

# Pike County 2012 Hazard Mitigation Plan Update

**Prepared for:**

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# **Pike County Hazard Mitigation Plan**

## *Certification of Annual Review Meetings*

The Pike County Hazard Mitigation Steering Committee has reviewed this Hazard Mitigation Plan. See Section 8 of the Pike County 2012 Hazard Mitigation Plan for further details regarding this form. The director of the Hazard Mitigation Steering Committee hereby certifies the review.

<b>YEAR</b>	<b>DATE OF MEETING</b>	<b>PUBLIC OUTREACH ADDRESSED?*</b>	<b>SIGNATURE</b>
2013			
2014			
2015			
2016			
2017			

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

# Pike County Hazard Mitigation Plan

## Record of Changes

DATE	DESCRIPTION OF CHANGE MADE, MITIGATION ACTION COMPLETED, OR PUBLIC OUTREACH PERFORMED	CHANGE MADE BY (PRINT NAME)	CHANGE MADE BY (SIGNATURE)

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

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<b>Table of Acronyms</b>			
<b>ACRONYM</b>	<b>FULL NAME</b>	<b>ACRONYM</b>	<b>FULL NAME</b>
CFR	Code of Federal Regulations	NHC	National Hurricane Center
CRS	Community Ratings System	NOAA	National Oceanic and Atmospheric Association
DCED	Department of Community and Economic Development	NWS	National Weather Service
DCNR	Department of Conservation and Natural Resources	PEIRS	Pennsylvania Emergency Incident Reporting System
DCNR-BOF	Department of Conservation and Natural Resources-Bureau of Forestry	PA DEP	Pennsylvania Department of Environmental Protection
DFIRM	Digital Flood Insurance Rate Map	PaGWIS	Pennsylvania Groundwater Information System
EOP	Emergency Operations Plan	PASDA	Pennsylvania Spatial Data Access
EPA	Environmental Protection Agency	PDSI	Palmer Drought Severity Index
EPCRA	Emergency Planning and Community Right-to-Know Act	PEMA	Pennsylvania Emergency Management Agency
EPZ	Emergency Planning Zone	PennDOT	Pennsylvania Department of Transportation
FEMA	Federal Emergency Management Agency	PHGA	Peak Horizontal Ground Acceleration
FIRM	Flood Insurance Rate Map	RF	Risk Factor
HMP	Hazard Mitigation Plan	SALDO	Subdivision and Land Development Ordinance
HMPT	Hazard Mitigation Planning Team	SARA	Superfund Amendments and Reauthorization Act
HMPU	Hazard Mitigation Plan Update	SFHA	Special Flood Hazard Area
HMSC	Hazard Mitigation Steering Committee	SFIP	State Flood Insurance Program

<b>Table of Acronyms</b>			
<b>ACRONYM</b>	<b>FULL NAME</b>	<b>ACRONYM</b>	<b>FULL NAME</b>
HVA	Hazards Vulnerability Analysis	TRI	Toxic Release Inventory
LEPC	Local Emergency Planning Committee	UCC	Universal Construction Code
MRLC	Multi-Resolution Land Characteristics Consortium	US DOT	United States Department of Transportation
NCDC	National Climatic Data Center	USACE	United States Army Corps of Engineers
NDIS	National Drought Information System	USDA	United States Department of Agriculture
NDMC	National Drought Mitigation center	USGS	United States Geological Survey
NFIP	National Flood Insurance Program	WYO	Write Your Own
NFPA	National Fire Protection Association		

## **Introduction**

### **1.1. Background**

Disasters can strike anywhere, anytime. A disaster can come in many forms including floods, earthquakes, winter storms, and tornadoes, among others. The result of these disasters has been the loss of homes, property, communities, jobs, and in some cases, lives. Since 1955 there have been forty-three Presidential Disaster and Emergency Declarations in Pennsylvania, twelve of which affected Pike County. In addition to these Presidential Declarations, there have been nineteen Gubernatorial Proclamations of Disaster Emergency affecting Pike County since 1954.

Hazard Mitigation is defined as “any cost-effective action taken to eliminate or reduce the long term risk to life and property from natural, man- made and/or technological hazards.” Pre-disaster mitigation actions are taken in advance of a hazard event and are essential to breaking the disaster cycle of damage, reconstruction, and repeated damage. With careful selection, successful mitigation actions are cost-effective means of reducing risk of loss over the long-term. Actions can be structural or nonstructural in nature and can include construction of levees, storm drainage improvements, property acquisition, floodproofing, natural resource protection, zoning ordinance amendments, land use planning, public awareness, and improved emergency service measures, among others.

Accordingly, the Pike County Hazard Mitigation Planning Team (HMPT), composed of government leaders from Pike County and the Commonwealth, in cooperation with elected officials of the County and its municipalities, have prepared this Hazard Mitigation Plan (HMP). 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.

### **1.2. Purpose**

This Hazard Mitigation Plan was developed for the purpose of:

- Providing a blueprint for reducing property damage and saving lives from the effects of future natural and human-made disasters in Pike County;
- Qualifying the County for pre-disaster and post-disaster grant funding;
- Complying with state and federal legislative requirements related to local hazard mitigation planning;
- Demonstrating a firm local commitment to hazard mitigation principles; and
- Improving community resiliency following a disaster event.

The Pike County Hazard Mitigation Plan was prepared in accordance with Section 322 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), 42 U.S.C. 5165, enacted under paragraph 104 of the Disaster Mitigation Act of 2000, P.L. 106-390. Section 322 requires local governments to have an approved local mitigation plan to be eligible to receive grants under the Hazard Mitigation Grant Program and identifies the planning requirements necessary to receive approval. Section 322 requires that mitigation plans

describe the process for identifying hazards, creating a risk assessment and vulnerability analysis, identifying and prioritizing mitigation strategies, and developing an implementation schedule for the County and each of the municipalities.

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

### 1.3. Scope

The Pike County 2012 HMP has been prepared to meet requirements set forth by FEMA and the Pennsylvania Emergency Management Agency (PEMA) in order for the County to be eligible for funding and technical assistance from state and federal hazard mitigation programs. It will be updated and maintained to continually address both natural and human-made hazards determined to be of significant risk to the County and/or its local municipalities. Updates will take place following significant disasters or at a minimum, once a year.

The Pike County Hazard Mitigation Plan assembles important inventory and data on potential hazards to our communities and prioritizes these hazards in frequency and severity. It analyzes and reviews alternative mitigation options based on the resource capabilities of our County and communities. The plan then selects the most appropriate course for future mitigation of the hazards facing our County residents. The plan will enable the County and its municipalities to effectively respond to hazards as they occur and reduce the potential risks of these hazards to the health, safety and welfare of our residents. Additionally, the Plan will allow for Pike County communities' eligibility for a full range of assistance following hazard events.

### 1.4. Authority and References

Authority for this plan originates from the following federal sources:

- Robert T. Stafford Disaster Relief and Emergency Assistance Act, 42 U.S.C., Section 322, as amended;
- Code of Federal Regulations (CFR), Title 44, Parts 201 and 206; and
- Disaster Mitigation Act of 2000, Public Law 106-390, as amended.
- National Flood Insurance Act of 1968, as amended, 42 U.S.C. 4001 *et seq.*

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

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

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

- FEMA 386-1: *Getting Started*. September 2002.

- FEMA 386-2: *Understanding Your Risks: Identifying Hazards and Estimating Losses*. August 2001.
- FEMA 386-3: *Developing the Mitigation Plan*. April 2003.
- FEMA 386-4: *Bringing the Plan to Life*. August 2003.
- FEMA 386-5: *Using Benefit-Cost Review in Mitigation Planning*. May 2007.
- FEMA 386-6: *Integrating Historic Property and Cultural Resource Considerations into Hazard Mitigation Planning*. May 2005.
- FEMA 386-7: *Integrating Manmade Hazards into Mitigation Planning*. September 2003.
- FEMA 386-8: *Multijurisdictional Mitigation Planning*. August 2006.
- FEMA 386-9: *Using the Hazard Mitigation Plan to Prepare Successful Mitigation Projects*. August 2008.
- FEMA *Local Multi-Hazard Mitigation Planning Guidance*. July 1, 2008.
- FEMA *National Fire Incident Reporting System 5.0: Complete Reference Guide*. January, 2008.

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

- PEMA: *Hazard Mitigation Planning Made Easy!*
- PEMA Mitigation Ideas: *Potential Mitigation Measures by Hazard Type; A Mitigation Planning Tool for Communities*. March 6, 2009.
- PEMA: *Draft Standard Operating Guide*. October 9, 2009.

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

Pike County is located in the far northeast corner of Pennsylvania (see Figure 2.1-1). The Delaware River serves as its entire eastern border with New York State to the northeast and with New Jersey to the southeast. Lake Wallenpaupack and Wayne County make up the northwestern border, while Monroe County is at the southwestern border. With its 547 square miles, the county ranks forty-second out of the sixty-seven Commonwealth counties in terms of land mass.

Approximately 34.5% of the county is publicly owned. Included in this figure are close to 91,000 acres owned by the Commonwealth of Pennsylvania and over 17,000 acres owned by the Federal Government in the Delaware Water Gap National Recreation Area and a small amount (approximately 9 acres) in the Upper Delaware Scenic and Recreational River Corridor, all

located within Pike County. These Federal properties are located along the Delaware River and are managed by the US Department of Interior's National Park Service.

The County's location along the Upper Delaware River Corridor and the location of the Lackawaxen River, a major Delaware tributary which flows through the northern part of the County in Lackawaxen Township, both play a significant role in the County's Hazard Mitigation planning efforts. Additionally, the County's strategic location near to the metropolitan centers in nearby New York and New Jersey also impact the human- made and societal hazards affecting the County.

All of Pike County's major watersheds are classified as "high quality" or "exceptional value." Pike County's watersheds are depicted in Figure 2.1-2.

Figure 2.1-1: Base map of Pike County (Pike County GIS Office, 2011).

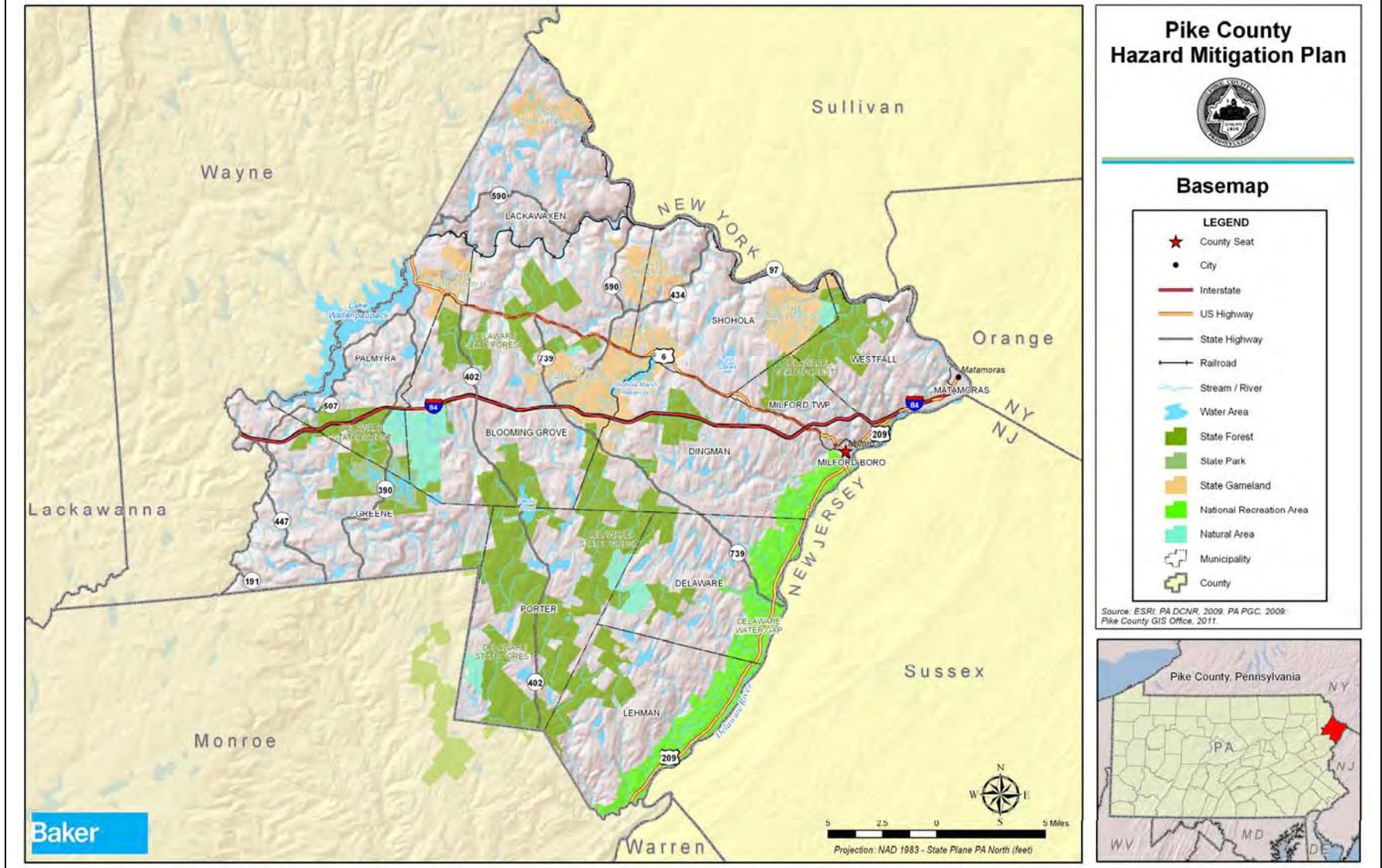
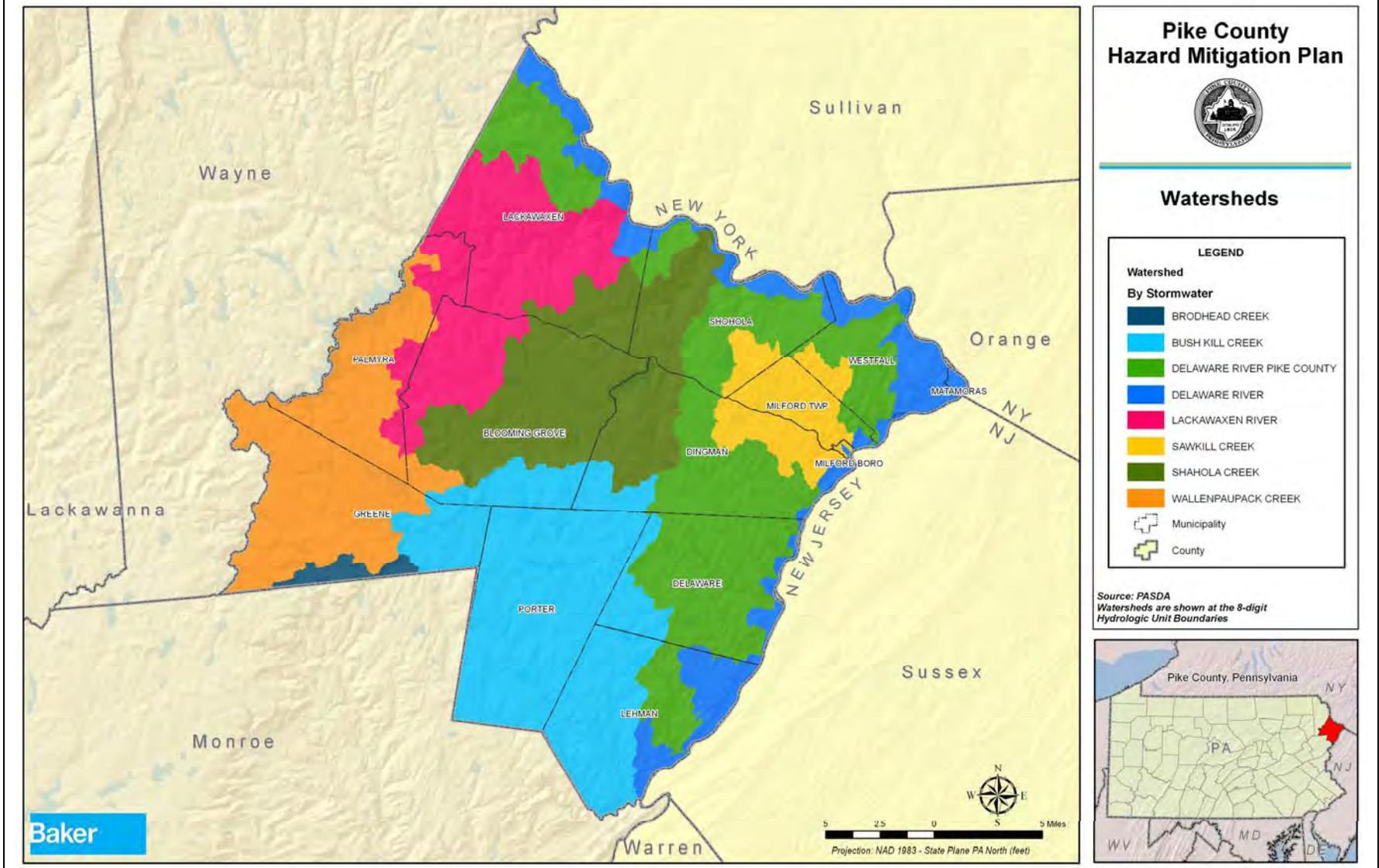


Figure 2.1-2: Major Watersheds of Pike County (PASDA, 2010).



## **2.2. Community Facts**

Pike County formed in 1814 when it separated from Wayne County. The County was named for Zebulon Montgomery Pike, who discovered of Pike's Peak. He also was a General killed in the war of 1812. By the Act of April 1, 1836, a portion of Pike County was cut off to form part of Monroe County; otherwise, its boundaries remain as they were established by the Act of 1814. At the time it was formed, it included 5 townships. Today it contains 13 municipalities: Blooming Grove Township, Delaware Township, Dingman Township, Greene Township, Lackawaxen Township, Lehman Township, Matamoras Borough, Milford Borough, Milford Township, Palmyra Township, Porter Township, Shohola Township, and Westfall Township. The County Seat is Milford Borough.

The County's proximity to New York City and location along the Delaware River historically made it an important area for transportation of commodities and resources, particularly coal. Today, recreation is the main industry in the County. With its many lakes, rivers, streams, state game and forest lands and the Delaware Water Gap National Recreation Area, it is estimated that the population of the county often doubles during the months from April to October. Hunting, fishing, biking, hiking, nature watching and canoeing are the major recreational attractions to the area.

The largest recreation resource in the County is Lake Wallenpaupack which was created in 1926 when Pennsylvania Power and Light Company built a hydroelectric plant and dam on the Lackawaxen River. The Delaware River, Lackawaxen River and the large tracts of public land are also major eco-tourism attractions. Major employers in Pike County also include school districts, government, and retailers.

## **2.3. Population and Demographics**

Pike County has been rated as one of the fastest growing Pennsylvania counties for several decades. Between 2000 and 2010 the County experienced a 23.9% population increase. This is higher than the population increase of 21.7% that took place between 1990 and 2000. Table 2.3-1 shows the distribution of population of County population by municipality in the 2000 and 2010 decennial censuses. Lehman Township saw the largest percent increase of almost 42%.

Pike County's increased population has primarily come from the migration of people from New York and New Jersey. The impetus for the migration of people has been the desire for lower home prices, less crime, and more open space. Over 72 percent of the County's workforce commute to jobs outside of Pike County (DCED, 2005). Many are commuting to the New York City / New Jersey metropolitan area.

<b>Table 2.3-1: List of municipalities in Pike County with associated populations (U.S. Census, 2011).</b>			
<b>MUNICIPALITY</b>	<b>2000 POPULATION</b>	<b>2010 POPULATION</b>	<b>PERCENT CHANGE (%)</b>
Blooming Grove Township	3,621	4,819	33.08

**Table 2.3-1: List of municipalities in Pike County with associated populations (U.S. Census, 2011).**

MUNICIPALITY	2000 POPULATION	2010 POPULATION	PERCENT CHANGE (%)
Delaware Township	6,319	7,396	17.04
Dingman Township	8,788	11,926	35.71
Greene Township	3,149	3,956	25.63
Lackawaxen Township	4,154	4,994	20.22
Lehman Township	7,515	10,663	41.89
Matamoras Borough	2,312	2,469	6.79
Milford Borough	1,104	1,021	-7.52
Milford Township	1,292	1,530	18.42
Palmyra Township	3,145	3,312	5.31
Porter Township	385	485	25.97
Shohola Township	2,088	2,475	18.53
Westfall Township	2,430	2,323	-4.40
<b>TOTAL</b>	<b>46,302</b>	<b>57,369</b>	<b>23.9</b>

The median income of households in Pike County is \$56,447 (in 2009 inflation-adjusted numbers). This is about \$5,000 more than the national median household income (U.S. Census ACS, 2005-2009). Almost 7 percent of the County population lives in poverty.

The median age of the County population is 41.8 years with 76.7 percent of the population over 18 years of age and 14.9 percent 65 years or older. There are an estimated 38,350 housing units, 57.2 percent of which are occupied with 42.8 percent being vacant (U.S. Census, 2010). The median value of an owner occupied home in the County is \$210,900. 88.4 percent of the County population is White and 6.6 percent of the County population is Black.

## 2.4. Land Use and Development

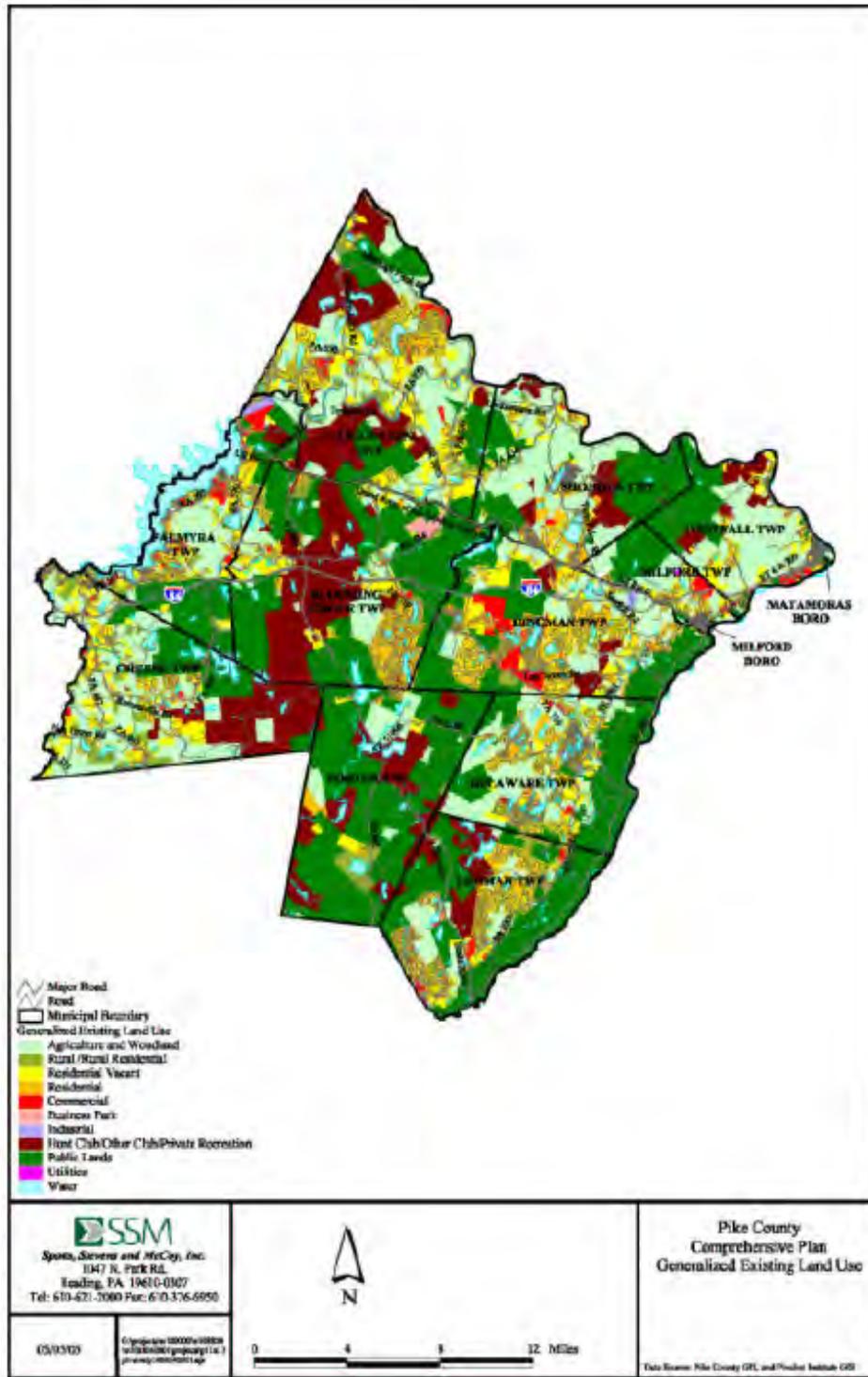
Over 95% of Pike County's land cover is undeveloped with almost 89 percent of this total devoted to forest and agricultural land uses (Figure 2.4-1). In addition, approximately 10 percent of the County is made up of water and wetlands, primarily due to the Delaware Water Gap National Recreation Area on the eastern border and Lake Wallenpaupack on the western border.

Transportation facilities within Pike County include highway and rail facilities. The county's highway system is formed around approximately 35 miles of Interstate Route 84. This road runs east to west across the center of the county. Access to I-84 is limited to six interchanges.

The County has become a commuter-shed for metropolitan New York and New Jersey via I-84, Routes 206 and 15, I-80, and mass transit which provide acceptable yet long commutes (Pike

County Office of Community Planning, 2006). Most of the County's state routes are in less than excellent condition and were not designed to handle the increase in traffic volume being generated by the expanded population.

Figure 2.4-1: Pike County land use as depicted in the 2006 Pike County Comprehensive Plan (Pike County Office of Community Planning, 2006).



### 2.5. Data Sources and Limitations

A variety of data sources were used in the plan. Parcel values were obtained from the parcel layer provided by the County GIS Office. Total parcel value included both land and building values. All critical facilities provided in **Appendix E**, with the exception of nursing homes and 911 centers, were developed based on data provided by the Pike County GIS Office. Nursing home data was obtained from the PA Department of Health and the 911 centers were obtained from PEMA. The County GIS Office also provided spatial data on land use, transportation routes, streams, schools, utilities, and water bodies.

The countywide Effective Digital Flood Insurance Rate Map (DFIRM), published on October 6, 2000, was provided by the Pike County GIS Office. This data provides flood frequency and elevation information used in the flood hazard risk assessment. Additional data for the base map was provided by the Pennsylvania Game Commission 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).

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. Version MR-4 of this software was used to estimate losses for floods in Pike County.

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. The list of critical facilities includes 911 centers, ambulance buildings, cell towers, day cares, fire department, municipal buildings, nursing homes, police departments, and schools. Table 2.5-1 summarizes the critical facilities in Pike County by type and by municipality. For a complete listing of critical facilities, please see **Appendix E**.

Table 2.5-1: Summary of Critical Facilities by Type and Municipality.

MUNICIPALITY	CRITICAL FACILITY TYPE										
	911 CENTER	AMBULANCE BUILDING	CELL TOWER	DAY-CARE	FIRE DEPARTMENT	MUNICIPAL BUILDING	JAIL	NURSING HOME	POLICE DEPARTMENT	SCHOOL	GRAND TOTAL
Blooming Grove Township	0	0	12	0	3	2	1	0	1	0	19
Delaware Township	0	1	2	4	2	1	0	0	0	0	10
Dingman Township	0	0	5	3	1	1	0	0	0	3	13
Greene Township	0	0	3	2	2	1	0	0	0	0	8
Lackawaxen Township	0	2	3	0	4	1	0	0	0	0	10
Lehman Township	0	0	2	4	2	1	0	0	0	1	10
Matamoras Borough	0	0	0	2	1	1	0	0	1	0	5
Milford Borough	1	0	0	3	1	1	0	1	2	0	9
Milford Township	0	0	3	1	0	1	0	1	0	0	6
Palmyra Township	0	0	5	0	2	1	0	0	0	4	12
Porter Township	0	0	1	0	0	0	0	0	0	0	1
Shohola Township	0	0	0	0	2	1	0	0	1	1	5

Table 2.5-1: Summary of Critical Facilities by Type and Municipality.

MUNICIPALITY	CRITICAL FACILITY TYPE										
	911 CENTER	AMBULANCE BUILDING	CELL TOWER	DAY-CARE	FIRE DEPARTMENT	MUNICIPAL BUILDING	JAIL	NURSING HOME	POLICE DEPARTMENT	SCHOOL	GRAND TOTAL
Westfall Township	0	0	1	1	3	1	0	0	0	5	11
<b>Grand Total</b>	<b>1</b>	<b>3</b>	<b>37</b>	<b>20</b>	<b>23</b>	<b>13</b>	<b>1</b>	<b>2</b>	<b>5</b>	<b>13</b>	<b>109</b>

When applicable, Pennsylvania Emergency Incident Reporting System (PEIRS) incident data spanning approximately the last 8 years (1/1/2002 -6/1/2009) was used in the 2012 plan update. 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: Environmental Hazards (Hazardous Material Releases); Transportation Accident; Urban Fire and Explosion, and Utility Interruption.

Every attempt was made to provide consistency in reported data and in data sources. However, at the time of this plan update, the US Census Bureau is in the middle of tabulating the results of the 2010 Decennial Census; at this time, population counts are available at only the municipal, county, and state level. No population counts exist for Census Tracts or Blocks in Pennsylvania at this point. As a result, while population change data is reported in this HMP by municipality from 2000-2010, the calculated population at risk to flooding in Section 4.3.3.5 is derived from the 2000 Census Block geography. It was important to use the 2000 block data to interpolate the population living in the SFHAs because larger geographies would grossly overestimate risk. In addition, the age of housing units reported in Section 4.3.8.5 comes from the 2000 American Community Survey because the Decennial Census no longer collects this information. As new data from the 2010 Census becomes available between 2011 and 2013, it will be incorporated into the HMP.

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

### **3. Planning Process**

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

In early summer 2006, the Pike County Board of Commissioners identified a planning partnership designed to address the specific development of a Hazard Mitigation Plan for the County which would build upon the final County Comprehensive Plan Update and be included as an integral but separate component of the County's Plan. The Pike County Emergency Management Agency met with the Pike County Planning Commission, the Pike County Office of Community Planning and representatives of the Pike County Board of Commissioners to discuss the furtherance of this planning project based on the information collected in the Hazard Vulnerability Analysis and the Pike County Comprehensive Plan Update.

## Pike County 2012 Hazard Mitigation Plan

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An outcome of this meeting was the identification of a Hazard Mitigation Working Committee (now referred to as the Hazard Mitigation Planning Team (HMPT)) which included members of the County EMA, County Planning Commission, Planning Staff, as well as representatives from throughout the County.

The 2006 Pike County Hazard Mitigation Plan was developed as a joint partnership of the Pike County Board of Commissioners, the Pike County Planning Commission and the Pike County Office of Community Planning, the Pike County Emergency Management Agency, and the County's thirteen municipal governments. Guidance and assistance was provided by the Pennsylvania Emergency Management Agency and the Federal Emergency Management Agency.

Input from the 2006 HMPT and the public was obtained through meetings, forms, questionnaires and general correspondence. All 13 municipalities participated in development of the 2006 Pike County Hazard Mitigation Plan.

To begin the 2012 HMP update process, the Pike County Office of Community Planning held a kickoff meeting. Representatives from municipalities, county agencies, adjacent counties, non-profit groups, and other stakeholders were mailed an invitation to attend the meeting. Contact information was obtained from all meeting attendees and used to create a HMPT mailing list. Section 3.2 provides a discussion of the HMPT as well as a table of members with their corresponding organization.

Municipal officials and the other stakeholders continued to receive notification regarding all HMP meetings via telephone, email, or some combination. A brief description of each meeting that was held is available in Section 3.3. In addition, meeting minutes, describing in detail, events of each meeting are available in **Appendix C – Meeting and Other Participation documentation.**

In order to obtain information from municipalities and other stakeholders, forms and surveys were distributed and collected throughout the planning process. Some of the forms were completed during planning meetings while others were sent via email or were posted to the HMP website, [www.PikeHMP.com](http://www.PikeHMP.com). These forms were completed and returned in between scheduled meetings. All municipalities were required to have a representative attend at least one meeting and provide pertinent information for the HMP update. Table 3.1-1 lists each municipality along with their specific participation and contributions to the planning process. Sign-in sheets for each meeting with individual names are available in **Appendix C – Meeting and Other Participation Documentation** along with all completed forms and surveys.

**Pike County 2012 Hazard Mitigation Plan**

**Table 3.1-1: Summary of participation from local municipalities during the 2012 HMPU.**

MUNICIPALITY	MEETING				WORKSHEETS/SURVEYS/FORMS					
	KICK-OFF MEETING March 14, 2011	RISK ASSESSMENT / MITIGATION SOLUTIONS WORKSHOP May 5, 2011	PUBLIC MEETING June 16, 2011	PARTICIPATION TELE-CONFERENCE June 24, 2011	CAPABILITY ASSESSMENT SURVEY	EVAL. OF HAZARDS AND RISK FORM	COUNTYWIDE OR JURISDICTIONAL RISK FACTOR EVALUATION	GOALS AND OBJECTIVES EVAL. FORM	MITIGATION ACTION	HMP COMMENT FORM
Blooming Grove Township	✓		✓		✓	✓			✓	
Delaware Township		✓			✓	✓	✓	✓	✓	
Dingman Township	✓	✓	✓		✓	✓	✓	✓	✓	✓
Greene Township		✓	✓		✓	✓	✓	✓	✓	
Lackawaxen Township		✓			✓	✓	✓	✓	✓	
Lehman Township	✓	✓			✓	✓	✓	✓	✓	
Matamoras Borough		✓	✓		✓	✓	✓	✓	✓	✓
Milford Borough	✓		✓		✓	✓			✓	
Milford Township				✓	✓	✓			✓	
Palmyra Township			✓		✓	✓			✓	
Porter Township		✓	✓		✓	✓	✓	✓	✓	
Shohola Township	✓	✓	✓		✓	✓	✓	✓	✓	
Westfall Township		✓	✓		✓	✓	✓	✓	✓	

With funding support from PEMA, Michael Baker Jr., Inc., a full-service engineering firm that provides hazard mitigation planning guidance and technical support, assisted the County through the update process. The 2012 Pike County HMP Update was completed in December 2011.

The 2012 HMP follows an outline developed by PEMA in 2009 which provides a standardized format for all local HMPs in the Commonwealth of Pennsylvania. As a result, the format of the 2012 Pike County HMP contrasts with the 2006 Pike County HMP, but all information that was still current was carried over into the new plan. These changes are summarized in Table 3.1-2. Additional update summaries are provided for each section of the plan in Sections 4.1, 5.1, 6.1, and 7.1.

<b>Table 3.1-2: Summary of changes to the format of the 2006 and 2012 versions of the Pike County HMP.</b>	
2006 HMP SECTION	2012 HMPU SECTION
Introduction	Section 1
Section 1- Hazard Mitigation Planning Process	
1.1 Purpose	Section 1.2
1.2 Methodology	Section 3
1.3 Municipal and Public Involvement	Sections 3.3 and 3.4
1.4 Study Area	Section 2
Section 2 – Hazard Identification / Vulnerability Analysis	
2.1 Analysis Methods	Section 4.4
2.2 County / Municipal Profiles	Section 2
2.3 Natural Hazards – History, Vulnerability & Probability	Section 4.3
2.4 Man-made (caused) Hazards – History, Vulnerability & Probability	Section 4.3
2.5 Pike County Vulnerability Summary	Section 4.4
Section 3 – Capability Assessment	
3.1 Current Resources	Section 5.2
3.2 Administrative and Regulatory	Section 5.2.4
3.3 Partnerships	Section 5.2
3.4 Other	Section 5.2
3.5 Fiscal	Section 5.2.5
Section 4 – Hazard Mitigation Strategies and Implementation Actions	
4.1 Pike County Comprehensive Plan Framework for Hazard Mitigation Strategies	Section 6.1
4.2 Hazard Mitigation Approach Strategies	Section 6.3
4.3 Important Components of Hazard Mitigation Opportunities	Section 6.3
4.4 Hazard Mitigation Strategies for Natural Hazards	Section 6.3
4.5 Hazard Mitigation Projects and Priorities	Section 6.4
Section 5 – Plan Maintenance	

**Table 3.1-2: Summary of changes to the format of the 2006 and 2012 versions of the Pike County HMP.**

2006 HMP SECTION	2012 HMPU SECTION
5.1 Monitoring and Evaluating – Annual 5-year cycle	Section 7
5.2 Updates	Section 7

### **3.2. The Planning Team**

The Hazard Mitigation Steering Committee (HMSC) for the 2012 HMP Update (HMPU) included:

- 1) Michael Mrozinski, Assistant Director, Pike County Office of Community Planning
- 2) Roger Maltby, Emergency Management Coordinator, Pike County Emergency Management Agency
- 3) Sally Corrigan, Director, Pike County Office of Community Planning
- 4) Alexis Melusky, Planner, Michael Baker Jr., Inc.

The HMSC developed a list of potential HMPT members which included municipal officials, state and Pike County government representatives, adjacent county representative and other non-profit organizations. All invited stakeholders are listed in **Appendix C**. These individuals were invited to participate in the HMP update process. The HMSC worked throughout the process to plan and hold meetings, collect information and conduct public outreach.

The stakeholders listed in Table 3.2-1 served on the 2012 countywide HMPT and actively participated in the planning process through attendance at meetings, completion of assessment surveys, or submission of comments. Participants representing multiple jurisdictions are listed more than once.

**Table 3.2-1: Stakeholders who participated in the planning process.**

MUNICIPALITY/ORGANIZATION	PARTICIPANT(S)
Blooming Grove Township	Steve Mullin, Marj Mullin, Scott Meyer
DCNR Forestry	Bill Delling
Delaware Township	Kyle Wright
Delaware Valley School District	Mark Moglia, Chris Lordi
Dingman Township	William Mikulak
Greene Township	Maryann Hubbard
Lackawaxen Township	Vincent Albanese
Lake Wallenpaupack Watershed District	Nick Spinelli
Lehman Township	Edward Bland, Stanley Whittaker
Matamoras Borough	Gary Babb
Milford Borough	Matt Osterberg, Vincent Accordino
Milford Township	Viola Canouse
National Park Service	Denise Codse-Baver

**Table 3.2-1: Stakeholders who participated in the planning process.**

MUNICIPALITY/ORGANIZATION	PARTICIPANT(S)
Orange and Rockland Utilities	Gene Reynolds, Dominick Greene
Palmyra Township	Tom Simons
Porter Township	Rob Hellyer
Shohola Township	Robert Myers
Twin and Walker Creeks Conservancy	Shirley Masuo
Westfall Township	Robert Ewbank

### 3.3. Meetings and Documentation

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

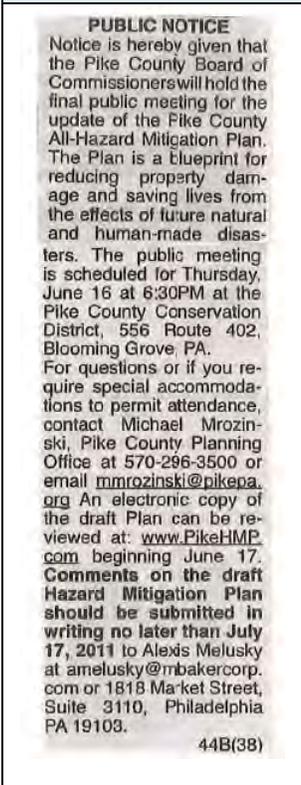
**March 14, 2011 – Kickoff Meeting** held at the Pike County Conservation District Office to discuss project scope, schedule, goals and available resources. Hazards from the 2006 plan were evaluated and new hazards to include in the 2011 update were selected using the “Evaluation of Hazards and Risk Form.” Capability Assessment Surveys were also completed by municipal attendees.

