marshall Township; Oakmont Borough; Ross Township	
Category:	Plans and Regulations; Natural Systems Protection
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter
Lead Agency/Department:	Municipal manager and council/supervisors
Implementation Schedule:	Ongoing to comply with MS4 permits
Funding Source:	Municipal budget
ACTION NO: 60	**Continue annual public safety meetings concerning gas wells and gas compressor station hazards.**
COMMUNITY: Frazer Township	
Category:	Education and Awareness

Table 6.4-1 Mitigation Action Plan	
Hazard(s) Addressed:	Environmental Hazards; Urban Fire and Explosion
Lead Agency/Department:	EMC
Implementation Schedule:	Annually
Funding Source:	Staff time
ACTION NO: 61	**Review the evacuation plan of Pittsburgh Mills as well as the entire township and post the information to the website or include in a newsletter.**
COMMUNITY: Frazer Township	
Category:	Education and Awareness
Hazard(s) Addressed:	All hazards
Lead Agency/Department:	EMC
Implementation Schedule:	Annually
Funding Source:	Staff time
ACTION NO: 62	**Update the township GIS mapping system and program.**
COMMUNITY: Hampton Township	
Category:	Plans and Regulations
Hazard(s) Addressed:	All hazards, emphasis on natural hazard events
Lead Agency/Department:	Department of Community Development
Implementation Schedule:	Within 5 years
Funding Source:	DCED
ACTION NO: 63	**Implement a five-year maintenance program for existing flood retention and detention ponds.**
COMMUNITY: Hampton Township	
Category:	Plans and Regulations; Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter
Lead Agency/Department:	Hampton Shaler Water Authority
Implementation Schedule:	Every five years
Funding Source:	Water Authority budget
ACTION NO: 64	**Further develop/update the Township's emergency plans, public trainings, and improve all-hazards communication by posting information on website.**
COMMUNITY: Kilbuck Township	
Category:	Education and Awareness
Hazard(s) Addressed:	All hazards
Lead Agency/Department:	EMC
Implementation Schedule:	Annually
Funding Source:	Staff time

Table 6.4-1 Mitigation Action Plan	
ACTION NO: 65	**Mitigate the impact and risks associated with the response and recovery operations during utility outage emergencies by obtaining natural gas generators for the municipal building and the fire station.**
COMMUNITY: Liberty Borough	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter; Tornado, Windstorm; Utility Interruption; Winter Storm
Lead Agency/Department:	EMC
Implementation Schedule:	Within 5 years
Funding Source:	FEMA/PEMA
ACTION NO: 66	**Improve enforcement of building codes in floodplain areas.**
COMMUNITY: City of McKeesport	
Category:	Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter
Lead Agency/Department:	Community Development Department
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 67	**Work with realtors to conduct real estate disclosures related to sales in floodplains.**
COMMUNITY: City of McKeesport	
Category:	Education and Awareness
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter
Lead Agency/Department:	Community Development Department
Implementation Schedule:	Within 2 years
Funding Source:	Staff time
ACTION NO: 68	**Monitor areas at risk to subsidence by remaining aware of changes in groundwater levels, with a focus on areas of Transverse Park that have sunk in the past.**
COMMUNITY: Mount Oliver	
Category:	Education and Awareness
Hazard(s) Addressed:	Subsidence, Sinkhole
Lead Agency/Department:	EMC
Implementation Schedule:	Ongoing
Funding Source:	Staff time
ACTION NO: 69	**Use municipal newsletter to provide information to residents to help educate them on preparedness, with an emphasis on severe weather-related events.**
COMMUNITY: Pine Township	
Category:	Education and Awareness

Table 6.4-1 Mitigation Action Plan	
Hazard(s) Addressed:	Drought; Earthquake; Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter; Tornado, Windstorm; Winter Storm
Lead Agency/Department:	EMC
Implementation Schedule:	Within 1 year
Funding Source:	Staff time
ACTION NO: 70	**Because the Borough has a high proportion of renters, engage rental housing owners to floodproof properties and educate tenants about flooding issues.**
COMMUNITY: Pitcairn Borough	
Category:	Education and Awareness
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter
Lead Agency/Department:	Borough manager
Implementation Schedule:	Within 1 year
Funding Source:	Staff time
ACTION NO: 71	**Implement development of a model that looks at not only hydrology but also social/community development impacts, economics, and hazard mitigation potential to make strategic, directed investments in flood reduction and stormwater management**
COMMUNITY: City of Pittsburgh	
Category:	Plans and Regulations; Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter
Lead Agency/Department:	Pittsburgh Water and Sewer Authority; Office of Sustainability
Implementation Schedule:	Within 4 years
Funding Source:	Sewer service fees
ACTION NO: 72	**Use Pittsburgh's selection as one of the 100 Resilient Cities named by the Rockefeller Foundation to strengthen integration between planning mechanisms in the city of Pittsburgh and look holistically at risk reductions and improvements in quality of life.**
COMMUNITY: City of Pittsburgh	
Category:	Plans and Regulations
Hazard(s) Addressed:	All hazards, emphasis on Flood, Flash Flood, Ice Jam; Environmental Hazards; and Transportation Accidents
Lead Agency/Department:	Chief Resilience Officer
Implementation Schedule:	Within 2 years
Funding Source:	Rockefeller Foundation
ACTION NO: 73	**Review this HMP and use its data on hazard-prone properties to direct land use planning, zoning updates, and investment in safe areas as the City prepares its first Comprehensive Plan.**
COMMUNITY: City of Pittsburgh	

Table 6.4-1 Mitigation Action Plan	
Category:	Plans and Regulations
Hazard(s) Addressed:	All hazards
Lead Agency/Department:	City of Pittsburgh Department of City Planning
Implementation Schedule:	As comprehensive plan and land use ordinances are updated
Funding Source:	Staff time
ACTION NO: 74	**Develop a Climate Action Plan to address air quality and ensure responsible future development.**
COMMUNITY: City of Pittsburgh	
Category:	Plans and Regulations
Hazard(s) Addressed:	Environmental Hazards
Lead Agency/Department:	Office of Sustainability; City of Pittsburgh Department of City Planning
Implementation Schedule:	Within 5 years
Funding Source:	Staff time
ACTION NO: 75	**Implement the Grid Security Project in the 2030 Districts Downtown and in Oakland to not only reduce energy use but also create resilience through microgrid security projects.**
COMMUNITY: City of Pittsburgh	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Utility Interruption
Lead Agency/Department:	Office of Sustainability
Implementation Schedule:	Within 10 years
Funding Source:	Public-Private Partnerships
ACTION NO: 76	**Use green infrastructure to improve river water quality, comply with the Clean Water Act, and reduce flooding, especially on city-owned or controlled properties.**
COMMUNITY: City of Pittsburgh	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter
Lead Agency/Department:	Office of Sustainability
Implementation Schedule:	Ongoing
Funding Source:	EPA
ACTION NO: 77	**Investigate and prioritize additional floodproofing of municipal facilities.**
COMMUNITY: Sharpsburg Borough	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter
Lead Agency/Department:	Borough manager
Implementation Schedule:	Within 5 years

Table 6.4-1 Mitigation Action Plan	
Funding Source:	FEMA/PEMA
ACTION NO: 78	**Conduct stream restoration to reduce flooding.**
COMMUNITY: Sharpsburg Borough	
Category:	Natural Systems Protection
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter
Lead Agency/Department:	Borough manager
Implementation Schedule:	Within 5 years
Funding Source:	Municipal budget
ACTION NO: 79	**Purchase backup power for the township building and/or relocate building out of the floodplain.**
COMMUNITY: South Fayette Township	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter
Lead Agency/Department:	Borough manager
Implementation Schedule:	Within 5 years
Funding Source:	FEMA/PEMA
ACTION NO: 80	**Purchase generators for Springdale Borough Water Plants, which generate water for 3,400 in the Borough and have emergency interconnects to several surrounding boroughs**
COMMUNITY: Springdale Borough	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter
Lead Agency/Department:	Public Works
Implementation Schedule:	Within 5 years
Funding Source:	FEMA/PEMA; PennVEST
ACTION NO: 81	**Develop a formal procedure for administering an evacuation of homes in danger of flooding.**
COMMUNITY: West Deer Township	
Category:	Plans and Regulations; Education and Awareness
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter
Lead Agency/Department:	EMC
Implementation Schedule:	Within 2 years
Funding Source:	Staff time
ACTION NO: 82	**Install duck bills on storm sewers to prevent backflow onto Water Street and into cellars.**
COMMUNITY: West Elizabeth Borough	
Category:	Structure and Infrastructure