**April 18, 2011 – Internal Mitigation Strategy Review Meeting** held via conference call with the HMSC to conduct a preliminary review of plan goals and objectives and evaluate the status of 2006 plan actions/projects in advance of the entire community reviewing the Mitigation Strategy.

**May 5, 2011 – Risk Assessment / Mitigation Solutions Workshop** held at the Pike County Conservation District Office to review the HMPU’s risk assessment and discuss hazards. Both countywide and jurisdictional risk factors and mitigation goals and objectives were reviewed by the HMPT. Projects from the 2006 HMP were reviewed by municipalities who had included projects in the 2006 HMP and new projects and actions were developed to be included in the HMPU.

**June 16, 2011 – Final Public Meeting** – held at the Pike County Conservation District Office to update the public about the HMP process and findings. The meeting was advertised in two local newspapers on June 8, 2011: the Pocono Record and the News Eagle; and one newspaper on June 9, 2011: the Pike County Dispatch. Municipalities were emailed a meeting reminder and encouraged to inform their residents about the meeting. Several verbal comments were noted in

**Figure 3.4-1: Public noticed published in the Pocono Record and the News Eagle on June 8, 2011 and the Pike Dispatch Pike County Dispatch June 9, 2011.**



the meeting minutes and attendees were asked to review the entire plan on the County's hazard mitigation plan website [www.PikeHMP.com](http://www.PikeHMP.com) and provide written comments within a 30-day comment period.

**June 24, 2011 – Participation Teleconference** – held via teleconference to give Milford Township the opportunity to participate in the planning process. The municipal representative was briefed about progress on the HMP to date, information from past meetings, and their role in the planning process.

### **3.4. Public & Stakeholder Participation**

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

- 1. Capability Assessment Survey:** Collects information on local planning, regulatory, administrative, technical, fiscal, political and resiliency capabilities that can be included in the plan's Capability Assessment section.
- 2. Evaluation of Hazards and Risk Form:** Collects information from the HMPT regarding whether there have been changes to the frequency of occurrence, magnitude of impact, or geographic extent of hazards identified in the 2006 HMP. In addition, the form asks members of the HMPT to select any additional hazards that they believe should be considered for inclusion in the 2012 HMPU.
- 3. Mitigation Strategy Goal and Objective Comment Worksheet:** Collected comments and suggestions from municipalities on the HMPU goals and objectives that had been vetted by the HMSC at the Internal Mitigation Strategy Review Meeting.
- 4. Countywide and Jurisdictional Risk Evaluation Worksheet:** These forms asked the HMPT to review the Countywide Risk Factors for the hazards and provide feedback. In addition, municipal representatives were asked to review their jurisdiction's risk for each hazard in comparison to the Countywide risk factors to comment on whether they had the same risk, or a greater or less than risk than the County as a whole.
- 5. 2006 Project Evaluation Form:** Because many municipalities had actions/projects in the 2006 HMP, they were asked to evaluate the status of projects submitted in the previous planning process, indicating if there had been progress, if a project had been discontinued or completed, and whether each project should be carried over into the 2012 Plan.

6. **Mitigation Action Form:** Allows communities to propose mitigation actions for the HMP and include information about each action such as a lead agency/department, implementation schedule, priority, estimated costs, and potential funding source(s).
7. **HMP Comment Form:** Provided to representatives and the public at the public meeting and used to provide comments on the hazards, risk assessment, mitigation strategy, and any other topics of the users choice.

Community participation and comment was encouraged throughout the planning process, particularly through the project website, [www.PikeHMP.com](http://www.PikeHMP.com). This site acted as a repository for the entire planning process, including presentations, agendas, minutes, and worksheets from each meeting as well as promulgating meeting dates, times, and important announcements. The public was also encouraged to provide images and stories on the effects of the identified hazards in their community on the website.

To advertise the public meeting, a newspaper notice was published in three local newspapers (the Pocono Record, the News Eagle, and the Pike County Dispatch) to notify the citizens of Pike County of the date and time of the public meeting. A copy of this newspaper notice is shown in Figure 3.4-1. In addition, a press release was issued about the meeting and a meeting flyer was distributed to municipalities to post in municipal buildings. Copies of the newspaper notice, press release, and meeting flyer are included in **Appendix C**.

Pike County posted the 2012 Draft HMP update on the HMP update website ([www.PikeHMP.com](http://www.PikeHMP.com)) beginning on June 17, 2011 and accepted comments through July 17, 2011. The availability of the draft HMPU was made public by the three public notices and by disseminating the information to the HMPT via email. Comments were to be submitted in writing to Michael Mrozinski of the Pike County Office of Community Planning, to Alexis Melusky of Michael Baker Jr., Inc., by mail or email; or online on the HMP Update website.

Three public comments were received at the final public meeting and recorded on HMP Comment Forms. In addition, several comments were received from the Pike County Office of Community Planning and Pike County EMA via the phone. No additional comments were received during the 30-day comment period. Copies of comments received are available in **Appendix C**.

### **3.5. Multi-Jurisdictional Planning**

This HMP was developed using a multi-jurisdictional approach. With funding support from PEMA, the County departments had resources such as technical expertise and data which local jurisdictions lacked. However, involvement from local municipalities was critical to the collection of local knowledge related 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 13 municipalities in the planning process. Tables 3.1-1 and 3.2-1 list jurisdictional participation 2012 HMPU.

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 mailed or emailed invitations to all meetings and received telephone call or email reminders (if email addresses were available) prior to each meeting. Surveys and forms were emailed to jurisdictions requesting that local information be provided and jurisdictions were also directed to the HMP update website where all forms were posted. In the end, all 13 municipalities in the County participated in the plan, thus achieving 100% participation. This represents the same participation as that achieved in 2006 when all thirteen municipalities participated and adopted the 2006 HMP.

### **3.6. Existing Planning Mechanisms**

There are numerous existing regulatory and planning mechanisms in place at the state, County, and municipal level of government which support hazard mitigation planning efforts. These tools include the Commonwealth of Pennsylvania Standard All-Hazard Mitigation Plan, the Pike County Emergency Operations Plan, the Pike County Hazard Vulnerability Assessment, the Pike County Comprehensive Plan, the Pike County Open Space, Greenways, and Recreation Plan, local Emergency Operation Plans, the Pike County draft Act 167 Plan, local floodplain management ordinances, local zoning ordinances, local subdivision and land development ordinances, local comprehensive plans, and other watershed, greenway, or environmental plans. These mechanisms were discussed at community meetings and are described in Section 5.2. Information from several of these documents has been incorporated into this plan and mitigation actions have been developed to further integrate these planning mechanisms into the hazard mitigation planning process.

Information on identified development constraints and potential future growth areas was incorporated from the Pike County Comprehensive Plan so that vulnerability pertaining to future development could be established. The County Hazard Vulnerability Analysis provided direction for hazard identification as well as information on past occurrences and vulnerability. Floodplain management ordinance information was used to aid in the establishment of local capabilities in addition to participation in the NFIP.

## **4. Risk Assessment**

### **4.1. Update Process Summary**

This risk assessment provides a factual basis for activities proposed by the County in their mitigation strategy. Hazards that may affect Pike County are identified and defined in terms of location and geographic extent, magnitude of impact, previous events and likelihood of future occurrence. This hazard profile structure differs from what was used in the 2006 Pike County HMP; however all information from the previous plan has been included or updated in the 2012 HMPU, unless otherwise indicated.

The Pike County Hazard Mitigation Planning Team reviewed the hazards profiled in the 2006 Pike County HMP at a March 14, 2011 kickoff meeting. It was determined that all of the existing hazards should be continued into the plan update. Additionally, the HMPT reviewed hazards on PEMA's standard list of hazards using an *Evaluation of Hazards and Risk Form*. All 13

municipalities in Pike County completed this form and the HMSC used results from the form to determine that three additional hazards should be profiled in the plan update: Drowning, Pandemic, Hurricane, Tropical Storm, and Nor'easter. In addition, the 2006 plan profiled Hazardous Materials Incidents (now under the hazard profile titled Environmental Hazards) and the HMPT decided to include hazard information about Oil and Gas Wells drilling under this hazard profile. Hazard profiles were then developed in order to define the characteristics of the hazard as it applies to Pike County.

Following hazard identification and profiling, a vulnerability assessment was performed to identify the impact of natural or human-caused hazard events on people, buildings, infrastructure and the community. Each natural and human-made hazard is discussed in terms of its potential impact on individual communities in Pike County, including the types of parcels and critical facilities that may be at risk. The assessment allows the County and its municipalities to focus mitigation efforts on areas most likely to be damaged or most likely to require early response to a hazard event. A vulnerability analysis was performed which identifies structures, critical facilities or people that may be impacted by hazard events and describes what those events can do to physical, social and economic assets. Depending upon data availability, assessment results consist of an inventory of vulnerable structures or populations.

**4.2. Hazard Identification**

**4.2.1. Table of Presidential Disaster Declarations**

Presidential Disaster and Emergency Declarations are issued when it has been determined that state and local governments need assistance in responding to a disaster event. Table 4.2-1 identifies Presidential Disaster and Emergency Declarations issued between 1955 through January 2011 that have affected Pike County. Additional declarations beyond January 2011 can be found on the FEMA website at: [http://www.fema.gov/news/disasters\\_state.fema?id=42](http://www.fema.gov/news/disasters_state.fema?id=42).

<b>Table 4.2-1: Presidential Disaster and Emergency Declarations affecting Pike County.</b>		
<b>DECLARATION NUMBER</b>	<b>DATE</b>	<b>EVENT</b>
4025	September, 2011	Remnants of Hurricane Irene
1649	June, 2006	Severe Storms, Flooding, and Mudslides
1587	April, 2005	Severe Storms, Flooding, and Mudslides
3235	September, 2005	Proclamation of Emergency - Hurricane Katrina
1557	September, 2004	Tropical Depression Ivan
1219	June, 1998	Flooding, Severe Storms, and Tornadoes
1085	January, 1996	Blizzard
1093	January, 1996	Flooding
3105	March, 1993	Proclamation of Emergency - Blizzard
340	June, 1972	Flood (Agnes)
273	August, 1969	Drought
206	August, 1965	Drought
40	August, 1955	Flood (Diane)

In addition to these Presidentially-declared events, eighteen events warranted Gubernatorial Disaster Declarations or Proclamations. Table 4.2-2 lists Gubernatorial Disaster Declarations or Proclamations that have been issued for Pike County between 1954 and 2011.

<b>Table 4.2-2: Gubernatorial Disaster Declarations or Proclamations affecting Pike County.</b>	
<b>DATE</b>	<b>EVENT</b>
January, 2011	Proclamation of Emergency – Severe Winter Storm
April, 2007	Proclamation of Emergency - Severe Winter Storm
February, 2007	Proclamation of Emergency - Regulations
February, 2007	Proclamation of Emergency - Severe Winter Storm
September, 2006	Proclamation of Emergency - Tropical Depression Ernesto
September, 2003	Hurricane Isabel / Henri - related storms and flooding
February, 2002	Drought and Water Shortage
September, 1999	Hurricane Floyd
July, 1999	Drought
April, 1997	Snowstorm
September, 1995	Drought
January, 1994	Severe Winter Storms
November, 1980	Drought Emergency
February, 1978	Blizzard
January, 1978	Heavy Snow
February, 1974	Truckers Strike
February, 1972	Heavy Snow
January, 1966	Heavy Snow

Pike County has also received Small Business Administration Disaster Assistance for a number of disaster events. A Small Business Administration Disaster Declaration qualifies communities for access to affordable, timely, and accessible financial assistance. Table 4.2-3 illustrates Small Business Administration Disaster Declarations issued for Pike County between 1954 and 2011.

<b>Table 4.2-3: Small Business Administration Disaster Declarations affecting Pike County.</b>	
<b>DATE</b>	<b>EVENT</b>
April, 2007	Severe Storms and Flooding
July, 1991	Drought
February, 1981	Flash Flood (Matamoras)

Since 1955, declarations have been issued for various hazard events including hurricanes or tropical storms, severe winter storms, and flooding. A unique Presidential Emergency Declaration was issued in September, 2005. Through Emergency Declaration 3235, President George W. Bush declared that a state of emergency existed in the Commonwealth of

Pennsylvania and ordered federal aid to supplement Commonwealth and local response efforts to help people evacuated from their homes due to Hurricane Katrina. All counties within the Commonwealth, including Pike County, were indirectly affected by Hurricane Katrina as a result of evacuee assistance.

**4.2.2. Summary of Hazards**

Table 4.2-4 summarizes hazards identified in the 2006 Pike County HMP which included the County’s Hazard Vulnerability Assessment (HVA).

<b>HAZARD</b>
Dam Failure
Droughts and Water Supply Deficiencies
Earthquakes
Energy Emergencies
Fire Hazards (both urban fires and wildfires)
Fixed Nuclear Facility Incidents
Floods
Hazardous Material Incidents
Tornadoes and Windstorms
Terrorism and Nuclear Attack
Transportation Incidents
Winter Storms

The hazards shown in Table 4.2-4 were not ranked according to risk in the 2006 HMP. All hazards identified in 2006 HMP were included in the 2012 HMPU.

At the Stakeholder kickoff meeting, the members of the HMPT were each provided with an *Evaluation of Hazards and Risk Form* and the PEMA Standard List of Hazards which is a comprehensive list of all hazards to be considered for evaluation in the 2012 HMPU. This list was obtained primarily from the 2007 Edition of the National Fire Protection Association’s *NFPA 1600: Standard on Disaster/Emergency Management and Business Continuity Programs* (NFPA, 2007). Following review of this hazards list and completion of the *Evaluation of Hazards and Risk Form*, several additional hazards were considered in need of risk assessment. The HMPT decided to expand environmental hazards to include not only hazardous material releases but also oil and gas well drilling and add the new hazards of drowning, hurricane, tropical storm, and nor’easter, and pandemic. Table 4.2-5 contains a complete list of all potential hazards in Pike County identified through the risk assessments and planning meetings. Hazard profiles are included in Section 4.3 for each of these hazards.

**Table 4.2-5: List and description of natural and human-made hazards profiled in the 2012 HMP.**

**Pike County 2012 Hazard Mitigation Plan**

HAZARD TYPE	HAZARD	HAZARD DESCRIPTION
Natural Hazards	Drought	Drought is a natural climatic condition which occurs in virtually all climates, the consequence of a natural reduction in the amount of precipitation experienced over a long period of time, usually a season or more in length. High temperatures, prolonged winds, and low relative humidity can exacerbate the severity of drought. This hazard is of particular concern in Pennsylvania due to the presence of farms as well as water-dependent industries and recreation areas across the Commonwealth. A prolonged drought could severely impact these sectors of the local economy, as well as residents who depend on wells for drinking water and other personal uses (National Drought Mitigation Center, 2006).
	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. Most property damage and earthquake-related deaths are caused by the failure and collapse of structures due to ground shaking which is dependent upon amplitude and duration of the earthquake (FEMA, 1997).
	Flood, Flash Flood, & Ice Jam	Flooding is the temporary condition of partial or complete inundation on normally dry land and it is the most frequent and costly of all hazards in Pennsylvania. Flooding events are generally the result of excessive precipitation. General flooding is typically experienced when precipitation occurs over a given river basin for an extended period of time. 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. The severity of a flood event is dependent upon a combination of stream and river basin topography and physiography, hydrology, precipitation and weather patterns, present soil moisture conditions, the degree of vegetative clearing as well as the presence of impervious surfaces in and around flood-prone areas. Winter flooding can include ice jams which occur when warm temperatures and heavy rain cause snow to melt rapidly. Snow melt combined with heavy rains can cause frozen rivers to swell, which breaks the ice layer on top of a river. The ice layer often breaks into large chunks, which float downstream, piling up in narrow passages and near other obstructions such as bridges and dams. All forms of flooding can damage infrastructure (USACE, 2007).
	Hurricane, Tropical Storm, & Nor'easter	Hurricanes and tropical storms are classified as cyclones and are any closed circulation developing around a low-pressure center in which the winds rotate counter-clockwise (in the Northern Hemisphere) and whose diameter averages 10-30 miles across. While most of Pennsylvania is not directly affected by the devastating impacts cyclonic systems can have on coastal regions, many areas in the state are subject to the primary damaging forces associated with these storms including high-level sustained winds, heavy precipitation and tornadoes. Areas in southeastern Pennsylvania could be susceptible to storm surge and tidal flooding. The majority of hurricanes and tropical storms form in the Atlantic Ocean, Caribbean Sea and Gulf of Mexico during the official Atlantic hurricane season which extends from June through November (FEMA, 1997).
	Pandemic	A pandemic occurs when infection from of a new strain of a certain disease, to which most humans have no immunity, substantially exceeds the number of expected cases over a given period of time. Such a disease may or may not be transferable between humans and animals. (Martin & Martin-Granel, 2006).

**Table 4.2-5: List and description of natural and human-made hazards profiled in the 2012 HMP.**

HAZARD TYPE	HAZARD	HAZARD DESCRIPTION
	Tornado & Windstorm	<p>A tornado is a violent windstorm characterized by a twisting, funnel-shaped cloud extending to the ground. Tornadoes are most often generated by thunderstorm activity (but sometimes result from hurricanes or tropical storms) when cool, dry air intersects and overrides a layer of warm, moist air forcing the warm air to rise rapidly. The damage caused by a tornado is a result of high wind velocities and wind-blown debris. According to the National Weather Service, tornado wind speeds can range between 30 to more than 300 miles per hour. They are more likely to occur during the spring and early summer months of March through June and are most likely to form in the late afternoon and early evening. Most tornadoes are a few dozen yards wide and touch-down briefly, but even small, short-lived tornadoes can inflict tremendous damage. Destruction ranges from light to severe depending on the intensity, size and duration of the storm. Structures made of light materials such as mobile homes are most susceptible to damage. Waterspouts are weak tornadoes that form over warm water and are relatively uncommon in Pennsylvania. An average of over 800 tornadoes are reported annually nationwide, resulting in an average of 80 deaths and 1,500 injuries (NOAA, 1995). Based on NOAA Storm Prediction Center Statistics, the number of recorded F3, F4, &amp; F5 tornadoes between 1950-1998 ranges from &lt;1 to 15 per 3,700 square miles across Pennsylvania (FEMA, 2009).</p>
	Wildfire	<p>A wildfire is a raging, uncontrolled fire that spreads rapidly through vegetative fuels, exposing and possibly consuming structures. Wildfires often begin unnoticed and can spread quickly, creating dense smoke that can be seen for miles. Wildfires can occur at any time of the year, but mostly occur during long, dry hot spells. Any small fire in a wooded area, 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 fields, grass, brush and forests. 98% of wildfires in Pennsylvania are a direct result of people, often caused by debris burns (Department of Conservation and Natural Resources, 2009).</p>
	Winter Storm	<p>Winter storms may include snow, sleet, freezing rain, or a mix of these wintry forms of precipitation. 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. Many winter storms are accompanied by low temperatures and heavy and/or blowing snow, which can severely impair visibility and disrupt transportation. The Commonwealth of Pennsylvania has a long history of severe winter weather.</p>
Technological and Human-made Hazards	Dam Failure	<p>A dam is a barrier across flowing water that obstructs, directs, or slows down water flow. Dams provide benefits such as flood protection, power generation, drinking water, irrigation and recreation. Failure of these structures results in an uncontrolled release of impounded water. Failures are relatively rare, but immense damage and loss of life is possible in downstream communities when such events occur. Aging infrastructure, hydrologic, hydraulic and geologic characteristics, population growth and design and maintenance practices should be considered when assessing dam failure hazards. The failure of the South Fork Dam, located in Johnstown, PA, was the deadliest dam failure ever experienced in the United States. It took place in 1889 and resulted in the Johnstown Flood which claimed 2,209 lives (FEMA, 1997). Today there are approximately 3,200 dams and reservoirs throughout Pennsylvania (PADEP, 2008).</p>

Table 4.2-5: List and description of natural and human-made hazards profiled in the 2012 HMP.

HAZARD TYPE	HAZARD	HAZARD DESCRIPTION
	Drowning	Drowning is death from suffocation, typically associated with swimming, fishing, boating or bridge accidents, or suicide. It can be a significant hazard in communities with numerous residential pools or water bodies (e.g. ponds, lakes, rivers, etc...) and extensive outdoor recreational activity. Drowning rates are particularly high for children ages 1-14. The Centers for Disease Control and Prevention estimates that drowning is the second leading cause of injury death (after motor vehicle crashes) among children ages 1-14. (CDC, 2008).
	Environmental Hazards	<p>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:</p> <ul style="list-style-type: none"> <li>• <b>Hazardous material releases;</b> at fixed facilities or as such materials are in transit and including toxic chemicals, infectious substances, biohazardous waste, and any materials that are explosive, corrosive, flammable, or radioactive (PL 1990-165, § 207(e)).</li> <li>• <b>Air or Water Pollution;</b> the release of harmful chemical and waste materials into water bodies or the atmosphere, for example (National Institute of Health Sciences, July 2009; Environmental Protection Agency, Natural Disaster PSAs, 2009).</li> <li>• <b>Superfund Facilities;</b> hazards originating from abandoned hazardous waste sites listed on the National Priorities List (Environmental Protection Agency, National Priorities List, 2009).</li> <li>• <b>Manure Spills;</b> involving the release of stored or transported agricultural waste, for example (Environmental Protection Agency, Environmental Impacts of..., 1998).</li> <li>• <b>Product Defect or Contamination;</b> highly flammable or otherwise unsafe consumer products and dangerous foods (Consumer Product Safety Commission, 2003).</li> </ul>
	Nuclear Incident	Nuclear accidents generally refer to events involving the release of significant levels of radioactivity or exposure of workers or the general public to radiation (FEMA, 1997). Nuclear accidents/incidents can be placed into three categories: 1) Criticality accidents which involve loss of control of nuclear assemblies or power reactors, 2) Loss-of-coolant accidents which result 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, and 3) Loss-of-containment accidents which involve the release of radioactivity. The primary concern following such an incident or accident 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. (FEMA, 1997).
	Terrorism	Terrorism is use of force or violence against persons or property with the intent to intimidate or coerce. Acts of terrorism include threats of terrorism; assassinations; kidnappings; hijackings; bomb scares and bombings; cyber attacks (computer-based); and the use of chemical, biological, nuclear and radiological weapons. (FEMA, 2009).
	Transportation Accidents	Transportation accidents can result from any form of air, rail, water, or road travel. It is unlikely that small accidents would significantly impact the larger community. However, certain accidents could have secondary regional impacts such as a hazardous materials release or disruption in critical supply/access routes, especially if vital transportation corridors or junctions are present.

**Table 4.2-5: List and description of natural and human-made hazards profiled in the 2012 HMP.**

HAZARD TYPE	HAZARD	HAZARD DESCRIPTION
	Urban Fire and Explosion	An urban fire involves a structure or property within an urban or developed area. For hazard mitigation purposes, major urban fires involving large buildings and/or multiple properties are of primary concern. The effects of a major urban fire include minor to significant property damage, loss of life, and residential or business displacement. Explosions are extremely rapid releases of energy that usually generate high temperatures and often lead to fires. The risk of severe explosions can be reduced through careful management of flammable and explosive hazardous materials. (FEMA, 1997).
	Utility Interruption	<p>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:</p> <ul style="list-style-type: none"> <li>• Geomagnetic Storms – including temporary disturbances of the Earth’s magnetic field resulting in disruptions of communication, navigation, and satellite systems (National Research Council et al., 1986).</li> <li>• Fuel or Resource Shortage – resulting from supply chain breaks or secondary to other hazard events, for example (Mercer County, PA, 2005).</li> <li>• Electromagnetic Pulse – originating from an explosion or fluctuating magnetic field and causing damaging current surges in electrical and electronic systems (Institute for Telecommunications Sciences, 1996).</li> <li>• Information Technology Failure – due to software bugs, viruses, or improper use (Rainer Jr., et al, 1991).</li> <li>• Ancillary Support Equipment – electrical generating, transmission, system-control, and distribution-system equipment for the energy industry (Hirst &amp; Kirby, 1996).</li> <li>• Public Works Failure – damage to or failure of highways, flood control systems, deepwater ports and harbors, public buildings, bridges, dams, for example (U.S. Senate Committee on Environment and Public Works, 2009).</li> <li>• Telecommunications System Failure – damage to data transfer, communications, and processing equipment, for example (FEMA, 1997).</li> <li>• Transmission Facility or Linear Utility Accident – liquefied natural gas leakages, explosions, facility problems, for example (United States Department of Energy, 2005).</li> <li>• Major Energy, Power, Utility Failure – interruptions of generation and distribution, power outages, for example (United States DOE, 2000).</li> </ul>

### 4.3. Hazard Profiles and Vulnerability Analysis

#### NATURAL HAZARDS

##### 4.3.1. Drought

##### 4.3.1.1. Location and Extent

Droughts are regional climatic events; therefore, when droughts occur in Pike County, impacts are felt across the entire County as well as areas outside County boundaries. The spatial extent for areas of impact can range from areas of Pennsylvania to the entire mid-Atlantic region.

While all of Pike County has an equal occurrence of severe or extreme drought, the agricultural industry is often hardest hit. Approximately 3% of Pike County is agricultural land so a severe drought could have a limited effect (Figure 2.4-1).

##### 4.3.1.2. Range of Magnitude

Hydrologic droughts occur after months or years of below normal precipitation and entail a reduction of stream flows, reduction in lake reservoir storage and the 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, soil moisture, water for navigation and recreation. Drought can also create conditions conducive to wildfire events.

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 New York City reservoirs in the 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 (PSDI) – a soil moisture algorithm calibrated for relatively homogeneous regions which measures dryness based on recent precipitation and temperature (see Table 4.3.1-1).

<b>Table 4.3.1-1: Palmer Drought Severity Index classifications (NDMC, 2009).</b>	
<b>SEVERITY CATEGORY</b>	<b>PSDI VALUE</b>
Extremely wet	4.0 or more
Very wet	3.0 to 3.99
Moderately wet	2.0 to 2.99
Slightly wet	1.0 to 1.99
Incipient wet spell	0.5 to 0.99
Near normal	0.49 to -0.49
Incipient dry spell	-0.5 to -0.99
Mild drought	-1.0 to -1.99
Moderate drought	-2.0 to -2.99
Severe drought	-3.0 to -3.99
Extreme drought	-4.0 or less

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

- **Drought Watch**: A period to alert government agencies, public water suppliers, water users and the public regarding the potential for future drought-related problems. The focus is on increased monitoring, awareness and preparation for response if conditions worsen. A request for voluntary water conservation is made. The objective of voluntary water conservation measures during a drought watch is to reduce water uses by 5 percent in the affected areas. Due to varying conditions, individual water suppliers or municipalities may be asking for more stringent conservation actions.
- **Drought Warning**: This phase involves a coordinated response to imminent drought conditions and potential water supply shortages through concerted voluntary conservation measures to avoid or reduce shortages, relieve stressed sources, develop new sources, and

if possible forestall the need to impose mandatory water use restrictions. The objective of voluntary water conservation measures during a drought warning is to reduce overall water uses by 10-15 percent in the affected areas. Due to varying conditions, individual water suppliers or municipalities may be asking for more stringent conservation actions.

- **Drought Emergency**: This stage is a phase of concerted management operations to marshal all available resources to respond to actual emergency conditions, to avoid depletion of water sources, to assure at least minimum water supplies to protect public health and safety, to support essential and high priority water uses and to avoid unnecessary economic dislocations. It is possible during this phase to impose mandatory restrictions on non-essential water uses that are provided in the Pennsylvania Code (Chapter 119), if deemed necessary and if ordered by the Governor of Pennsylvania. The objective of water use restrictions (mandatory or voluntary) and other conservation measures during this phase is to reduce consumptive water use in the affected area by fifteen percent, and to reduce total use to the extent necessary to preserve public water system supplies, to avoid or mitigate local or area shortages, and to assure equitable sharing of limited supplies.
- **Local Water Rationing**: Although not a drought phase, local municipalities may, with the approval of the PA Emergency Management Council, implement local water rationing to share a rapidly dwindling or severely depleted water supply in designated water supply service areas. These individual water rationing plans, authorized through provisions of the Pennsylvania Code (Chapter 120), 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.

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.

A worst case scenario for droughts in Pike County occurred in 1995. There was a gubernatorial disaster declaration for drought which was affecting eastern Pennsylvania. Pike County was under a drought warning from September 1 through December 18, with a status of drought emergency declared from September 20 through November 8. Mandatory restrictions were in

place concerning water use on lawns, gardens, golf courses, paved surfaces, water fountains and vehicles. Preliminary crop losses caused by the drought were \$300 million statewide.

**4.3.1.3. Past Occurrence**

Declared drought status for Pike County from 1980 to 2010 is shown in Table 4.3.1-2. Descriptions for drought status categories (i.e. *watch*, *warning*, and *emergency*) are included in Section 4.3.1.2. The Pennsylvania Department of Environmental Protection (DEP) is the agency responsible for collecting drought information. Data for all counties in the Commonwealth is available from November 1980 through December 2010.

<b>Table 4.3.1-2: Pike County Declared Drought Status from 1980 to 2010 (PADEP, 2010).</b>			
<b>DATE</b>	<b>DROUGHT STATUS</b>	<b>DATE</b>	<b>DROUGHT STATUS</b>
Jul 7, 1988 - Aug 24, 1988	Watch	Jan 15, 1999 - Mar 15, 1999	Warning
Aug 24, 1988 - Dec 12, 1988	Watch	Mar 15, 1999 - Jun 10, 1999	Watch
Jun 28, 1991 - Jul 24, 1991	Watch	Jun 10, 1999 - Jun 18, 1999	Warning
Jul 24, 1991 - Aug 16, 1991	Emergency	Jun 18, 1999 - Jul 20, 1999	Warning
Aug 16, 1991 - Sep 13, 1991	Emergency	Jul 20, 1999 - Sep 30, 1999	Emergency
Sep 13, 1991 - Oct 21, 1991	Emergency	Sep 30, 1999 - Dec 16, 1999	Watch
Oct 21, 1991 - Jan 16, 1992	Emergency	Dec 16, 1999 - Feb 25, 2000	Watch
Jan 17, 1992 - Apr 20, 1992	Emergency	Feb 25, 2000 - May 5, 2000	Watch
Apr 20, 1992 - Jun 23, 1992	Warning	Aug 24, 2001 - Nov 6, 2001	Watch
Sep 1, 1995 - Sep 20, 1995	Warning	Nov 6, 2001 - Dec 5, 2001	Watch
Sep 20, 1995 - Nov 8, 1995	Emergency	Dec 5, 2001 - Feb 12, 2002	Warning
Nov 8, 1995 - Dec 18, 1995	Warning	Feb 12, 2002 - May 13, 2002	Emergency
Dec 3, 1998 - Dec 8, 1998	Watch	Sep 5, 2002 - Nov 7, 2002	Watch
Dec 8, 1998 - Dec 14, 1998	Watch	Apr 11, 2006 - Jun 30, 2006	Watch
Dec 14, 1998 - Dec 16, 1998	Warning	Aug 8, 2007 - Sep 5, 2007	Watch
Dec 16, 1998 - Jan 15, 1999	Warning	Sep 16, 2010 – Nov 10, 2010	Warning

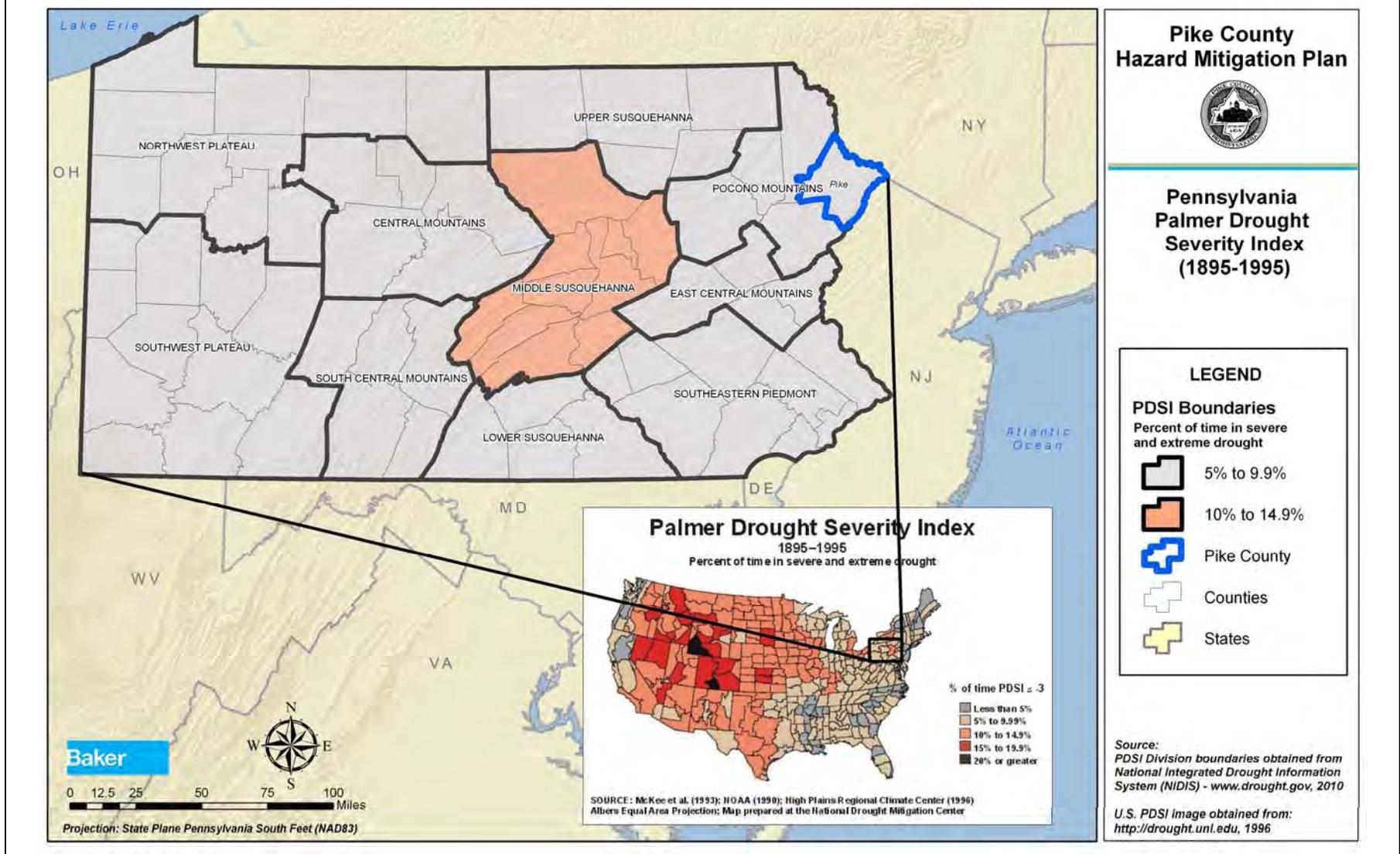
Pike County also has record of a drought event prior to 1980. During the summer of 1977, the Matamoras Municipal Water Authority was forced to drill several new wells when their original artesian wells began to dry up. For several weeks, water was pumped across the Delaware River Bridge from Port Jervis, New York into the Matamoras system.

In addition, Table 4.2-1 shows that there were also two Presidential Disaster Declarations issued (1965 and 1969) in response to drought conditions within Pike County. Furthermore, there were five Gubernatorial Declarations or Proclamation and one declaration by the Small Business Administration in response to drought conditions within the County (Tables 4.2-2 and 4.2-3).

### 4.3.1.4. *Future Occurrence*

It is difficult to forecast the severity and frequency of future drought events in Pike County. Based on national data from 1895 to 1995, Pike County is in severe or extreme drought approximately 5-10 percent of the time (see Figure 4.3.1-2). This is equivalent to a PDSI value less than or equal to -3. The future occurrence of drought in Pike County can be considered *possible* as defined by the Risk Factor Methodology probability criteria (see Table 4.4-1). Due to the increasing demand for water by the increasing population base and the growing tourist population, droughts will continue to be a problem.

Figure 4.3.1-2: Percent of time areas of the United States have PSDI values  $\leq -3$  (NIDIS, 2010).



**4.3.1.5. Vulnerability Assessment**

The most significant losses resulting from drought events are typically found in the agriculture sector. Drought events can severely impair the local economy with prolonged drought negatively impacting the livelihood of residents within agricultural communities particularly. As mentioned above, approximately 3 percent of land in Pike County is used for agricultural purposes. However, Pike County ranks 65<sup>th</sup> out of the 67 Commonwealth counties in agricultural production, totaling \$2.5 million (USDA, 2007). The majority of sales to date have come from crop sales which total \$2.3 million (92%) in 2007. Livestock sales made up the other 8% of sales.

Water supplies are also vulnerable to the effects of drought. All of Pike County's water supply is provided by groundwater, either through private wells, municipal water authorities or community water systems. There are two municipal water supply districts in Pike County (US Census GID, 2007). These districts serve residents in Matamoras and Milford Boroughs. Future droughts will quickly affect those systems relying on surface supplies while those on wells should be able to handle short-term droughts without any major problem. However, longer-term droughts which inhibit recharging of groundwater aquifers will extend the problems for water suppliers and well owners for an undetermined length of time. With a limited number of exceptions, few of the water systems in the County provide large storage capacity. Many of the small water systems operate with limited funds and little money is being invested for any improvements. As the county's population grows, more water is being removed from the aquifer. Unless significant improvements to the infrastructure are made to improve storage capability, many suppliers could find it increasing difficult to meet the demands over extended periods of below normal precipitation when the aquifer is not being adequately recharged.

Pike County residents that use private domestic wells are also vulnerable to droughts because their wells can dry up. There are 6,675 of these domestic wells in Pike County, with at least one in every municipality. Table 4.3.1-3 shows the number of domestic wells per municipality as collected by the Pennsylvania Groundwater Information System (PaGWIS). According to this dataset, residents in Dingman Township are the most vulnerable to the water supply issues related to droughts because of the high amount of wells that are reported there. It is important to note, however, that the well data collected by PaGWIS relies on voluntary submissions of well record data by well drillers; therefore, it is not a complete database of all domestic wells in the County.

**Table 4.3.1-3: Number of reported domestic wells in Pike County (PaGWIS, 2011).**

MUNICIPALITY	NUMBER OF REPORTED DOMESTIC WELLS	MUNICIPALITY	NUMBER OF REPORTED DOMESTIC WELLS
Blooming Grove Township	157	Milford Borough	102
Delaware Township	808	Milford Township	125

**Table 4.3.1-3: Number of reported domestic wells in Pike County (PaGWIS, 2011).**

MUNICIPALITY	NUMBER OF REPORTED DOMESTIC WELLS	MUNICIPALITY	NUMBER OF REPORTED DOMESTIC WELLS
Dingman Township	2,222	Palmyra Township	335
Greene Township	850	Porter Township	144
Lackawaxen Township	316	Shohola Township	442
Lehman Township	893	Westfall Township	262
Matamoras Borough	19		
<b>TOTAL</b>	<b>6,675</b>		

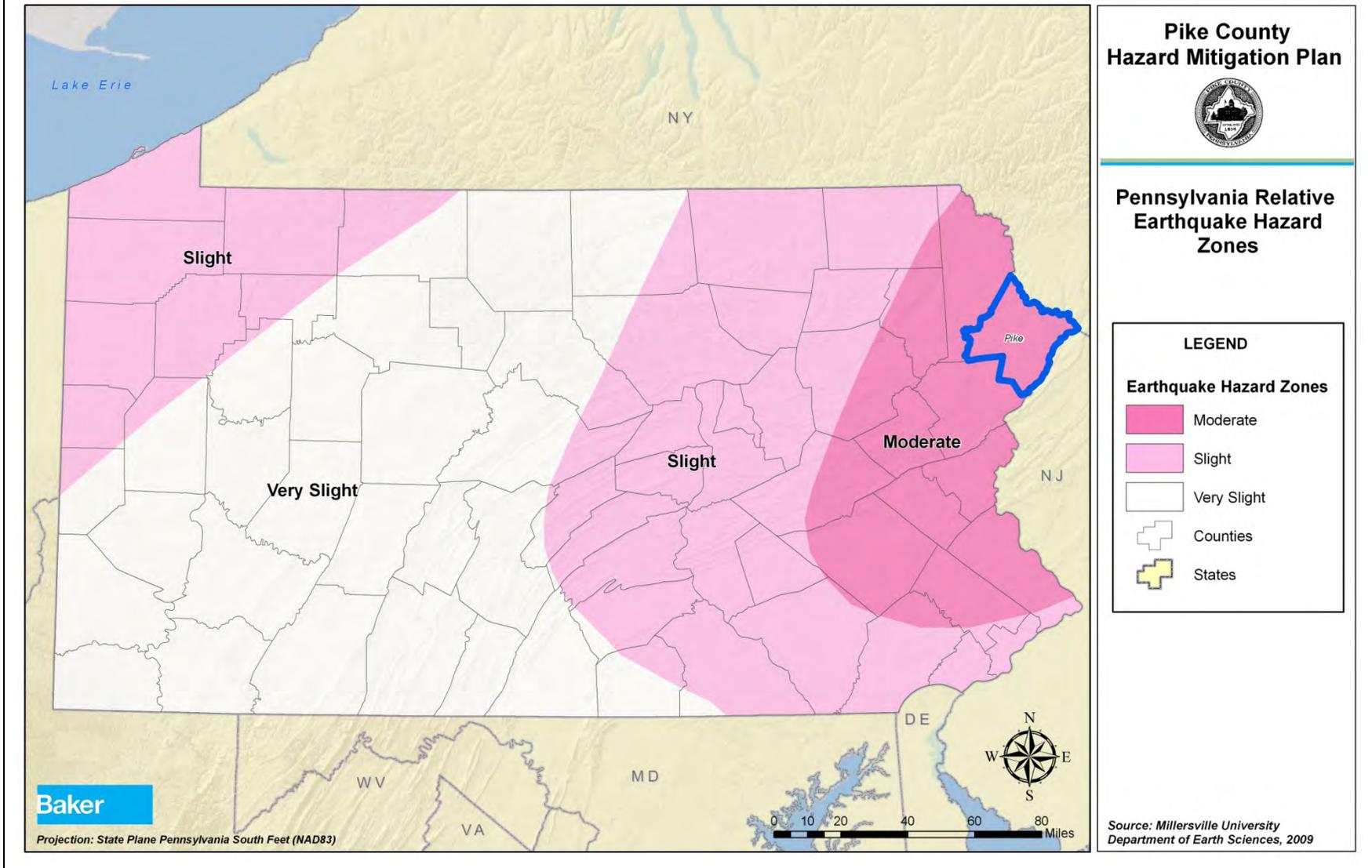
**4.3.2. Earthquake**

*4.3.2.1. Location and Extent*

Earthquakes are caused by a sudden slip of a fault caused by the dynamic pressure of the earth’s plates pushing together on both sides of the fault over time. The strength of an earthquake is determined by the size of the slip and how close the slip occurred to the surface. The most active faults are along the Pacific Coast, although some smaller, less active faults exist in the Eastern United States. Earthquakes in Pennsylvania have occurred but generally have not caused injury. However, the crust of the earth is constantly shifting and earthquakes do pose a possible threat that should be considered. Earthquake events in Pennsylvania do not typically impact areas greater than 100 km from the epicenter of the event and are usually mild events.

The Department of Earth Sciences at Millersville University identified relative earthquake hazard zones across the Commonwealth. As seen in Figure 4.3.2-1, Pike County falls entirely within the “moderate” zone. However, earthquakes originating in neighboring counties in New Jersey and New York may also impact Pike County.

Figure 4.3.2-1: Pennsylvania relative earthquake hazard zones (Millersville University Department of Earth Sciences, 2009).



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. A survey of historical earthquakes occurring within 100 km of Pike County with known magnitudes indicates that earthquakes have generally had magnitudes of up to 4.0 with an average moment magnitude of 3.03. Pennsylvania has not experienced any earthquakes with a magnitude greater than 6.0.

<b>Table 4.3.2-1: Richter scale magnitudes and associated earthquake size effects.</b>	
<b>RICHTER MAGNITUDES</b>	<b>EARTHQUAKE EFFECTS</b>
<b>Less than 3.5</b>	Generally not felt, but recorded.
<b>3.5-5.4</b>	Often felt, but rarely causes damage.
<b>Under 6.0</b>	At most, slight damage to well-designed buildings; can cause major damage to poorly constructed buildings over small regions.
<b>6.1-6.9</b>	Can be destructive in areas where people live up to about 100 kilometers across.
<b>7.0-7.9</b>	Major earthquake; can cause serious damage over large areas.
<b>8.0 or greater</b>	Great earthquake; can cause serious damage in areas several hundred kilometers across.

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 4.3.2-2. Based on historical data of earthquakes with a recorded Intensity, little damage is expected from earthquake events. However, since the worst earthquake recorded in Pennsylvania was a magnitude 5.2, a worst-case scenario for this hazard would be if an earthquake of similar magnitude occurred in Pike County or near the border in an adjacent county, causing mild damage in populated areas.

<b>Table 4.3.2-2: Modified Mercalli Intensity Scale with associated impacts.</b>			
<b>SCALE</b>	<b>INTENSITY</b>	<b>DESCRIPTION OF EFFECTS</b>	<b>CORRESPONDING RICHTER SCALE MAGNITUDE</b>
<b>I</b>	<b>Instrumental</b>	Detected only on seismographs	<4.2
<b>II</b>	<b>Feeble</b>	Some people feel it	<4.2
<b>III</b>	<b>Slight</b>	Felt by people resting; like a truck rumbling by	<4.2
<b>IV</b>	<b>Moderate</b>	Felt by people walking	<4.2
<b>V</b>	<b>Slightly Strong</b>	Sleepers awake; church bells ring	<4.8
<b>VI</b>	<b>Strong</b>	Trees sway; suspended objects swing; objects fall off shelves	<5.4
<b>VII</b>	<b>Very Strong</b>	Mild alarm, walls crack, plaster falls	<6.1

<b>VIII</b>	<b>Destructive</b>	Moving cars uncontrollable, masonry fractures, poorly constructed buildings damaged	<6.9
<b>IX</b>	<b>Ruinous</b>	Some houses collapse, ground cracks, pipes break open	<6.9
<b>X</b>	<b>Disastrous</b>	Ground cracks profusely, many buildings destroyed, liquefaction and landslides widespread	<7.3
<b>XI</b>	<b>Very Disastrous</b>	Most buildings and bridges collapse, roads, railways, pipes and cables destroyed, general triggering of other hazards	<8.1
<b>XII</b>	<b>Catastrophic</b>	Total destruction, trees fall, ground rises and falls in waves	>8.1

Another way to express an earthquake's severity is to compare its acceleration to the normal acceleration due to gravity. Peak horizontal ground acceleration (PHGA) measures the strength of ground movements in this manner. PGHA is the percent of *g* (acceleration due to gravity) experienced during the earthquake or the rate in change of motion of the earth's surface during an earthquake as a percent of the established rate of acceleration due to gravity. In general, an acceleration of 10- to 15- percent of gravity is associated with structural damage to ordinary buildings not designed to withstand earthquakes, although soil conditions at individual sites will impact the amount of damage. The US Geological Survey's Earthquake Hazards Program places the PGHA value for Pike County at between 10 and 14 (USGS, 2008).

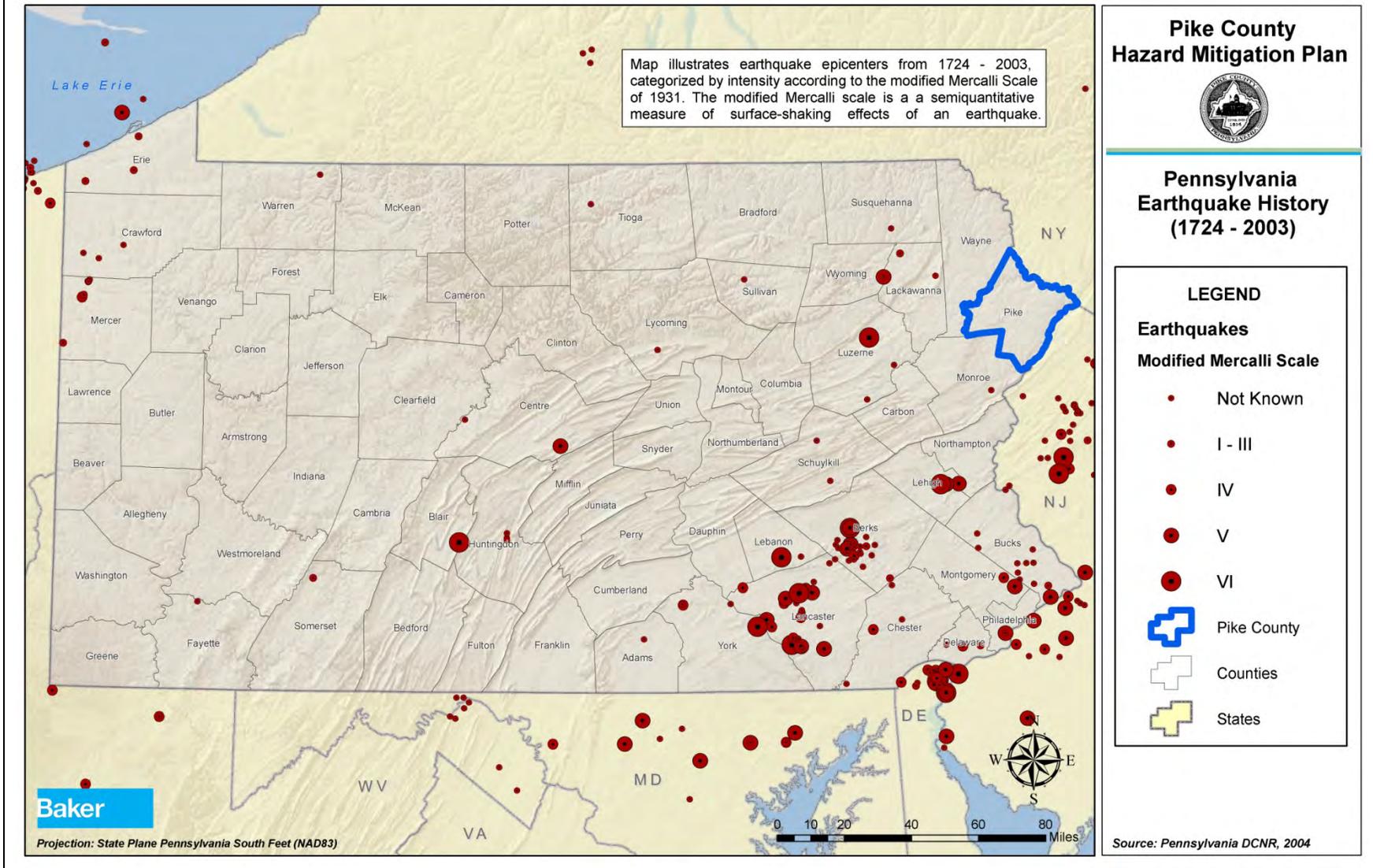
Environmental impacts of earthquakes can be numerous, widespread, and devastating, particularly if indirect impacts like economic impacts are considered. Some examples of these impacts are listed below, but these impacts are unlikely to occur in Pike County:

1. Induced tsunamis and flooding or landslides and avalanches;
2. Poor water quality;
3. Damage to vegetation; and
4. Breakage in sewage or toxic material containments.

**4.3.2.3. Past Occurrence**

According to records maintained by the Pennsylvania Department of Conservation and Natural Resources (DCNR), there have been no earthquakes recorded with epicenters in Pike County (Figure 4.3.2-2). However parts of the county probably experienced some of the shock waves of some minor earthquakes that have occurred around the region. There have been 292 events located within 100 miles of Pike County that took place in other Pennsylvania counties, New Jersey, and New York. It is important to note that some of these events may not have been true earthquakes but instead may have been the result of mine or quarry blasts. On the whole, though, these events have largely been minor events with magnitudes of less than 5.

Figure 4.3.2-2: Pike County and Pennsylvania earthquake history (DCNR, 2004).



#### 4.3.2.4. *Future Occurrence*

The probability of an earthquake event occurring is very low. Pike County does not sit on any fault lines; therefore it is reasonable to believe that the county will not experience earthquake damage anytime soon. Therefore the future occurrence of earthquakes can be considered *unlikely* as defined by the Risk Factor Methodology probability criteria (see Table 4.4-1).

#### 4.3.2.5. *Vulnerability Assessment*

Pike County has no earthquake building codes, therefore, should the county experience a substantial earthquake, it would be reasonable to expect that there could be property and infrastructure damage and a possibility of loss of life. Structural damage is anticipated to be minimal; however, the hydrologic changes in the area can be impacted. Domestic wells may go dry, while other, previously dry wells, may flow again as the bedrock geology shifts. Most likely, in the event of an earthquake, unanchored objects may be upset, but few damages are expected. Due to the low probability of damaging earthquakes in Pike County, mitigation for this threat should be adequately addressed through the implementation of the Uniform Construction Code and municipal building inspections/permitting.

### 4.3.3. **Flood, Flash Flood, Ice Jam**

#### 4.3.3.1. *Location and Extent*

A flood is a natural event for rivers and streams. Flooding occurs when excess water from snowmelt or rainfall fills a stream, causing it to overflow onto the stream banks and adjacent floodplains. Floodplains are lowlands adjacent to rivers, streams, and creeks that are subject to recurring floods. Flash flood conditions can result from a large amount of rainfall over a short time span. Similarly, a small amount of rain can also result in floods in locations where the soil is frozen or saturated from a previous wet period or if the rain is concentrated in an area of impervious surfaces such as large parking lots, paved roadways, or other densely developed areas. In addition, ice jams can occur when broken river ice caught in a narrow channel of a river or stream results in flooding.

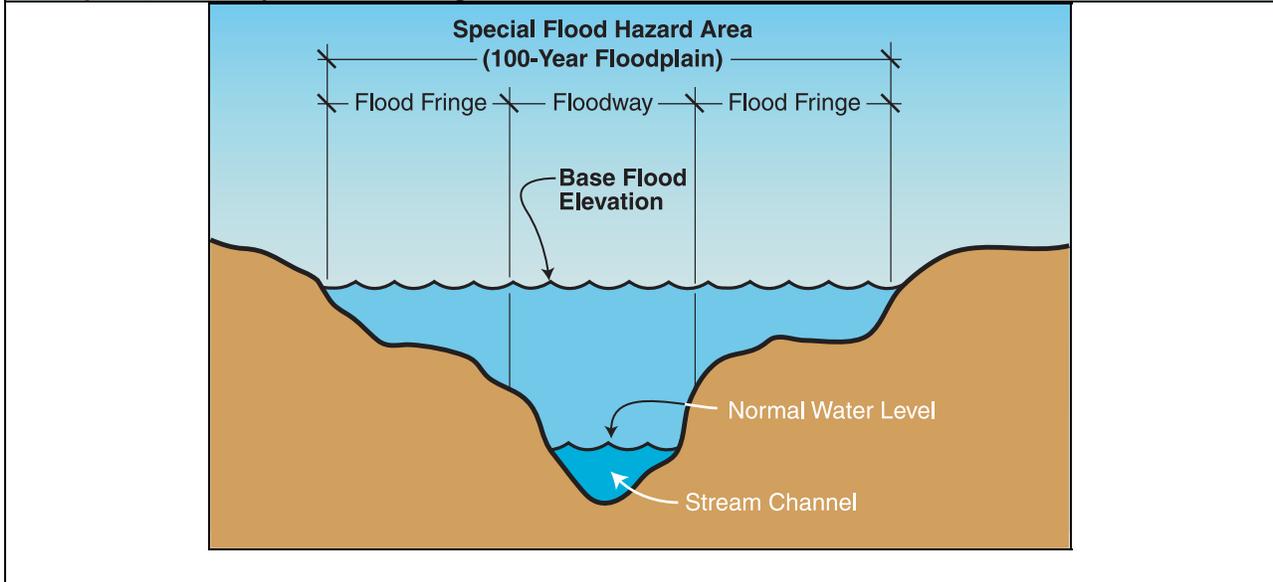
Pike County's biggest flooding threat remains along the Delaware River corridor and portions of the Lackawaxen River. Other major creeks within the County include the East Branch Wallenpaupack, Shohola, Billings, and Blooming Grove Creek. Lake Wallenpaupack also comprises a portion of the County's western border and is prone to flooding.

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

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

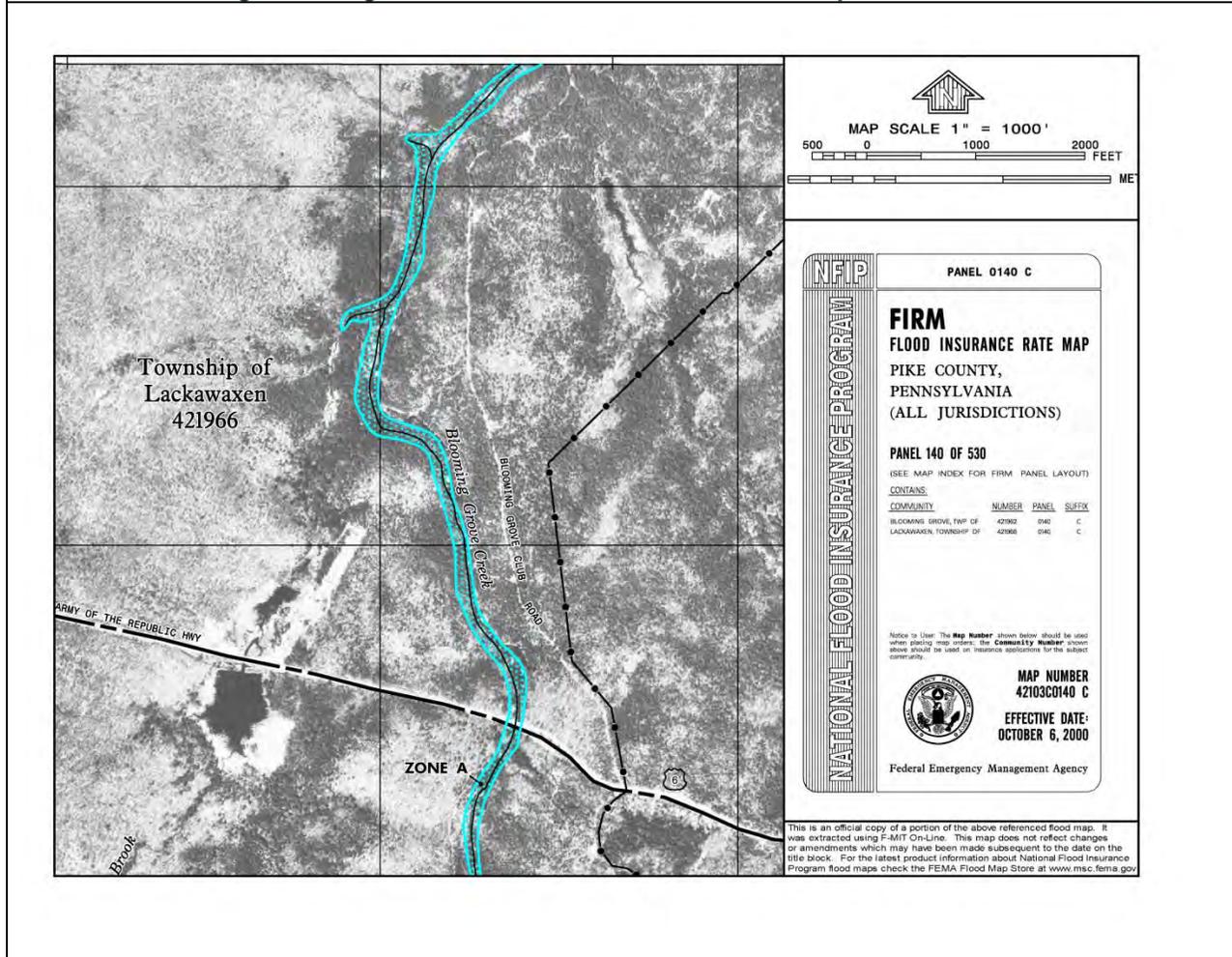
Insurance Program (NFIP), for which Flood Insurance Rate Maps (FIRM) are published, identifies the 1% annual chance flood. This 1% annual chance flood event is used to delineate the *Special Flood Hazard Area* (SFHA) and identify *Base Flood Elevations*. Figure 4.3.3-1 illustrates these terms. The SFHA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

**Figure 4.3.3-1: Diagram identifying Special Flood Hazard Area, 1% annual chance (100-Year) floodplain, floodway and flood fringe.**



Countywide DFIRMs were published for Pike County in October 2000. An example of the mapping products published is shown in Figure 4.3.3-2. FIRMs for the entire county 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. All thirteen municipalities in the County were determined to have special flood hazard areas (SFHA).

Figure 4.3.3-2: Preliminary FIRM Panel 42103C0140C, released October 6, 2000, showing flood hazard areas along Blooming Grove Creek in Lackawaxen Township.



Flood sources identified in the most recent mapping project include: Balliard Creek, Billings Creek, Blooming Grove Creek, the Delaware River, East Branch Wallenpaupack Creek, Grassy Brook, Lackawaxen River, Panther Creek, Saw Creek, Shohola Creek, Twin Lakes Creek, Walker Lake Creek, and Wallenpaupack Creek. Figure 4.3.3-3 shows the location of these watercourses and flood zones in Pike County. The location of approximate and detailed (including Base Flood Elevations) Special Flood Hazard Areas (1% annual chance zones) are shown.



### 4.3.3.2. *Range of Magnitude*

Floods are considered hazards when they affect people and property. Nationwide, hundreds of floods occur each year making flooding one of the most common hazards in all 50 states and U.S. territories. Flooding is common in Pennsylvania and can occur during any season of the year from a variety of sources. Every two to three years, serious flooding occurs along one or more of Pennsylvania's major rivers or streams, and it is not unusual for this to occur several years in succession. 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.

Several factors determine the severity of floods, including rainfall intensity and duration, topography, and ground cover. Additional conditions found within the County that can exacerbate the effects of floods include steep slopes, obstructions, hazardous materials facilities, and quantities of impervious surface. Steep slopes increase the velocity at which water travels over the land, increasing the speed of runoff entering the receiving body of water. Obstructions such as bridge abutments can block flood flow and trap debris, damming floodwaters, and potentially causing increased flooding upstream. Hazardous materials facilities that store hazardous materials in the 1-percent-annual-chance floodplain present potential sources of contamination during flood events. Paved surfaces that replace once-vegetated ground cover with buildings, concrete, and asphalt increase the surface runoff of stormwater. Floods in Pike County are also exacerbated when the New York City reservoirs located upstream along the Delaware River and the Neversink River in New York release water.

In Pike County there are seasonal differences in how floods are caused. In the winter and early spring (February to April), major flooding has occurred as a result of heavy rainfall on dense snow pack throughout contributing watersheds. Winter floods also have resulted from runoff of intense rainfall on frozen ground, and local flooding has been exacerbated by ice jams in streams and creeks. Ice jam floods 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.

Summer floods have occurred from intense rainfall on dry hard-packed or previously saturated soils. Summer thunderstorms deposit large quantities of rainfall over a short period of time have also produced flash 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.

A worst case scenario for flooding occurred in September 2004, following a very wet August that included some rain from the remnants of Tropical Storm Bonnie and Tropical Depression Charley. Remnants of Hurricane Frances dumped an average of 3 inches in the county on September 8th. On September 18th, Tropical Depression Ivan dumped 4 to 5 inches of rain over an already saturated county causing widespread damage. Rainfall for August and September averaged over 20 inches across the county. In addition to the damage caused by runoff, many streams flooded. Rainfall in the headwaters of the Delaware River was such that both the Lackawaxen River and Delaware River rose above flood stage causing the evacuation of many low lying areas, including portions of Westfall Township, Matamoras Borough, and Lackawaxen Township. Pike County qualified for both Public Assistance and Individual Assistance as part of the Presidential Declaration of Major Disaster. Over 300 property owners applied for Individual Assistance. Many roads remained closed for weeks while repairs were made. Particularly hard hit were Shohola, Lackawaxen, Palmyra, Greene, Dingman, Delaware and Lehman Townships. Two county-owned bridges – one in Shohola Township and one in Lehman Township - sustained major damage. A portion of the Twin Lakes road was washed away.

**4.3.3.3. Past Occurrence**

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

Table 4.3.3-1 lists flood event information from 1993 to 2010 obtained from the NCEM, including flood events that have resulted in disaster declarations. In fact, six of the twelve Presidential Disaster and Emergency Declarations affecting Pike County have been in response to hazard events related to flooding (see Table 4.2-1).

<b>Table 4.3.3-1: Flood and flash flood events impacting Pike County from 1993-2010 (NCEM, 2011). "Countywide" indicates several locations in the County were affected.</b>	
<b>DATE</b>	<b>LOCATION &amp; DESCRIPTION</b>
11/27/1993	Eastern Pennsylvania. Flood/flash Flood – General rainfall totals of 2.50 to 3.50 inches occurred throughout eastern Pennsylvania with numerous locations receiving 4.00 to 5.00 inches.
09/27/1994	Pike County. Flash/flash Flood – The worst damage was along the Sawkill Creek. Three households along the creek had to be evacuated in Milford.
01/19/1996	Pike County. Flash Flood.
09/08/1996	Milford, Pike County. Flash Flood – Serious street flooding was reported in Milford. Also, local law enforcement officials had to rescue 500 to 700 people from the agricultural fairgrounds as flood waters rapidly reached a depth of one to two feet.

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**Table 4.3.3-1: Flood and flash flood events impacting Pike County from 1993-2010 (NCDC, 2011). “Countywide” indicates several locations in the County were affected.**

DATE	LOCATION & DESCRIPTION
09/16/1999	Pike County. Flood – Water was seen rushing down hillsides where numerous road washouts were reported.
07/16/2000	Pike County. Urban/small stream flood – Minor flooding was reported in the southern portion of the county due to heavy thunderstorm rains.
06/26/2002	Shohola, Pike County. Flash Flood – Localized heavy thunderstorm rains caused numerous road washouts in Shohola Township. A state of emergency was declared in the township due to the washouts and also to trees and wires blocking the roads.
06/21/2003	Milford, Pike County. Flash Flood – State route 739 washed out in Dingman Township. Heavy rain fell during the afternoon into the evening of the 21st. Radar estimated 2 to 3 inches of rain fell. Rain also fell on the 20th making the ground saturated.
05/12/2004	Pecks Pond, Pike County. Flash flood – 2 to 3 feet of water on Route 402.
08/12/2004	Shohola, Pike County. Flash Flood – Numerous road washouts from flash flooding reported in the towns of Shohola, Lackawaxen, Porter, and Blooming Grove. This included the settlements of Lords Valley and Pecks Pond.
08/30/2004	Milford, Pike County. Flash Flood – Heavy rain caused numerous roads to flood just west of Milford. Rainfall amounts were 1.5 to 3 inches.
09/18/2004	Pike County. Flood/Flash Flood – Rainfall amounts were 4 to 7 inches which started on the 16th and continued into the 18th. This rain was from the remnants of hurricane Ivan. Most creeks and streams went out of their banks. In addition, the Delaware and Lackawaxen Rivers had major flooding. About a dozen rescues were performed. Over 100 roads were closed. The entire village of Newfoundland was evacuated. 6 bridges were closed. 2 businesses were closed.
04/02/2005	Pike County and Southern Wayne. Flood – Lackawaxen River at Hawley rose to its flood stage of 11 feet and crested, which was the fourth highest crest on record. The high crest was partially due to Lake Wallenpaupack making high releases. This was the second highest flood of record and the highest in almost 50 years.
04/03/2005	Pike County. Flood/Flash Flood – Storm from the Ohio Valley brought 2 to 4 inches of rain. Rivers and streams already had high flows due to rainstorm and snowmelt. Numerous roads, bridges and buildings were damaged. All streams and creeks were out of their banks. A state of emergency was declared in Matamoras. 100 homes were damaged. 15 homes had damage to the foundations and were condemned.
10/08/2005	Southeastern Pike County. Flash Flood – Streams and creeks went out of their banks. Many roads were closed. 6 to 10 inches of rain fell in this area.
06/28/2006	Milford, Pike County. Flood – Major flooding occurred along the Delaware River from Matamoras, PA and Port Jervis, NY south through the eastern border of Pike County.
03/11/2011	Dingmans Ferry. Flash Flood – Rainfall amounts ranged from 1.5 to 2 inches, with isolated amounts over 3 inches in Pike County resulting in road flooding throughout the County.

In addition, Pike County has record of several historical flood events prior to 1993. These are presented in Table 4.3.3-2.

**Table 4.3.3-2: Historical flood and flash flood events impacting Pike County.**

DATE	LOCATION & DESCRIPTION
August 1955	This event was the result of heavy rains associated with the remnants of Hurricanes Connie and Diane, which moved through the area less than one week apart. After a relatively dry summer,

<b>Table 4.3.3-2: Historical flood and flash flood events impacting Pike County.</b>	
<b>DATE</b>	<b>LOCATION &amp; DESCRIPTION</b>
	the two storms dumped close to 20 inches of rain over a wide area with some areas receiving more. The results were devastating, particularly along the Lackawaxen and Delaware Rivers and the many streams.
June 1972	The remnants of Hurricane Agnes produced very heavy rains across most of Pennsylvania including Pike County. There was some minor flooding within the county.
February 1981	A series of ice jams along both the Lackawaxen and Delaware Rivers caused significant flooding. Significant property damage occurred in Matamoras, Westfall and Lackawaxen and Port Jervis, NY. One Matamoras resident lost her life. Telephone and natural gas service were lost when lines that crossed the Delaware River were taken down or ruptured. (A near repeat occurred in 1982). Residents were eligible for SBA loans to rebuild.

Hurricane Irene and Tropical Storm Lee are two recent storm events that impacted Pike County resulting in rainfall and flooding. Hurricane Irene made landfall in the United States on August 27, 2011. It was downgraded to a tropical storm as it headed north and remnants of it affected Pike County with rainfall on August 28th. Tropical Storm Lee developed as a tropical disturbance in the Gulf of Mexico and was a particularly large and slow-moving storm. By the time it reached Pennsylvania, the storm had lost its tropical characteristics and merged with an upper level trough positioned over the eastern third of the US. The storm then stalled over Pennsylvania, bringing rainfall to the region.

While both storm events brought rainfall and flooding to Pike County, neither Hurricane Irene nor Tropical Storm Lee resulted in flooding and damages that surpassed other major storm events that have impacted Pike County and resulted in worst case scenarios or record flood levels. According to the Pike County EMA, the results of the two storms were minor in comparison to other storms that have affected the County. Hurricane Irene resulted in more of an impact to Pike County than Tropical Storm Lee. Many homes had flooded basements as a result of sump pump failure from periods of utility interruption during Irene. There were approximately 120 structures which were classified as minor, affected, or inaccessible due to damages resulting from the storm. No homes or businesses were destroyed or suffered major damage that would render the structures inhabitable for an extended period of time. In addition, while there was some damage to municipal roads and some municipal property, no public buildings or treatment facilities were damaged. There were however a few bridges or private culverts that were damaged by Irene. According to the Pike County EMA, there were few, if any reports of damage from Tropical Storm Lee. There were no utility interruptions in Pike County during Tropical Storm Lee and the rainfall was not as steady as it was with Hurricane Irene. Damages that did occur from Lee were only additional damage to roads that were already damaged by Hurricane Irene.

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Pike County was eligible for Public Assistance for Irene only and this was because of damage to roads and debris removal. The County was not eligible for Individual Assistance for either storm because all surveyed damage was considered minor under FEMA's guidelines.

Ice jams are a frequent occurrence on the Delaware River near Pike County and on the Lackawaxen River. There are no official local, state, or federal databases that track occurrences of ice jams; however, news articles have recorded several events. As mentioned above in Table 4.3.3-2, a February 1981 flood event was the result of a series of ice jams on the Lackawaxen and Delaware Rivers. In February of 1988, a 10-mile ice jam was reported on the Delaware River stretching from Dingmans Ferry to just north of Milford (The Morning Call, 1988). Backwater flooding occurred just north of the ice jam. In January of 1999, an ice jam that formed in New York moved down the Delaware River and lodged south of Milford (The Morning Call, 1999). It resulted in minor flooding.

In addition to the aforementioned past flood events, the NFIP identifies properties that frequently experience flooding. *Repetitive loss properties* are structures insured under the NFIP which have had at least two paid flood losses of more than \$1,000 over any ten year period since 1978. Table 4.3.3-3 displays repetitive loss properties by jurisdiction and type in Pike County. The County has 28 repetitive loss properties, 26 of which are single family homes. Westfall Township has the most repetitive loss properties (18), followed by Matamoras Borough (6), Lackawaxen Township (2), Dingman Township (1) and Porter Township (1).

<b>Table 4.3.3-3: Summary of the number and type of Repetitive Loss properties by municipality (PEMA, 2010; FEMA CIS, 2011).</b>							
MUNICIPALITY	TYPE					SUM OF REPETITIVE LOSS PROPERTIES	NUMBER OF REPETITIVE LOSSES
	NON-RESIDENTIAL	2-4 FAMILY	SINGLE FAMILY	CONDO	OTHER RESIDENT		
Blooming Grove Township	0	0	0	0	0	0	N/A
Delaware Township	0	0	0	0	0	0	N/A
<b>Dingman Township</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>2</b>
Greene Township	0	0	0	0	0	0	N/A
<b>Lackawaxen Township</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>6</b>
Lehman Township	0	0	0	0	0	0	N/A
<b>Matamoras Borough</b>	<b>0</b>	<b>0</b>	<b>6</b>	<b>0</b>	<b>0</b>	<b>6</b>	<b>14</b>
Milford Borough	0	0	0	0	0	0	N/A
Milford Township	0	0	0	0	0	0	N/A
Palmyra Township	0	0	0	0	0	0	N/A

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**Table 4.3.3-3: Summary of the number and type of Repetitive Loss properties by municipality (PEMA, 2010; FEMA CIS, 2011).**

MUNICIPALITY	TYPE					SUM OF REPETITIVE LOSS PROPERTIES	NUMBER OF REPETITIVE LOSSES
	NON-RESIDENTIAL	2-4 FAMILY	SINGLE FAMILY	CONDO	OTHER RESIDENT		
<b>Porter Township</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>4</b>
Shohola Township	0	0	0	0	0	0	N/A
<b>Westfall Township</b>	<b>2</b>	<b>0</b>	<b>16</b>	<b>0</b>	<b>0</b>	<b>18</b>	<b>39</b>
<b>TOTAL</b>	<b>2</b>	<b>0</b>	<b>26</b>	<b>0</b>	<b>0</b>	<b>28</b>	<b>65</b>

A property is considered a *severe repetitive loss property* either when there are at least four losses each exceeding \$5,000 or when there are two or more losses where the building payments exceed the property value. As of March 4, 2010, there was one severe repetitive loss property in Pike County. It is a single-family home located in Westfall Township.

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 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 Pike County are in the Regular Program. Table 4.3.3-4 lists the Pike County municipalities participating in the NFIP.

The minimum floodplain management requirements to be part of the Regular Program include:

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

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, no municipalities in Pike County participate in CRS.

<b>Table 4.3.3-4: Pike County Municipal Participation in the National Flood Insurance Program.</b>				
<b>COMMUNITY</b>	<b>PARTICIPATION STATUS</b>	<b>CID</b>	<b>INITIAL FIRM IDENTIFIED</b>	<b>CURRENT EFFECTIVE MAP DATE</b>
Blooming Grove Township	PARTICIPATING	421962	10/18/88	10/06/00
Delaware Township	PARTICIPATING	421963	12/04/85	10/06/00
Dingman Township	PARTICIPATING	421964	12/04/85	10/06/00
Greene Township	PARTICIPATING	421965	10/18/88	10/06/00

<b>Table 4.3.3-4: Pike County Municipal Participation in the National Flood Insurance Program.</b>				
<b>COMMUNITY</b>	<b>PARTICIPATION STATUS</b>	<b>CID</b>	<b>INITIAL FIRM IDENTIFIED</b>	<b>CURRENT EFFECTIVE MAP DATE</b>
Lackawaxen Township	PARTICIPATING	421966	08/04/88	10/06/00
Lehman Township	PARTICIPATING	421967	06/19/89	10/06/00
Matamoras Borough	PARTICIPATING	420758	01/05/89	10/06/00
Milford Borough	PARTICIPATING	420759	06/01/89	10/06/00
Milford Township	PARTICIPATING	422642	12/04/85	10/06/00
Palmyra Township	PARTICIPATING	421968	11/19/82	10/06/00
Porter Township	PARTICIPATING	422500	10/15/85	10/06/00
Shohola Township	PARTICIPATING	421969	07/15/88	10/06/00
Westfall Township	PARTICIPATING	421970	02/02/89	10/06/00

**4.3.3.4. Future Occurrence**

In Pike County, flooding occurs commonly and can occur during any season of the year. Therefore the future occurrence of floods in Pike 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 uses historical records to determine the probability of occurrence for different extents of flooding. The probability of occurrence is expressed in percentages as the chance of a flood of a specific extent occurring in any given year.

The NFIP recognizes the 1 percent -annual-chance flood, also known as the *base flood*, as the standard for identifying properties subject to federal flood insurance purchase requirements. A 1% annual chance flood is a flood which has a 1 percent chance of occurring over a given year. The DFIRMs identify areas subject to the 1- and 0.2 percent-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 the Flood Insurance Study Report.