Table 6.4-1 Mitigation Action Plan	
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter
Lead Agency/Department:	Public Works
Implementation Schedule:	Within 5 years
Funding Source:	Municipal budget
ACTION NO: 83	**Create a better emergency notification system, possibly using reverse 911 and the website.**
COMMUNITY: West View Borough	
Category:	Education and Awareness
Hazard(s) Addressed:	All hazards
Lead Agency/Department:	EMC
Implementation Schedule:	Annually
Funding Source:	Staff time
ACTION NO: 84	**Continue to monitor evacuation plans to ensure adequacy as the Borough changes and develops.**
COMMUNITY: Wilmerding Borough	
Category:	Education and Awareness
Hazard(s) Addressed:	All hazards
Lead Agency/Department:	EMC
Implementation Schedule:	Annually
Funding Source:	Staff time
ACTION NO: 85	**Consider adding hazard-specific criteria to the County's consistency review checklists for development, plans, ordinances, and grants.**
COMMUNITY: Allegheny County Economic Development	
Category:	Plans and Regulations
Hazard(s) Addressed:	All hazards
Lead Agency/Department:	Allegheny County Economic Development Planning Division
Implementation Schedule:	Within 5 years
Funding Source:	Staff time
ACTION NO: 86	**If funding becomes available, acquire, elevate, or floodproof structures, with an emphasis on mitigating Repetitive Loss and Severe Repetitive Loss properties.**
COMMUNITY: All Municipalities in Allegheny County	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter
Lead Agency/Department:	Borough manager
Implementation Schedule:	As funds become available
Funding Source:	FEMA/PEMA

Table 6.4-1 Mitigation Action Plan	
ACTION NO: 87	**Clear Chartiers Creek banks of saplings, brush, and other plant matter to reduce flooding instances.**
COMMUNITY: Heidelberg Borough	
Category:	Natural Systems Protection
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter
Lead Agency/Department:	Borough manager
Implementation Schedule:	Within 5 years
Funding Source:	Municipal budget
ACTION NO: 88	**Complete stream restoration of Plum Creek to restore natural ecology and address flooding**
COMMUNITY: Oakmont Borough	
Category:	Natural Systems Protection
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter
Lead Agency/Department:	Borough manager
Implementation Schedule:	Within 5 years
Funding Source:	Municipal budget; DEP, DCNR, and DCED grant funding
ACTION NO: 89	**Separate sewer lines**
COMMUNITY: O'Hara Township	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter
Lead Agency/Department:	Borough
Implementation Schedule:	Within 5 years
Funding Source:	Municipal tax dollars
ACTION NO: 90	**Create an educational program via newsletter to inform citizens regarding hazards identified in the community and how to mitigate with an immediate focus on conveying the new floodplain locations, followed by information on purchasing insurance (especially the difference between homeowner's and floodplain insurance).**
COMMUNITY: East Deer Township	
Category:	Education and Awareness
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter
Lead Agency/Department:	EMC
Implementation Schedule:	Within 1 year
Funding Source:	Staff time
ACTION NO: 91	**Dredge Bull Creek and clear it of debris.**
COMMUNITY: Fawn Township	
Category:	Natural Systems Protection

Table 6.4-1 **Mitigation Action Plan**	
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter
Lead Agency/Department:	Chairman, Township Supervisors
Implementation Schedule:	Within 3 years
Funding Source:	Municipal budget
ACTION NO: 92	**Reduce possibility of damage and loss of function to community-identified critical facilities in the floodplain.**
COMMUNITY: Bell Acres Borough; Brackenridge Borough; Carnegie Borough; Castle Shannon Borough; Clairton; Collier Township; Coraopolis Borough; Dravosburg Borough; Duquesne; East Deer Township; Elizabeth Borough; Elizabeth Township; Emsworth Borough; Etna Borough; Fawn Township; Forward Township; Glassport Borough; Hampton Township; Harmar Township; Indiana Township; Jefferson Hills Borough; Leetsdale Borough; McCandless Township; McKees Rocks Borough; McKeesport; Monroeville; Moon Township; Munhall Borough; Neville Township; North Fayette Township; O'Hara Township; Penn Hills Township; Pitcairn Borough; Pittsburgh; Plum Borough; Reserve Township; Richland Township; Scott Township; Sewickley Borough; Shaler Township; Sharpsburg Borough; South Fayette Township; South Park Township; South Versailles Township; Tarentum Borough; Verona Borough; West Elizabeth Borough; White Oak Borough	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter
Lead Agency/Department:	Borough manager
Implementation Schedule:	As funds become available
Funding Source:	FEMA/PEMA
ACTION NO: 93	**Clean excess sediment from the culvert under Commercial Street. It is blocked by sediment which causes flooding along Baldwin Street during heavy rain events.**
COMMUNITY: Bridgeville Borough	
Category:	Natural Systems Protection
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Bridgevillle Borough and EMC
Implementation Schedule:	Within 1 year
Funding Source:	Bridgevillle Borough
ACTION NO: 94	**Conduct the Baldwin Street back flow preventer program. This program provides the installation of back flow preventers to residents experiencing basement flooding caused by back flow from sewer lines.**
COMMUNITY: Bridgeville Borough	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Bridgevillle Borough and EMC
Implementation Schedule:	Within 1 year
Funding Source:	Bridgeville Borough

Table 6.4-1 Mitigation Action Plan	
ACTION NO: 95	**Install a track rack and lower the ballfield at McLaughlin Park to allow primary flooding to occur in the park. Remove debris on the bridge at Bower Hill Road to prevent overflows along the retaining wall on Maple Ave.**
COMMUNITY: Bridgeville Borough	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Bridgevillle Borough and EMC
Implementation Schedule:	Within 1 year
Funding Source:	Allegheny County GEDTF Grant
ACTION NO: 96	**Improve the storm water system along Bower Hill to prevent flooding along Bower Hill Road during rain events.**
COMMUNITY: Bridgeville Borough	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Bridgevillle Borough and EMC
Implementation Schedule:	Within 1 year
Funding Source:	Allegheny County GEDTF Grant
ACTION NO: 97	**Install a levee and pump system to address flash flooding and flooding along Commercial Ave.**
COMMUNITY: Bridgeville Borough	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Bridgevillle Borough and EMC
Implementation Schedule:	Within 2 years
Funding Source:	Allegheny County GEDTF Grant
ACTION NO: 98	**Replace the retaining wall along Werner Street to prevent future breeches from heavy storms.**
COMMUNITY: Bridgeville Borough	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Bridgevillle Borough and EMC
Implementation Schedule:	Within 1 year
Funding Source:	Allegheny County GEDTF Grant
ACTION NO: 99	**Create a plan for pandemic response.**
COMMUNITY: Castle Shannon Borough	
Category:	Plans and Regulations
Hazard(s) Addressed:	Pandemic Response

Table 6.4-1 Mitigation Action Plan	
Lead Agency/Department:	Emergency Management Coordinator
Implementation Schedule:	Within 1 year
Funding Source:	PEMA and/or FEMA
ACTION NO: 100	**Landslide mitigation at three critical infrastructure points located on Mount Washington to stabilize hillsides.**
COMMUNITY: City of Pittsburgh	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Landslide; Subsidence, Sinkhole
Lead Agency/Department:	Pittsburgh Dept. of Mobility and Infrastructure
Implementation Schedule:	Ongoing
Funding Source:	TBD
ACTION NO: 101	**Remediation project on the storm and sanitary sewer system to prevent backflow into residential and commercial properties, and outflow into Chartiers Creek.**
COMMUNITY: Crafton Borough	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Crafton Borough
Implementation Schedule:	Within 5 years
Funding Source:	ALCOSAN GROW Grant, G.O. Bonds, Sewer Fund Reserves
ACTION NO: 102	**Natural restoration of streambank through riparian buffer restoration to prevent erosion and sedimentation of the stream.**
COMMUNITY: Etna Borough	
Category:	Natural Systems Protection
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Etna Borough
Implementation Schedule:	Within 2 years
Funding Source:	PA DEP; Allegheny County Conservation Dist.; PEMA/FEMA/Army Corps
ACTION NO: 103	**Conduct mitigation programs along roads near hillsides to prevent landslides. These can include restore hillsides, regrading, tree plantings, and wall supports.**
COMMUNITY: Etna Borough	
Category:	Natural Systems Protection
Hazard(s) Addressed:	Landslide
Lead Agency/Department:	PennDOT, Etna Borough
Implementation Schedule:	Within 3 years
Funding Source:	PennDOT; PA DCED; Allegheny County Conservation Dist.; Economic Development; PEMA/FEMA