Table 4.3.3-5 shows a range of flood recurrence intervals and associated probabilities of occurrence.

<b>Table 4.3.3-5: Recurrence intervals and associated probabilities of occurrence (USACE, 2011).</b>		
<b>FLOOD RECURRENCE INTERVAL</b>	<b>CHANCE OF OCCURRENCE IN ANY GIVEN YEAR (%)</b>	<b>FLOWS</b>
5 year	20	Extreme

10 year	10	Heavy to extreme
25 year	4	Moderate
50 year	2	Light to moderate
100 year	1	Light
500 year	0.2	Mild

**4.3.3.5. Vulnerability Assessment**

Because of the topography, climate and the fact that there are so many streams, ponds, lakes and rivers within the county, all municipalities in Pike County have areas that are flood prone. For purposes of assessing vulnerability, the County focused on community assets that are located in the 1%-annual-chance floodplain and 0.2%-annual-chance-floodplain. Please note that while other 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, 0.2%-annual chance flood hazard area, addressable structures, critical facilities and transportation routes within it, are included in **Appendix D**. These maps were created using FEMA Countywide digital data from the current effective FIRMS.

Table 4.3.3-6 displays the 2010 population per municipality that lives within the 1%-annual-chance floodplain and 0.2%-annual-chance-floodplain. Dingman Township has the most people living in the 1%-annual-chance floodplain (199) while Matamoras Borough has the most people living within the 0.2%-annual-chance-floodplain (1,935). In regard to percent of total population, Milford Borough has the largest percent (4%) living in the 1%-annual-chance floodplain while Matamoras Borough has over 78% of its total population living within the 0.2%-annual-chance-floodplain. Table 4.3.3-6 also shows the percent of population change in the 1%-annual-chance floodplain and 0.2%-annual-chance-floodplain between 2000 and 2010. The population that lives in the 1%-annual-chance floodplain grew by approximately 23% between 2000 and 2010 while the population that lives in the 0.2%-annual-chance-floodplain decreased by approximately 23% during that time frame.

Table 4.3.3-7 displays the total number of structures, manufactured housing units, and critical facilities intersecting the 1%-annual-chance floodplain and 0.2%-annual-chance floodplain along with the total number of structures, manufactured housing units, and critical facilities in each municipality. 695 structures (approximately 41.7% of all addressable structures) in the County are located in the 1%-annual-chance floodplain. Even more structures (997) are located in the 0.2%-annual-chance-floodplain however most of these are located in Matamoras Borough or Westfall Township. Porter and Westfall Townships each have over 100 structures located in the 1%-annual-chance floodplain and are the most vulnerable to flood losses. On the other end of the spectrum, Delaware Township, Milford Township and Matamoras Borough have less than 15 structures located in the 1%-annual-chance floodplain and are therefore least vulnerable to the 1%-annual-chance flood event.

Table 4.3.3-7 also displays the number of critical facilities that are located in the 1%-annual-chance floodplain and 0.2%-annual-chance floodplain by jurisdiction. Only 2 of 109 critical facilities are located in the 1%-annual-chance floodplain and 6 are located in the 0.2%-annual-chance-floodplain. Lehman and Westfall Townships contain the two critical facilities located in the 1%-annual-chance floodplain. Both Matamoras Borough and Westfall Township have 3 critical facilities located in the 0.2%-annual-chance-floodplain.

Table 4.3.3-7 also shows the number of manufactured housing units (e.g. mobile homes) that are located in the 1%-annual-chance floodplain and 0.2%-annual-chance-floodplain. A total of 33 of these homes are located in the 1%-annual-chance floodplain and 2 in the 0.2%-annual-chance-floodplain. Shohola Township has the most manufactured housing units in the 1%-annual-chance floodplain with 10.

*Pike County 2012 Hazard Mitigation Plan*

**Table 4.3.3-6: Pike County population vulnerability summary for flood hazards (U.S. Census 2010, 2000).**

COMMUNITY	2010 POPULATION	ESTIMATED 2010 POPULATION IN 1% ANNUAL CHANCE FLOOD ZONE	PERCENT OF 2010 POPULATION IN 1% ANNUAL CHANCE FLOOD ZONE	ESTIMATED 2010 POPULATION IN 0.2% ANNUAL CHANCE FLOOD ZONE	PERCENT OF 2010 POPULATION IN 0.2% ANNUAL CHANCE FLOOD ZONE	ESTIMATED 2000 POPULATION IN 1% ANNUAL CHANCE FLOOD ZONE	ESTIMATED 2000 POPULATION IN 0.2% ANNUAL CHANCE FLOOD ZONE	PERCENT POPULATION CHANGE IN 1% ANNUAL CHANCE FLOOD ZONE	PERCENT POPULATION CHANGE IN 0.2% ANNUAL CHANCE FLOOD ZONE
Blooming Grove Township	4,819	130	2.7%	0	0.0%	5	0	2500.0%	0%
Delaware Township	7,396	25	0.3%	0	0.0%	15	0	66.7%	0%
Dingman Township	11,926	199	1.7%	0	0.0%	242	0	-17.8%	0%
Greene Township	3,956	37	0.9%	0	0.0%	42	0	-11.9%	0%
Lackawaxen Township	4,994	47	0.9%	0	0.0%	111	0	-57.7%	0%
Lehman Township	10,663	100	0.9%	0	0.0%	62	0	61.3%	0%
Matamoras Borough	2,469	18	0.7%	1,935	78.4%	2	1,859	800.0%	4%
Milford Borough	1,021	41	4.0%	0	0.0%	44	0	-6.8%	0%
Milford Township	1,530	17	1.1%	0	0.0%	2	0	750.0%	0%
Palmyra Township	3,312	16	0.5%	0	0.0%	0	0	100.0%	0%
Porter Township	485	6	1.2%	0	0.0%	38	0	-84.2%	0%
Shohola Township	2,475	63	2.5%	0	0.0%	80	0	-21.3%	0%
Westfall Township	2,323	8	0.3%	866	37.3%	270	416	-97.0%	108.2%
<b>Total</b>	<b>57,369</b>	<b>707</b>	<b>1.2%</b>	<b>2,801</b>	<b>4.9%</b>	<b>913</b>	<b>2,275</b>	<b>-22.6%</b>	<b>23.1%</b>

Table 4.3.3-7: Structure and critical facility vulnerability summary for flood hazards.

MUNICIPALITY	TOTAL ADDRESS-ABLE STRUCTURES	TOTAL ADDRESS-ABLE STRUCTURES IN 1% ANNUAL CHANCE FLOOD ZONE	TOTAL ADDRESS-ABLE STRUCTURES IN 0.2% ANNUAL CHANCE FLOOD ZONE	TOTAL CRITICAL FACILITIES	TOTAL CRITICAL FACILITIES IN 1% ANNUAL CHANCE FLOOD-PLAIN	TOTAL CRITICAL FACILITIES IN 0.2% ANNUAL CHANCE FLOOD-PLAIN	TOTAL MANUFACTURED HOMES*	TOTAL MANUFACTURED HOMES IN 1% ANNUAL CHANCE FLOOD PLAIN*	TOTAL MANUFACTURED HOMES IN 0.2% ANNUAL CHANCE FLOOD PLAIN*
Blooming Grove	4,269	24	0	19	0	0	86	1	0
Delaware Township	4,501	15	0	10	0	0	14	0	0
Dingman Township	7,149	45	1	13	0	0	1778	2	0
Greene Township	3,363	55	0	8	0	0	563	7	0
Lackawaxen Township	5,076	95	0	10	0	0	143	5	0
Lehman Township	5,051	97	0	10	1	0	18	5	0
Matamoras Borough	1,007	7	759	5	0	3	0	0	0
Milford Borough	591	28	1	9	0	0	0	0	0
Milford Township	837	14	0	6	0	0	1	0	0
Palmyra Township	4,457	17	0	12	0	0	260	0	0
Porter Township	1,066	117	0	1	0	0	48	0	0

Table 4.3.3-7: Structure and critical facility vulnerability summary for flood hazards.

MUNICIPALITY	TOTAL ADDRESS-ABLE STRUCTURES	TOTAL ADDRESS-ABLE STRUCTURES IN 1% ANNUAL CHANCE FLOOD ZONE	TOTAL ADDRESS-ABLE STRUCTURES IN 0.2% ANNUAL CHANCE FLOOD ZONE	TOTAL CRITICAL FACILITIES	TOTAL CRITICAL FACILITIES IN 1% ANNUAL CHANCE FLOOD-PLAIN	TOTAL CRITICAL FACILITIES IN 0.2% ANNUAL CHANCE FLOOD-PLAIN	TOTAL MANUFACTURED HOMES*	TOTAL MANUFACTURED HOMES IN 1% ANNUAL CHANCE FLOOD PLAIN*	TOTAL MANUFACTURED HOMES IN 0.2% ANNUAL CHANCE FLOOD PLAIN*
Shohola Township	3,472	39	1	5	0		1906	10	0
Westfall Township	1,205	142	235	11	1	3	187	3	2
<b>TOTAL</b>	<b>42,044</b>	<b>695</b>	<b>997</b>	<b>119</b>	<b>2</b>	<b>6</b>	<b>5,004</b>	<b>33</b>	<b>2</b>

\*Note that HAZUS-MH MR4 was used to estimate the number of manufactured homes in the County and verified by County representatives for accuracy.

Additional information on flood vulnerability and losses in Pike County, including the 1 percent annual chance flood event results from HAZUS, is provided in Section 4.4.3, Potential Loss Estimates.

Pike County's biggest life threat remains along the Delaware River corridor and portions of the Lackawaxen River. Much of the commercial development in the county has taken place along the Delaware River area of Westfall Township as is evident by the fact that Westfall has the most structures in the SFHA. Other areas of Westfall Township not in the SFHA may not flood but access to it may be cut off. During the floods of 2004, 2005 and 2006, Route 6 & 209 near the Milford Senior Care and near Westfall Towne Center became flooded. As the water continued to rise, much of the 4-lane section of Route 6 & 209 near the Welcome Center was also under water.

Another area that poses a problem is along the Lackawaxen River. The only access to these residents in many places is by using the Towpath Road, which runs along the river. During the August 2004, April 2005 and June 2006 storms, parts of this road and Route 590 were washed out or inaccessible.

Additionally, the PPL hydroelectric power generation facility at Lake Wallenpaupack has the potential for serious flooding impacts to downstream communities when the facility is forced to open the flood gates during high water periods. The normally dry Wallenpaupack Creek bed below the dam carries a full water flow during these releases and empties into the Lackawaxen River downstream. PPL also continues its normal generation schedule with discharge from the facility directly into the Lackawaxen River although the company is working to adjust its normal generation schedule to account for this. To reduce vulnerability, PPL distributed weather radios to residents that live below the Wallenpaupack Dam in both Wayne and Pike Counties as a means to get public warnings out on possible problems at the dam.

As a result of the floods of 2004, 2005, and 2006 several municipalities completed mitigation actions to reduce their vulnerability to future floods. For example, both Matamoras Borough and Lackawaxen Township installed warning sirens and Matamoras put an emergency radio station in operation to advise people what to do when the sirens go off. There was also an emergency backup generator installed at the Matamoras/Westfall Emergency Operations Center which supplies backup power to the police station for the Eastern Pike Regional Police Department.

The County is working to reduce the risk of flooding attributed to increases in impervious surfaces by creating a countywide Act 167 Stormwater Management Plan. Act 167 plans require municipalities to adopt stringent stormwater management ordinances that aim to minimize additional flows to local streams and creeks during storm events. Through the use of best management practices (BMPs) and limits on discharge rates, these new ordinances should help to prevent increases in flooding problems but will not solve already existing problems. The plans themselves contain a plethora of information concerning land use and hydrology in the watershed. Act 167 plans include detailed obstruction evaluations (including size, shape, and ability to pass various storm events), municipal surveys regarding flooding problem areas, frequency, extent of damage, and speculation as to the cause of these problems. The data also

includes information on existing and proposed stormwater management facilities. Pike County is currently completing Phase II of its countywide Act 167 plan.

In addition, as the county population has grown and development has occurred, local zoning and flood plain ordinances have helped reduce the number of new threats. However, these ordinances could be strengthened.

### **4.3.4. Hurricane, Tropical Storm, Nor'easter**

#### **4.3.4.1. Location and Extent**

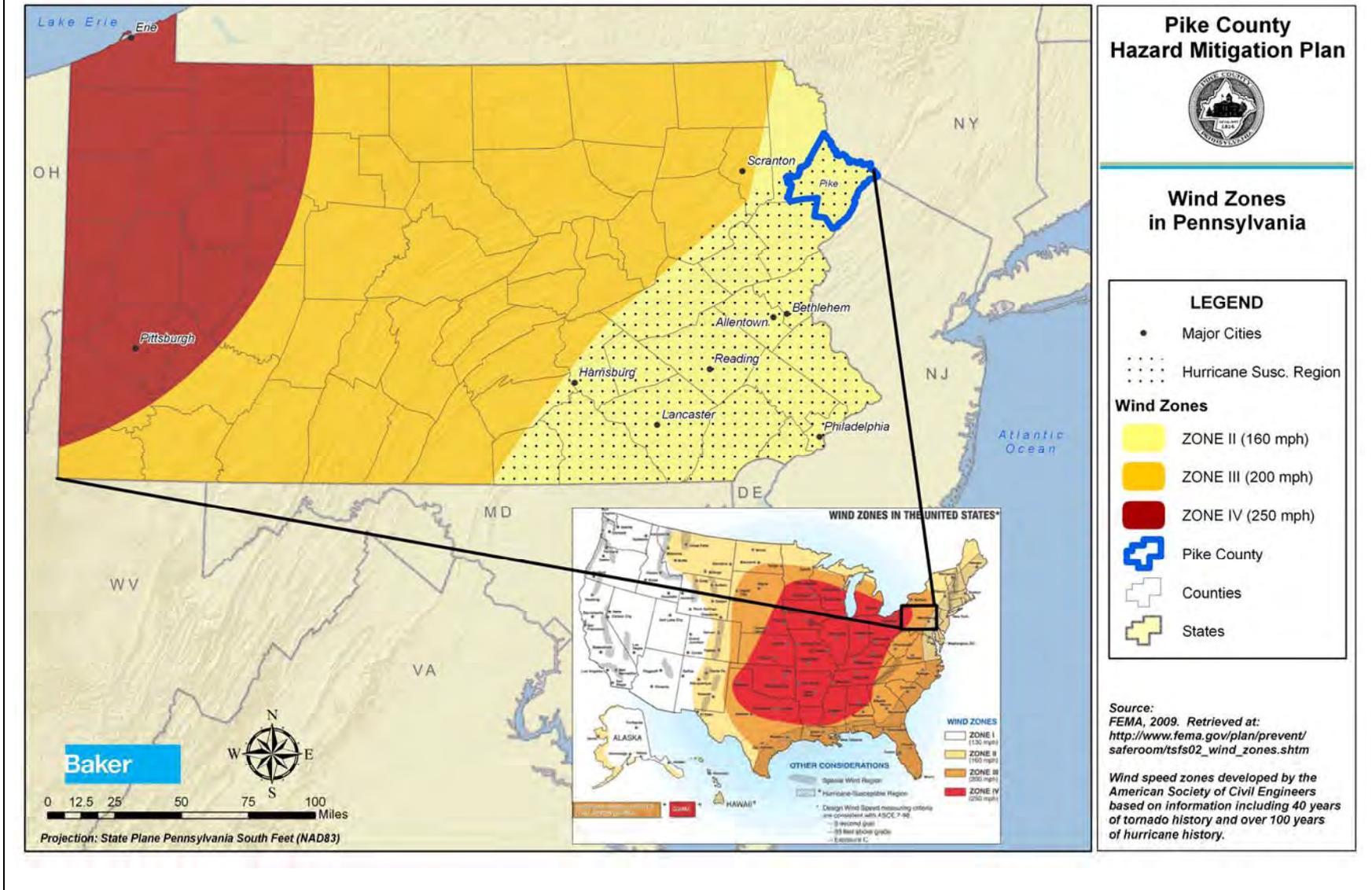
A hurricane is a type of tropical cyclone, which is a generic term for a cyclonic, low-pressure system that features strong winds and precipitation. Cyclones with maximum sustained winds of less than 39 miles per hour (mph) are called tropical depressions. Additionally, a tropical storm is a cyclone with maximum sustained winds between 39-74 mph. Tropical storms impacting Pike County develop in tropical or sub-tropical waters found in the Atlantic Ocean, Gulf of Mexico, or Caribbean Sea. These storms sometimes develop into hurricanes with wind speeds in excess of 74 mph. Nor'easters are also coastal storms and they travel from the south to the northeast.

While Pike County is located about 60 miles from the Atlantic Coast, coastal storms can track inland causing heavy rainfall and 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 Pike County are equally subject to the impacts of hurricanes, tropical storms, and nor'easters. Areas in Pike County which are subject to flooding, wind, and winter storm damage are particularly vulnerable.

Figure 4.3.4-1 shows wind speed zones developed by the American Society of Civil Engineers based on information including 40 years of tornado history and over 100 years of hurricane history. It identifies wind speeds that could occur across the United States to be used as the basis for design and evaluation of the structural integrity of shelters and critical facilities.

Pike County falls within Zone II, meaning design wind speeds for shelters and critical facilities should be able to withstand a 3-second gust of up to 160 mph, regardless of whether the gust is the result of a tornado, hurricane, tropical storm, or windstorm event. Pike County also falls wholly within the identified Hurricane Susceptibility Region.

Figure 4.3.4-1: Design Wind Speed Zones for Pike County (FEMA, 2009).



4.3.4.2. *Range of Magnitude*

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

The impact tropical storm or hurricane events have on an area is typically measured in terms of wind speed. Expected damage from hurricane force winds is measured using the Saffir-Simpson Scale. The Saffir-Simpson Scale categorizes hurricane intensity linearly based upon maximum sustained winds, barometric pressure, and storm surge potential 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 percent of all tropical cyclones making landfall, they account for over 70 percent of the damage in the United States. The likelihood of these damages occurring in Pike County is assessed in Section 4.3.4.4, *Future Occurrence*.

**Table 4.3.4-1: Saffir-Simpson Scale categories with associated wind speeds and damages (NHC, 2009).**

STORM CATEGORY	WIND SPEED (mph)	DESCRIPTION OF DAMAGES
1	74-95	MINIMAL: Damage is limited primarily to shrubbery and trees, unanchored mobile homes, and signs. No significant structural damage.
2	96-110	MODERATE: Some trees are toppled, some roof coverings are damaged, and major damage occurs to mobile homes. Some roofing material, door, and window damage.
3	111-130	EXTENSIVE: Some structural damage to small residences and utility buildings, with a minor amount of curtain wall failures. Mobile homes are destroyed. Large trees are toppled. Terrain may be flooded well inland.
4	131-155	EXTREME: Extensive damage to roofs, windows, and doors; roof systems on small buildings completely fail. More extensive curtain wall failures. Terrain may be flooded well inland.
5	>155	CATASTROPHIC: Complete roof failure on many residences and industrial buildings. Some complete building failures with small utility buildings blown over or away. Massive evacuation of residential areas may be required.

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 Pike County 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 case hurricane, tropical storm, or nor'easter event in Pike County was tropical depression Ivan. On September 18, 2004 Ivan dumped 4-5 inches of rain on the County which had experienced heavy rainfall from Hurricane Frances just 10 days earlier. Rainfall in the headwaters of the Delaware River was such that both the Lackawaxen River and Delaware River rose above flood stage causing the evacuation of many low lying areas, including portions of Westfall Township, Matamoras and Lackawaxen Township. Pike County qualified for both Public Assistance and Individual Assistance as part of the Presidential Declaration of Major Disaster. Over 300 property owners applied for Individual Assistance. Many roads remained closed for weeks while repairs were made. Particularly hard hit were Shohola, Lackawaxen, Palmyra, Greene, Dingman, Delaware and Lehman Townships. Two county-owned bridges – one in Shohola Township and one in Lehman Township - sustained major damage. A portion of the Twin Lakes road was washed away.

**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 or within 30 nautical miles of Pike County. Typically when these storms reach Pike County, they have lost their hurricane speed winds, so structural damage is usually not as bad as coastal communities' experience.

<b>Table 4.3.4-2: Previous tropical storm events with centers of circulation within 30 nautical miles of Pike County.</b>		
<b>YEAR</b>	<b>EVENT</b>	<b>STRENGTH IN/NEAR PIKE COUNTY</b>
1994	Beryl	Tropical Storm
1949	Not Named	Hurricane
1939	Not Named	Hurricane
1929	Not Named	Hurricane
1899	Not Named	Hurricane
1878	Not Named	Hurricane

It is important to note that a number of hurricane, tropical storm, and nor'easter events have impacted the County without tracking through or near it; these storm events include Hurricanes Agnes (1972), Floyd (1999), Henri/Isabel (2003), Diane (1955), and Tropical Depression Ivan (2004). Each of these storm events resulted in a Presidential or Gubernatorial Disaster Declaration for Pike County.

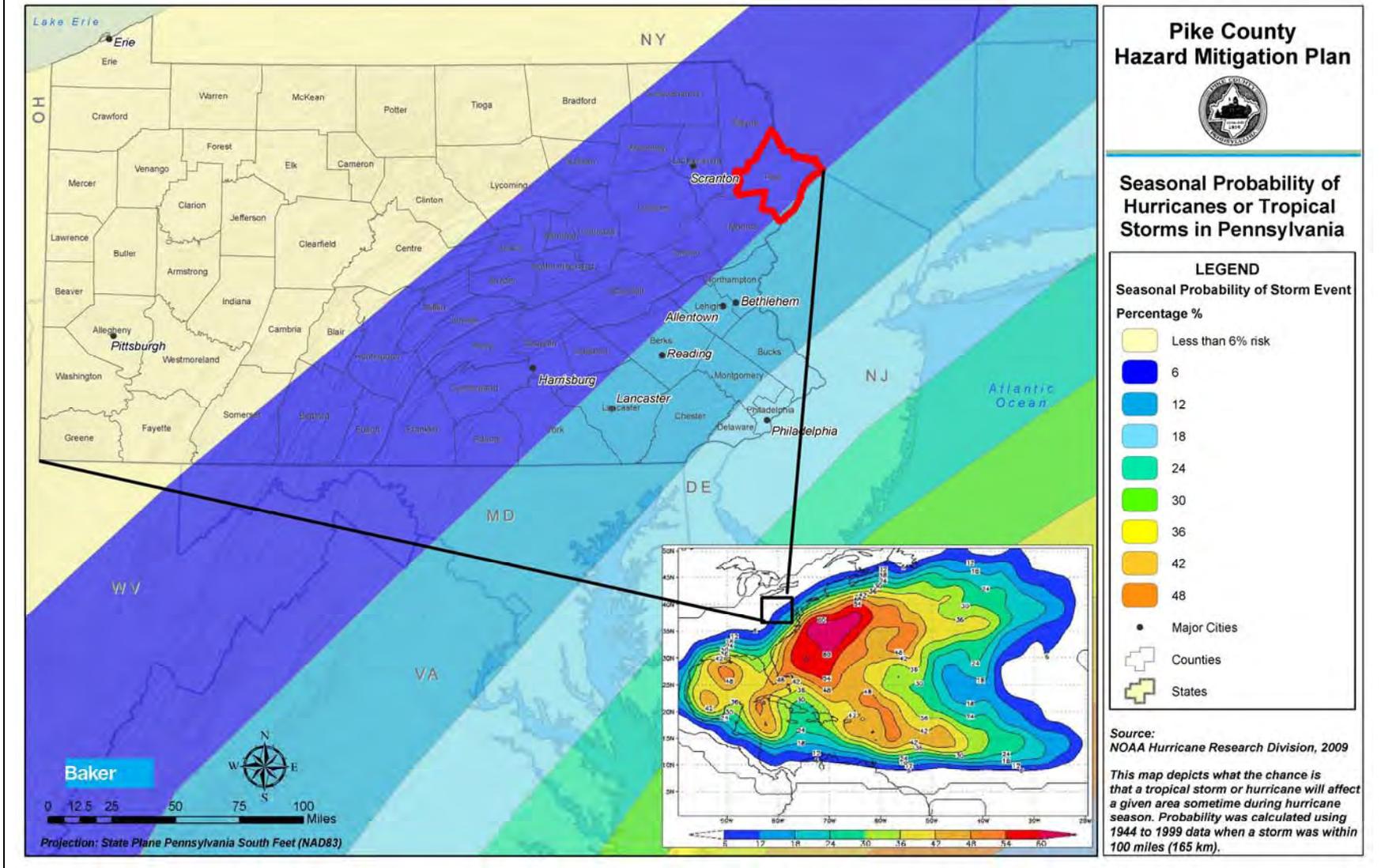
In addition, Pike County, as well as many other counties in Pennsylvania, recently experienced impacts of two other large storm events, Hurricane Irene and Tropical Storm Lee. These two storm events are described in more detail in Section 4.3.3.3. Primary impacts of these two storms were related to flooding and little damage occurred as a result of wind.

**4.3.4.4. Future Occurrence**

Although hurricanes and tropical storms can cause flood events consistent with 1 percent- and 2 percent- level frequency, their probability of occurrence is measured relative to wind speed. 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 approximately a 6 to 12 percent chance of experiencing a tropical storm or hurricane event between June and November of any given year in the County. This translates to a future occurrence of *possible*, as defined by the Risk Factor Methodology probability criteria (see Table 4.4-1).

Figure 4.3.3-2: Seasonal Probability of a hurricane or tropical storm affecting Pike County (NOAA Hurricane Research Division, 2009).



### 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 4.3.6.5. The County is also vulnerable to severe winter weather impacts caused by Nor'easters which are evaluated in 4.3.8.5.

### 4.3.5. **Pandemic**

#### 4.3.5.1. *Location and Extent*

Pandemic is defined as a disease affecting or attacking the population of an extensive region which may include several countries and/or continents. It is further described as extensively epidemic. Generally, pandemic events cause sudden, pervasive illness in all age groups on a global scale, though some age groups may be more at risk. As such, pandemic events cover a wide geographic area and can affect large populations, including the entirety of Pike County, depending on the disease. The exact size and extent of the infected population is dependent upon how easily the illness is spread, the mode of transmission, and the amount of contact between infected and non-infected persons.

Two pandemics of concern in Pike County include a pandemic influenza outbreak or a West Nile Virus outbreak. 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 Pike County every year from 2000-2004 and 2006-2007. It has not been detected in the County since 2007. The virus is highly temporal with most cases occurring between April and October (PADEP-WNCP, 2009).

Influenza, also known as "the flu", is a contagious disease that is caused by the influenza virus and typically presents with fever, headache, sore throat, cough, and muscle aches. 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. Influenza spreads via the air in crowded populations in enclosed spaces, and it may persist on surfaces and in the air. Individuals are communicable for 3-5 days after clinical onset.

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. As stated in the Pennsylvania Department of Health Influenza Pandemic Response Plan, "an influenza pandemic is inevitable and will probably give little warning," underscoring the importance of planning for this hazard (PA Department of Health, 2005).

### 4.3.5.2. *Range of Magnitude*

The impact of a pandemic ranges from, on the low end, large numbers of individuals being sick for short periods of time to, on the high end, a situation in which so many people are simultaneously ill that the County is unable to maintain its continuity of government, schools closed, and economic activity grinds to a halt. In the worst cases, the County could expect over 100 deaths. However, the magnitude of a pandemic in Pike County will range significantly depending on the aggressiveness of the disease 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 Pike County in 2000, there were no positive human cases or human deaths. If the virus were to occur in Pike County, it is typically more serious in older adults.

Pandemic influenza is more easily transmitted person-to-person than West Nile Virus, 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 4.3.5-2). The 1918 Spanish flu pandemic remains the worst-case pandemic event on record. 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 Department of Health and Human Services, 2010).

In contrast, the severity of illness from the 2009 H1N1 influenza flu virus has 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 and early 2010 have recovered without needing medical treatment. However, the virus has resulted in many deaths, one of which occurred in Pike County. According to the CDC, about 70% of those who have been hospitalized with the 2009 H1N1 flu virus in the United States have belonged to a high risk group (CDC, 2009).

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.

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

**4.3.5.3. Past Occurrence**

West Nile Virus arrived in the United States in 1999 and was first detected in Pike County in 2000 when mosquito pools, dead birds and/or horses tested positive for the virus. Since then, the number of positive counties in Pennsylvania, human cases, and West Nile deaths has fluctuated with the temperature and precipitation each year. Table 4.3.5-1 illustrates the virus's overall cases, human cases, and mortality from 2001-2010. In Pike County, there have been birds and mosquitoes that have tested positive for the virus, however no positive human cases and therefore no human deaths.

<b>Table 4.3.5-1: Previous West Nile Virus occurrences in Pike County from 2001-2010 (PA West Nile Control Project, 2011).</b>			
<b>YEAR</b>	<b>NUMBER OF POSITIVE CASES</b>	<b>POSITIVE HUMAN CASES</b>	<b>HUMAN DEATHS</b>
2001	1	0	0
2002	4	0	0
2003	13	0	0
2004	1	0	0
2005	0	0	0
2006	1	0	0
2007	1	0	0
2008	0	0	0
2009	0	0	0
2010	0	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 4.3.5-2

<b>Table 4.3.5-2: List of previous significant outbreaks of influenza over the past century (Global Security, 2009; World Health Organization, 2009).</b>		
<b>DATE</b>	<b>PANDEMIC NAME/SUBTYPE</b>	<b>WORLDWIDE DEATHS (APPROXIMATE)</b>
1918-1920	Spanish Flu / H1N1	50 million
1957-1958	Asian Flu / H2N2	1.5-2 million
1968-1969	Hong Kong Flu / H3N2	1 million
2009-2010	Swine Flu / 2009 H1N1	18,036

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 1968 with deaths peaking between December 1968 and January 1969 (Global Security, 2009). More recently, 43 cases of 2009 H1N1 have been confirmed in Pike County resulting in 1 death.

#### 4.3.5.4. *Future Occurrence*

Future occurrences of pandemic West Nile Virus are unclear. Instances of the 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 occur due to climate change, the range of the virus in the United States will grow (Epstein, 2001).

As with West Nile Virus, the precise timing of pandemic influenza is uncertain. Based on historical events, Pike County is expected to experience pandemic influenza outbreaks approximately every 11 to 41 years. 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 (US Health and Human Services, 2009). As a result, future pandemic events are considered *unlikely* as defined by the Risk Factor Methodology probability criteria (see Table 4.4-1).

#### 4.3.5.5. *Vulnerability Assessment*

In general, jurisdictions that are more densely populated are more vulnerable to pandemic disease when the disease is directly spread from human to human, but every jurisdiction in the County has some vulnerability to this kind of disease threat.

Should a pandemic reach the County, the County’s doctors and other health professionals should expect to see additional outpatient visits. There are no hospitals located within the county so if a pandemic that would require hospitalization were to occur, Pike County residents would have to rely on facilities either in Port Jervis, NY, Newton, NJ, Stroudsburg, PA, Honesdale, PA or Scranton, PA.

In addition, if a pandemic were to affect a nearby county, Pike County may expect to see an influx of people entering the County. This will increase the vulnerability of Pike County’s current residents.

Pike County also experiences high tourism attraction, particularly from more metropolitan areas. Tourists entering the County could be carrying a virus which could spread to current residents and cause a potential outbreak.

### 4.3.6. **Tornado and Windstorm**

#### 4.3.6.1. *Location and Extent*

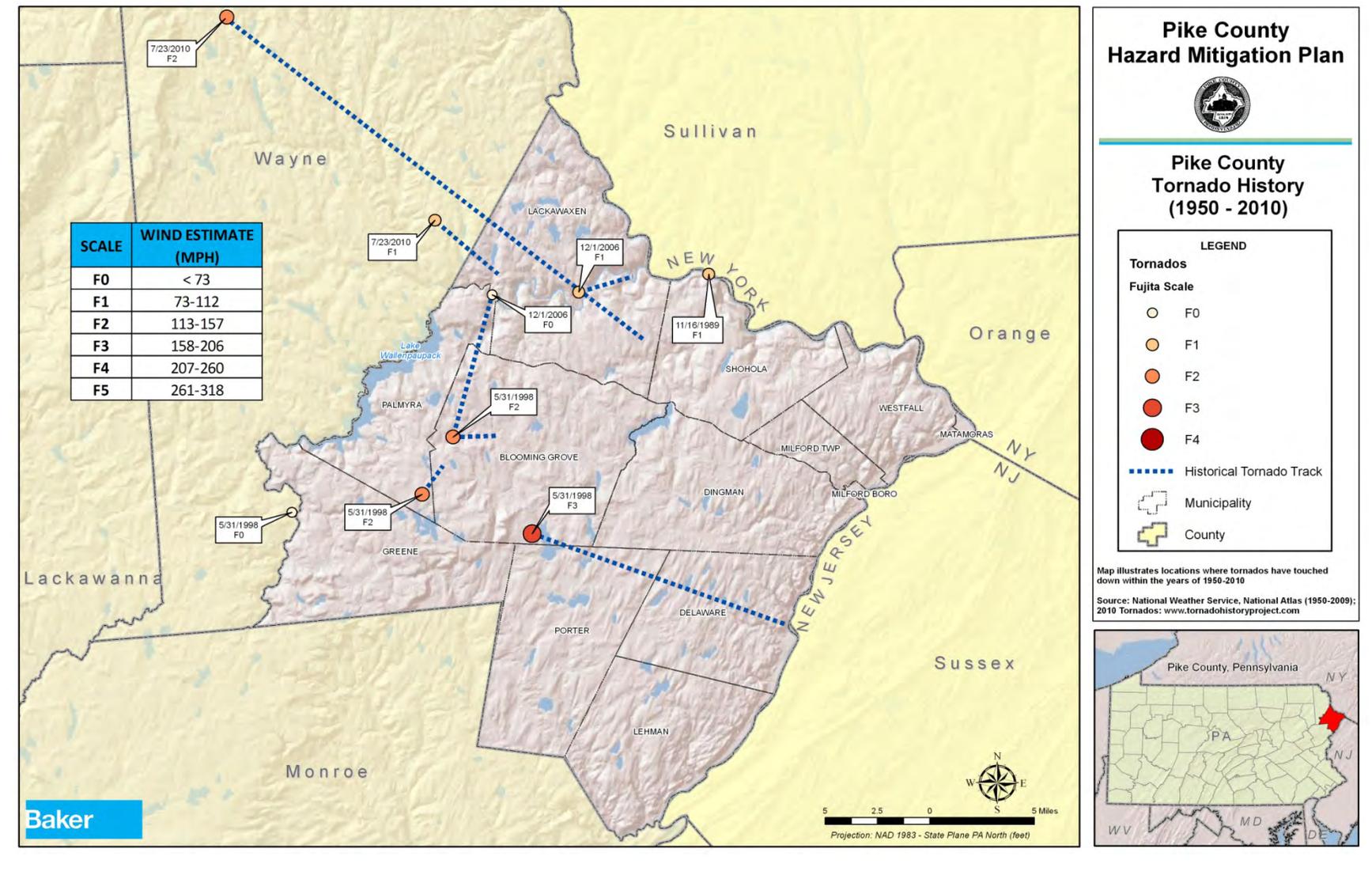
Tornadoes and wind storms can occur throughout Pike County though events are usually localized. However, severe thunderstorms may result in conditions favorable to the formation of numerous or long-lived tornadoes. Tornadoes can occur at any time during the day or night, but are most frequent during 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 a common occurrence, especially during the spring and summer months as warm and cold fronts collide and are experienced on a more region-wide scale. While such winds usually accompany tornadoes, straight-lined 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.

Figure 4.3.4-1 in section 4.3.4 shows that most of the County is located in the Zone III wind zone. Figure 4.3.6-1 depicts that tornado activity has occurred throughout the entire county.

Figure 4.3.6-1: Tornadoes that have touched down in Pike County between 1950 and 2008 (NWS via National Atlas, 1950-2004; Tornado History Project).



4.3.6.2. *Range of Magnitude*

Each year, tornadoes account for \$1.1 billion in damages and cause over 80 deaths nationally (NCAR, 2001). 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 light to severe 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 4.3.6-1, 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 4.3.6-1 since the magnitude of previous tornado occurrences is based on the F-Scale.

Table 4.3.6-1: 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	<b>Minor damage:</b> Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over. Confirmed tornadoes with no reported damage (i.e., those that remain in open fields) are always rated EF0.
EF1	86-110	F1	<b>Moderate damage:</b> Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
EF2	111–135	F1-F2	<b>Considerable damage:</b> Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
EF3	136–165	F2-F3	<b>Severe damage:</b> Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown;

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			structures with weak foundations blown away some distance.
<b>EF4</b>	166–200	F3	<b>Devastating damage:</b> Well-constructed houses and whole frame houses completely leveled; cars thrown and small missiles generated.
<b>EF5</b>	>200	F3-F6	<b>Extreme damage:</b> 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 4.3.4-1 in section 4.3.4 shows wind speed zones developed by the American Society of Civil Engineers based on information including 40 years of tornado history and over 100 years of hurricane history. It identifies wind speeds that could occur across the United States to be used as the basis for design and evaluation of the structural integrity of shelters and critical facilities.

Pike County falls within Zone III, meaning design wind speeds for shelters and critical facilities should be able to withstand a 3-second gust up to 160 mph, regardless of whether the gust is the result of a tornado, hurricane, tropical storm, or windstorm event. Therefore, these structures should be able to withstand speeds experienced in an EF3 tornado.

Since tornado events are typically localized, environmental impacts are rarely widespread. However, where these events occur, severe damage to plant species is likely. This includes loss of trees and an increased threat of wildfire in areas where dead trees are not removed. Hazardous material facilities should meet design requirements for the wind zones identified in Figure 4.3.4-1 in order to prevent release of hazardous materials into the environment.

A worst case scenario for tornados occurred on May 31, 1998 when within about a 3 hour stretch from 7 to 10 pm, four different tornadoes affected the County. Pike County was included in a Presidential Disaster Declaration for Individual Assistance for these tornadoes. These tornadoes included:

- An F1 tornado touched down on the border of Pike County and Wayne County in the Greene Township area. Damage was limited to numerous downed trees.
- An F2 tornado touched down in Blooming Grove Township in the Madden Road area. Damage included downed trees, blocked roads and severe structural damage to one house.
- An F2 tornado touched down in the Greene Township area of Promised Land State Park. Damage included thousands of downed trees, blocked roads and downed utility lines and poles. Many homes received minor damage. Numerous cabins within the state park were either damaged or destroyed.
- An F3 tornado touched down in Porter Township along Rt. 402 near Pecks Pond. This storm traveled the greatest distance and eventually ended in Delaware Township near Camp Speers. It downed thousands of trees and power lines, blocking numerous roads, damaged vehicles and damaged or destroyed numerous houses and buildings.

Particularly hard hit was the Blue Heron Lake area, where thirteen homes were damaged with four being totally destroyed. Numerous houses in Marcel Lake Estates also received some type of damage. Estimated damage for this F3 tornado was \$1 million (NCDC, 2011).