Table 6.4-1 Mitigation Action Plan	
ACTION NO: 104	**Property acquisition to restore roadway integrity of Old Mill Road. The property will be developed into open space and park lands. Efforts to stop soil erosion will occur at the edge of the property.**
COMMUNITY: Fox Chapel Borough	
Category:	Natural Systems Protection
Hazard(s) Addressed:	Subsidence and sinkholes
Lead Agency/Department:	Fox Chapel Borough
Implementation Schedule:	Within 2 years
Funding Source:	Fox Chapel Borough Land Trust; Fox Chapel Borough
ACTION NO: 105	**Install a detention facility on private properties for flood mitigation. Clean and upgrade existing facilities by changing pipe angles to improve flow.**
COMMUNITY: Franklin Park Borough	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Franklin Park Borough
Implementation Schedule:	Within 1 year
Funding Source:	Franklin Park Borough
ACTION NO: 106	**Improve existing detention facility to improve flow and reduce flooding near the White Oak Court. Replace existing pipe with a larger one and change angle.**
COMMUNITY: Franklin Park Borough	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Franklin Park Borough
Implementation Schedule:	Within 1 year
Funding Source:	Franklin Park Borough
ACTION NO: 107	**Flood mitigation project along Dalton Drive and Nevin Drive. Add catch basins on both roads to reduce flooding. Add underground detention to private property and municipal grounds and enlarge pipe.**
COMMUNITY: Franklin Park Borough	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Franklin Park Borough
Implementation Schedule:	Within 1 year
Funding Source:	Franklin Park Borough; Pennvest
ACTION NO: 108	**Conduct bi-annual visual inspections on roadways and apply stabilization measures where needed along landslide impacted roadways.**
COMMUNITY: Frazer Township	

Table 6.4-1 Mitigation Action Plan	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Landslides
Lead Agency/Department:	Frazer Township Road Department, Township Engineer
Implementation Schedule:	Within 1 year
Funding Source:	Frazer Township
ACTION NO: 109	**Acquire information and supplies needed for pandemic response. Stay updated on guidelines.**
COMMUNITY: Ingram Borough	
Category:	Education and Awareness
Hazard(s) Addressed:	Pandemic Response
Lead Agency/Department:	Ingram Borough elected officials and employees
Implementation Schedule:	Ongoing
Funding Source:	TBD
ACTION NO: 110	**Conduct mitigation projects in the Borough to reduce flood issues along a major highway and secondary roads. Continually remove debris that blocks storm sewer grates.**
COMMUNITY: Leetsdale Borough	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter
Lead Agency/Department:	Allegheny County; Quaker Valley School District, Leetsdale Borough
Implementation Schedule:	Within 1 year
Funding Source:	Quaker Valley School District; Leetsdale Borough
ACTION NO: 111	**Provide residents with access to alternative energy sources and more affordable energy providers. Provide information on protecting the home from extreme temperatures. Operate a shelter during extreme temperature situations.**
COMMUNITY: Millvale Borough	
Category:	Education and Awareness
Hazard(s) Addressed:	Extreme Temperature
Lead Agency/Department:	Borough of Millvale
Implementation Schedule:	Ongoing
Funding Source:	Borough of Millvale, Millvale Eco-District, Tri-Boro Eco-District, local foundations, utility providers
ACTION NO: 112	**Monitor highly likely slide areas based on engineer mapping, mine mapping, historical mapping, and relation to existing slides. Plan for early identification, green infrastructure, and natural restoration of areas surrounding slide prone land.**
COMMUNITY: Millvale Borough	
Category:	Natural Systems Protection

Table 6.4-1 Mitigation Action Plan	
Hazard(s) Addressed:	Landslides
Lead Agency/Department:	Borough of Millvale
Implementation Schedule:	Ongoing
Funding Source:	Land acquisition and development, ALT, local foundations, DCNR, PEMA/FEMA
ACTION NO: 113	**Develop and implement Flood Ordinances.**
COMMUNITY: Millvale Borough	
Category:	Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Borough of Millvale
Implementation Schedule:	Ongoing
Funding Source:	ACOE, PEMA, FEMA, and the commonwealth
ACTION NO: 114	**Cleanout Girty's Run on a regular basis to prevent flooding.**
COMMUNITY: Millvale Borough	
Category:	Natural Systems Protection
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Borough of Millvale
Implementation Schedule:	Ongoing
Funding Source:	ACOE, PEMA, FEMA, and the commonwealth
ACTION NO: 115	**Conduct dredging and wall reconstruction.**
COMMUNITY: Millvale Borough	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Borough of Millvale
Implementation Schedule:	Ongoing
Funding Source:	ACOE, PEMA, FEMA, and the commonwealth
ACTION NO: 116	**Introduce green building design to address water displacement and green infrastructure to reduce flooding.**
COMMUNITY: Millvale Borough	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Borough of Millvale
Implementation Schedule:	Ongoing
Funding Source:	ACOE, PEMA, FEMA, and the commonwealth
ACTION NO: 117	**Determine the effects of erosion within Girty's Run and its smaller tributaries. Implement reforestation and daylighting where needed.**

Table 6.4-1 Mitigation Action Plan	
COMMUNITY: Millvale Borough	
Category:	Natural Systems Protection
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Borough of Millvale
Implementation Schedule:	Within 2 years
Funding Source:	DCNR
ACTION NO: 118	**Plum Creek Flood Mitigation Project: consult accuracy of the study reach with USACE, design and construct improvements within the floodplain to minimize localized flooding.**
COMMUNITY: Oakmont Borough	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Oakmont Borough
Implementation Schedule:	Within 4 years
Funding Source:	Oakmont Borough, PA DEP, PA DCNR, PA Fish and Boat Commission
ACTION NO: 119	**Develop and implement a Continuity of Operations Plan to ensure critical services can continue through and after a disaster.**
COMMUNITY: Pine Township	
Category:	Plans and Regulations
Hazard(s) Addressed:	All Hazards
Lead Agency/Department:	EMC, Pine Township
Implementation Schedule:	Within 1 year
Funding Source:	TBD
ACTION NO: 120	**Provide education and information about flooding and storm drains to residents through Township Newsletter and Website.**
COMMUNITY: Pine Township	
Category:	Education and Awareness
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	EMC, Pine Township
Implementation Schedule:	Ongoing
Funding Source:	N/A
ACTION NO: 121	**Reduce storm water flow to Lewis Run Creek from West Mifflin AGG Airport. Possible eliminate the creek crossover.**
COMMUNITY: Pleasant Hills Borough	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam

Table 6.4-1 Mitigation Action Plan	
Lead Agency/Department:	PennDOT
Implementation Schedule:	Within 5 years
Funding Source:	PennDOT
ACTION NO: 122	**Stormwater Task Force Committee: meets on an ongoing basis to identify and prioritize stormwater projects needed in the borough.**
COMMUNITY: Plum Borough	
Category:	Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Plum Borough
Implementation Schedule:	Ongoing
Funding Source:	Plum Borough; grant funding
ACTION NO: 123	**Flood proof structures in the borough, with emphasis on repetitive loss properties.**
COMMUNITY: Port Vue Borough	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter
Lead Agency/Department:	Port Vue Borough
Implementation Schedule:	Ongoing
Funding Source:	FEMA/PEMA
ACTION NO: 124	**Ongoing consultation with Borough Engineer to monitor for additional land fall areas on Romine Avenue.**
COMMUNITY: Port Vue Borough	
Category:	Natural Systems Protection
Hazard(s) Addressed:	Landslide
Lead Agency/Department:	Port Vue Borough
Implementation Schedule:	Ongoing
Funding Source:	FEMA/PEMA
ACTION NO: 125	**Ongoing consultation with Borough Engineer to monitor for additional land fall areas on Port Vue Avenue.**
COMMUNITY: Port Vue Borough	
Category:	Education and Awareness
Hazard(s) Addressed:	Landslide
Lead Agency/Department:	Port Vue Borough
Implementation Schedule:	Ongoing
Funding Source:	FEMA/PEMA
ACTION NO: 126	**Remove and replace collapsed storm pipe along Blossom Drive.**
COMMUNITY: Richland Township	

Table 6.4-1 Mitigation Action Plan	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Richland Township
Implementation Schedule:	Within 1 year
Funding Source:	Richland Township
ACTION NO: 127	**Follow mitigation recommendations from State Health Department. This requires having all personal protective equipment (PPE) for employees of the township.**
COMMUNITY: Ross Township	
Category:	Plans and Regulations
Hazard(s) Addressed:	Pandemic Response
Lead Agency/Department:	Ross Township, EMC
Implementation Schedule:	Ongoing
Funding Source:	FEMA/PEMA
ACTION NO: 128	**Place the Hazard Mitigation Plan and Floodplain map on the Township Website.**
COMMUNITY: Scott Township	
Category:	Education and Awareness
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Scott Township
Implementation Schedule:	Within 2 years
Funding Source:	Scott Township
ACTION NO: 129	**Relocate a section of storm sewer currently in a vulnerable flood area.**
COMMUNITY: Scott Township	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Scott Township
Implementation Schedule:	Within 1 year
Funding Source:	Scott Township; St. Clair Hospital
ACTION NO: 130	**Protect and improve stream water quality and reduce run-off pollutants through the Allegheny County Stormwater Management Plan.**
COMMUNITY: Scott Township	
Category:	Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Allegheny County
Implementation Schedule:	Within 1 year
Funding Source:	Scott Township

Table 6.4-1 Mitigation Action Plan	
ACTION NO: 131	**Use Allegheny County Quarterly Trainings to distribute all hazards education and preparedness materials to Scott Township.**
COMMUNITY: Scott Township	
Category:	Education and Awareness
Hazard(s) Addressed:	All Hazards
Lead Agency/Department:	Allegheny County
Implementation Schedule:	Ongoing
Funding Source:	Scott Township
ACTION NO: 132	**Replace undersized culverts. Restore and harden streambanks where appropriate to reduce flood damage to roadways during heavy storms.**
COMMUNITY: Sewickley Heights Borough	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam; Hurricane, Tropical Storm, Nor'easter
Lead Agency/Department:	Sewickley Heights Borough
Implementation Schedule:	Ongoing
Funding Source:	Allegheny County Conservation Dist., PA DEP
ACTION NO: 133	**Address priority issues as possible as identified in the 2018 Little Sewickley Creek Stream Assessment.**
COMMUNITY: Sewickley Heights Borough	
Category:	Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Sewickley Heights Borough
Implementation Schedule:	Ongoing
Funding Source:	PA DEP, Allegheny County Conservation Dist.
ACTION NO: 134	**Improve website and add maps and storylines through ArcGIS to allow residents to interact with hazard data.**
COMMUNITY: Sewickley Heights Borough	
Category:	Education and Awareness
Hazard(s) Addressed:	All Hazards
Lead Agency/Department:	Sewickley Heights Borough
Implementation Schedule:	Within 2 years
Funding Source:	Sewickley Heights Borough
ACTION NO: 135	**Enforce stricter building standards in the flood zone. This includes restricting or limiting certain projects and requiring that new construction is flood-proofed.**
COMMUNITY: Tarentum Borough	
Category:	Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam

Table 6.4-1 Mitigation Action Plan	
Lead Agency/Department:	Tarentum Borough Code Officials
Implementation Schedule:	Ongoing
Funding Source:	CDBG Program
ACTION NO: 136	**Develop a detention facility on Lynn Avenue.**
COMMUNITY: Turtle Creek Borough	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Turtle Creek Borough
Implementation Schedule:	Within 2 years
Funding Source:	Watershed Restoration and Protection program
ACTION NO: 137	**Develop a rain garden on Brown Avenue.**
COMMUNITY: Turtle Creek Borough	
Category:	Natural Systems Protection
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam
Lead Agency/Department:	Turtle Creek Borough
Implementation Schedule:	Within 2 years
Funding Source:	Watershed Restoration and Protection program
ACTION NO: 138	**Revise the existing zoning ordinance to include a landslide overlay district. The overlay will incorporate preventative measures such as grading restrictions and engineering requirements.**
COMMUNITY: West Homestead Borough	
Category:	Plans and Regulations
Hazard(s) Addressed:	Landslides
Lead Agency/Department:	West Homestead Borough
Implementation Schedule:	Within 2 years
Funding Source:	West Homestead Borough
ACTION NO: 139	**Update pandemic response capabilities in the Borough by updating the Pandemic Plan, purchasing sanitizing supplies for public places, and purchasing PPE for employees and volunteers.**
COMMUNITY: Heidelberg Borough	
Category:	Plans and Regulations
Hazard(s) Addressed:	Pandemic Response
Lead Agency/Department:	Heidelberg Borough
Implementation Schedule:	Within 6 months
Funding Source:	Grants and local donations

Table 6.4-1 Mitigation Action Plan	
ACTION NO: 140	**Provide training to local law enforcement and Borough employees and departments on responding to civil disturbances.**
COMMUNITY: Heidelberg Borough	
Category:	Education and Awareness
Hazard(s) Addressed:	Civil Disturbances
Lead Agency/Department:	Heidelberg Borough
Implementation Schedule:	Within 1 year
Funding Source:	Grants
ACTION NO: 141	**Clear Chartiers Creek banks of saplings, brush, and other plant matter to reduce flooding instances, and update residents with a Flood Warning and Evacuation Signal System.**
COMMUNITY: Heidelberg Borough	
Category:	Natural Systems Protection, Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam
Lead Agency/Department:	Heidelberg Borough
Implementation Schedule:	Within 2 years
Funding Source:	Chartiers Valley District Flood Authority and Grants
ACTION NO: 142	**Evaluate all structural/infrastructure and natural systems protection mitigation projects within the Pine Creek watershed to identify where Pine Creek WIP priority areas overlap and where there may be an opportunity for mutual financial, risk reduction, and improved water quality benefits**
Pine Township, Richland Township, McCandless Township, Hampton Township, Ross Township, Shaler Township, Etna Borough, O'Hara Township, Indiana Township, Fox Chapel Borough	
Category:	Natural Systems Protection, Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam
Lead Agency/Department:	Pine Creek Watershed Coalition and municipal officials
Implementation Schedule:	5 years
Funding Source:	TBD
ACTION NO: 143	**Acquisition and demolition of old industrial building/complex**
Etna Borough	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Flood, Flash Flood, and Ice Jam
Lead Agency/Department:	Borough of Etna
Implementation Schedule:	5 Years
Funding Source:	PEMA/FEMA; DEP; Allegheny County Conservation District, DCED, Army Corps of Engineers

Table 6.4-1 Mitigation Action Plan	
ACTION NO: 144	**Consider conducting outreach to all municipalities on an annual basis to coordinate and track any updates to data, progress on mitigation actions and additional hazard mitigation information.**
Allegheny County Department of Emergency Services	
Category:	Education and Awareness
Hazard(s) Addressed:	All Hazards
Lead Agency/Department:	Allegheny County
Implementation Schedule:	5 Years
Funding Source:	NA
ACTION NO: 145	**County EMA to encourage municipalities to develop a prioritized list of at-risk structures/assets regarding the SFHA and high hazard dams**
Allegheny County Department of Emergency Services	
Category:	Structure and Infrastructure
Hazard(s) Addressed:	Flood
Lead Agency/Department:	Allegheny County
Implementation Schedule:	5 Years
Funding Source:	NA
ACTION NO: 146	County EMA to look into working with municipalities to develop mutual-aid agreements between municipalities to share resources and administrative and technical capabilities through mutual aid agreements
Allegheny County Department of Emergency Services	
Category:	Education and Awareness
Hazard(s) Addressed:	All Hazards
Lead Agency/Department:	Allegheny County
Implementation Schedule:	5 Years
Funding Source:	NA
ACTION NO: 147	Glenn Avenue Flood Mitigation
Port Vue Borough	
Category:	Plans and Regulations
Hazard(s) Addressed:	Flood, Flash Flood, Ice Jam, Hurricane, Tropical Storm, Nor'Easter
Lead Agency/Department:	Port Vue Borough EMC
Implementation Schedule:	5 Years
Funding Source:	NA
ACTION NO: 148	County EMA to attend meetings or share data to update County-wide planning efforts to ensure applicable mitigation actions and HMP-related findings are incorporated
Allegheny County Department of Emergency Services	
Category:	Education and Awareness
Hazard(s) Addressed:	All Hazards

Table 6.4-1 Mitigation Action Plan	
Lead Agency/Department:	Allegheny County
Implementation Schedule:	5 Years
Funding Source:	NA
ACTION NO: 149	Promote participation in the NFIP and encourage municipalities to fill out the NFIP survey.
Coraopolis, Leetsdale, McKees Rock, Neville, Sharpsburg, Tarentum	
Category:	Education and Awareness
Hazard(s) Addressed:	Flood
Lead Agency/Department:	Allegheny County
Implementation Schedule:	5 Years
Funding Source:	NA

Actions were compared with one another to determine a ranking or priority by applying the Multi-Objective Mitigation Action Prioritization criteria. The HMPSC used the Mitigation Action Prioritization form to assign scores to each criterion using the following weighted, multi-objective mitigation action prioritization criteria.

- **Effectiveness** (weight: 20% of score): The extent to which an action reduces the vulnerability of people and property.
- **Efficiency** (weight: 30% of score): The extent to which time, effort, and cost is well used as a means of reducing vulnerability.
- **Multi-Hazard Mitigation** (weight: 20% of score): The action reduces vulnerability for more than one hazard.
- **Addresses High Risk Hazard** (weight: 15% of score): The action reduces vulnerability for people and property from a hazard(s) identified as high risk.
- **Addresses Critical Communications/Critical Infrastructure** (weight: 15% of score): The action pertains to the maintenance of critical functions and structures such as transportation, supply chain management, data circuits, etc.

Scores of 1-3 were assigned for each multi-objective mitigation action prioritization criterion where 1 is a low score and 3 is a high score. Actions were prioritized using the cumulative score assigned to each. Each mitigation action was given a priority ranking (Low, Medium, and High) based on the following:

- Low Priority (highlighted yellow): 1.0 – 1.8
- Medium Priority (highlighted orange): 1.9 – 2.4
- High Priority (highlighted red): 2.5 – 3.0

Cumulative results of the prioritization of mitigation actions are included in Table 6.4-2.