**4.3.6.3. Past Occurrence**

Tornadoes have occurred in all seasons and all regions of Pennsylvania, but the northern, western, and southeastern portions of the Commonwealth have been struck more frequently. A list of tornado events that have occurred in Pike County between 1950 and 2011 is shown in Table 4.3.6-2 with an associated Fujita Tornado Scale magnitude. A map showing the approximate location of previous events is included in Figure 4.3.6-1.

<b>Table 4.3.6-2: Previous tornado events between 1950 and 2011 in Pike County (NCDC, 2011).</b>					
<b>LOCATION</b>	<b>DATE</b>	<b>ESTIMATED LENGTH</b>	<b>ESTIMATED WIDTH</b>	<b>MAGNITUDE</b>	<b>ESTIMATED PROPERTY DAMAGE (\$)</b>
*Sullivan County, NY	11/16/80	1.50 miles	200 yards	F1	25,000,000
Blooming Grove	05/31/98	2.00 miles	550 yards	F2	200,000
Blooming Grove	05/31/98	3.00 miles	200 yards	F2	400,000
Pecks Pond	05/31/98	20.00 miles	200 yards	F3	1,000,000
Greentown	05/31/98	0.30 miles	30 yards	F0	40,000
Kimbles	12/01/06	7.00 miles	100 yards	F0	20,000
Rowland	12/01/06	5.00 miles	200 yards	F1	20,000
*Wayne County	07/23/10	3.00 miles	100 yards	F1	50,000
*Wayne County	07/23/10	17.00 miles	400 yards	F2	100,000
*Tornado did not originate in Pike County but tracked into the County					

Pike County also has record of a June 1999 storm that crossed Pike County producing a small tornado that downed trees and utility lines from Lake Wallenpaupack to Matamoras along Route 6. Structural damage occurred in Blooming Grove Township, Shohola Township, Dingman Township, Milford Borough and Matamoras. Information about the track, length, width, and property damage from the tornado is not available.

Windstorm events may be the result of thunderstorms, hurricanes, tropical storms, winter storms, or nor'easters. There have been 17 high wind events (with wind speeds greater than 50 knots) recorded in Pike County since 1950. The highest wind speed recorded in the County occurred on July 23, 2010 producing 70 knot winds. A list of events greater than 50 knots that have occurred since 1950 is shown in Table 4.3.6-3.

**Table 4.3.6-3: Previous windstorm events greater than 50 knots in Pike County between 1950 and 2011 (NCDC, 2011).**

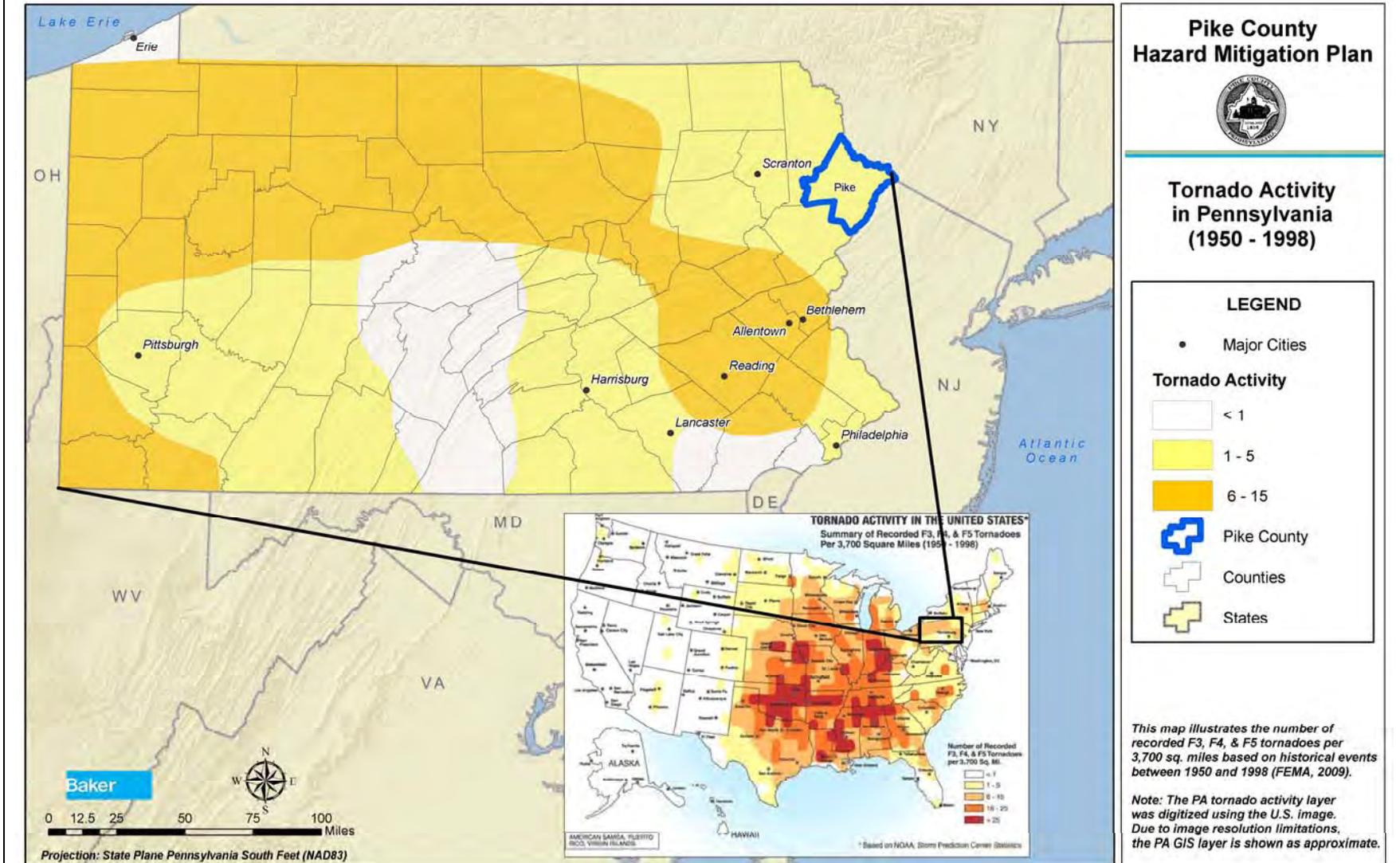
LOCATION	DATE	ESTIMATED WIND SPEED (knots)	ESTIMATED PROPERTY DAMAGE (\$)
Countywide	09/02/1990	53	NP
Countywide	02/17/1998	55	30,000
Countywide	05/18/2000	60	NP
Tafton	06/02/2000	55	NP
Countywide	12/12/2000	52	450,000
Tamiment	04/09/2001	52	NP
Rowland	08/03/2001	60	NP
Lackawaxen	03/10/2002	60	NP
Lackawaxen	06/26/2002	60	50,000
Milford	07/21/2003	55	20,000
Countywide	10/15/2003	60	700,000
Countywide	11/13/2003	58	190,000
Milford	05/27/2005	60	5,000
Dingmans Ferry	08/03/2006	60	6,000
Milford	08/03/2006	60	5,000
Paupack	06/21/2007	83	NP
Lackawaxen	07/23/2010	70	50,000

**4.3.6.4. Future Occurrence**

According to the National Weather Service, the Commonwealth of Pennsylvania has an annual average of ten tornadoes with two related deaths. While the chance of being hit by a tornado is small, the damage that results when the tornado arrives is devastating. An F4 tornado can carry wind velocities of 200 mph, resulting in a force of more than 100 pounds per square foot of surface area. This is a “wind load” that exceeds the design limits of most buildings.

Based on tornado activity information for Pennsylvania between 1950 and 1998, Pike County lies within an area that has experienced one to five F3, F4, or F5 tornadoes per 3,700 square miles (see Figure 4.3.6-2). This equals about a 2 - 10 percent chance that the planning area will be affected by a Category F3, F4, or F5 tornado each year. The probability of tornados in Pike County can be considered *possible* as defined by the Risk Factor Methodology probability criteria (see Table 4.4-1).

Figure 4.3.6-3: Number of recorded F3, F4, & F5 Tornadoes per 3,700 sq. miles based on historical events, 1950-1998 (FEMA, 2009).



**4.3.6.5. Vulnerability Assessment**

High winds and tornadoes can affect an entire county equally. The age, conditions, and building quality of homes can make structures more susceptible to damage from high winds. The greatest threat will be from severe windstorms that often accompany thunderstorms and the potential from damage from downed trees. Areas such as Matamoras and Milford boroughs have many old trees that are very susceptible to wind damage. As the population of the county has increased, many new homes have been built in densely wooded areas, increasing the potential for structural damage, injury and/or death.

While the frequency of windstorms and minor tornadoes is expected to remain relatively constant, vulnerability increases in more densely developed areas. It is important to identify specific critical facilities and assets that are most vulnerable to the hazard and take stock in the condition of structures and infrastructure that are susceptible.

Manufactured housing (i.e. mobiles homes) is particularly vulnerable to high winds and tornadoes. The U.S. Census Bureau defines manufactured homes as “movable dwellings, 8 feet or more wide and 40 feet or more long, design to be towed on its own chassis, with transportation gear integral to the unit when it leaves the factory, and without need of a permanent foundation (Census, 2010).” They can include multi-wides and expandable manufactured homes but exclude travel trailers, motor homes, and modular housing. Due to their light-weight and often unanchored design, manufactured housing is extremely vulnerable to high winds and will generally sustain the most damage.

Table 4.3.6-4 displays the number of manufactured housing units per municipality in Pike County. Dingman and Shohola Townships are all more vulnerable to tornadoes and windstorms as each municipality has over one thousand manufactured homes. Both Dingman and Shohola Townships indicated that they believe that the number of manufactured homes displayed in the Census for their municipalities includes travel trailers that park semi-permanently at several campground parks.

<b>Table 4.3.6-4: Manufactured housing units per municipality in Pike County (U.S. Census, 2000).</b>	
<b>MUNICIPALITY</b>	<b>NUMBER OF MANUFACTURED HOMES</b>
Blooming Grove Township	90
Delaware Township	23
Dingman Township	1,789
Greene Township	612
Lackawaxen Township	164
Lehman Township	36
Matamoras Borough	0
Milford Borough	0
Milford Township	5

<b>Table 4.3.6-4: Manufactured housing units per municipality in Pike County (U.S. Census, 2000).</b>	
<b>MUNICIPALITY</b>	<b>NUMBER OF MANUFACTURED HOMES</b>
Palmyra Township	271
Porter Township	16
Shohola Township	1,899
Westfall Township	183
<b>TOTAL</b>	<b>5,088</b>

**4.3.7. Wildfire**

**4.3.7.1. 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.

Because a majority- about 88 percent or 294,464 acres - of Pike County’s land cover is forestland, the potential geographic extent of wildfires is quite large (USDA Forest Service, 2004). 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; 83% of all Pennsylvania wildfires occur in these two time periods. In the spring, bare trees allow sunlight to reach the forest floor, drying fallen leaves and other ground debris. In the fall, dried leaves are also fuel for fires.

Winter storms often result in extra debris cover from fallen trees and branches. This debris may not be completely cleared after each winter, adding potential fuel sources in the area for a wildfire.

**4.3.7.2. 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 worst case scenario for wildfires occurred in Pike County in April of 2008 when a four day fire that took place in Pike County and part of Monroe County burned 995 acres primarily in Greene Township. The fire was ten miles long at its edges and flames reached 15 feet in height. Twelve agencies were called in to help battle the blaze (Compton, 2008).

In addition to the risk wildfires pose to the general public and property owners, the safety of firefighters is also a concern. Although loss of life among firefighters does not occur often in Pennsylvania, it is always a risk. More common firefighting injuries include falls, sprains, abrasions or heat-related injuries such as dehydration. Response to wildfires also exposes

emergency responders to the risk of motor vehicle accidents and can place them in remote areas away from the communities that they are chartered to protect.

While some fires are not human-caused and are part of natural succession processes, a wildfire can kill people, livestock, fish and wildlife. They often destroy property, valuable timber, forage and recreational and scenic values. 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. Wildfire can also have a positive environmental impact in that they burn dead trees, leaves, and grasses to allow more open spaces for new vegetation to grow and receive sunlight. Another positive effect is that it stimulates the growth of new shoots on trees and shrubs and its heat can open pine cones and other seed pods.

**4.3.7.3. Past Occurrence**

Wildfires are a constant threat in Pike County. There have been 225 wildfire events reported to the Pennsylvania Department of Conservation and Natural Resources Bureau of Forestry between 2002-2008. This number does not include wildfires that were not reported to DCNR or that were controlled solely by the volunteer fire departments in the County, this is the most comprehensive list of wildfire occurrences available for Pike County. Table 4.3.7-1 shows the list of wildfire events reported to the DCNR from 2002-2008.

Of all of Pike County’s jurisdictions, Dingman Township had the most wildfires between 2002 and 2008 according to DCNR. However, as a result of one large fire event in 2008, Greene Township had the largest total number of acres burned by wildfires between 2002 and 2008 with 1,001 acres burned.

Pike County also has record of two large wildfires prior to 2002. In March of 1999 a controlled burn performed by the National Park Service accidentally spread due to rapid changes in weather conditions. The wildfire burned close to 500 acres and required several days and resources and manpower from several states to extinguish. Another large wildfire occurred in April 1990 when approximately 200 acres of woodlands burned at the end of Firetower Road in Westfall and Shohola Townships.

<b>Table 4.3.7-1: List of wildfire events reported in Pike County from 2002-2008 (DCNR 2010).</b>					
<b>YEAR</b>	<b>MUNICIPALITY</b>	<b>AREA (acres)</b>	<b>YEAR</b>	<b>MUNICIPALITY</b>	<b>AREA (acres)</b>
2002	BLOOMING GROVE TWP	0.25	2008	DINGMAN TWP	0.10
2003	BLOOMING GROVE TWP	0.20	2008	DINGMAN TWP	0.10
2003	BLOOMING GROVE TWP	0.50	2008	DINGMAN TWP	0.10
2003	BLOOMING GROVE TWP	0.10	2008	DINGMAN TWP	1.00
2004	BLOOMING GROVE TWP	0.50	2008	DINGMAN TWP	0.50
2005	BLOOMING GROVE TWP	0.70	2008	DINGMAN TWP	0.00

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**Table 4.3.7-1: List of wildfire events reported in Pike County from 2002-2008 (DCNR 2010).**

YEAR	MUNICIPALITY	AREA (acres)	YEAR	MUNICIPALITY	AREA (acres)
2005	BLOOMING GROVE TWP	0.10	2008	DINGMAN TWP	0.10
2005	BLOOMING GROVE TWP	0.20	2004	GREENE TWP	1.50
2005	BLOOMING GROVE TWP	0.10	2005	GREENE TWP	1.20
2005	BLOOMING GROVE TWP	0.20	2006	GREENE TWP	0.40
2005	BLOOMING GROVE TWP	31.00	2006	GREENE TWP	0.30
2006	BLOOMING GROVE TWP	0.10	2008	GREENE TWP	0.10
2006	BLOOMING GROVE TWP	0.10	2008	GREENE TWP	0.40
2006	BLOOMING GROVE TWP	0.10	2008	GREENE TWP	2.00
2006	BLOOMING GROVE TWP	0.50	2008	GREENE TWP	0.10
2006	BLOOMING GROVE TWP	0.10	2008	GREENE TWP	995.00
2006	BLOOMING GROVE TWP	0.10	2002	LACKAWAXEN TWP	0.10
2006	BLOOMING GROVE TWP	0.10	2002	LACKAWAXEN TWP	0.75
2006	BLOOMING GROVE TWP	0.20	2002	LACKAWAXEN TWP	8.00
2007	BLOOMING GROVE TWP	9.20	2002	LACKAWAXEN TWP	0.25
2007	BLOOMING GROVE TWP	0.10	2003	LACKAWAXEN TWP	4.50
2007	BLOOMING GROVE TWP	0.30	2003	LACKAWAXEN TWP	0.25
2008	BLOOMING GROVE TWP	0.10	2004	LACKAWAXEN TWP	1.50
2008	BLOOMING GROVE TWP	0.40	2005	LACKAWAXEN TWP	3.00
2008	BLOOMING GROVE TWP	0.25	2006	LACKAWAXEN TWP	0.20
2001	DELAWARE TWP	0.70	2006	LACKAWAXEN TWP	0.20
2001	DELAWARE TWP	4.50	2006	LACKAWAXEN TWP	0.10
2002	DELAWARE TWP	2.00	2006	LACKAWAXEN TWP	0.20
2002	DELAWARE TWP	0.70	2006	LACKAWAXEN TWP	0.10
2002	DELAWARE TWP	0.10	2007	LACKAWAXEN TWP	0.20
2002	DELAWARE TWP	0.10	2007	LACKAWAXEN TWP	0.10

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**Table 4.3.7-1: List of wildfire events reported in Pike County from 2002-2008 (DCNR 2010).**

YEAR	MUNICIPALITY	AREA (acres)	YEAR	MUNICIPALITY	AREA (acres)
2002	DELAWARE TWP	0.10	2007	LACKAWAXEN TWP	2.20
2002	DELAWARE TWP	0.10	2008	LACKAWAXEN TWP	0.20
2002	DELAWARE TWP	0.40	2008	LACKAWAXEN TWP	0.50
2002	DELAWARE TWP	0.10	2008	LACKAWAXEN TWP	0.50
2002	DELAWARE TWP	0.10	2008	LACKAWAXEN TWP	0.50
2002	DELAWARE TWP	0.20	2008	LACKAWAXEN TWP	2.00
2002	DELAWARE TWP	0.10	2008	LACKAWAXEN TWP	0.20
2002	DELAWARE TWP	0.10	2002	LEHMAN TWP	4.50
2002	DELAWARE TWP	0.10	2002	LEHMAN TWP	0.50
2002	DELAWARE TWP	0.10	2002	LEHMAN TWP	0.50
2002	DELAWARE TWP	0.20	2003	LEHMAN TWP	0.50
2002	DELAWARE TWP	0.40	2003	LEHMAN TWP	0.50
2004	DELAWARE TWP	0.10	2004	LEHMAN TWP	0.25
2004	DELAWARE TWP	0.01	2004	LEHMAN TWP	0.10
2004	DELAWARE TWP	0.10	2005	LEHMAN TWP	0.20
2004	DELAWARE TWP	0.05	2005	LEHMAN TWP	0.10
2004	DELAWARE TWP	0.10	2005	LEHMAN TWP	2.10
2004	DELAWARE TWP	0.10	2006	LEHMAN TWP	0.60
2005	DELAWARE TWP	0.20	2006	LEHMAN TWP	0.50
2005	DELAWARE TWP	0.10	2007	LEHMAN TWP	0.10
2005	DELAWARE TWP	0.10	2007	LEHMAN TWP	0.10
2006	DELAWARE TWP	0.30	2008	LEHMAN TWP	0.50
2006	DELAWARE TWP	0.10	2008	LEHMAN TWP	2.20
2006	DELAWARE TWP	0.10	2008	LEHMAN TWP	0.10
2006	DELAWARE TWP	0.10	2008	LEHMAN TWP	0.10

*Pike County 2012 Hazard Mitigation Plan*

**Table 4.3.7-1: List of wildfire events reported in Pike County from 2002-2008 (DCNR 2010).**

<b>YEAR</b>	<b>MUNICIPALITY</b>	<b>AREA (acres)</b>	<b>YEAR</b>	<b>MUNICIPALITY</b>	<b>AREA (acres)</b>
2006	DELAWARE TWP	0.10	2008	LEHMAN TWP	0.50
2007	DELAWARE TWP	0.10	2008	LEHMAN TWP	0.10
2007	DELAWARE TWP	0.20	2008	LEHMAN TWP	0.10
2007	DELAWARE TWP	0.20	2006	MATAMORAS BORO	0.10
2007	DELAWARE TWP	0.10	2002	MILFORD TWP	0.75
2007	DELAWARE TWP	0.10	2005	MILFORD TWP	4.00
2007	DELAWARE TWP	0.10	2006	MILFORD TWP	3.30
2007	DELAWARE TWP	0.10	2007	MILFORD TWP	0.10
2008	DELAWARE TWP	0.50	2007	MILFORD TWP	0.50
2008	DELAWARE TWP	0.20	2007	MILFORD TWP	0.20
2008	DELAWARE TWP	0.10	2008	MILFORD TWP	0.20
2008	DELAWARE TWP	0.10	2008	MILFORD TWP	0.00
2008	DELAWARE TWP	2.50	2008	MILFORD TWP	0.30
2008	DELAWARE TWP	0.20	2008	MILFORD TWP	1.00
2002	DINGMAN TWP	0.60	2008	MILFORD TWP	0.20
2002	DINGMAN TWP	0.10	2003	PALMYRA TWP	1.20
2002	DINGMAN TWP	0.50	2005	PALMYRA TWP	0.75
2002	DINGMAN TWP	0.10	2005	PALMYRA TWP	0.20
2003	DINGMAN TWP	0.50	2005	PALMYRA TWP	0.10
2003	DINGMAN TWP	0.30	2006	PALMYRA TWP	0.10
2003	DINGMAN TWP	0.20	2007	PALMYRA TWP	0.10
2004	DINGMAN TWP	2.00	2007	PALMYRA TWP	5.00
2005	DINGMAN TWP	0.30	2008	PALMYRA TWP	0.20
2005	DINGMAN TWP	0.25	2008	PALMYRA TWP	0.40
2005	DINGMAN TWP	0.75	2008	PALMYRA TWP	0.40

*Pike County 2012 Hazard Mitigation Plan*

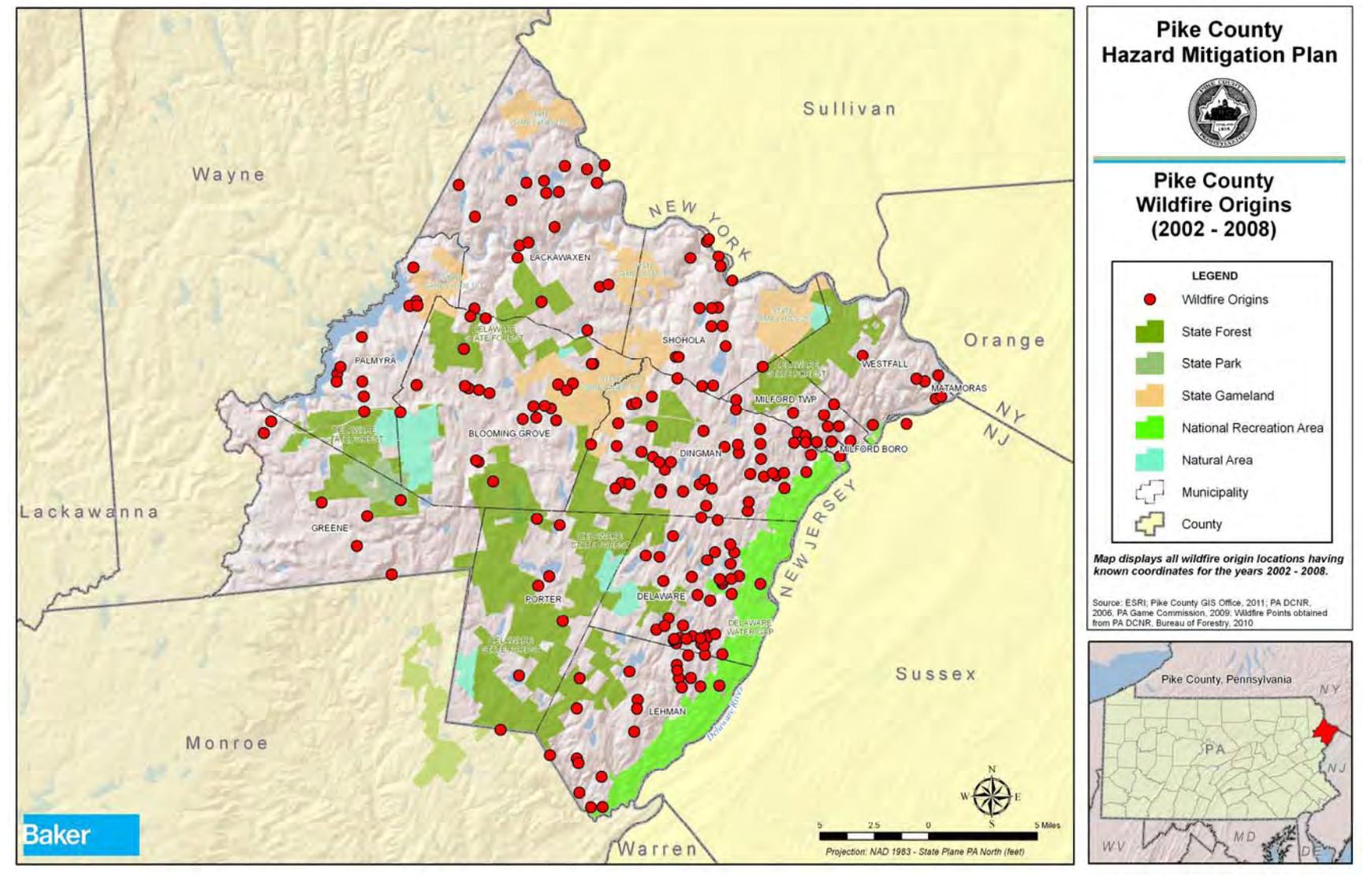
**Table 4.3.7-1: List of wildfire events reported in Pike County from 2002-2008 (DCNR 2010).**

YEAR	MUNICIPALITY	AREA (acres)	YEAR	MUNICIPALITY	AREA (acres)
2005	DINGMAN TWP	0.10	2002	PORTER TWP	1.50
2005	DINGMAN TWP	0.20	2003	PORTER TWP	1.00
2005	DINGMAN TWP	0.10	2003	PORTER TWP	0.20
2005	DINGMAN TWP	0.20	2005	PORTER TWP	0.10
2005	DINGMAN TWP	0.10	2005	PORTER TWP	0.10
2005	DINGMAN TWP	0.10	2007	PORTER TWP	0.20
2006	DINGMAN TWP	2.50	2008	PORTER TWP	0.20
2006	DINGMAN TWP	0.20	2002	SHOHOLA TWP	0.25
2006	DINGMAN TWP	0.33	2002	SHOHOLA TWP	1.70
2006	DINGMAN TWP	0.25	2003	SHOHOLA TWP	4.70
2006	DINGMAN TWP	0.20	2003	SHOHOLA TWP	4.50
2006	DINGMAN TWP	0.10	2005	SHOHOLA TWP	0.20
2006	DINGMAN TWP	3.00	2005	SHOHOLA TWP	0.10
2006	DINGMAN TWP	0.10	2006	SHOHOLA TWP	5.00
2006	DINGMAN TWP	0.10	2006	SHOHOLA TWP	2.00
2006	DINGMAN TWP	8.00	2006	SHOHOLA TWP	0.75
2006	DINGMAN TWP	0.10	2006	SHOHOLA TWP	0.60
2006	DINGMAN TWP	0.50	2007	SHOHOLA TWP	0.25
2006	DINGMAN TWP	0.10	2007	SHOHOLA TWP	1.50
2007	DINGMAN TWP	0.10	2007	SHOHOLA TWP	0.10
2007	DINGMAN TWP	1.50	2008	SHOHOLA TWP	0.60
2007	DINGMAN TWP	0.00	2008	SHOHOLA TWP	0.10
2007	DINGMAN TWP	0.10	2008	SHOHOLA TWP	0.10
2007	DINGMAN TWP	0.40	2002	WESTFALL TWP	0.25
2007	DINGMAN TWP	0.00	2003	WESTFALL TWP	0.20

<b>Table 4.3.7-1: List of wildfire events reported in Pike County from 2002-2008 (DCNR 2010).</b>					
<b>YEAR</b>	<b>MUNICIPALITY</b>	<b>AREA (acres)</b>	<b>YEAR</b>	<b>MUNICIPALITY</b>	<b>AREA (acres)</b>
2007	DINGMAN TWP	0.10	2004	WESTFALL TWP	3.30
2007	DINGMAN TWP	0.10	2005	WESTFALL TWP	18.00
2007	DINGMAN TWP	0.10	2008	WESTFALL TWP	0.20
2008	DINGMAN TWP	0.10	2008	WESTFALL TWP	0.10
2008	DINGMAN TWP	0.20	2008	WESTFALL TWP	0.60
2008	DINGMAN TWP	0.20	2008	WESTFALL TWP	0.10
2008	DINGMAN TWP	1.50			
				<b>TOTAL</b>	<b>1,199</b>

Figure 4.3.7-1 maps the origins of the wildfire events which were reported to the DCNR listed in Table 4.3.7-1 above. It is important to note that this is not an inclusive map of all wildfires, just those with known locations. The map shows that previous occurrences of wildfires have occurred throughout the entire County instead of concentrated in a single jurisdiction or area of Pike County.

Figure 4.3.7-1: Wildfire origins in Pike County between 2002 and 2008. (DCNR-BOF, 2009)



#### 4.3.7.4. *Future Occurrence*

Between 2002 and 2008 approximately 1,200 acres of land burned in Pike County in the wildfire events shown in Figure 4.3.7-1. These previous events indicate that wildfire events will continue to occur annually. Weather conditions like drought can increase the likelihood of wildfires occurring. Any fire, without the quick response or attention of fire-fighters, forestry personnel, or visitors to the forest, has the potential to become a wildfire.

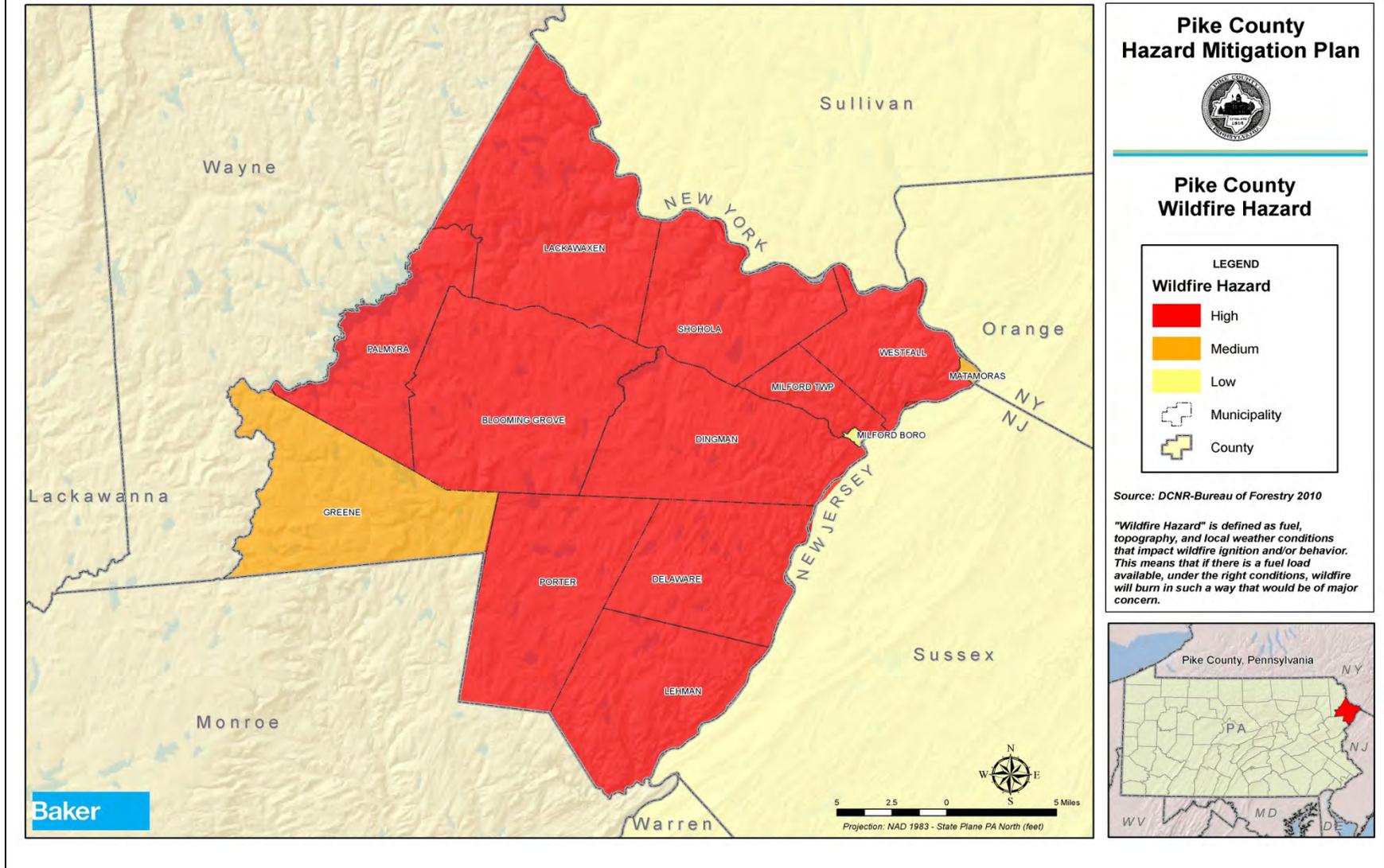
The probability of a wildfire occurring in Pike County is *highly likely* in any given year as defined by the Risk Factor Methodology probability criteria (see Table 4.4-1). However, the likelihood of one of those fires attaining significant size and intensity is unpredictable and highly dependent on environmental conditions and firefighting response.

#### 4.3.7.5. *Vulnerability Assessment*

The Pennsylvania Bureau of Forestry has conducted an independent wildfire hazard risk assessment for the various municipalities across Pike County. Results of that assessment are shown in Figure 4.3.7-2. *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, all jurisdictions in Pike County have a *high* wildfire rating with the exception of Greene Township and Matamoras Borough which have a medium rating and Milford Borough which has a low rating. The individual vulnerability of communities will differ based on the design of the urban/wild land interface, the number of ingress and egress points into a community, and the availability of water to fight fires. However, as this assessment suggests, the majority of municipalities in the County (those with a *high* wildfire rating) are more vulnerable to wildfire.

During drought periods and with increased residential development as the County continues to grow, there is a concern with wild land fires and the effect they could have with the urban interface. Some small housing communities within the County are working with the PA DCNR on Firewise plans to better deal with these issues. For example, in 2005 DCNR commended Pike County's Hemlock Farms community for their success in implementing wildfire prevention and reducing the threat of wildfire through the Firewise program, which is aimed at protecting buildings and residents and bolstering local firefighter support. If more communities in the county embrace similar initiatives, the threat of wildfire in Pike County may significantly lessen.

Figure 4.3.7-2: Wildfire hazard potential per municipality in Pike County (DCNR-BOF, 2010).



#### 4.3.8. Winter Storm

##### 4.3.8.1. Location and Extent

Winter storms consist of cold temperatures and heavy snow or ice. Major winter storms occur in Pennsylvania several times annually. They are regional events. Every county in the Commonwealth, including Pike, is subject to severe winter storms.

Within Pike County there are variations in the average amount of snowfall that is received throughout different parts of the County because of terrain differences; higher elevations experience greater snowfalls than lower-lying areas. Generally, the average annual snowfall in the County increases from the southeast to northwest as shown in Figure 4.3.8-1.

##### 4.3.8.2. 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 following the jet stream. Being located in the northeast portion of Pennsylvania, Pike County often experiences the effects of Nor'easter storms – low pressure fronts that move northward along the Atlantic coastline, pulling large amounts of moisture off of the Atlantic Ocean.

Due to their regular occurrence, these storms are considered hazards only when they result in damage to communications networks, impacts vegetation, cause structural collapse and cause very serious transportation problems. Winter storms have also been known to contribute to severe flooding. 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:

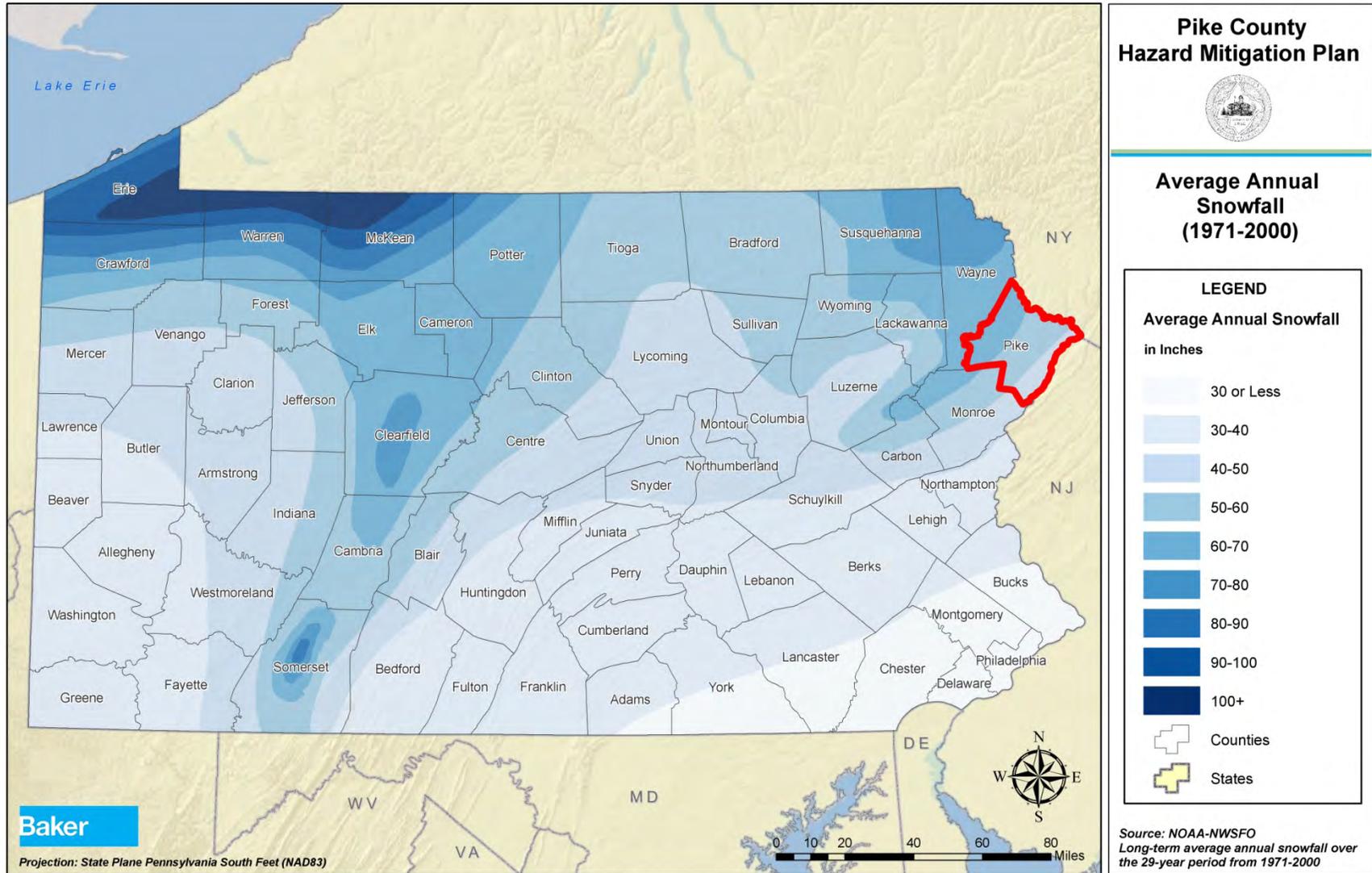
- **Heavy Snowstorm:** Accumulations of four inches or more in a six-hour period, or six inches or more in a twelve-hour period.
- **Sleet Storm:** Significant accumulations of solid pellets which form from the freezing of raindrops or partially melted snowflakes causing slippery surfaces posing hazards 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.