Table 6.4-2 **Mitigation Action Prioritization.**

MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA Low = 0-1.8 Medium = 1.9-2.4 High = 2.5-3					
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Critical Communications/ Critical Infrastructure	Total Score
1	Provide an annual table-top training for emergency management staff.	0	1	3	2.5	1	1.4
2	Develop a continuity plan for municipal services and buildings.	1	2.5	3	2	3	2.3
3	Equip the pump station with a surge protector.	3	1.5	1	2.5	3	2.1
4	Provide community outreach and education about flooding.	1.5	3	1	3	3	2.3
5	Identify properties in the community at high risk of flooding for purposes of property protection.	3	3	1	3	2	2.5
6	Conduct Active Shooter Training with Frazer Township Police Department and Mutual Aid Police Departments to prepare for potential mall shootings, bombings, or other types of emergencies within the Pittsburgh Mill Mall and surrounding businesses.	2	2	1	2	1	1.7

Table 6.4-2 **Mitigation Action Prioritization.**

MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA Low = 0-1.8 Medium = 1.9-2.4 High = 2.5-3					
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Critical Communications/ Critical Infrastructure	Total Score
7	Establish a flood warning system and install stream gauges.	2	3	1	3	2	2.3
8	Coordinate with PennDOT, Allegheny County Maintenance, and North Fayette Township Transportation on winter storm response.	1	3	1	3	3	2.2
9	Participate in the StormReady program.	2	3	2.5	3	3	2.7
10	Monitor storage of public pool chemicals and Port Authority subway tunnel.						0
11	Upgrade or replace equipment.	1	1	1	1	2	1.2
12	Use website and newsletter to encourage residents in low lying areas to consider flood insurance.	2	3	1	3	2	2.3
13	Review zoning regulations pertaining to airports.	2	3	1	2.5	1	2.0
14	Identify and correct critical road drainage concerns in landslide-prone areas.	1	2	1	3	0	1.5

Table 6.4-2 **Mitigation Action Prioritization.**

MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA Low = 0-1.8 Medium = 1.9-2.4 High = 2.5-3					
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Critical Communications/ Critical Infrastructure	Total Score
15	Identify hazards within the Borough and correct said hazards through the enforcement of building codes.	3	3	2.5	3	2	2.8
16	Provide elevation and flood-proofing projects to homes in hazard areas.	3	3	1	3	2	2.5
17	Obtain equipment and crew necessary to clear debris from water detention facility.	2	2	1	3	1	1.8
18	Establish a legal means to keep waterways open and continue to remove silt from streams.	2	1	1	3	1	1.5
19	Conduct Phase 2 of the Lower Allison Park flood retention project.	3	3	1	3	2	2.5
20	Remedy basement flooding and sanitary sewer overflows using green infrastructure.	3	2.5	1	3	1	2.2
21	Promote storm water management and provide NFIP information to the public.	3	3	1	3	3	2.6
22	Implement stormwater projects.	2.5	2	1	3	3	2.2

Table 6.4-2 **Mitigation Action Prioritization.**

MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA Low = 0-1.8 Medium = 1.9-2.4 High = 2.5-3					
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Critical Communications/ Critical Infrastructure	Total Score
23	Demolish vacant structures through the Safe Neighborhood Demolition Program.	3	2.5	1	3	1.5	2.2
24	Clear riverbanks per Commonwealth regulations for 100 yards above and below established bridges and replace with proper foliage.	3	2	1	3	1	2
25	Continue to structurally address landslide hazard on Arlington Avenue in Port Vue and educate residents about the landslide hazard.	2	3	1	3	2	2.3
26	Continue to conduct subdivision reviews to ensure new development is not in high hazard landslide/mine subsidence areas.	3	3	2	1.5	3	2.6
27	Reduce flooding in Greendale by increasing the capacity of the storm sewer system.	3	2	1	3	1	2
28	Demolish houses in floodprone areas identified in the HMP.	3	2.5	1	3	1.5	2.2

Table 6.4-2 **Mitigation Action Prioritization.**

MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA Low = 0-1.8 Medium = 1.9-2.4 High = 2.5-3					
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Critical Communications/ Critical Infrastructure	Total Score
29	Repair Girty's Run walls and floor.	2.5	2	1	3	1	1.9
30	Remove obstructions in floodplains as properties redevelop.	3	2	1	3	1.5	2.1
31	Continue Dirty Camp Run Flood Control Project to completion, improve/replace related infrastructure, and conduct stream restoration to support project.	3	2	1	3	1	2
32	Clean bank and bed areas, dredge bed and under bridge, and reconstruct bridge base to reduce flooding at/near bridges, reduce erosion of banks, and prevent blockage of roads.	2.5	1.5	1	3	1	1.8
33	Revise storm water management ordinance to meet state requirements and revise ordinances addressing landslides to limit development in landslide prone areas.	3	3	2	3	2	2.7

Table 6.4-2 **Mitigation Action Prioritization.**

MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA Low = 0-1.8 Medium = 1.9-2.4 High = 2.5-3					
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Critical Communications/ Critical Infrastructure	Total Score
34	Maintain West Run channel and remove obstructions to prevent flooding.	2.5	1.5	1	3	1	1.8
35	Continue blight/abandonment program to demolish abandoned properties.	3	2	2	1.5	1	2.0
36	Continue program to clean out Girty's Run at least twice a year.	2	2	1	2.5	1	1.7
37	Coordinate with Girty's Run Authority to separate storm water and sewer lines.	3	1.5	1	3	2	2
38	Provide training to local law enforcement on responding to civil disturbances.	2	1.5	1	1	2	1.5
39	Use the County's mitigation action tracking spreadsheet to encourage implementation of actions identified in this hazard mitigation plan update.	3	3	3	3	3	3
40	Use the county LEPC and Quarterly Trainings to distribute all-hazards education and preparedness materials to communities.	3	2	3	3	3	2.7

Table 6.4-2 **Mitigation Action Prioritization.**

MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA Low = 0-1.8 Medium = 1.9-2.4 High = 2.5-3					
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Critical Communications/ Critical Infrastructure	Total Score
41	Address identified data limitations regarding lack of detailed information about: Individual structures located in the 100-year floodplain; flood probabilities other than the 100-year flood; and first floor elevations for priority areas. Basements/finished basements/crawl spaces	3	1	1	3	1.5	1.8
42	Continue to coordinate with Norfolk Southern about rail traffic, conducting rail exercises, and training municipal staff on how to improve reactions if an incident occurs.	3	3	2	3	2.5	2.7
43	Conduct an education and awareness campaign about the Borough's emergency management policies, procedures, and reasoning, including providing a resource	2	2	3	2	2	2.2

Table 6.4-2 **Mitigation Action Prioritization.**

MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA Low = 0-1.8 Medium = 1.9-2.4 High = 2.5-3					
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Critical Communications/ Critical Infrastructure	Total Score
	guide so residents know where to turn for information.						
44	Create response plan for train derailment events and, in Baldwin, for fires in the commercial/industrial district in coordination with surrounding municipalities.	3	2.5	3	3	2	2.7
45	Perform regular maintenance on drainage systems with an emphasis on projects with greatest impact on reducing flooding and controlling runoff.	2	1.5	1	3	1	1.7
46	Monitor subsidence risk factors, plan for subsidence events, educate residents, and refer new developments to the Mine Subsidence Insurance Program if the development is an area that has been undermined.	3	2	1	2	1.5	1.9

Table 6.4-2 **Mitigation Action Prioritization.**

MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA Low = 0-1.8 Medium = 1.9-2.4 High = 2.5-3					
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Critical Communications/ Critical Infrastructure	Total Score
47	Monitor drought conditions and water supply resources to provide early warning to residents about the need to conserve water.	2.5	2	1	1.5	3	2.0
48	Conduct tornado awareness activities and educate residents on proper sheltering	2.5	2	1	2	3	2.1
49	Mitigate landslides along Cambridge Road by continuing installation of retaining wall segments to stabilize hillside.	3	2	1	3	1	2
50	Review EAPs of dams to conform to DEP standards and include additional information as needed.	2	2	2	1	1	1.7
51	Continue education to borough organizations on evacuation routes.	2	2	3	2	3	2.4
52	Acquire floodprone properties in the Baldwin Street area of the Borough.	3	3	1	3	3	2.6
53	Update municipal emergency response plan.	2.5	2	3	2	2.5	2.4

Table 6.4-2 **Mitigation Action Prioritization.**

MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA Low = 0-1.8 Medium = 1.9-2.4 High = 2.5-3					
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Critical Communications/ Critical Infrastructure	Total Score
54	Complete the Irwin Street/Fallen Timber Storm Drainage Project to prevent flooding.	3	2	1	3	1	2
55	Purchase and install flood barriers at the Fire Station.	3	2.5	1	3	3	2.5
56	As old facilities become vacant, acquire, demolish, and establish stormwater management areas prohibiting redevelopment as established in municipal comprehensive plan.	3	2.5	2	3	1	2.4
57	Construct flood wall behind industrial site at Crescent Avenue/Grant Avenue to and past the Butler/Kittanning Street Bridge and purchase Stop Barrier for the Bridge and for Butler Street near Duquesne Electric Company.	3	1.5	1	3	2	2

Table 6.4-2 **Mitigation Action Prioritization.**

MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA Low = 0-1.8 Medium = 1.9-2.4 High = 2.5-3					
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Critical Communications/ Critical Infrastructure	Total Score
58	Conduct a comprehensive review and revision, if needed, of zoning ordinances that emphasizes hazard-resistant future development.	3	3	3	3	1	2.7
59	Adopt MS4 protocols, plans, and procedures to deal with flooding.	3	3	1	3	1	2.3
60	Continue annual public safety meetings concerning gas wells and gas compressor station hazards.	2	3	1	1	2	1.95
61	Review the evacuation plan of Pittsburgh Mills as well as the entire township and post the information to the website or include in a newsletter.	2	2	1	1	2	1.65
62	Update the township GIS mapping system and program.	3	2	3	1	1	2.1
63	Implement a five-year maintenance program for existing flood retention and detention ponds.	2.5	1.5	1	3	1	1.8

Table 6.4-2 **Mitigation Action Prioritization.**

MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA Low = 0-1.8 Medium = 1.9-2.4 High = 2.5-3					
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Critical Communications/ Critical Infrastructure	Total Score
64	Further develop/update the Township's emergency plans, public trainings, and improve all-hazards communication by posting information on website.	2.5	1.5	3	2.5	2	2.2
65	Mitigate the impact and risks associated with the response and recovery operations during utility outage emergencies by obtaining natural gas generators for the municipal building and the fire station.	3	2.5	3	3	3	2.9
66	Improve enforcement of building codes in floodplain areas.	2.5	2	1	3	1.5	2.0
67	Work with realtors to conduct real estate disclosures related to sales in floodplains.	3	3	1	3	3	2.6
68	Monitor areas at risk to subsidence by remaining aware of changes in groundwater levels, with a focus on areas	2	2	1	1.5	1	1.6

Table 6.4-2 **Mitigation Action Prioritization.**

MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA Low = 0-1.8 Medium = 1.9-2.4 High = 2.5-3					
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Critical Communications/ Critical Infrastructure	Total Score
	of Transverse Park that have sunk in the past.						
69	Use municipal newsletter to provide information to residents to help educate them on preparedness, with an emphasis on severe weather-related events.	2	2	3	3	1	2.2
70	Because the Borough has a high proportion of renters, engage rental housing owners to floodproof properties and educate tenants about flooding issues.	3	2.5	1	3	1.5	2.2
71	Implement development of a model that looks at not only hydrology but also social/community development impacts, economics, and hazard mitigation potential to make strategic, directed	3	2.5	1	3	1	2.2

Table 6.4-2 **Mitigation Action Prioritization.**

MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA Low = 0-1.8 Medium = 1.9-2.4 High = 2.5-3					
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Critical Communications/ Critical Infrastructure	Total Score
	investments in flood reduction and stormwater management.						
72	Use Pittsburgh's selection as one of the 100 Resilient Cities named by the Rockefeller Foundation to strengthen integration between planning mechanisms in the city of Pittsburgh and look holistically at risk reductions and improvements in quality of life.	3	3	3	3	2	2.9
73	Review this HMP and use its data on hazard-prone properties to direct land use planning, zoning updates, and investment in safe areas as the City prepares its first Comprehensive Plan.	3	2.5	3	3	2	2.7
74	Develop a Climate Action Plan to address air quality and ensure responsible future development.	2.5	2.5	2	3	1.5	2.3

Table 6.4-2 **Mitigation Action Prioritization.**

MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA Low = 0-1.8 Medium = 1.9-2.4 High = 2.5-3					
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Critical Communications/ Critical Infrastructure	Total Score
75	Implement the Grid Security Project in the 2030 Districts Downtown and in Oakland to not only reduce energy use but also create resilience through microgrid security projects.	3	2	2	2	2.5	2.3
76	Use green infrastructure to improve river water quality, comply with the Clean Water Act, and reduce flooding, especially on city-owned or controlled properties.	3	3	1	3	1	2.3
77	Investigate and prioritize additional floodproofing of municipal facilities.	2	2.5	1	3	3	2.3
78	Conduct stream restoration to reduce flooding.	2.5	2.5	1	3	1.5	2.1
79	Purchase backup power for the township building and/or relocate building out of the floodplain.	2.5	3	3	3	3	2.9

Table 6.4-2 **Mitigation Action Prioritization.**

MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA Low = 0-1.8 Medium = 1.9-2.4 High = 2.5-3					
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Critical Communications/ Critical Infrastructure	Total Score
80	Purchase generators for Springdale Borough Water Plants, which generate water for 3,400 in the Borough and have emergency interconnects to several surrounding boroughs	3	3	3	3	3	3
81	Develop a formal procedure for administering an evacuation of homes in danger of flooding.	2	2	2	2.5	3	2.2
82	Install duck bills on storm sewers to prevent backflow onto Water Street and into cellars.	2.5	2	1	3	1	1.9
83	Create a better emergency notification system, possibly using reverse 911 and the website.	2	2.5	3	2.5	2.5	2.5
84	Continue to monitor evacuation plans to ensure adequacy as the Borough changes and develops.	2	1.5	3	1.5	1	1.8

Table 6.4-2 **Mitigation Action Prioritization.**

MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA Low = 0-1.8 Medium = 1.9-2.4 High = 2.5-3					
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Critical Communications/ Critical Infrastructure	Total Score
85	Consider adding hazard-specific criteria to the County's consistency review checklists for development, plans, ordinances, and grants.	3	2.5	3	2.5	1.5	2.6
86	If funding becomes available, acquire, elevate, or floodproof structures, with an emphasis on mitigating Repetitive Loss and Severe Repetitive Loss properties.	3	2.5	1	3	2	2.3
87	Clear Chartiers Creek banks of saplings, brush, and other plant matter to reduce flooding instances.	2	2.5	1	3	1.5	2.0
88	Complete stream restoration of Plum Creek to restore natural ecology and address flooding	2.5	2.5	1	3	1.5	2.125
89	Separate sewer lines	3	1.5	1	3	2	2

Table 6.4-2 **Mitigation Action Prioritization.**

MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA Low = 0-1.8 Medium = 1.9-2.4 High = 2.5-3					
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Critical Communications/ Critical Infrastructure	Total Score
90	Create an educational program via newsletter to inform citizens regarding hazards identified in the community and how to mitigate with an immediate focus on conveying the new floodplain locations, followed by information on purchasing insurance (especially the difference between homeowner's and floodplain insurance).	2	3	1	3	2	2.3
91	Dredge Bull Creek and clear it of debris.	2.5	1.5	1	3	1	1.8
92	Reduce possibility of damage and loss of function to community-identified critical facilities in the floodplain.	3	3	1	3	3	2.6
93	Clean excess sediment from the culvert under Commercial Street. It is blocked by sediment which causes flooding along Baldwin Street during heavy rain events.	3	2	1	3	2	2.6

Table 6.4-2 **Mitigation Action Prioritization.**

MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA Low = 0-1.8 Medium = 1.9-2.4 High = 2.5-3					
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Critical Communications/ Critical Infrastructure	Total Score
94	Conduct the Baldwin Street back flow preventer program. This program provides the installation of back flow preventers to residents experiencing basement flooding caused by back flow from sewer lines.	2.5	1	1	3	1	1.6
95	Install a track rack and lower the ballfield at McLaughlin Park to allow primary flooding to occur in the park. Remove debris on the bridge at Bower Hill Road to prevent overflows along the retaining wall on Maple Ave.	3	1.5	1	3	2.5	2.1
96	Improve the storm water system along Bower Hill to prevent flooding along Bower Hill Road during rain events.	3	2.5	2	3	1	2.4
97	Install a levee and pump system to address flash flooding and flooding along Commercial Ave.	2.5	2	2.5	3	3	2.5

Table 6.4-2 **Mitigation Action Prioritization.**

MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA Low = 0-1.8 Medium = 1.9-2.4 High = 2.5-3					
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Critical Communications/ Critical Infrastructure	Total Score
98	Replace the retaining wall along Werner Street to prevent future breeches from heavy storms.	3	2	1	2	1	1.9
99	Create a plan for pandemic response	1	2	1	1	1	1.3
100	Landslide mitigation at three critical infrastructure points located on Mount Washington to stabilize hillsides.	2	3	1	3	3	2.4
101	Remediation project on the storm and sanitary sewer system to prevent backflow into residential and commercial properties, and outflow into Chartiers Creek.	3	2	1	3	1	2
102	Natural restoration of streambank through riparian buffer restoration to prevent erosion and sedimentation of the stream.	2.5	2.5	1	3	1.5	2.1