Figure 4.3.8-1 shows mean annual snowfall in Pike County to be 40 to 50 inches in the southern part of the County, 50 to 60 inches in the central section, and 60 to 70 inches in the northwest. Two of the twelve Presidential Disaster and Emergency Declarations affecting Pike County have been in response to hazard events related to winter storms (see Table 4.2-1). Other reported winter storm events since 1994, including those associated with Disaster Declarations, are listed in Table 4.3.8-1.

A worst case scenario for winter storms occurred in March 1997. An isolated snow storm which affected only the northeast portion of Pennsylvania dumped up to 30 inches of very wet snow in Pike County. This storm caught everyone by surprise, stranding thousands of travelers along Interstate 84. This storm also brought down hundreds of trees throughout the county, dropping power and telephone lines, leaving large portions of the county without electricity and/or telephone service for up to five days. Highway departments and emergency responders struggled to cope with the multiple problems this storm caused. Eventually, with the help of the National Guard, over 1,200 people were brought off the highways and placed in shelters.

Figure 4.3.8-1: Mean Annual Snowfall for Pennsylvania and Pike County (NOAA-NWSFO).



### 4.3.8.3. Past Occurrence

The Commonwealth of Pennsylvania has a long history of severe winter weather. In the winter of 1993-4, 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.

As mentioned above, the first of these devastating winter storms occurred in early January with record snowfall depths (in excess of 33 inches in the southwest and south-central portions 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, affecting the southeastern portion of the Commonwealth, 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 PP&L stated that this was the worst winter storm in the history of the company, and 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 PA Department of Transportation (DOT) storage sites.

During January and February 1994, Pennsylvania experienced at least 17 regional or statewide winter storms. The consequences of these disasters resulted in the need for intervention by the President in an effort to alleviate the severity of the hardship and to aid the recovery of the hardest-hit counties.

In January 1996, another series of severe winter storms with 27- and 24-inch accumulated snow depths was followed by 50 to 60 degree temperatures resulting in rapid melting and flooding (as described in the preceding section on *Flood Hazard Vulnerability Assessment*).

In addition to the events described above, other winter storm events that impacted Pike County are listed in Table 4.3.8-1.

## Pike County 2012 Hazard Mitigation Plan

**Table 4.3.8-1: Previous winter storm events impacting Pike County since 1994 (NCDC, 2011). Events with the location “Multiple Counties” include Pike County.**

LOCATION	DATE	TYPE
Lehigh, Monroe, Northampton, Pike	11/27/1994	Winter Storm
Multiple Counties	12/09/1994	Freezing Rain
Multiple Counties	12/14/1994	Freezing Drizzle
Multiple Counties	12/31/1994	Freezing Rain
Multiple Counties	01/06/1995	Winter Storm
Multiple Counties	01/31/1995	Freezing Rain
Multiple Counties	02/03/1995	Heavy Snow
Multiple Counties	02/15/1995	Freezing Rain
Berks, Carbon, Lehigh, Monroe, Northampton, Northern Wayne, Pike	02/15/1995	Freezing Rain
Carbon, Monroe, Northern Wayne, Pike	02/27/1995	Freezing Rain
Multiple Counties	03/08/1995	Snow
Multiple Counties	06/01/1995	Snow Drought
Multiple Counties	11/14/1995	Heavy Snow
Multiple Counties	01/02/1996	Heavy Snow
Multiple Counties	01/07/1996	Heavy Snow
Multiple Counties	01/12/1996	Heavy Snow
Multiple Counties	03/06/1996	Heavy Snow
Lackawanna, Luzerne, Northern Wayne, Pike, Susquehanna, Wyoming	03/31/1997	Heavy Snow
Lackawanna, Luzerne, Northern Wayne, Pike, Susquehanna, Wyoming	04/01/1997	Heavy Snow
Multiple Counties	12/29/1997	Heavy Snow

## Pike County 2012 Hazard Mitigation Plan

**Table 4.3.8-1: Previous winter storm events impacting Pike County since 1994 (NCDC, 2011). Events with the location "Multiple Counties" include Pike County.**

LOCATION	DATE	TYPE
Lackawanna, Northern Wayne, Pike	01/15/1998	Ice Storm
Multiple Counties	02/23/1998	Heavy Snow
Lackawanna, Northern Wayne, Pike, Susquehanna	03/20/1998	Heavy Snow
Bradford, Lackawanna, Luzerne, Northern Wayne, Pike, Susquehanna, Wyoming	01/02/1999	Ice Storm
Multiple Counties	01/13/1999	Winter Storm
Lackawanna, Luzerne, Northern Wayne, Pike	03/14/1999	Heavy Snow
Multiple Counties	01/20/2000	Heavy Snow
Multiple Counties	01/25/2000	Heavy Snow
Multiple Counties	01/30/2000	Heavy Snow
Multiple Counties	02/13/2000	Ice Storm
Multiple Counties	02/18/2000	Heavy Snow
Lackawanna, Luzerne, Northern Wayne, Pike, Susquehanna, Wyoming	04/08/2000	Heavy Snow
Lackawanna, Luzerne, Northern Wayne, Pike, Wyoming	12/13/2000	Winter Storm
Lackawanna, Northern Wayne, Pike, Susquehanna	12/30/2000	Heavy Snow
Lackawanna, Luzerne, Northern Wayne, Pike	01/20/2001	Heavy Snow
Lackawanna, Luzerne, Northern Wayne, Pike, Susquehanna, Wyoming	02/05/2001	Heavy Snow
Pike	02/16/2001	Ice Storm
Pike	02/22/2001	Heavy Snow

## Pike County 2012 Hazard Mitigation Plan

**Table 4.3.8-1: Previous winter storm events impacting Pike County since 1994 (NCDC, 2011). Events with the location “Multiple Counties” include Pike County.**

LOCATION	DATE	TYPE
Multiple Counties	02/24/2001	Ice Storm
Bradford, Lackawanna, Luzerne, Northern Wayne, Pike, Susquehanna, Wyoming	03/04/2001	Heavy Snow
Northern Wayne, Pike, Susquehanna	03/12/2001	Ice Storm
Bradford, Lackawanna, Luzerne, Northern Wayne, Pike, Susquehanna, Wyoming	01/06/2002	Heavy Snow
Bradford, Lackawanna, Luzerne, Northern Wayne, Pike, Susquehanna, Wyoming	01/31/2002	Winter Storm
Bradford, Lackawanna, Luzerne, Northern Wayne, Pike, Susquehanna, Wyoming	02/01/2002	Winter Storm
Lackawanna, Luzerne, Northern Wayne, Pike, Wyoming	12/05/2002	Heavy Snow
Bradford, Lackawanna, Luzerne, Northern Wayne, Pike, Susquehanna, Wyoming	12/11/2002	Winter Weather/mix
Bradford, Lackawanna, Luzerne, Northern Wayne, Pike, Susquehanna, Wyoming	12/24/2002	Heavy Snow
Bradford, Lackawanna, Luzerne, Northern Wayne, Pike, Susquehanna, Wyoming	01/03/2003	Heavy Snow
Bradford, Lackawanna, Luzerne, Northern Wayne, Pike, Susquehanna, Wyoming	02/17/2003	Heavy Snow
Pike	03/06/2003	Heavy Snow
Multiple Counties	12/06/2003	Heavy Snow
Lackawanna, Northern Wayne, Pike, Susquehanna	01/28/2004	Heavy Snow

## Pike County 2012 Hazard Mitigation Plan

**Table 4.3.8-1: Previous winter storm events impacting Pike County since 1994 (NCDC, 2011). Events with the location "Multiple Counties" include Pike County.**

LOCATION	DATE	TYPE
Multiple Counties	01/06/2005	Winter Weather/mix
Multiple Counties	01/23/2005	Heavy Snow
Multiple Counties	03/01/2005	Heavy Snow
Multiple Counties	03/24/2005	Heavy Snow
Multiple Counties	10/25/2005	Winter Weather/mix
Lackawanna, Luzerne, Northern Wayne, Pike, Southern Wayne, Susquehanna, Wyoming	12/09/2005	Heavy Snow
Lackawanna, Luzerne, Northern Wayne, Pike, Southern Wayne, Wyoming	12/16/2005	Winter Storm
Multiple Counties	02/13/2007	Winter Storm
Pike, Southern Wayne, Wyoming	03/16/2007	Heavy Snow
Pike, Southern Wayne	02/22/2008	Winter Storm
Multiple Counties	12/19/2008	Heavy Snow
Multiple Counties	10/15/2009	Winter Weather
Multiple Counties	02/10/2010	Winter Storm
Pike, Southern Wayne	02/23/2010	Winter Storm
Multiple Counties	02/25/2010	Winter Storm
Bradford, Luzerne, Pike, Southern Wayne, Wyoming	02/20/2011	Winter Storm

Pike County has record of several winter storms prior to 1994. These include:

- January 1966 - very heavy snow causes problems across the entire state.
- November 1971 - heavy snow fell on Pike County on Thanksgiving, stranding hundreds of travelers along Rt. 84.
- January 1978 - very heavy snow brought the county to a standstill for two days.

- February 1978 - another storm similar to the one only about a week earlier with the same effects.
- March 1993 - a major Nor'easter hit the county, dumping in excess of 24 inches of snow over the majority of the county. This storm affected the entire east coast from Florida to Maine. Pike County was eligible for Public Assistance under the Presidential Declaration.

**4.3.8.4. Future Occurrence**

Winter storms are a regular, annual occurrence in Pike County and should be considered *highly likely* according to the risk factor methodology in Table 4.4-1. Approximately thirty-five winter storm events occur across Pennsylvania and a minimum of four occur in Pike County annually. Table 4.3.8-2 shows the probability of receiving measureable snowfall by month in Pike County. These probabilities are based on data collected over a minimum of 20 years. There is slight variation in the probabilities of snowfall in different locations in Pike County.

<b>Table 4.3.8-2: Probability of Measurable Snowfall in Pike County by Snow Station Location (NCDC, 2011).</b>				
<b>MONTH</b>	<b>PROBABILITY (%)</b>			
	<b>HAWLEY 1 E</b>	<b>LAKE MINISINK</b>	<b>MATAMORAS</b>	<b>PAUPACK 1 WSW</b>
January	100.00%	100.00%	96.70%	98.40%
February	100.00%	100.00%	100.00%	95.40%
March	97.50%	90.00%	93.20%	96.90%
April	66.70%	47.80%	53.10%	73.40%
May	3.90%	0.00%	0.00%	0.00%
June	0.00%	0.00%	0.00%	0.00%
July	0.00%	0.00%	0.00%	0.00%
August	0.00%	0.00%	0.00%	0.00%
September	0.00%	0.00%	0.00%	0.00%
October	8.80%	7.10%	1.90%	4.50%
November	68.80%	40.00%	55.00%	72.10%
December	96.30%	96.00%	95.30%	90.50%

### 4.3.8.5. Vulnerability Assessment

Winter storm events affect the entire County. Wintertime snow accumulations are expected and normal in Pike County.

Due to the rural nature of the county and the limited staff of the thirteen municipalities, any major winter storm will have an adverse effect on the county's transportation system. Motorists traveling along Interstate Route 84, Route 6 & 209, can expect to be faced with possible road closings and delays. Secondary roads are often narrow with steep embankments. Any amount of storm only makes these roads narrower and more dangerous. Unfortunately, Penn DOT has been reducing the size of the county staff over the past few years and reducing the number of trucks and rental pieces available for winter maintenance. This has caused serious concern by local officials.

The many private developments throughout the county also present a problem. These developments have either small maintenance departments or contract out necessary services. Many of these developments are responsible for far more lane miles than the municipality that they are located in. As the population of the county continues to grow, a much larger portion of the people must rely on the roads within these developments. These are often not cleared as quickly or to the same degree as state or local highways.

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. Many areas are heavily wooded which make emergency response to these areas difficult when roadways are blocked by downed trees and wires.

Additionally, as the population grows, the number of school buses transporting students has also increased as has the number of fuel delivery type vehicles.

The most common, but potentially serious effect of very heavy snowstorms with accumulations exceeding six or more inches in a 12-hour period are traffic accidents; interruptions in power supply and communications; and the failure of inadequately designed and/or maintained roofing systems. Similar to the discussion under tornadoes and wind storms, vulnerability to the effects of winter storms on buildings is dependent on the age of the building (and what building codes may have been in effect at the time), type of construction, and condition of the structure (i.e., how well has the structure been maintained).

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. Table 4.3.8-3 below shows that while a majority of structures in Pike County were built since 1940, about 2,647 structures, approximately 6% of all structures in the county are over 60 years old. Additional information on construction type and building codes enforced at time of construction would allow a more thorough assessment of the vulnerability of structures to winter storm impacts such as severe wind and heavy snow loading. However, based on the available information both Lackawaxen Township and Matamoras Borough have the most structures of any municipality in the county built prior to 1940 (over 400 each). For Matamoras Borough, these structures

comprise 44% of its total housing units. Milford Borough has 354 housing units built before 1940 and these comprise 63% of its total housing units.

<b>Table 4.3.8-3: Age of housing units in Pike County (US Census, 2000).</b>		
<b>Municipality</b>	<b>Number of Housing Units Built Prior to 1940</b>	<b>Percent of Total Housing Units</b>
Blooming Grove township	219	7%
Delaware township	104	3%
Dingman township	116	2%
Greene township	280	10%
Lackawaxen township	463	12%
Lehman township	55	1%
Matamoras borough	428	44%
Milford borough	354	63%
Milford township	59	10%
Palmyra township	186	5%
Porter township	52	6%
Shohola township	148	5%
Westfall township	183	17%
<b>Total</b>	<b>2,647</b>	<b>6%</b>

Because of the frequency of winter storms, strategies have been developed to respond to these events. Snow removal and utility repair equipment is present to respond to typical events. The use of auxiliary heat and electricity supplies such as wood burning stoves, kerosene heaters and gasoline power generators reduces the vulnerability of humans to extreme cold temperatures commonly associated with winter storms. People residing in structures lacking adequate equipment to protect against cold temperatures or significant snow and ice are more vulnerable to winter storm events. Even for communities that are prepared to respond to winter storms, severe events involving snow accumulations that exceed six or more inches in a twelve hour period can cause a large number of traffic accidents, strand motorists due to snow drifts, interrupt power supply and communications, and cause the failure of inadequately designed and/or maintained roof systems.

## HUMAN-MADE HAZARDS

### 4.3.9. Dam Failure

Due to sensitivity issues, the Dam Failure profile can be found in **Appendix G**.

### 4.3.10. Drowning

#### 4.3.10.1. Location and Extent

Drowning accidents can be categorized as unintentional, suicide, homicide, or undetermined depending on the circumstances (PA DOH, 2004). Unintentional drowning can be a significant hazard in communities with numerous water bodies (e.g. ponds, lakes, rivers, etc...) and extensive outdoor recreational activity. In addition, drowning accidents can occur in swimming pools at private residences as above ground pools such as “kiddie pools” and inflatable pools become more popular.

Pike County has been and continues to grow in popularity as a tourist destination. Water related recreational opportunities such as fishing, boating, and swimming are popular among visitors. One of the most popular tourist destinations in the County is Lake Wallenpaupack where drownings are a frequent occurrence. The Palmyra Township Beach is the only public beach on Lake Wallenpaupack however there are numerous other private properties surrounding the lake.

Drownings also have occurred in the Delaware River, where the danger stems from swift currents, deep holes, and sudden drop offs (NPS, 2008). Milford Beach is a popular swimming location along the Delaware and contains a federal boat launch in addition to its sand beach.

Other popular water bodies for swimming, boating, and fishing in the County include a 20-acre lake at the Pike County Park (Milford Township), Pecks Pond (owned partially by the state) in Porter Township, and two lakes at Promised Land State Park (Greene Township).

#### 4.3.10.2. Range of Magnitude

By definition, drowning generally results in death. However, nonfatal drownings can cause brain damage that may result in long-term disabilities including memory problems, learning disabilities, and loss of basic nervous system functions.

Drowning rates are particularly high for children ages 1-14 and according to the Center for Disease Control (CDC, 2011). In a typical year, counties in Pennsylvania can range from having 0 to 100 drowning incidents and depend on factors such as the physical environment (access to water bodies) and a combination of social and cultural issues (wanting to learn how to swim and interest in recreational water-related activities).

Across the state, thirty-three percent of residents who died from drowning were under 20 years of age (PA DOH, 2004). Approximately seventy-six percent of drowning accidents in Pennsylvania from 2001 to 2005 have been unintentional, another fourteen percent were suicides, eight percent were from undetermined causes, and less than two percent were deemed homicides.

A worst case scenario for drowning occurred in July of 2009 when a man drowned when boating with family and friends in Lake Wallenpaupack. Numerous rescue teams from Pennsylvania, New York, and New Jersey, including the FBI, state police, state Fish & Boat Commission and area volunteer response teams assisted in the search for the body (News Eagle, July 24, 2009). It took a week to recover the body from the water because of cold water temperatures and the nature of the bottom of the lake. It was the second drowning in Lake Wallenpaupack that month.

**4.3.10.3. Past Occurrence**

There is no official federal, state, or county reporting system for drownings however the Pennsylvania Department of Health has a report of drowning deaths that occurred in Pike County between 1999 and 2004. Table 4.3.10-1 lists the number of deaths from drowning and the ages of people that died from drowning in the County. Note that there is overlap between the years for the two reports so double counting may have occurred. The data does not include information about the water bodies where the drownings occurred.

<b>Table 4.3.10-1: Incidents of drowning and submersion that have occurred in Pike County (Bureau of Health Statistics and Research, Pennsylvania Department of Health, 1999-2003, 2000-2004).</b>				
<b>YEARS</b>	<b>NUMBER OF DEATHS</b>	<b>AGE AT DEATH</b>		
		<b>&lt;20</b>	<b>20-64</b>	<b>65+</b>
1999-2003	3	0	2	1
2000-2004	5	1	2	2

According to the National Park Service, between 1980 to 2008 there have been 56 deaths due to drowning in the Upper Delaware River, which stretches from Wayne County to Milford. Twenty nine of those that drowned were swimming or wading and the average age was twenty-eight (NPS, 2008). The National Park Service report does not include the specific locations in the Upper Delaware River where the drownings occurred.

In addition, the following incidents involving Delaware River water rescues were reported to PEMA through the PEIRS voluntary reporting system (PEIRS, 2002-2009):

- February 2006 – A boater went missing on the Delaware River in Westfall Township; A search was conducted and the body was recovered.
- April 2008 – A search was conducted on the Delaware River in Lehman Township for two boaters. The report is inconclusive as to the status of the boaters.

A recent drowning incident on the Delaware River occurred on Memorial Day, May 31, 2010 when a 31 year old man drowned while trying to swim across the Delaware River at Milford Beach (The River Reporter, 2010).

An internet search also turned up information on drowning incidents in Lake Wallenpaupack. A man's body was discovered near a dock in Lake Wallenpaupack in May of 2009 (WNEP-TV, 2009). In July of 2009, a mother of two wandered away from a beached boat and died of an accidental drowning in Lake Wallenpaupack (News Eagle, July 3, 2009). In September of 2009, a Florida man drowned in the lake near the Seeley's Landing area (Pocono Record, 2009).

#### 4.3.10.4. Future Occurrence

It is impossible to predict when and where drowning may occur; however, given past occurrences of drownings in Pike County the majority have occurred in Lake Wallenpaupack or the Delaware River. During the warm summer months, as activities such as swimming, boating and fishing increase so does the likelihood of drowning. Based on past occurrence and the popularity of Pike County as a tourist destination for water-related recreation, the future occurrence of drowning in Pike County can be considered *highly likely* as defined by the Risk Factor Methodology probability criteria (see Table 4.4-1).

#### 4.3.10.5. Vulnerability Assessment

As tourism continues to increase in the County and number of visitors grows, drowning is likely to continue without mitigation actions in place. Municipalities that border Lake Wallenpaupack and the Delaware River are more vulnerable to drownings as their residents have easiest access to the water bodies. However, residents from other municipalities and from outside the County also frequent the facilities.

In 2009, the rules for the Upper Delaware River, from Hancock, NY to Sparrowbush, NY (slightly upstream of Milford Beach) were changed to make wearing life jackets mandatory for people of all ages when river gage heights at Barryville or Callicoon surpass six feet. This may reduce risk of drowning hazards in the upper river valley Pike County municipalities that border the Delaware River, however, Milford Beach is situated below the area covered by those rules.

### 4.3.11. Environmental Hazards

Environmental hazards in Pike County primarily focus on hazardous material releases and pollution or fire from oil and gas well drilling. Hazardous material releases can occur at facilities or along transportation routes. These releases can result in injury and death and contaminate air, water and soils. Activities associated with oil and gas well drilling can cause fire and pollute streams and drinking water.

#### 4.3.11.1. Location and Extent

##### A. HAZARDOUS MATERIALS RELEASES

Hazardous materials fall into several categories, such as flammable and combustible materials, compressed gases, explosive and blasting agents, radioactive materials, oxidizing materials, poisons, and corrosive liquids. Hazardous materials incidents are generally unintentional, and associated with transportation accidents or accidents at fixed facilities. However, hazardous materials can be released as a criminal or terrorist act. Any release can result in injury and death and may contaminate air, water and/or soils.

Facilities that use, manufacture, or store hazardous materials in Pennsylvania must comply with both Title III of the Federal Superfund Amendments and Reauthorization Act (SARA), also known as the Emergency Planning and Community Right-to-Know Act (EPCRA), and the Commonwealth's reporting requirements under the Hazardous Materials Emergency Planning and Response Act (1990-165), as amended. The community right-to-know reporting requirements keep communities abreast of the presence and release of chemicals at individual facilities. EPCRA was designed to ensure that state and local communities are prepared to respond to potential chemical accidents through Local Emergency Planning Committees (LEPCs). LEPCs are charged with developing emergency response plans for SARA Title III facilities; these plans cover the location and extent of hazardous materials, establish evacuation plans, response procedures, methods to reduce the magnitude of a materials release, and establish methods and schedules for training and exercises.

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

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

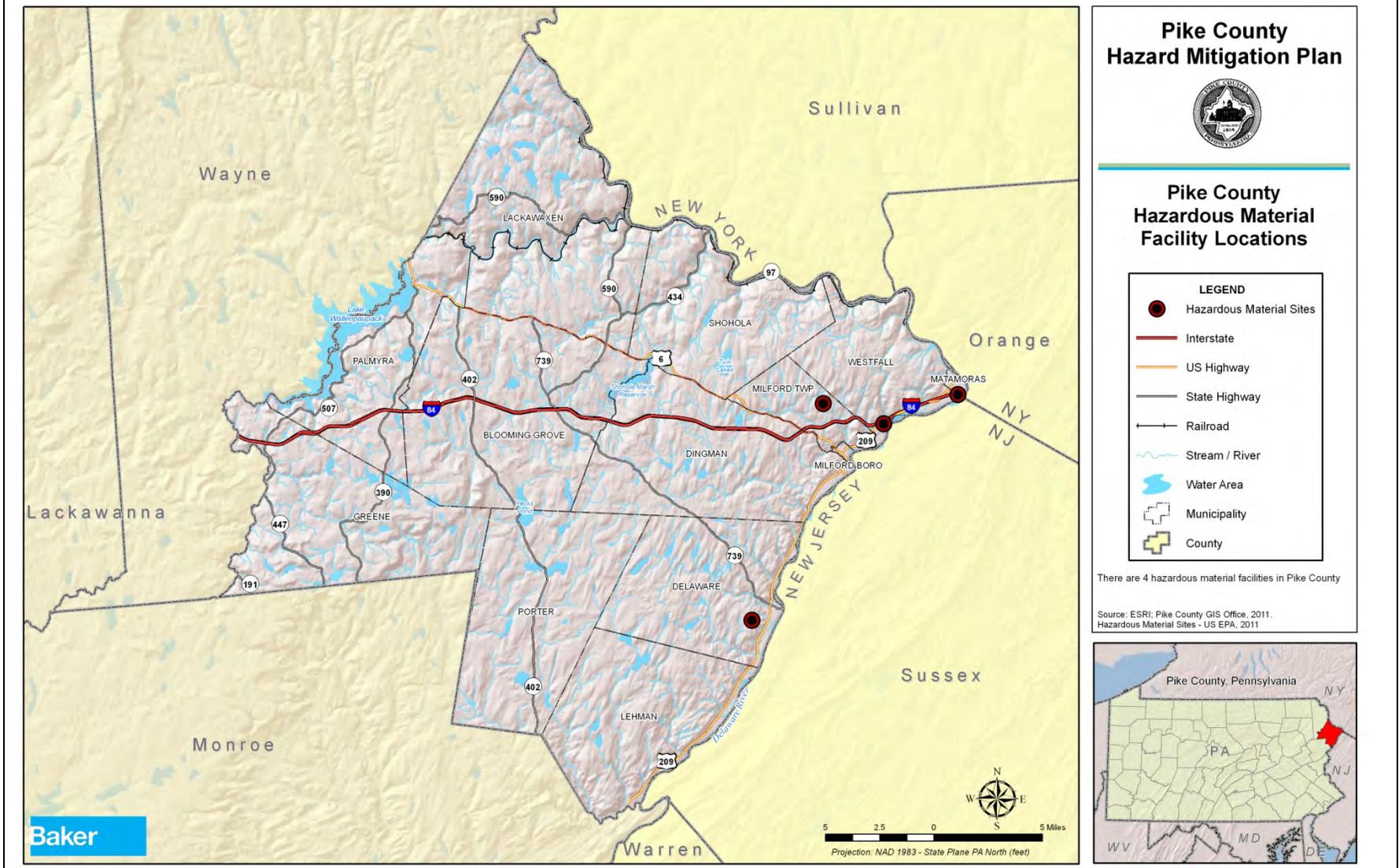
Using this dataset will help to provide a more complete picture of the risk of hazardous materials releases in the County. Pike County has 4 EPA-identified hazardous materials sites throughout the County, shown in Figure 4.3.11-1. Two of these facilities are classified as using or storing extremely hazardous substances as defined by the United States Environmental Protection Agency (SARA Title III). Several of these facilities are located in close proximity to population centers that could be affected should a major accident or spill occur. In addition, there are two natural gas transmission lines (Columbia Gas and Tennessee Gas) that cross the County and pose a threat of hazardous material release.

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

Pike County has a few highly traveled highways and a railway network that pose a risk for hazardous material incidents. These networks transport hazardous material daily, on Interstate

84, US Route 6, US Route 209, PA 402, and PA 739. These major roads pass through the more populous areas. Similarly, rail lines pass through residential areas and boroughs where larger numbers of people could be vulnerable should a serious accident occur in these places. These major transportation routes are shown in Figure 4.3.11-1.

Figure 4.3.11-1: Pike County hazardous material facilities and major roadways (US EPA, 2011; Pike County GIS Office, 2011).



**B. OIL AND GAS WELLS**

Though oil and gas wells have not had great impact on the County in the past, the recent trend in developing Marcellus Shale in neighboring counties may soon spread to Pike County.

The Marcellus Shale is a rich, organic, black shale formation that lies below a large portion of Pennsylvania. In the past, the formation was not thought of as a key resource, but now that the technology for extracting natural gas from shale has been proven, drilling companies are flocking to the region (Bradford County, PA, 2011).

Figure 4.3.11.-2 shows the extent of the Marcellus Shale Formation. Pike County lies completely within the shale formation, so it may be vulnerable to shale drilling in the near future. There are active and abandoned wells in three of the thirteen municipalities in Pike County, though none are Marcellus Shale wells. Two of the existing wells are active and one is inactive. Figure 4.3.11-3 shows the location of these wells.

Figure 4.3.11-2: Map of Marcellus Shale Formation in Pennsylvania (PA DEP, 2011)

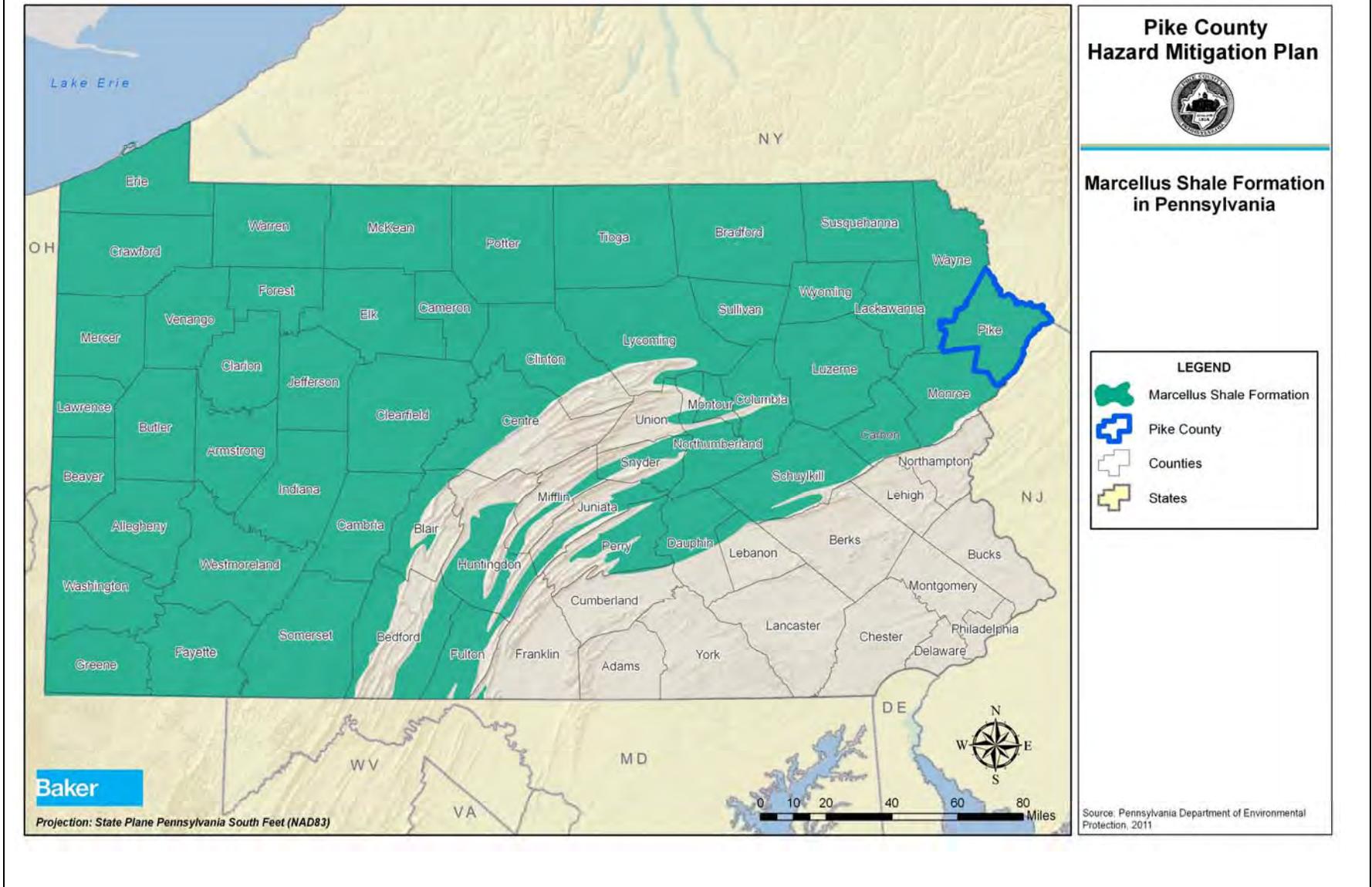
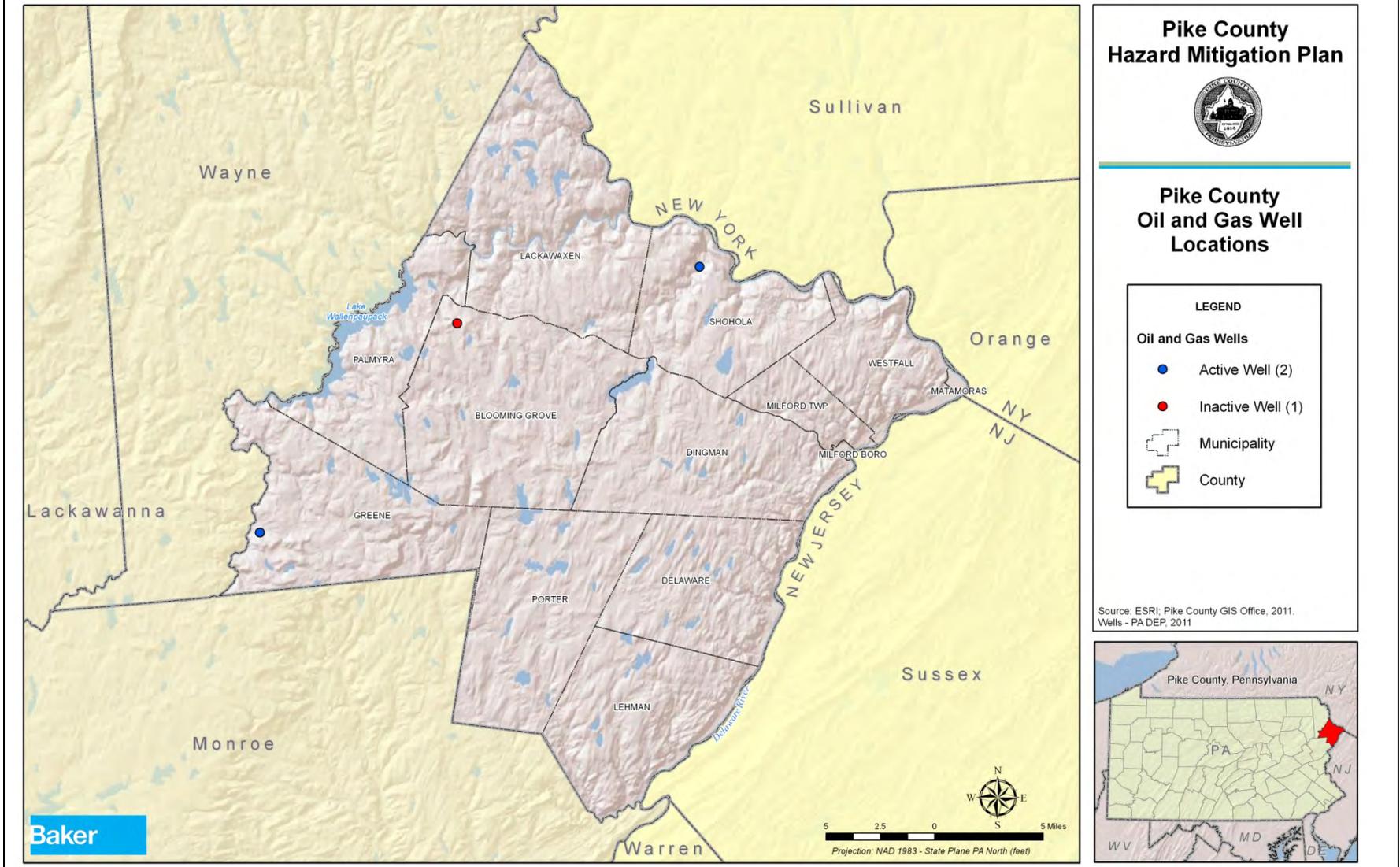


Figure 4.3.11-3: Oil and Gas wells within Pike County (PA DEP, 2011).



4.3.11.2. Range of Magnitude

**A. HAZARDOUS MATERIALS 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, or 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.

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

The severity of a given incident is dependent not only on the circumstances described above, but also 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.

The worst case scenario for a hazardous material release occurred in January 1995 when 1,000 gallons of diesel fuel was spilled after a Conrail freight train derailed near Parkers Glen in Shohola Township (PEIRS, 2002-2009)

**B. OIL AND GAS WELLS**

Oil and gas well drilling can have a variety of effects on the environment. Abandoned oil and gas wells which are not properly plugged can contaminate groundwater and consequently drinking water wells. Surface waters and soil are sometimes polluted by brine, a salty wastewater product of oil and gas well drilling, and from oil spills occurring at the drilling site or from a pipeline breach. This can spoil public drinking water supplies and be particularly detrimental to vegetation and aquatic animals.

In order to extract natural gas, hydraulic fracking must be implemented along with drilling wells. Wells are drilled first, and then are cased in to protect groundwater from natural gas or other substances. Next, to fracture the shale around the well, the drillers pump the fracking water, which is a mix of water, sand, and chemicals, into the well to force the natural gas extraction (DEP, 2010). If the natural gas is accidentally ignited, a well fire could occur. 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.

Although there are no Marcellus Shale gas wells in the County, there are two other active wells. A possible worst-case scenario for oil and gas well incidents in Pike County would be if one of these wells in the County were to experience a blowout. This would potentially cause an explosion and could lead to contamination of water supplies for nearby well-dependent populations.

4.3.11.3. *Past Occurrence*

**A. HAZARDOUS MATERIALS RELEASE**

With some exceptions, the majority of hazardous material release incidents over the years has involved petroleum product spills along the highways or has involved the railroad. Most of these are the result of collisions or derailments and have a limited impact on people and the environment. The number and quantity of hazardous materials being produced, stored and transported continue to increase each year in Pennsylvania.

There have been a total of 50 incidences of hazardous material releases in Pike County from 2002 to 2009. Most of the incidences happened during transit, but a few occurred at fixed sites. Table 4.3.11-1 shows the compiled list of incidents reported to the Pennsylvania Emergency Incident Reporting System (PEIRS) during this time period. Since the PEIRS data is from a voluntary reporting system this may not be a complete data set. Cumulatively, EPA TRI records indicate that there have been a total of 309 pounds of chemicals released from fixed sites in Pike County between 2001 and 2002 (Scorecard, 2005).