Table 6.4-2 **Mitigation Action Prioritization.**

MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA Low = 0-1.8 Medium = 1.9-2.4 High = 2.5-3					
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Critical Communications/ Critical Infrastructure	Total Score
103	Conduct mitigation programs along roads near hillsides to prevent landslides. These can include restore hillsides, regrading, tree plantings, and wall supports.	2	3	1	3	2	2.3
104	Property acquisition to restore roadway integrity of Old Mill Road. The property will be developed into open space and park lands. Efforts to stop soil erosion will occur at the edge of the property.	2	1	1	2	1	1.4
105	Install a detention facility on private properties for flood mitigation. Clean and upgrade existing facilities by changing pipe angles to improve flow.	3	1.5	1.5	3	2	2.1
106	Improve existing detention facility to improve flow and reduce flooding near the White Oak Court. Replace existing pipe with a larger one and change angle.	3	1.5	1.5	3	2	2.1

Table 6.4-2 **Mitigation Action Prioritization.**

MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA Low = 0-1.8 Medium = 1.9-2.4 High = 2.5-3					
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Critical Communications/ Critical Infrastructure	Total Score
107	Flood mitigation project along Dalton Drive and Nevin Drive. Add catch basins on both roads to reduce flooding. Add underground detention to private property and municipal grounds and enlarge pipe.	3	1.5	1.5	3	2	2.1
108	Conduct bi-annual visual inspections on roadways and apply stabilization measures where needed along landslide impacted roadways.	1.5	2	1	3	1	1.7
109	Acquire information and supplies needed for pandemic response. Stay updated on guidelines.	1	2	1	1	1	1.3
110	Conduct mitigation projects in the Borough to reduce flood issues along a major highway and secondary roads. Continually remove debris that blocks storm sewer grates.	3	2	1.5	3	2	2.3

Table 6.4-2 **Mitigation Action Prioritization.**

MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA Low = 0-1.8 Medium = 1.9-2.4 High = 2.5-3					
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Critical Communications/ Critical Infrastructure	Total Score
111	Provide residents with access to alternative energy sources and more affordable energy providers. Provide information on protecting the home from extreme temperatures. Operate a shelter during extreme temperature situations.	1	1.5	1	2	1	1.3
112	Monitor highly likely sinking areas based on engineer mapping, mine mapping, historical mapping, and relation to existing sink holes. Plan for early identification, green infrastructure, and natural restoration of areas surrounding sink prone land.	1.5	1.5	1	3	2	1.7
113	Develop and implement Flood Ordinances.	1	2	1	3	1.5	1.7
114	Cleanout Girty's Run on a regular basis to prevent flooding.	2	2	1	3	3	2.1
115	Conduct dredging and wall reconstruction.	2	1	2	3	2	1.9

Table 6.4-2 **Mitigation Action Prioritization.**

MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA Low = 0-1.8 Medium = 1.9-2.4 High = 2.5-3					
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Critical Communications/ Critical Infrastructure	Total Score
116	Introduce green building design to address water displacement and green infrastructure to reduce flooding.	2	1.5	1.5	3	2	1.9
117	Determine the effects of erosion within Girty's Run and its smaller tributaries. Implement reforestation and daylighting where needed.	2	2	1	3	3	2.1
118	Plum Creek Flood Mitigation Project: consult accuracy of the study reach with USACE, design and construct improvements within the floodplain to minimize localized flooding.	3	3	1	3	2	2.5
119	Develop and implement a Continuity of Operations Plan to ensure critical services can continue through and after a disaster.	2	2	3	3	3	2.5
120	Provide education and information about flooding and storm drains to residents	2	3	1	3	2	2.3

Table 6.4-2 **Mitigation Action Prioritization.**

MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA Low = 0-1.8 Medium = 1.9-2.4 High = 2.5-3					
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Critical Communications/ Critical Infrastructure	Total Score
	through Township Newsletter and Website.						
121	Reduce storm water flow to Lewis Run Creek from West Mifflin AGG Airport. Possible eliminate the creek crossover.	1.5	2	1	3	3	2
122	Stormwater Task Force Committee: meets on an ongoing basis to identify and prioritize stormwater projects needed in the borough.	3	3	1	3	3	2.6
123	Flood proof structures in the borough, with emphasis on repetitive loss properties.	3	2.5	1	3	1.5	2.2
124	Ongoing consultation with Borough Engineer to monitor for additional land fall areas on Romine Avenue.	2	2.5	1	3	1.5	2.0
125	Ongoing consultation with Borough Engineer to monitor for additional land fall areas on Port Vue Avenue.	2	2.5	1	3	1.5	2.0

Table 6.4-2 **Mitigation Action Prioritization.**

MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA Low = 0-1.8 Medium = 1.9-2.4 High = 2.5-3					
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Critical Communications/ Critical Infrastructure	Total Score
126	Remove and replace collapsed storm pipe along Blossom Drive.	1.5	2	1	3	3	2
127	Follow mitigation recommendations from State Health Department. This requires having all personal protective equipment (PPE) for employees of the township.	1	2	1	1	1	1.3
128	Place the Hazard Mitigation Plan and Floodplain map on the Township Website.	2	3	1	3	2	2.3
129	Relocate a section of storm sewer currently in a vulnerable flood area.	1.5	2	1	3	3	2
130	Protect and improve stream water quality and reduce run-off pollutants through the Allegheny County Stormwater Management Plan.	3	3	1	3	3	2.6
131	Use Allegheny County Quarterly Trainings to distribute all hazards education and preparedness materials to Scott Township.	1.5	3	1	3	2	2.2

Table 6.4-2 **Mitigation Action Prioritization.**

MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA Low = 0-1.8 Medium = 1.9-2.4 High = 2.5-3					
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Critical Communications/ Critical Infrastructure	Total Score
132	Replace undersized culverts. Restore and harden streambanks where appropriate to reduce flood damage to roadways during heavy storms.	2.5	1	2	3	3	2.1
133	Address priority issues as possible as identified in the 2018 Little Sewickley Creek Stream Assessment.	2	2	1.5			1.3
134	Improve website and add maps and storylines through ArcGIS to allow residents to interact with hazard data.	2	3	1	3	2	2.3
135	Enforce stricter building standards in the flood zone. This includes restricting or limiting certain projects and requiring that new construction is flood-proofed.	2.5	2	1	3	1.5	2.0
136	Develop a detention facility on Lynn Avenue.	3	1	2	3	3	2.2
137	Develop a rain garden on Brown Avenue.	1	1.5	1	3	1	1.5

Table 6.4-2 **Mitigation Action Prioritization.**

MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA Low = 0-1.8 Medium = 1.9-2.4 High = 2.5-3					
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Critical Communications/ Critical Infrastructure	Total Score
138	Revise the existing zoning ordinance to include a landslide overlay district. The overlay will incorporate preventative measures such as grading restrictions and engineering requirements.	3	3	1	3	2	2.5
139	Update pandemic response capabilities in the Borough by updating the Pandemic Plan, purchasing sanitizing supplies for public places, and purchasing PPE for employees and volunteers.	1	2	1	1	1	1.3
140	Provide training to local law enforcement and Borough employees and departments on responding to civil disturbances.	2	1.5	1	1	2	1.5
141	Clear Chartiers Creek banks of saplings, brush, and other plant matter to reduce flooding instances, and update residents with a Flood Warning and Evacuation Signal System.	2	2	1	3	1.5	1.9

Table 6.4-2 **Mitigation Action Prioritization.**

MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA Low = 0-1.8 Medium = 1.9-2.4 High = 2.5-3					
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Critical Communications/ Critical Infrastructure	Total Score
142	Evaluate all structural/infrastructure and natural systems protection mitigation projects within the Pine Creek watershed to identify where Pine Creek WIP priority areas overlap and where there may be an opportunity for mutual financial, risk reduction, and improved water quality benefits	3	3	1	3	2	2.5
144	Consider conducting outreach to all municipalities on an annual basis to coordinate and track any updates to data, progress on mitigation actions and additional hazard mitigation information	2	3	3	3	3	2.8
145	County EMA to encourage municipalities to develop a prioritized list of at-risk structures/assets regarding the SFHA and high hazard dams	2	3	3	3	3	2.8

Table 6.4-2 **Mitigation Action Prioritization.**

MITIGATION ACTIONS		MULTI-OBJECTIVE MITIGATION ACTION PRIORITIZATION CRITERIA Low = 0-1.8 Medium = 1.9-2.4 High = 2.5-3					
NO.	NAME	Effectiveness	Efficiency	Multi-Hazard Mitigation	Addresses High Risk Hazard	Addresses Critical Communications/ Critical Infrastructure	Total Score
146	County EMA to look into working with municipalities to develop mutual-aid agreements between municipalities to share resources and administrative and technical capabilities through mutual aid agreements	2	3	3	2	1	2.35
147	Glenn Avenue Flood Mitigation	2	2	1	3	2	1.95
148	County EMA to attend meetings or share data to update County-wide planning efforts to ensure applicable mitigation actions and HMP-related findings are incorporated	2	2	2	2	1	1.85
149	Promote participation in the NFIP and encourage municipalities to fill out the NFIP survey.	2	2	1	3	2	1.95

7. Plan Maintenance

7.1. Update Process Summary

Monitoring, evaluating and updating this plan, is critical to maintaining its value and success in Allegheny County's hazard mitigation efforts. Ensuring effective implementation of mitigation activities paves the way for continued momentum in the planning process and gives direction for the future. This section explains who will be responsible for maintenance activities and what those responsibilities entail. It also provides a methodology and schedule of maintenance activities including a description of how the public will be involved on a continued basis.

The plan maintenance described here is similar to and builds upon the maintenance schedule established in the 2011 HMP and continued in the 2015 HMP. Allegheny County Emergency Services will continue to act as the lead agency for plan development, and the plan will be evaluated annually on or around the anniversary of plan adoption.

Allegheny County has approached and will continue to approach plan maintenance through the quarterly EMC trainings. Trainings occurring in November always address damage assessments, while the March training each year addresses hazard mitigation; Allegheny County Emergency Services selects a mitigation topic to cover every year. Training notes have not been historically kept, but a sample agenda from the 2020 Quarterly training is in Appendix C. In addition, the County will include documentation of annual plan reviews in the next plan update. In addition, the public has had continual access to the plan and mitigation activities have been underway in many communities and the county. For more information, see Section 6.1.2: Mitigation Successes. In addition, Allegheny County Emergency Services and Allegheny County Economic Development work with the municipalities year-round to advance mitigation and preparedness through trainings and technical assistance.

7.2. Monitoring, Evaluating, and Updating the Plan

The Allegheny County Department of Emergency Services that served on HMPSC established for the 2020 HMP Update is designated to administer the plan maintenance processes of monitoring, evaluation and updating with support and representation from all participating municipalities. Mr. Steven Wilharm of the Allegheny County Department of Emergency Services will lead the HMPSC in all associated plan maintenance requirements, including annual reviews. The Allegheny Department of Emergency Services will coordinate maintenance efforts, but the input needed for effective periodic evaluations will come from community representatives, local emergency management coordinators and planners, the general public and other important stakeholders. The Allegheny Department of Emergency Services will oversee the progress made on the implementation of action items identified in the 2020 HMPU and modify actions, as needed, to reflect changing conditions. At the March quarterly training, Allegheny County Emergency Services will address hazard mitigation progress with each municipality through the local EMCs. The EMCs will be asked to work with the Allegheny Department of Emergency Services to provide and document updates on applicable mitigation actions and feedback on changing hazard vulnerabilities within their communities.

In addition, Allegheny County Emergency Services will continue to collaborate with Allegheny County Economic Development as the HMPSC. ACED will be invited to participate in the quarterly training to share planning, land use, and other countywide planning efforts that will reduce or eliminate risk. Should a significant disaster occur within the County, the Allegheny Department of Emergency Services will reconvene within 30 days of the disaster to review and update the HMP.

Upon each HMP evaluation, the Allegheny Department of Emergency Services will consider whether applications should be submitted for existing mitigation grant programs. A decision to apply for funding will be based on appropriate eligibility and financial need requirements. The Allegheny Department of Emergency Services will also support local and county officials in applying for post-disaster mitigation funds when they are available. All state and federal mitigation funding provided to the County or local municipalities will be reported in subsequent plan updates. In addition, new plans and programs being developed within the County will be evaluated as to the ability and necessity to incorporate the 2020 HMP into them.

The HMP will be updated every five years, as required by the Disaster Mitigation Act of 2000, or following a disaster event. Future plan updates will account for any new hazard vulnerabilities, special circumstances, or new information that becomes available. During the five-year review process, the following questions will be considered as criteria for assessing the effectiveness the HMP.

Has the nature or magnitude of hazards affecting the County changed?

- Are there new hazards that have the potential to impact the County?
- Do the identified goals and actions address current and expected conditions?
- Have mitigation actions been implemented or completed?
- Has the implementation of identified mitigation actions resulted in expected outcomes?
- Are current resources adequate to implement the Plan?
- Should additional local resources be committed to address identified hazards?

Issues that arise during monitoring and evaluation which require changes to the risk assessment, mitigation strategy and other components of the plan will be incorporated during future updates.

7.3. Continued Public Involvement

As was done during the development of the 2020 HMP, the Allegheny Department of Emergency Services will involve the public during the evaluation and update of the. The public will have access to an electronic copy of the current HMP through their local municipal office, the Department of Emergency Services, and Allegheny County Economic Development. Allegheny County Emergency Services will also keep a paper copy of the plan should a citizen not have ready electronic access. This paper copy will include physical copies of the community flood vulnerability maps to ensure communities can view and use large-scale, full color maps to aid in mitigation efforts. Information on upcoming events related to the HMP or solicitation for comments will be announced via newsletters, newspapers, mailings, and on the County website (http://www.alleghenycounty.us/emerserv/index.aspx). The Allegheny Department of Emergency Services will incorporate all relevant comments during the next update of the HMP.

8. Plan Adoption

The Plan was submitted to the Pennsylvania Emergency Management Agency on November 18th, 2021. It was forwarded to FEMA for final review and approval-pending-adoption on January 13th, 2021. FEMA granted approval-pending-adoption on March 18th, 2021. Full approval from FEMA was received on <*Month Day, Year*>.

This section of the plan includes copies of the local adoption resolutions passed by Allegheny County and its municipal governments. The completed Local Mitigation Plan Review Tool can be found in Appendix B. Adoption resolution templates are provided to assist the County and municipal governments with recommended language for future adoption of the HMP.

Allegheny County 2020 Hazard Mitigation Plan

County Adoption Resolution

Resolution No. _____

Allegheny County, Pennsylvania

WHEREAS, the municipalities of Allegheny 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, Allegheny County acknowledges the requirements of Section 322 of DMA 2000 to have an approved Hazard Mitigation Plan as a prerequisite to receiving post-disaster Hazard Mitigation Grant Program funds, and

WHEREAS, the Allegheny County 2020 Hazard Mitigation Plan has been developed by the Allegheny County Emergency Management Agency and the Allegheny County Planning Commission in cooperation with other county departments, local municipal officials, and the citizens of Allegheny County, and

WHEREAS, a public involvement process consistent with the requirements of DMA 2000 was conducted to develop the Allegheny County 2020 Hazard Mitigation Plan, and

WHEREAS, the Allegheny County 2020 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 Allegheny that:

- The Allegheny County 2020 Hazard Mitigation Plan is hereby adopted as the official Hazard Mitigation Plan of the County, and
- The respective officials and agencies identified in the implementation strategy of the Allegheny County 2020 Hazard Mitigation Plan are hereby directed to implement the recommended activities assigned to them.

ADOPTED, this _____ day of _____, 2021

ATTEST:

_____

ALLEGHENY COUNTY COUNCIL

By _____

By _____

By _____

Allegheny County 2020 Hazard Mitigation Plan

Municipal Adoption Resolution

Resolution No. _____

<Borough/Township of Municipality Name>, Allegheny County, Pennsylvania

WHEREAS, the *<Borough/Township of Municipality Name>*, Allegheny County, Pennsylvania is most vulnerable to natural and human-made hazards which may result in loss of life and property, economic hardship, and threats to public health and safety, and

WHEREAS, Section 322 of the Disaster Mitigation Act of 2000 (DMA 2000) requires state and local governments to develop and submit for approval to the President a mitigation plan that outlines processes for identifying their respective natural hazards, risks, and vulnerabilities, and

WHEREAS, the *<Borough/Township of Municipality Name>* acknowledges the requirements of Section 322 of DMA 2000 to have an approved Hazard Mitigation Plan as a prerequisite to receiving post-disaster Hazard Mitigation Grant Program funds, and

WHEREAS, the Allegheny County 2020 Hazard Mitigation Plan has been developed by the Allegheny County Emergency Management Agency and the Allegheny County Planning Commission in cooperation with other county departments, and officials and citizens of *<Borough/Township of Municipality Name>*, and

WHEREAS, a public involvement process consistent with the requirements of DMA 2000 was conducted to develop the Allegheny County 2020 Hazard Mitigation Plan, and

WHEREAS, the Allegheny County 2020 Hazard Mitigation Plan recommends mitigation activities that will reduce losses to life and property affected by both natural and human-made hazards that face the County and its municipal governments,

NOW THEREFORE BE IT RESOLVED by the governing body for the *<Borough/Township of Municipality Name>*:

- The Allegheny County 2020 Hazard Mitigation Plan is hereby adopted as the official Hazard Mitigation Plan of the *<Borough/Township>*, and
- The respective officials and agencies identified in the implementation strategy of the Allegheny County 2020 Hazard Mitigation Plan are hereby directed to implement the recommended activities assigned to them.

ADOPTED, this _____ day of _____, 2021

ATTEST: ***<BOROUGH/TOWNSHIP OF MUNICIPALITY NAME>***

_____ By _____

By _____