<b>Table 4.3.11-1: Previous hazardous materials incidents in Pike County between 2002 and 2009 (PEIRS, 2002-2009).</b>			
<b>DATE</b>	<b>LOCATION</b>	<b>MATERIAL INVOLVED</b>	<b>TYPE OF INCIDENT/DETAILS</b>
02/13/2002	Porter Township	Unknown	Unknown

## Pike County 2012 Hazard Mitigation Plan

**Table 4.3.11-1: Previous hazardous materials incidents in Pike County between 2002 and 2009 (PEIRS, 2002-2009).**

DATE	LOCATION	MATERIAL INVOLVED	TYPE OF INCIDENT/DETAILS
05/05/2002	Dingmans Ferry	Unknown	Storage tank leaking due to heat expansion
05/21/2002	Dingman Township	Diesel fuel	Diesel fuel spill; Transportation County was Schneider National and cleanup was carried out by PennDOT and My Place Towing
06/26/2002	Porter Township	Unknown	Unknown
07/20/2002	Delaware Township	Pesticide	Pesticide spill during spraying of repellent
11/28/2002	Matamoras Borough	Gasoline	Motor vehicle accident occurred resulting in 40 gallons of gasoline spilling on the ground at a gas station
01/14/2003	Delaware Township	Gasoline	Less than 55 gallons of petroleum product spilled; limited impact on environment, soils or waterways
02/20/2003	Blooming Grove Township	Kerosene	A residential storage tank leaked about 75 gallons of kerosene; cleanup by a private contractor
04/03/2003	Milford Borough	Dye tear gas	Dye tear gas packs detonated in the Wayne Bank; building was vented after emergency units responded; no injuries reported
05/22/2003	Greene Township	Diesel fuel	Motor vehicle accident occurred on Interstate 84 involving a tractor trailer; the saddle tank on the trailer ruptured, spilling about 120 gallons of diesel fuel; cleanup by a private contractor, and no injuries reported
10/01/2003	Blooming Grove Township	Diesel fuel	A multi-vehicle accident took place on interstate 84 involving a tractor trailer; the saddle tank ruptured on the trailer and approximately 100 gallons of diesel fuel spilled. cleanup by a private contractor, and no injuries reported
11/06/2003	Delaware Township	Gasoline	Less than 55 gallons of petroleum product spilled; limited impact on environment, soils or waterways
12/19/2003	Milford Township	Diesel fuel	An unknown source leaked 70 gallons of diesel fuel onto gravel; some fuel spilled into a drain leading to a local stream that is part of the Milford Water Authority watershed protection area; cleanup provided by TEEM Environmental
06/02/2004	Dingman Township	Diesel fuel	Less than 55 gallons of petroleum product spilled; limited impact on environment, soils or waterways; cleanup provided by PennDOT
07/13/2004	Westfall Township	Diesel fuel	A diesel fuel tank was punctured, spilling 70 gallons of fuel onto a roadway; cleanup provided by local emergency units
01/12/2005	Milford Township	Diesel fuel	On Interstate 84, the saddle tank of a tractor-trailer ruptured, spilling about 125 gallons of diesel fuel; cleanup by a private contractor, and no injuries reported

## Pike County 2012 Hazard Mitigation Plan

**Table 4.3.11-1: Previous hazardous materials incidents in Pike County between 2002 and 2009 (PEIRS, 2002-2009).**

DATE	LOCATION	MATERIAL INVOLVED	TYPE OF INCIDENT/DETAILS
02/14/2005	Dingman Township	Diesel fuel	Unknown quantity of diesel fuel spilled onto ground from an overturned tractor-trailer; cleanup provided by a private contractor
05/23/2005	Matamoras Borough	Natural Gas	Maintenance crew ruptured a gas line, releasing natural gas; leak was secured by the local gas company without incident; no injuries reported
05/25/2005	Palmyra Township	Heating oil	A delivery truck spilled an unknown amount of heating oil onto the ground; Lake Wallenpaupack may have received some of the spill; cleanup provided by a private contractor
05/27/2005	Palmyra Township	Unknown	A chemical spilled from a tractor-trailer at a rest stop on Interstate 84; no injuries reported
06/02/2005	Blooming Grove Township	Diesel fuel	Less than 55 gallons of petroleum product spilled; limited impact on environment, soils or waterways; cleanup provided by local emergency units
06/03/2005	Palmyra Township	Diesel fuel	Less than 55 gallons of petroleum product spilled; limited impact on environment, soils or waterways; cleanup provided by a private contractor
12/28/2005	Westfall Township	Diesel fuel	Accident involving a tractor-trailer occurred on Interstate 84; the saddle tank ruptured on the trailer, and an unknown amount of diesel fuel spilled onto the roadway; cleanup coordinated by emergency crews
01/05/2006	Westfall Township	Caustic soda	Water system was inadvertently contaminated with caustic soda; a teacher, student and the principal of the Delaware Valley School District, Middle School received minor burn injuries; DEP is monitoring the situation
02/14/2006	Blooming Grove Township	Diesel fuel	Less than 55 gallons of petroleum product spilled; limited impact on environment, soils or waterways; cleanup provided by local emergency units
03/02/2006	Blooming Grove Township	Diesel fuel	A tractor-trailer was jackknifed and about 250 gallons of diesel fuel were spilled; cleanup provided by Lords Valley Towing
04/25/2006	Matamoras Borough	Natural Gas	A gas line was ruptured at a construction site causing a release of natural gas; the local gas company secured the release without incident
06/08/2006	Palmyra Township	Diesel fuel	Less than 55 gallons of petroleum product spilled; limited impact on environment, soils or waterways; cleanup provided by local emergency units
06/12/2006	Dingman Township	Asphalt	Asphalt Spill; Clean up by Datom Products
06/14/2006	Matamoras Borough	Gasoline	Less than 55 gallons of petroleum product spilled; limited impact on environment, soils or waterways; cleanup provided by local emergency units

## Pike County 2012 Hazard Mitigation Plan

**Table 4.3.11-1: Previous hazardous materials incidents in Pike County between 2002 and 2009 (PEIRS, 2002-2009).**

DATE	LOCATION	MATERIAL INVOLVED	TYPE OF INCIDENT/DETAILS
08/02/2006	Lehman Township	Diesel fuel	Less than 55 gallons of petroleum product spilled; limited impact on environment, soils or waterways; cleanup provided by local emergency units
09/21/2006	Blooming Grove Township	Diesel fuel	A fuel tank on a tractor-trailer was punctured by road debris, spilling an indeterminate amount of diesel fuel on a berm; cleanup was provided by a private contractor and no injuries were reported
10/01/2006	Dingman Township	Diesel fuel	Less than 55 gallons of petroleum product spilled; limited impact on environment, soils or waterways; cleanup provided by local emergency units
11/15/2006	Greene Township	Diesel fuel	Less than 55 gallons of petroleum product spilled; limited impact on environment, soils or waterways; cleanup provided by local emergency units
12/09/2006	Lehman Township	Diesel fuel	Less than 55 gallons of petroleum product spilled; limited impact on environment, soils or waterways; cleanup provided by local emergency units
02/02/2007	Dingman Township	Liquid oxygen	A truck transporting liquid oxygen started to leak; emergency units secured the leak
05/14/2007	Matamoras Borough	Natural gas	A main gas line was ruptured at a construction site and caused a natural gas release; Orange and Rockland Gas Company secured the release without incident
05/31/2007	Lehman Township	Propane	Propane release occurred; the release was secured by local emergency units and no injuries were reported
06/04/2007	Blooming Grove Township	X-ray development acid	A van transporting x-ray development acid was reported to be on fire; cleanup was organized by emergency units and no injuries were reported
07/27/2007	Westfall Township	Hydraulic Oil	Less than 55 gallons of petroleum product spilled; limited impact on environment, soils or waterways; cleanup provided by local emergency units
08/04/2007	Blooming Grove Township	Gasoline	A vehicle accident on the McConnell Spillway resulted in an unknown amount of gasoline spilling; cleanup coordinated by emergency units and no injuries were reported
08/11/2007	Greene Township	Diesel fuel	Less than 55 gallons of petroleum product spilled; limited impact on environment, soils or waterways; cleanup provided by local emergency units
09/07/2007	Blooming Grove Township	Diesel fuel	Less than 55 gallons of petroleum product spilled; limited impact on environment, soils or waterways; cleanup provided by local emergency units

## Pike County 2012 Hazard Mitigation Plan

**Table 4.3.11-1: Previous hazardous materials incidents in Pike County between 2002 and 2009 (PEIRS, 2002-2009).**

DATE	LOCATION	MATERIAL INVOLVED	TYPE OF INCIDENT/DETAILS
10/19/2007	Dingman Township	Diesel fuel	A tractor-trailer spilled approximately 70 gallons of diesel fuel; cleanup coordinated by emergency units
12/11/2007	Blooming Grove Township	Diesel fuel	A saddle tank ruptured on a tractor-trailer spilling an unknown quantity of diesel fuel onto a roadway; cleanup was coordinated by emergency units
05/23/2008	Delaware Township	Gypsy Moth spray	After Gypsy Moth spraying occurred, tank washout activities caused an undetermined amount of spray to be released into the Wild Acres Lake
08/03/2008	Westfall Township	Gasoline	Gasoline spilled but had a limited impact on environment, soils or waterways; cleanup provided by local emergency units
08/11/2008	Palmyra Township	Gasoline	A vehicle was driven into a pond and resulted in spilling unknown quantities of gasoline and oil; cleanup coordinated by the State Police
11/05/2008	Dingman Township	Natural gas	A Columbia Gas Company transmission line ruptured, causing a natural gas release and for Interstate 84 to close; Columbia Gas Company secured the release without incident
04/28/2009	Palmyra Township	Toxic/Infectious Substance	A leak of an unknown chemical substance occurred at a rest stop on Interstate 84; local fire units responded and cleanup was coordinated by TEEM Environmental

Pike County also has record of several hazardous material incidents prior to 2002. These are displayed in Table 4.3.11-2.

**Table 4.3.11-2: Historical hazardous materials incidents in Pike County.**

DATE	LOCATION	MATERIAL INVOLVED	TYPE OF INCIDENT/DETAILS
January 1978	Westfall Township	Acetaldehyde	Conrail freight train derailed north of Mill Rift; one derailed tank car containing acetaldehyde began leaking and required the evacuation of several residences along the Delaware River in both Pennsylvania and New York.
December 1990	Milford Township	Carbon bisulfate	A Yellow freight tractor-trailer jack-knifed on icy Route 84 west of the Milford exit. One tandem trailer, carrying twelve 55-gallon drums of Carbon bisulfate overturned spilling cargo. Emergency officials closed portions of Route 84 for up to 12 hours to allow for safe clean up
February 1992	Milford Township	Natural Gas	The odor of natural gas forced the evacuation of 54 patients at the former Milford Head Trauma center (Facility has since closed and is now the location of Belle-Reve).

**Table 4.3.11-2: Historical hazardous materials incidents in Pike County.**

DATE	LOCATION	MATERIAL INVOLVED	TYPE OF INCIDENT/DETAILS
November 1993	Milford Township	Non-toxic substance	One lane of Route 84 westbound near the Milford exit was closed for a period of time, while emergency officials investigated a material leaking from a tractor-trailer. Material was later identified as a non-toxic substance
August 1994	Westfall Township	Chlorine gas	A chlorine gas leak occurred at Matamoras Municipal Water Authority Well #5 in Westfall Township. One individual was taken to the hospital for treatment.
January 1995	Shohola Township	Diesel fuel	The lead locomotive of a Conrail freight train derailed in Shohola Township in the area near Parkers Glen. The derailment resulted in the unit, turning on its side, releasing close to 1000 gallons of diesel fuel
August 1999	Palmyra Township	Various substances	A tractor-trailer parked at the Route 390 exit of Route 84 was reported to be leaking something. Trailer was carrying a mixed load of hazardous waste material. TEEM Environmental responded and cleaned up two leaking drums – one a flammable material, the other a non-toxic polymer, similar to glue
December 1999	Dingman Township	Flammable solution	A tractor-trailer accident along Route 84 in Dingman Township resulted in at least twelve 400-lb containers of a highly flammable solution to leak. TEEM Environmental provided clean up.

**B. OIL AND GAS WELLS**

Environmental incidents including water contamination and fire spurring from oil and gas well drilling have occurred numerous times in Pennsylvania over the past century. Being that there is very little oil and gas well drilling in Pike County and no Marcellus shale drilling, there have been no past occurrences of oil and gas well accidents in Pike County. However, there have been many natural gas incidents occurring in nearby counties as gas companies rush to develop the natural gas deposits from Marcellus Shale. Most recently, in April 2011, a large spill occurred in Bradford County during fracking operations, and seven families were asked to evacuate their homes. An unknown amount of contaminated fluids spilled from the well, and reportedly contaminated a local creek that runs into the Susquehanna River (Gilliland, 2011). In Clearfield County in 2010, high gas pressure during the fracking process caused a rupture that discharged polluted water and explosive gas for sixteen hours. Though the drilling took place in a remote area at least a mile from any homes and no one was injured, it was still a major accident where the drilling process went out of control (ThePittsburghChannel, 2010).

**4.3.11.4. Future Occurrence**

**A. HAZARDOUS MATERIALS RELEASE**

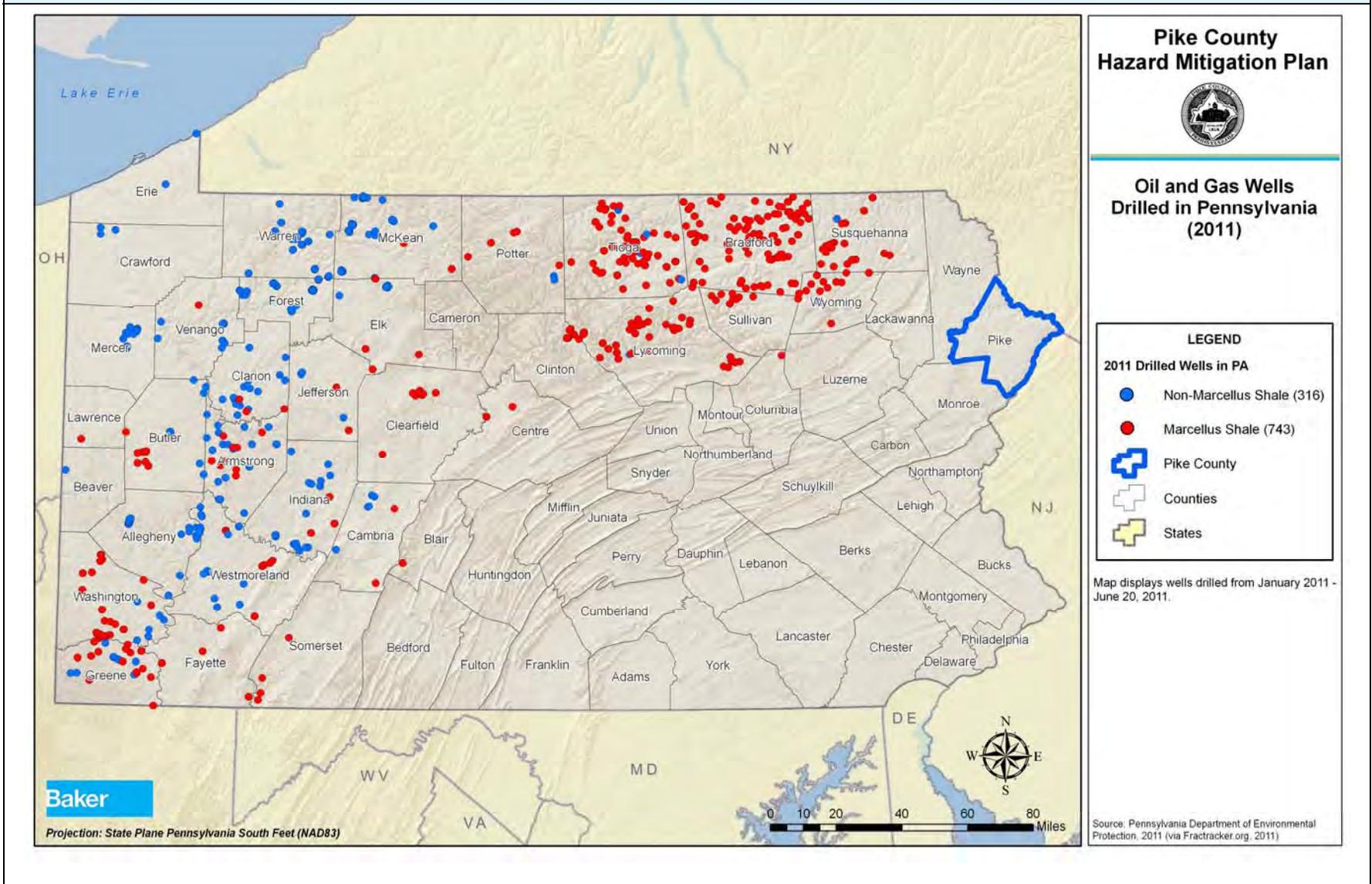
Even with all the population growth, Pike County remains a rural county. The prospect of becoming a home to a company that would require the use of large quantities of hazardous materials remains extremely low. The transport, storage, and handling of hazardous materials are on the increase nationwide and with this is the potential for an increase in accidents. Neither Pennsylvania nor Pike County is immune. Unfortunately as the County has grown, the condition of many of the highways has not improved to keep up with that growth. In fact, PennDOT has continued to reduce staff, making winter maintenance difficult. With the County's highways and railroads active role in transporting such materials, major transportation accidents involving hazardous materials could happen. Therefore the future occurrence of environmental hazards in Pike County can be considered *possible* as defined by the Risk Factor Methodology probability criteria (see Table 4.4-1).

While many incidents involving hazardous materials releases have occurred in Pike County in the past, they are generally difficult to predict. Any occurrence is largely dependent upon the accidental or intentional actions of a person or group. Population growth, especially in areas close to transportation routes, can expose more people to these hazards if a release incident occurs.

### **B. OIL AND GAS WELLS**

It is difficult to predict when and where environmental hazards will arise. Stringent monitoring through the Pennsylvania Department of Environmental Protection will reduce the likelihood of potential impacts to the community and the environment. Incidents involving oil and gas well drilling are expected to remain relatively low, but may increase if development of Marcellus Shale progresses in Pike County. In Figure 4.3.11-4, the rapid development of Marcellus Shale natural gas deposits is shown. Though Pike County has yet to be affected, it may be impacted soon. The County recently began to plan for future impact of Marcellus Shale on their region by starting a Marcellus Shale Task Force in October of 2010.

Figure 4.3.11-4: Map of Oil and Gas wells drilled in Pennsylvania in 2011 (PA DEP, 2011)



**4.3.11.5. Vulnerability Assessment**

**A. HAZARDOUS MATERIALS RELEASE**

There are approximately 35 miles of Interstate Route 84 that crosses east to west across the County from the Delaware River at the Matamoras - Westfall border to the Wayne County border at Greene Township. This road is a major route from the New England states west. It is a vulnerable corridor for hazardous waste accidents as many materials, including high level radioactive waste are transported through the corridor. Other potential sources of hazardous materials include two natural gas transmission lines that cross the County, each with a compressor station, the two SARA facilities within the County, each containing chlorine gas, and several fuel dispensing facilities with large bulk tanks containing either fuel oil, diesel fuel, kerosene, or propane.

Regarding railroad transport of hazardous materials, Norfolk Southern took over operation of approximately 26 miles of its Southern Tier Route along the Delaware River from Conrail in 1999. A January 2001 listing of the top 50 commodities showed that approximately 6,000 car loads of hazardous materials were transported along this line in the previous 12 months – liquefied petroleum amounted to 1,900 car loads. In January 2005, Norfolk Southern leased this line to the Central New York Railroad, which is owned by the New York, Susquehanna and Western Railroad. This railroad has plans to improve the track conditions with hope of increasing traffic. It appears that more trains may now be using the line than have used it for many years thus making populations that live along the lines vulnerable to hazardous material accidents.

Jurisdictions that are home to EPA-identified hazardous material facilities should be considered vulnerable to releases from these fixed facilities. Westfall Township has the most hazardous materials facilities with two, followed by Delaware Township and Milford Township which each host one facility. Lackawaxen, Palmyra, Shohola, Blooming Grove, Greene, Porter, Lehman, and Delaware townships have much lower relative vulnerability to fixed hazardous materials incidents because they have no hazardous material facilities although communities that border a site would be vulnerable.

Populations in and around the communities that are home to EPA-identified hazardous material sites are more vulnerable to facility releases, particularly those within 1.5 miles of the facility. Table 4.3.11-3 shows the number of addressable structures and critical facilities within 1.5 miles of hazardous materials sites. Unsurprisingly, the four municipalities with hazardous material sites have the most structures and some of the most critical facilities within the buffer. Delaware Township is the most populated municipality with a hazardous material site.

Jurisdictions without fixed hazardous materials facilities in general do not have vulnerable structures or critical facilities. However, it is important to note that even if a jurisdiction houses no hazardous materials sites, it may be vulnerable to a release event occurring in an adjacent municipality, as is the case with Matamoras Borough.

Table 4.3.11-3: EPA-Identified hazardous material facilities per municipality (EPA, 2008).

MUNICIPALITY	NUMBER OF HAZARDOUS MATERIAL SITES	TOTAL ADDRESSABLE STRUCTURES WITHIN 1.5 MILE BUFFER OF HAZARDOUS MATERIAL SITES	TOTAL CRITICAL FACILITIES WITHIN 1.5 MILE BUFFER OF HAZARDOUS MATERIAL SITES
Blooming Grove Township	0	0	0
Delaware Township	1	101	3
Dingman Township	0	22	0
Greene Township	0	0	0
Lackawaxen Township	0	0	0
Lehman Township	0	0	0
Matamoras Borough	1	1,007	5
Milford Borough	0	0	0
Milford Township	1	430	3
Palmyra Township	0	0	0
Porter Township	0	0	0
Shohola Township	0	0	0
Westfall Township	1	558	6
<b>TOTAL</b>	<b>4</b>	<b>2,118</b>	<b>17</b>

Transportation of hazardous materials also increases risk of hazardous material releases to those jurisdictions through which carriers pass. Transportation carriers must have response plans in place to address accidents, otherwise the local emergency response team will step in to secure and restore the area. Quick response minimizes the volume and concentration of hazardous materials that disperse through air, water and soil. Populations living within ¼ mile of major highways and railways should also be considered more vulnerable in the event of a transportation incident involving hazardous materials. For more information on the numbers of addressable structures located within ¼ mile of major highways and railways, please see Section 4.3.14.5.

There are two natural gas transmission pipelines that bisect the County. They are displayed in figured 4.3.16-1. Breaks in the pipelines could result in hazardous material releases as well as explosions and utility interruptions. Municipalities most vulnerable to pipeline accidents include Westfall, Milford, Dingman, Delaware, Lehman, Shohola, and Lackawaxen Township.

**B. OIL AND GAS WELLS**

Although there are only two active oil or gas wells, one inactive well, and one plugged well in Pike County, all 13 communities in Pike County are vulnerable on some level, directly or indirectly, to environmental hazards resulting from oil and gas well activity. Surface waters closest to well sites are most vulnerable to damage and oil and gas industry workers are most likely to be affected by gas well fires.

In addition, well drilling and operation poses a threat to groundwater resources. One of the greatest fears of residents in Marcellus Shale counties is that groundwater will become contaminated as a result of developing the natural gas deposits. Groundwater is currently the sole source of drinking water in Pike County according to a watershed specialist from the Pike County Conservation District and the majority of Pike County residents obtain their groundwater from wells drilled into bedrock (Kane, 2009). 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. Ideally vulnerability of private drinking well owners would be established by comparing distance of drinking water wells to known oil and gas well locations but this data is not available at this time. Private drinking water is largely unregulated and information on these wells is submitted to the Pennsylvania Topographic and Geologic Survey by water well drillers. Therefore the existing data is largely incomplete and/or inaccurate (PaGWIS). Table 4.3.11-3 shows the number of oil wells, gas wells, and domestic drinking water wells by jurisdiction.

<b>Table 4.3.11-3: Number of oil wells, gas wells and domestic drinking water wells by jurisdiction (PAGWIS).</b>					
<b>MUNICIPALITY</b>	<b>OIL AND GAS WELLS</b>				<b>DOMESTIC DRINKING WATER WELLS</b>
	<b>ACTIVE</b>	<b>ABANDONED</b>	<b>INACTIVE</b>	<b>PLUGGED</b>	
Blooming Grove Township	0	0	1	1	157
Delaware Township	0	0	0	0	808
Dingman Township	0	0	0	0	2222
Greene Township	1	0	0	0	850
Lackawaxen Township	0	0	0	0	316
Lehman Township	0	0	0	0	893
Matamoras Borough	0	0	0	0	19
Milford Borough	0	0	0	0	102

Table 4.3.11-3: Number of oil wells, gas wells and domestic drinking water wells by jurisdiction (PAGWIS).					
MUNICIPALITY	OIL AND GAS WELLS				DOMESTIC DRINKING WATER WELLS
	ACTIVE	ABANDONED	INACTIVE	PLUGGED	
Milford Township	0	0	0	0	125
Palmyra Township	0	0	0	0	335
Porter Township	0	0	0	0	144
Shohola Township	1	0	0	0	442
Westfall Township	0	0	0	0	262
<b>Total</b>	<b>2</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>6,675</b>

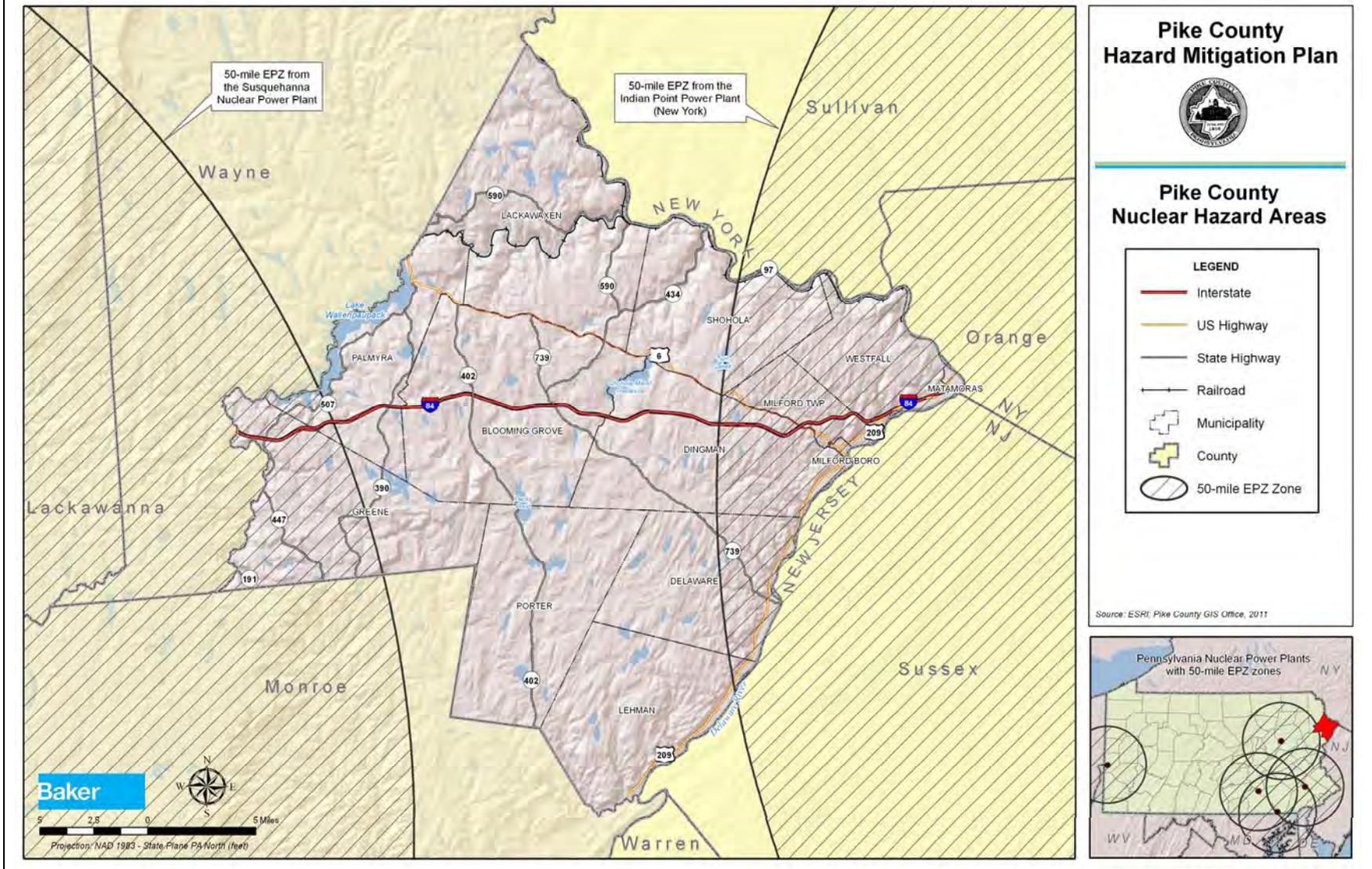
**4.3.12. Nuclear Incidents**

*4.3.12.1. Location and Extent*

Nuclear Incidents generally refer to events involving the release of significant levels of radioactivity or exposure of workers or the general public to radiation. The Nuclear Regulatory Commission encourages the use of Probabilistic Risk Assessments to quantitatively estimate the potential risk to public health and safety considering the design, operations and maintenance practices at nuclear power plants. Probabilistic Risk Assessments 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 to prepare for radiological emergencies at the five nuclear power generating facilities in the Commonwealth of Pennsylvania. These plans include a *Plume Exposure Pathway Emergency Planning Zone (EPZ)* with a radius of ten miles from each nuclear power facility and an *Ingestion Exposure Pathway EPZ* with a radius of fifty miles from each facility.

As seen in Figure 4.3.12-1, Pike County is not located within the ten-mile Plume Exposure Pathway EPZ of any nuclear facility. However, the far western portion of the County lies within the fifty-mile Ingestion Exposure Pathway EPZ for the Susquehanna Steam Electric Station, located in Luzerne County, PA. In addition, the far eastern portion of the County’s land area is located within the Ingestion Exposure Pathway EPZ of the Indian Point Power Plant located in New York State. Other power plants in Pennsylvania, New York, and New Jersey are more than fifty miles away from Pike County. This distance exceeds the Plume Exposure and Ingestion Exposure Pathway EPZs for nuclear emergencies; therefore, these facilities are considered a minimal threat to the County. However, in the event of an emergency, evacuees from distant EPZs may seek shelter in Pike County.

Figure 4.3.12-1: Pike County's location in relation to the 50-mile EPZs of Nuclear Power Plants.



### 4.3.12.2. Range of Magnitude

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, but the Plume Exposure Pathway is not a significant concern for Pike County. The County instead focuses on the impact of the Ingestion Exposure Pathway EPZ. This EPZ refers to exposure primarily from ingestion of water or foods such as milk and fresh vegetables that have been contaminated with radiation. This kind of exposure can stem from any of the three categories of nuclear accident.

Nuclear accidents 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 (NRC, 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.
- 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 Protective Action Guides 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 Protective Action Guides for more than the immediate site area.

After a nuclear incident, the primary concern is the effect on the health of the population near the incident. The duration of primary exposure could range in length from hours to months depending on the proximity to the point of radioactive release. External radiation and inhalation and ingestion of radioactive isotopes can cause acute health effects (e.g. death, severe health impairment), chronic health effects (e.g. cancers) and psychological effects.

Potential environmental impacts specific to the 50-mile Ingestion Exposure Pathway EPZ, and therefore of most concern to Pike County, include the long-term effects of radioactive contamination in the environment and in agricultural products. Pike County can expect some radioactive contamination in very small amounts in the case of a nuclear incident. This is not a significant concern in terms of external exposure and immediate health risks, but even a small amount of radiation will require the protection of the food chain, particularly milk supplies. Small amounts of radiation ingested over time could lead to future health issues. As a result, in the case of a nuclear incident, foodstuffs, crops, milk, livestock feed and forage, and farm water supplies will need to be protected from and tested for contamination. Additionally, spills and releases of radiologically active materials from accidents can result in the contamination of soil and public water supplies.

The worst-case scenario nuclear incidents for Pike County would be if a General Emergency occurred at Indian Point Power Plant that leaked sufficient radiation to create longer-term damage in the form of contaminated water, soil, and food supplies in the County. In addition, New York residents may enter Pike County in search of a new residence or for medical care thus overwhelming existing community facilities and services.

#### 4.3.12.3. Past Occurrence

There has been one nuclear incident above the *Alert* classification in the United States. In March 1979, a *Site Area Emergency* event occurred at Three Mile Island - Unit 2. This event is the most serious commercial nuclear accident in United States history. During this incident, equipment malfunctions, design-related problems, and worker errors led to a partial meltdown of the Three Mile Island Unit 2 reactor core at Three Mile Island. The resulting contamination and state of the reactor core led to the development of a ten-year cleanup and scientific effort. Despite the severity of the damage, no injuries due to radiation exposure occurred. There were however, significant health effects reported due to the psychological stress on the individuals living in the area.

#### 4.3.12.4. 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).

Across the United States, a number of *Unusual Event* and *Alert* classification level events occur each year at the 100+ nuclear facilities that warrant notification of local emergency managers. Of these, *Alert* emergencies occur less frequently. For example, in 1997, there were forty notifications of *Unusual Events* and three *Alert* events nationwide. Based on historical events, *Site Area Emergency* and *General Emergency* incidents are very rare. The County expects that the future occurrence of a nuclear incident will continue to be *unlikely* as defined by the risk factor methodology in Table 4.4-1.

**4.3.12.5. Vulnerability Assessment**

Only portions of Pike County are located within the Ingestion Pathway EPZ of the Susquehanna Steam Electric Station or Indian Point Power Plant. Thus those municipalities more vulnerable to the contamination effects of nuclear incidents include Palmyra and Greene Townships for the Susquehanna Steam Electric Station and Shohola, Westfall, Milford, Dingman, Delaware, and Lehman Townships and Matamoras and Milford Boroughs for the Indian Point Power Plant. The number of structures and critical facilities within the 50 mile EPZ of each power plant is displayed in Table 4.3.12-1.

<b>Table 4.3.12-1: Structures and critical facilities with the 50 mile EPZ of power plants.</b>				
<b>Municipality</b>	<b>Addressable Structures in 50 mile EPZ of Indian Point Power Plant (NY)</b>	<b>Total Critical Facilities in 50 mile EPZ of Indian Point Power Plant (NY)</b>	<b>Addressable Structures in 50 mile EPZ of Susquehanna Power Plant (PA)</b>	<b>Total Critical Facilities in 50 mile EPZ of Susquehanna Power Plant (PA)</b>
Blooming Grove Township	0	0	0	0
Delaware Township	1195	4	0	0
Dingman Township	2015	4	0	0
Greene Township	0	0	2,670	7
Lackawaxen Township	0	0	0	0
Lehman Township	0	0	0	0
Matamoras Borough	1007	5	0	0
Milford Borough	591	9	0	0
Milford Township	837	6	0	0
Palmyra Township	0	0	789	0
Porter Township	0	0	0	0
Shohola Township	342	1	0	0
Westfall Township	1205	11	0	0
<b>TOTAL</b>	<b>7,192</b>	<b>40</b>	<b>3,459</b>	<b>7</b>

As stated in Section 4.3.12.2, the County's primary vulnerability to nuclear incidents comes in the form of food, soil, and water contamination. In terms of vulnerable land, the approximately 10,000 acres of farmland is vulnerable to radiological contamination in a nuclear incident. In 2007, the market value of all agricultural products of these farms totaled \$2.5 million. While unlikely that all agricultural products would be lost in the event of a nuclear incident, the County can expect some portion to be lost. 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.

Water contamination is also a concern in nuclear incidents. Public water suppliers that operate in or provide water to the County, coupled with the County's 6,675 domestic drinking water wells, are all vulnerable to the effects of a nuclear incident.

### **4.3.13. Terrorism**

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

An important consideration in evaluating terrorism hazards is the existence of facilities, landmarks, or other buildings of international, national, or regional importance. While Pike County has many notable landmarks from a local historic perspective, there are no sites which are considered significant landmarks in terms of national or international importance.

Nonetheless, terrorism can take many forms and terrorists have a wide range of personal, political, or cultural agendas. Therefore, there is no location that is not a potential terrorist target. Two types of terrorist activity are particularly relevant to Pike County: agriterrorism and intentional hazardous material releases. Agriterrorism is the direct, intentional, generally covert contamination of food supplies or introduction of pests and/or disease agents to crops and livestock. Approximately 3% of its land area dedicated to agriculture.

Several major transportation routes and two large gas transmission pipelines traverse the County; making intentional hazardous material releases a potential threat to citizens and the environment. This hazard is addressed in Section 4.3.11. In addition, there are several bridges that connect Pike County to the New York – New Jersey metropolitan area that could be considered potential targets.

Although the county does not have a large number of facilities that could be considered targets, it does have the type of facilities that are considered, including school complexes, shopping areas, government buildings, including jails, water distribution systems and dams, power plants and communications systems. A complete list of critical facilities is included in Appendix E.

In addition, all bridges and railways (discussed in Section 4.3.14) across the County are considered potential targets.

Furthermore, the threat of a nuclear attack is rare but should not be eliminated. There are still several countries in the world with nuclear capability and other nations continue to try to obtain that capability. Any areas that are identified as high risk areas or target areas would experience the direct effects of the weapon, including blast, radiation, extreme temperatures, wind and light

which is brighter than the sun. Depending on the size of the device, there could be total destruction within a 4-mile radius of the blast. Any survivors within a 20-mile radius can expect residual effects including fires, flooding, loss of power, fuel and water shortages, plus the release of other hazardous materials that may be in the area. People close to the blast would be killed. As the distance increases, more people will survive, however, people that do survive the initial blast may die due to an increase in exposure to gamma rays.

Because of the Pike County's location and proximity to the New York metropolitan area, should a major attack occur, the Pike County should expect to receive some exposure from radioactive fallout. Pike County should also expect to see an influx of people from the New York metropolitan area seeking safety.

### 4.3.13.2. *Range of Magnitude*

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).

Terrorist attacks can take many forms, including agriterrorism, arson/incendiary attack, armed attack, biological agent, chemical agent, cyberterrorism, conventional bomb, intentional hazardous material release, nuclear bomb and radiological agent. The severity of terrorist incidents depends upon the method of attack, the proximity of the attack to people, animals, or other assets and the duration of exposure to the incident or attack device. For example, chemical agents are poisonous gases, liquids or solids that have toxic effects on people, animals, or plants. Many chemical agents can cause serious injuries or death. 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 example of a worst case scenario for terrorism in Pike County would be if a terrorist bombed the Delaware River bridges connecting the County to the New York – New Jersey metropolitan area. These are major trucking routes for the region and would disrupt the transportation of goods and services. In addition, many of Pike County's residents commute to the New York – New Jersey metropolitan area for work and they would have to find alternate ways to reach their destinations.

### 4.3.13.3. *Past Occurrence*

Table 4.3.13-1 displays terrorism incidents reported to PEIRS between 2002 and 2009. The most common terroristic threat was bomb threats.

**Table 4.3.13-1: Terrorism incidents in Pike County from 2002-2009 (PEIRS, 2002-09)**

DAY	LOCATION	TYPE
02/08/2002	Lehman Township	Bomb Threat
02/14/2003	Palmyra Township	Bomb Threat
06/11/2003	Palmyra Township	Bomb Threat
12/18/2003	Palmyra Township	Bomb Threat
10/28/2004	Palmyra Township	School Bomb Threat
03/29/2006	Lehman Township	School Bomb Threat
04/05/2006	Lehman Township	School Bomb Threat
05/10/2006	Westfall Township	Bomb Threat
05/30/2006	Palmyra Township	Suspicious Activity
09/11/2006	Lehman Township	School Bomb Threat
07/02/2007	Dingman Township	Suspicious Device
12/29/2007	Blooming Grove Township	Suspicious Device
02/21/2008	Lehman Township	Terroristic Threat

**4.3.13.4. Future Occurrence**

Based on historical events, Pike County can expect to experience several terrorist threats each year however few that result in an actual terrorist incident. Therefore, the future occurrence of terrorism in Pike County can be considered *possible* according to the risk factor methodology displayed in Table 4.4-1. Note that this estimate is based on the occurrence of past events over a short period of time and is not the result of detailed statistical sampling. 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.

**4.3.13.5. Vulnerability Assessment**

The probability of Pike County becoming a terrorist target should remain relatively low, however, because of its proximity to other more vulnerable areas its vulnerability is increased. The County would experience some serious issues with influx of people from the more metropolitan areas to the east in situations of terrorism and/or nuclear threats to these areas. This influx of population in these critical situations would stress the rural facilities of the County and its municipalities.

Since the probability of terrorism occurring cannot be quantified in the same way as that of many natural hazards, it is not possible to assess vulnerability in terms of likelihood of

occurrence. Instead, vulnerability is assessed in terms of specific assets. By identifying potentially at-risk terrorist targets in a community, planning efforts can be put in place to reduce the risk of attack. All communities in Pike County are vulnerable on some level, directly or indirectly, to a terrorist attack. However, communities where the previously mentioned potential targets are located should be considered more vulnerable. Site-specific assessments should be based on the relative importance of a particular site to the surrounding community or population. Threats that are known to exist and vulnerabilities include:

- Inherent vulnerability:
  - Visibility – How aware is the public of the existence of the facility?
  - Utility – How valuable might the place be in meeting the objectives of a potential terrorist?
  - Accessibility – How accessible is the place to the public?
  - Asset mobility – is the asset's location fixed or mobile?
  - Presence of hazardous materials – Are flammable, explosive, biological, chemical and/or radiological materials present on site? If so, are they well secured?
  - Potential for collateral damage – What are the potential consequences for the surrounding area if the asset is attacked or damaged?
  - Occupancy – What is the potential for mass casualties based on the maximum number of individuals on site at a given time?
  
- Tactical vulnerability:
  - Site Perimeter*
    - Site planning and Landscape Design – Is the facility designed with security in mind – both site-specific and with regard to adjacent land uses?
    - Parking Security – Are vehicle access and parking managed in a way that separates vehicles and structures?
  - Building Envelope*
    - Structural Engineering – Is the building's envelope designed to be blast-resistant? Does it provide collective protection against chemical, biological and radiological contaminants?
  - Facility Interior*
    - Architectural and Interior Space Planning – Does security screening cover all public and private areas?
    - Mechanical Engineering – Are utilities and HVAC systems protected and/or backed up with redundant systems?
    - Electrical Engineering – Are emergency power and telecommunications available? Are alarm systems operational? Is lightning sufficient?
    - Fire Protection Engineering – Are the building's water supply and fire suppression systems adequate, code-compliant and protected? Are on-site personnel trained appropriately? Are local first responders aware of the nature of the operations at the facility?
    - Electronic and Organized Security – Are systems and personnel in place to monitor and protect the facility?

Pike County is involved in a Regional Catastrophic Planning Team which includes counties in New York and New Jersey in the New York City metropolitan area. The counties involved in the initiative correspond to the US Census Bureau's New York-Newark-Bridgeport, NY-NJ-CT-PA Combined Statistical Area (CSA) and include the largest city in the United States (New York), the two largest cities in New Jersey (Newark and Jersey City), and Bridgeport, Connecticut. Pike County is the only participating Pennsylvania County. The team offers planning support for COOP and COG plans, debris management plans, shelter plans, logistical planning, mass fatality planning, and mass casualty planning. Through Pike County's involvement in the group the County is able to plan for evacuation and sheltering needs if a terroristic incident were to occur.

### **4.3.14. Transportation Accidents**

#### **4.3.14.1. Location and Extent**

For the purposes of this plan, transportation accidents are defined as incidents involving highway, air, and rail travel, resulting in death, serious injury, extensive property loss or damage or situations that cause delay or closure. Accidents related to hazardous materials are considered as part of the hazardous materials section of Section 4.3.11.

Within Pike County, there are a total of 645 miles of developed roads. State highways account for 392 miles of this total while 252 miles are local municipal roads. The County is home to significant transportation routes such as Interstate 84, US 209, US 6, PA 739, PA 434, PA 590, PA 507, PA 447, PA 402, and PA 390. Figure 4.3.14-1 illustrates major transportation routes in the County. Figure 4.3.14-2 shows the traffic volume on key roadways.

There are two railroad lines operating in the County which transport passengers and freight of all types, including hazardous materials. One rail line is owned by Norfolk Southern Railway and is leased by the Central New York Railroad and its parent company, the New York, Susquehanna, and Western Railroad (NYSW). All dispatching is now done by the NYSW. The second line in operation is the Stourbridge Railroad, a local shortline operation that is owned by the Lackawaxen-Honesdale Shippers Association. It directly interchanges at Lackwaxen, PA with the Norfolk Southern Railway that owns the mainline route between Binghamton and Port Jervis. The same line of railroad is, through trackage rights, also run regularly by the New York Susquehanna and Western Railway, a subsidiary of CSX. Therefore rail users have their choice of shipping via Norfolk Southern or CSX. The Stourbridge Railroad is also used by the Wayne County Chamber of Commerce for passenger excursions, an important component of the local tourist economy. These services are carefully coordinated with freight deliveries to ensure that freight services always enjoy preference.

Although there is no airport within the County, there is an abundance of air traffic from airports in neighboring municipalities and states. With Stewart International Airport in Newburgh, NY and the Wilkes-Barre Scranton Airport in Avoca, PA, much of the county finds itself under one of their approach patterns. Stewart is home to a New York Air National Guard unit which has several large C-5As at their disposal.

Figure 4.3.14-1: Pike County transportation systems (PennDOT, 2010; Pike County GIS Office, 2011).

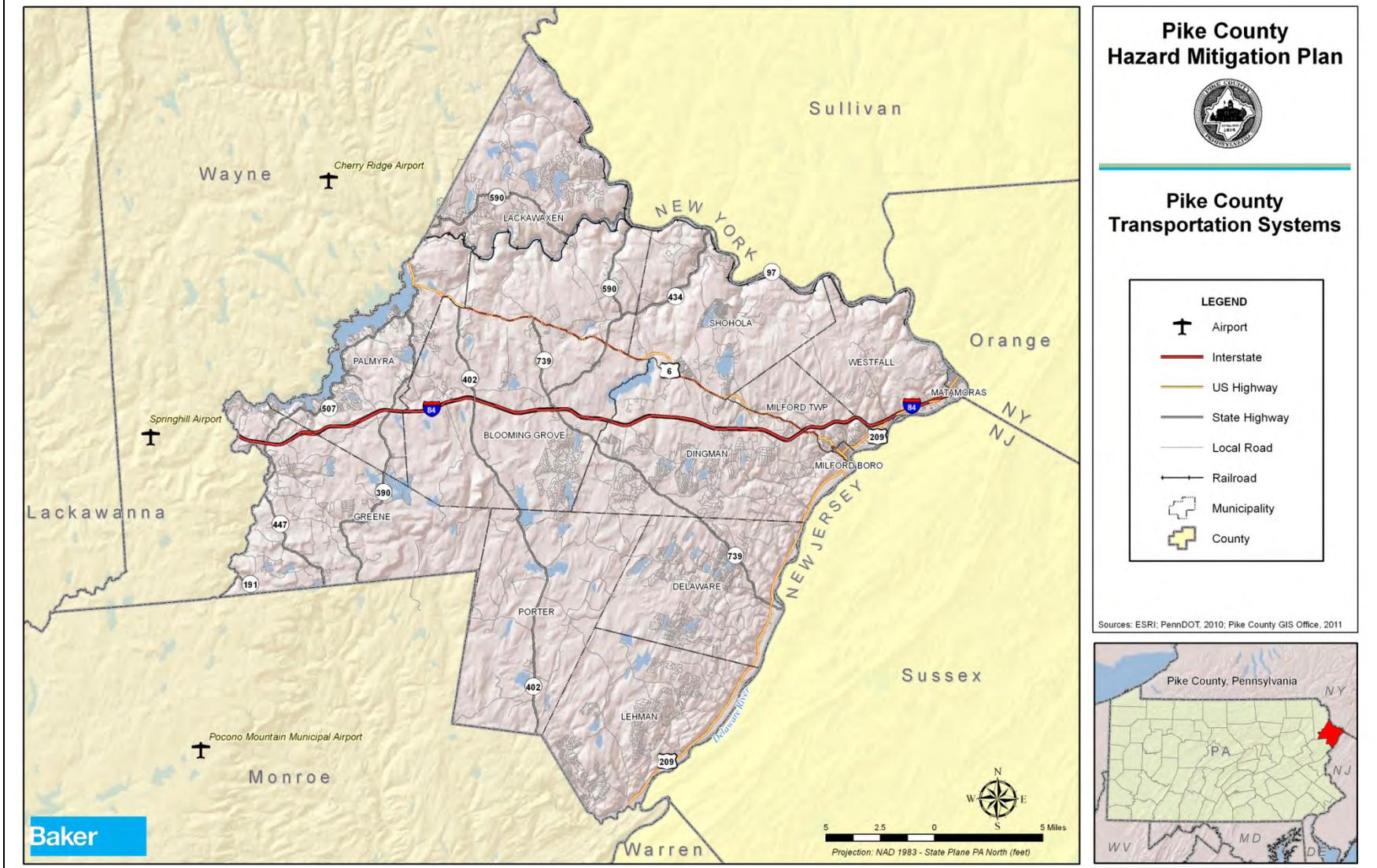
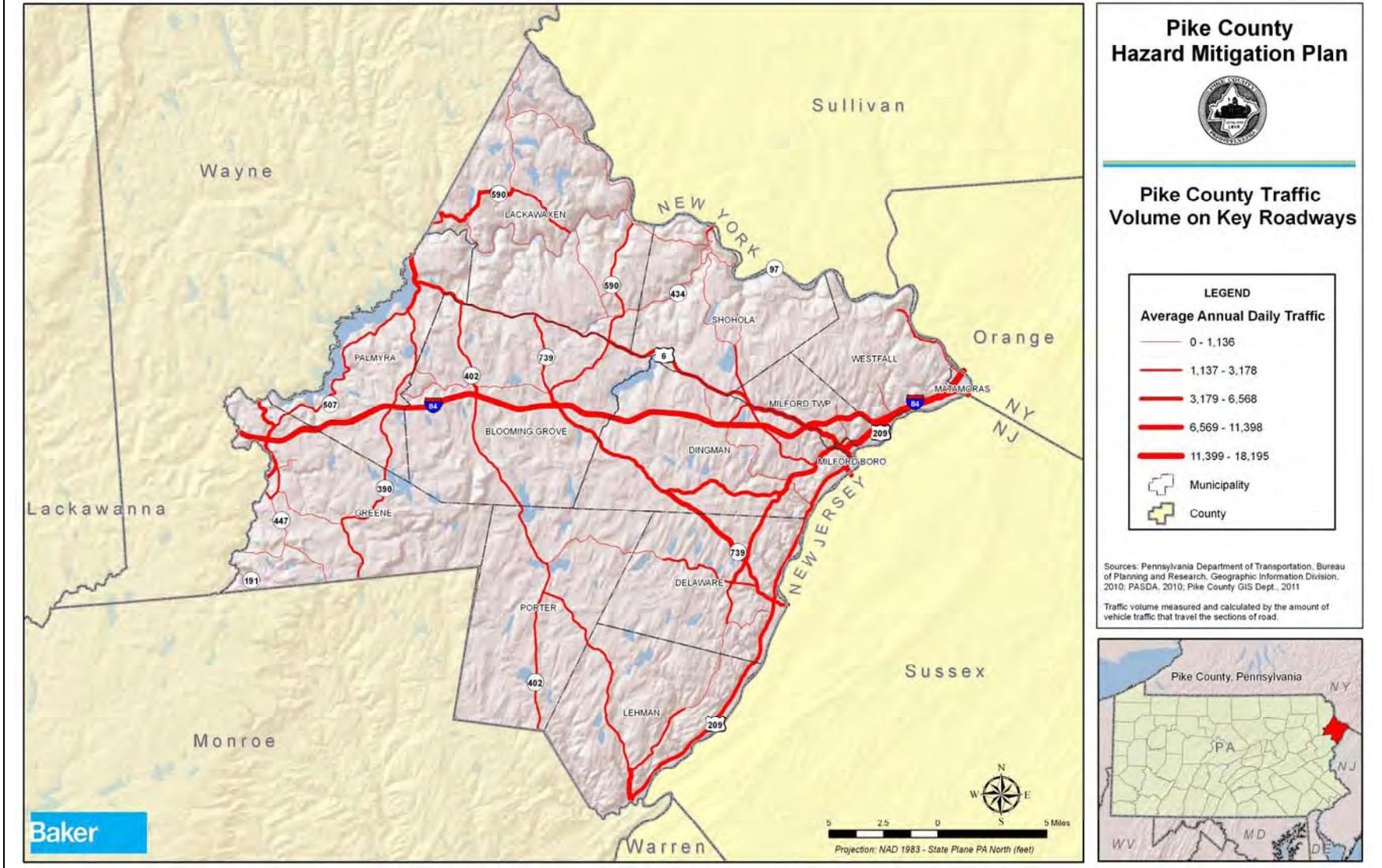


Figure 4.3.14-2: Pike County traffic volume on key roadways (PennDOT, 2010).



*4.3.14.2. Range of Magnitude*

At a minimum, transportation accidents can result in injuries to passengers and drivers and/or damage to vehicles. Significant transportation accidents can result in death or serious injury or extensive property loss or damage coupled with business interruptions and hours of congestion. Road and railway accidents in particular have the potential to result in hazardous material releases if the vehicle involved in an accident is hauling hazardous materials. The expected impacts of transportation accidents are amplified by the fact that there is often little warning of accidents.

School bus accidents are one of the worst type of vehicle accidents that occur due to the vulnerable age of the students and the number of people that can be injured. One-hundred percent of the school students attending one of the county's three school districts require transportation. With each school district growing on an annual basis, this means the number of school buses required to travel rural roads also increases. As the number of buses increase, the average experience level of the drivers has also decreased.

A worst case scenario within Pike County would involve an accident where a tanker truck hauling hazardous materials has an accident on Interstate 84. This would create a large traffic back up, and endanger critical facilities such as schools or nursing homes in a highly populated area.

*4.3.14.3. Past Occurrence*

There have been highway, rail, and air accidents in Pike County. In comparison to highway accidents, the past occurrences of rail and air accidents are quite small. There have been several small plane accidents and include the following: In 1992 – a small single seat plane crashed into the Delaware River in Westfall Township, killing the pilot. In 1994 a small plane crashed in Blooming Grove Township resulting in minor injuries. In 1995 a small plane crashed near Mountain Bay Airpark in Palmyra Township. In 1996 a small plane crashed off of Shiny Mountain Road in Palmyra Township, and in the same year, a small plane crashed in Lehman Township, killing two and injuring two. PEIRS data was used to identify the number of aircraft accidents in Pike County from 2002-2009. This data indicates that there have been two aircraft incidents, which occurred in 2006 and 2009. In 2006, three people died from a small aircraft crash in Palmyra Township. The other incident involved a small plane crash into a group of trees in Dingman Township; no fatalities or injuries were reported, only a search for the pilot.

Due to a decrease in rail traffic since 1976 with the formation of Conrail, there have been few railway accidents. Rail incidents include: the 1978 derailment north of Mill Rift, the 1995 derailment north of Pond Eddy, and a 2001 car-train collision in Lackawaxen that resulted in one death. Additionally, PEIRS data was also used identify railroad incidents that occurred between 2002 and 2009. Two railroad incidents were reported, one each in 2003 and 2005. In 2003, a New York Susquehanna & Western train derailed four cars on the Norfolk Southern line. The 2005 rail incident involved train cars derailing on the New York Susquehanna and Western rail line in Shohola Township. Neither injury nor material spill was reported for either incident.

The most common transportation accidents in the County are highway accidents involving motor vehicles. The County’s most serious transportation concerns involve Interstate 84 and US 209. These routes have the highest annual average traffic counts, the most truck traffic, and have illustrated the most potential for disaster in the past. Additionally, there is a temporal aspect to highway transportation accidents; in the spring and early summer, when construction and narrowed lanes are commonplace, the incidence of large-scale transportation accidents increases. Most motor vehicle accidents in Pike County have been limited to 1-3 vehicles. Recent exceptions to this include:

- A 1994 Westfall accident that occurred at the PA/NY border on I-84 westbound involving 14 vehicles,
- A 1997 accident along I-84 westbound during a snow storm involving 24 vehicles,
- A 2003 accident along I-84 eastbound in Dingman Township involving 1 straight truck and 6 tractor-trailer trucks (damage in this accident looked took over 12 hours to clean up), and
- An early 2005 accident during a snow squall on I-84 eastbound in Westfall that involved approximately 14 vehicles.

There was one death in all these incidents combined. In spite of the tremendous property damage, injuries were relatively minor.

Over the five-year period from 2005-2009, highway accidents have risen and fallen each year. Table 4.3.14-1 summarizes the overall vehicular crash data from 2005-2009 for Pike County. The data was gathered through the PennDOT Crash Statistics Reports.

<b>Table 4.3.14-1: Total number of crashes, traffic deaths, and pedestrian deaths for Pike County from 2005-2009 (PennDOT, 2009).</b>			
<b>YEAR</b>	<b>TOTAL CRASHES</b>	<b>TOTAL TRAFFIC DEATHS</b>	<b>TOTAL PEDESTRIAN DEATHS</b>
2005	675	12	0
2006	641	9	0
2007	684	9	0
2008	735	13	1
2009	595	5	1

**4.3.14.4. Future Occurrence**

Considering the current transportation network within the county and the steady increase in traffic volume, it is safe to assume that the number of vehicle accidents will continue to increase. Incidents involving air or rail should remain low. The County’s population has increased over the last decade, meaning it is likely that traffic volumes have also risen. New residents have limited knowledge of detour routes and alternate routes around accidents which contributes to

the accident-related congestion experienced recently in the County. The trucking industry is expected to continue, maintaining and possibly increasing the number of tractor-trailers on the County's road system. Transportation accidents may increase slightly over the next five years without proper mitigation strategies in place. Therefore, based on this and past occurrences, the probability of transportation accidents is characterized as *highly likely* as defined by the Risk Factor Methodology probability criteria (see Table 4.4-1). However, the low number of rail and air traffic accidents in the County indicates that the bulk of future transportation accidents will be roadway accidents.

#### 4.3.14.5. Vulnerability Assessment

Traffic of all types along all of the roadways within the County has increased tremendously over the past several years. Unfortunately many of the roads were not designed to handle the volume. Many have little or no shoulder and many larger vehicles, including school buses, pass each other with only limited distance between them. A transportation-related incident can occur on any stretch of road or railway in Pike County. However, severe accidents are more likely on the County's highways, such as Interstate 84, US 209, and PA 739, 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. These include populations in Lackawaxen, Shohola, and Westfall Townships. Most of Pike County is also susceptible to airplane accidents due to the air traffic through the two nearby airports.

Table 4.3.14-2 illustrates the vulnerability of addressable structures and critical facilities for each kind of transportation accident. For this analysis, vulnerability for highway accidents was defined as jurisdictions falling within a ¼ mile of Interstate and US highways, the high-speed roads likely to yield deadly crashes. Vulnerability for air traffic accidents is defined as jurisdictions located within five miles of the airports. Similar to highway accidents, jurisdictions that are vulnerable to rail accidents are those located within ¼ mile of rail lines. Using these definitions, all jurisdictions are vulnerable to at least one type of transportation accident.

The specific vulnerability of jurisdictions depends on the mode of transportation in question. All jurisdictions have addressable structures located within ¼ mile of major highways, and Palmyra Township has the most structures (2,371) located within ¼ mile of major highways. All jurisdictions except Porter Township also have critical facilities within ¼ mile of major highways. Of these, Milford Borough has the most with nine.

Lackawaxen Township by far has the highest number of addressable structures (552) and critical facilities (2) vulnerable to rail accidents. Greene Township is the only municipality with structures located within a 5 miles radius of an airport (the Spring Hill airport) and is most vulnerable to accidents that happen during take off and landing. However, other municipalities are vulnerable as plane crashes can occur anywhere.

Table 4.3.14-2: Addressable structures and critical facilities vulnerable to railroad, highway, and airport accidents.

MUNICIPALITY	TOTAL ADDRESSABLE STRUCTURES	ADDRESSABLE STRUCTURES WITHIN 1/4 MILE OF RAILROAD	CRITICAL FACILITIES WITHIN 1/4 MILE OF RAILROAD	ADDRESSABLE STRUCTURES WITHIN 1/4 MILE OF *MAJOR HIGHWAYS	CRITICAL FACILITIES WITHIN 1/4 MILE OF *MAJOR HIGHWAYS	ADDRESSABLE STRUCTURES WITHIN 5 MILE RADIUS OF AIRPORT	CRITICAL FACILITIES WITHIN 5 MILE RADIUS OF AIRPORT
Blooming Grove Township	4,269	0	0	647	6	0	0
Delaware Township	4,501	0	0	335	3	0	0
Dingman Township	7,149	0	0	809	5	0	0
Greene Township	3,363	0	0	1,059	5	401	0
Lackawaxen Township	5,076	552	2	1,007	8	0	0
Lehman Township	5,051	0	0	16	1	0	0
Matamoras Borough	1,007	0	0	713	4	0	0
Milford Borough	591	0	0	558	9	0	0
Milford Township	837	0	0	493	5	0	0
Palmyra Township	4,457	38	0	2,371	4	0	0
Porter Township	1,066	0	0	224	0	0	0
Shohola Township	3,472	155	0	921	3	0	0
Westfall Township	1,205	87	1	559	8	0	0
<b>TOTAL</b>	<b>42,044</b>	<b>832</b>	<b>3</b>	<b>9,712</b>	<b>61</b>	<b>401</b>	<b>0</b>

\*Major Highways include Interstates, US Highways and State Highways.

#### **4.3.15. Urban Fire and Explosion**

##### *4.3.15.1. Location and Extent*

Urban fire and explosion hazards include vehicle and building/structure fires as well as overpressure rupture, overheating, or other explosions that do not ignite. Urban fires and explosions often begin as a result of other hazards, particularly severe storms, drought, transportation accidents, hazardous materials releases, pipeline explosions, or criminal activity such as arson, and terrorism. Statewide, urban fires generally occur in the denser, more urbanized areas and occur most often in residential structures (US Fire Administration, 2009). Urban fires can more easily spread from building to building in these denser areas.

##### *4.3.15.2. Range of Magnitude*

Severe urban fires result in extensive damage to residential, commercial, and/or public property. Damages range 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 fire or explosion event.

Urban fires and explosions can also cause injuries and death. An instance of this occurred in Dingman Township on April 26, 2005, when a fire completely destroyed a home, garage, and two vehicles. Two members of the household were able to escape, but three people died during the fire (Seda, 2005).

Although most instances of fire do not reach disaster proportions, the sum of the impact of all small fires is often much greater than the impact of the few major fire and explosion hazards that occur. There are additional economic consequences related to this hazard. Urban fires and explosions may result in lost wages due to temporarily or permanently closed businesses, destruction and damage involving business and personal assets, loss of tax base, recovery costs, and lost investments on destroyed property. 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.

A worst-case urban fire event in Pike County occurred in 1998 when the largest fire ever recorded in Pike County occurred at the Altec-Lansing warehouse in Milford Township. The fire burned through the 80,000 square foot space and resulted in \$6 million in damages.

##### *4.3.15.3. Past Occurrence*

Pike County experiences a number of urban fire and explosion events each year, most of which are small and affect a limited number of structures. PEIRS data indicates that from 2002-2009,

there have been 19 urban fire events reported to PEMA (see Table 4.3.15-1). Please note that since PEIRS is a voluntary reporting system, this is not an inclusive list of fires in the County. Of the municipalities in Pike County, both Dingman and Westfall Townships had the highest number of urban fires reported to PEIRS with 4 events reported by each.

<b>Table 4.3.15-1: Urban fire events reported to PEIRS, 2002-2009 (PEMA, 2010)</b>			
<b>COMMUNITY</b>	<b>TYPE OF EVENT</b>	<b>DATE</b>	<b>DESCRIPTION OF EVENT</b>
Blooming Grove Township	Tire Fire	03/26/2003	Tire fire at the Lord's Valley Towing junkyard; no injuries reported
Westfall Township	Vehicle Fire	06/25/2003	A tractor-trailer fire occurred on I-84, closing one lane; cleanup and recovery done by My Place Towing
Delaware Township	Structure Fire	01/24/2005	Residential structure fire; one fatality reported
Dingman Township	Structure Fire	04/26/2005	Residential structure fire; three fatalities reported
Milford Township	Structure Fire	09/11/2005	Riding stable fire; no injuries reported
Westfall Township	Structure Fire	02/14/2006	Residential structure fire; one fatality and two injuries reported
Blooming Grove Township	Vehicle Fire	05/09/2006	Truck fire on I-84, no traffic backup; small amount of diesel fuel spilled onto road; cleanup coordinated by local emergency units; no injuries reported
Milford Township	Structure Fire	10/02/2006	Residential structure fire; State Route 6/209 temporarily closed; no injuries reported
Blooming Grove Township	Vehicle Fire	05/25/2007	A tractor-trailer fire occurred on I-84, closing the westbound exit ramp; trailer was hauling water and orange juice; no injuries reported
Dingman Township	School Fires	09/26/2007	Fire at Dingman-Delaware Primary School in the Delaware Valley School District; no injuries reported
Westfall Township	Structure Fire	12/08/2007	Commercial structure fire; one fatality reported
Westfall Township	Structure Fire	12/09/2007	Residential structure fire; no injuries reported
Lehman Township	Structure Fire	08/09/2008	Residential structure fire; one fatality reported
Dingman Township	Structure Fire	09/18/2008	Residential structure fire; no injuries reported
Delaware Township	Vehicle Fire	10/14/2008	Vehicle fire at intersection of State Route 739 and Nichercronk; thirty gallons of diesel fuel spilled; cleanup coordinated by emergency personnel
Milford Township	Vehicle Fire	12/29/2008	Tractor-trailer carrying chickens caught fire on I-84; accident impeded eastbound traffic
Dingman Township	Structure Fire	01/23/2009	Fire at Hilltop Xtra Mart Gas Station; no injuries reported
Shohola Township	Structure Fire	03/27/2009	Residential structure fire and barn fire; no injuries reported
Lehman Township	Structure Fire	03/30/2009	Residential structure fire; one fatality reported

Pike County also has record of several additional large fires or explosions that taxed the county's fire organization beyond normal daily operations:

- February 1981 – a large fire gutted the Arlington Hotel outside Milford in Dingman Township,
- September 1981 – a large fire in Milford Borough destroyed an auto body shop and several apartments,
- March 1982 – a large fire in Milford Borough destroyed a vacant hotel,
- 1991 – Several businesses destroyed along Route 739 in Blooming Grove Township,
- September 1992 – Several businesses destroyed at a strip mall along Route 739 in Blooming Grove Township,
- June 1994 – Milford Borough – a large portion of the Tom Quick Inn was gutted,
- March 1996 – Lehman Township – Pocomt Resort was destroyed,
- February 1997 – Several businesses destroyed along Route 739 in Blooming Grove Township,
- June 1998 – Milford Township – Altec-Lansing – lightning ignited the largest fire to ever hit Pike County, destroying an 80,000 square feet of warehouse space, resulting in more than \$6 million in damage. The warehouse was full of complete product awaiting shipment. More than 30 fire departments from Pennsylvania, New Jersey and New York fought unsuccessfully (This fire occurred at the same time the county was dealing with tornadoes at the western end of the county and was caused by the same storm front. Other fires also occurred during the same period).
- February 2005 – Westfall Township – a fire at the lumberyard at Luhr's Ace Hardware caused a reported \$1 million in damage,
- March 2005 – Lackawacken Township – a fire destroyed the main building Masthope Ski facility.
- November 2008 – A Columbia Gas Transportation and Storage Company pipeline exploded near the intersection of Route 6 and I-84. The company raised the pressure in the line during a test which caused the pipe to explode and a large piece of pipe to be flung one hundred yards through the air. No injuries were reported (Kane, Tom, The River Reporter, 2008)

Since 2009, Pike County has experienced mainly residential structure fires and explosions. The most recent fire disaster occurred in Westfall Township. One man died and the house was consumed by the fire, as is shown in Figure 4.3.15-1. The cause of the fire was unknown and firefighting efforts were inhibited by the heavy snow cover on the nearby roads (Brelje, 2011).

**Figure 4.3.15-1: Residential fire on Delaware Drive in Westfall Township where one man died and the home was ruined (Brelje, 2011).**



#### **4.3.15.4. Future Occurrence**

The future occurrence of urban fire and explosion events can be considered *possible*, as defined by the Risk Factor Methodology probability criteria (see Table 4.4-1) with minor events happening more frequently than major fires or explosions in the future. The greatest urban fire and explosion threats in Pike 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. However, except for the Altec-Lansing fire, fires in commercial type buildings have remained few. In addition, many of the newer buildings include sprinkler systems reducing the chance for a fire to reach disaster magnitude.

There is 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 Marcellus Shale natural gas extraction grows in the County.

#### **4.3.15.5. Vulnerability Assessment**

As the population of the County increases, the number of housing units increases. Although the majority of this housing growth has been single family type buildings, there has been an increase in townhouse type buildings being built, including senior housing apartments being built in Matamoras and Westfall. In addition, there are additional units of this type being proposed in other areas of the County. The majority of this growth is in areas with little or no central water supply system. In addition, there has been and continues to be commercial growth, including several retail stores in excess of 100,000 square feet.

Areas where large buildings are located or development is closely spaced should be considered more vulnerable to urban fire and explosion events; in Pike County, these denser jurisdictions include Matamoras and Milford Boroughs. However, Pike County as a whole is low density in

comparison with other counties in Pennsylvania; so the County has a few vulnerable pockets of density (U.S. Census, 2000).

The quick response of fire departments in the County helps reduce loss of life and property damage from urban fires and explosions. Pike County is protected by 19 volunteer fire departments – 16 are located within the county. The Lumberland, NY fire department provides initial response to a small portion of Westfall and Shohola Townships at Pond Eddy, PA, the Welcome Lake, PA (Wayne Co.) provides protection for the upper portion of Lackawaxen Township and Greene-Dreher (Wayne Co.) provides protection for a portion of Greene Township. Dispatch for all county based departments except for Bushkill is through the county's 9-1-1 center. Bushkill is dispatched from Monroe County.

Although many departments have seen a significant reduction in available help, most have added to their apparatus arsenals. Currently there are approximately 30 engines, 20 tankers, 5 ladder trucks, and an assortment of rescue and support-type vehicles. The most common pump sizes are 1,000 and 1,250 gallons per minute (GPM). However, there are some with capacities of 1,500 GPM to over 2,000 GPM. Most engines are now carrying 750 or 1,000 gallons of water and the average tanker size is over 2,000 gallons. In addition, there is over 5 miles of large diameter (4" or 5") hose throughout the county.

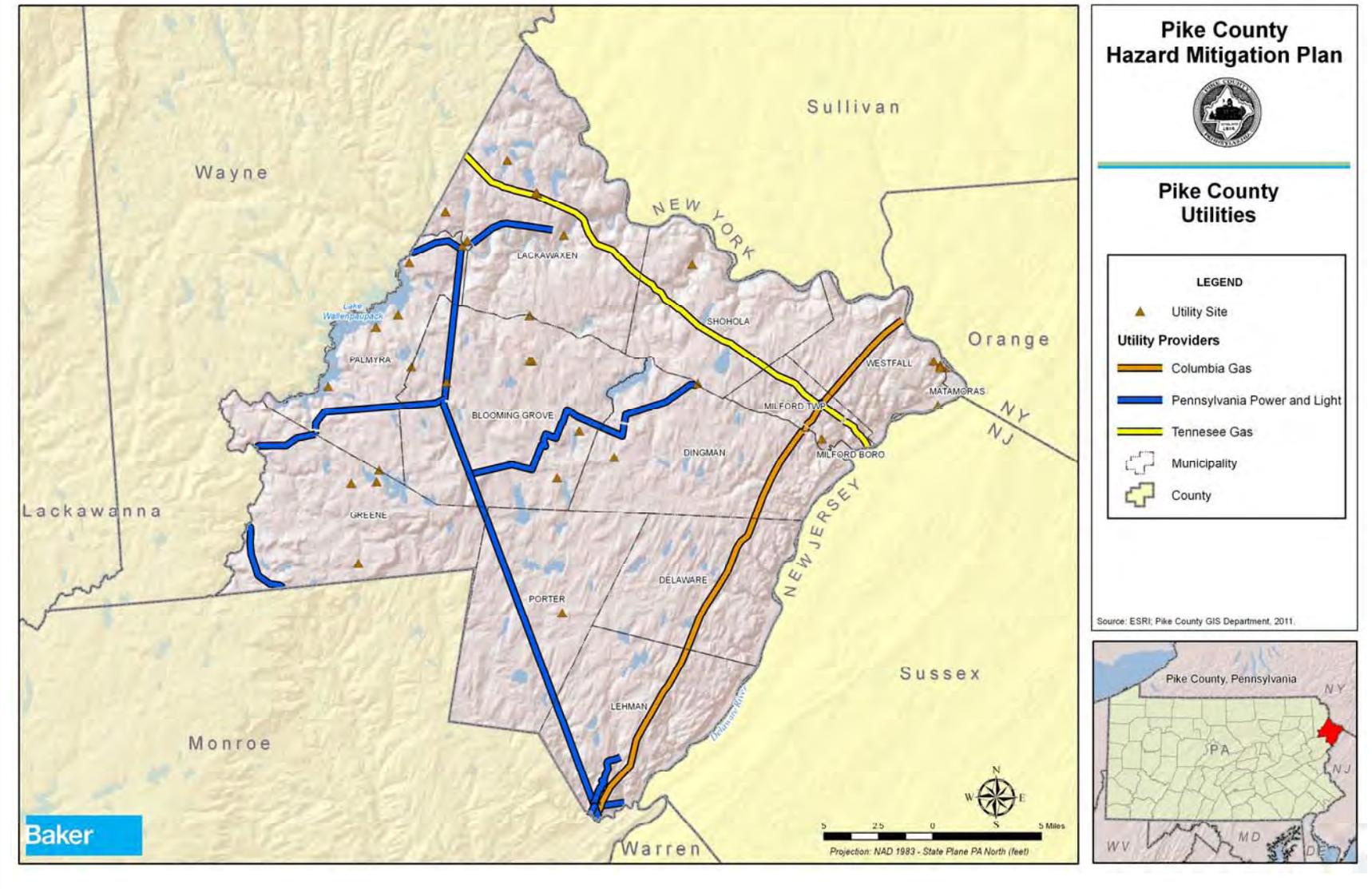
### **4.3.16. Utility Interruption**

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

Utility interruptions in Pike County include disruptions in water, fuel, electric and telecommunications capabilities. In Pike County the focus is primarily on power failures which are often a secondary impact of another hazard event. For example, severe thunderstorms or winter storms could bring down power lines and cause widespread disruptions in electricity service. Strong heat waves may result in rolling blackouts where power may not be available for an extended period of time. Local outages may be caused by traffic accidents or wind damage. Utility interruptions and power failures can take place throughout the County.

Utility interruptions can also be caused by disruptions in service to pipeline transmission lines. Columbia Gas and Tennessee Gas have pipelines that bisect the County (Figure 4.3.16-1). In addition, there are countless miles of residential connections to larger water, gas, and liquid pipelines. Lines can become damaged by cold temperatures thus causing cracks and disruptions in service. Public water service can also be impacted by dam failures which would cause a break in water service.

Figure 4.3.16-1: Location of utilities in Pike County (Pike County GIS Office, 2011).



**4.3.16.2. Range of Magnitude**

Most severe power failures or outages are regional events. A loss of electricity can have numerous impacts including, but not limited to food spoilage, loss of heat or air conditioning, basement flooding (i.e. sump pump failure), lack of indoor lighting, loss of water supply (i.e. well pump failure), and lack of phone or internet service. These issues are often more of a nuisance than a hazard, but can cause damage or harm depending on the population affected and the severity of the outage.

A worst case scenario for utility interruption in Pike County occurred in January 2005 when an ice storm caused major power outages effecting thousands of customers in Monroe, Carbon, Lackawanna, Wayne and Pike Counties. Because of the amount of equipment damage caused by the ice, some areas did not have power restored for over a week. Fortunately, Pike County did not have damage to the extent of its neighbors to the southwest.

**4.3.16.3. Past Occurrence**

In Pike County minor power outages occur annually, about 2-5 times per year. They are most often associated with winter storms and wind storms. Table 4.3.16-2 displays utility interruption events reported to PEIRS between 2002 and 2009.

<b>Table 4.3.16-2: Utility interruption at Pike County from 2002-2009 (PEIRS, 2002-09)</b>		
<b>DAY</b>	<b>LOCATION</b>	<b>TYPE</b>
01/17/2002	TOWNSHIP OF PALMYRA	Phone outage
03/02/2002	BUSHKILL	Phone outage
07/24/2002	TOWNSHIP OF DINGMAN	Power outage
01/18/2003	TOWNSHIP OF DELAWARE	Power outage
01/22/2003	TOWNSHIP OF DINGMAN	Power outage
11/14/2003	COUNTYWIDE	Phone outage
12/11/2003	TOWNSHIP OF DELAWARE	Power outage
06/16/2004	TOWNSHIP OF LEHMAN	Phone outage
08/26/2004	TOWNSHIP OF BLOOMING GROVE	Phone outage
09/26/2004	TOWNSHIP OF MILFORD	Power outage
10/10/2004	TOWNSHIP OF BLOOMING GROVE	Phone outage
01/06/2005	COUNTYWIDE	Power outage
01/24/2005	TOWNSHIP OF WESTFALL	Phone outage
03/24/2005	TOWNSHIP OF WESTFALL	Power outage

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06/09/2005	MATAMORAS	Phone outage
06/10/2005	TOWNSHIP OF WESTFALL	Power outage
06/17/2005	COUNTYWIDE	Power outage
02/19/2006	COUNTYWIDE	Power outage
07/20/2006	MATAMORAS	Water Main Break
10/25/2006	MATAMORAS	Water Main Break
08/09/2007	TOWNSHIP OF BLOOMING GROVE	Phone outage
06/10/2008	TOWNSHIP OF WESTFALL	Phone outage
10/28/2008	COUNTYWIDE	Power outage
01/17/2009	COUNTYWIDE	Phone outage

Pike County has record of several other utility interruptions in addition to those above mentioned:

- Pike County was affected by the November 1965 power outage that blacked out the entire northeastern United States.
- Pike County was affected by the nationwide gasoline shortages during the 1970s and had its share of long lines, high prices and facilities without product. Provisions were made in each situation to insure adequate supplies for emergency vehicles.
- The majority of the electrical outages have been weather related, being caused by snow and ice storms to windstorms. Recent long term outages include spring 1997 snowstorm that brought down trees and wires, blacking out large portions of the county for days; an August 1997 series of thunderstorms that left widespread outages and the tornado outbreak of May 1998.
- In August 2003, a large portion of northeast and north central United States as well as a large portion of Canada was hit by an electrical outage. The eastern portion of Pike County that is served by Orange and Rockland Utilities was affected and was without power for several hours.
- Met Ed has experienced numerous outages in its portion of coverage in Pike County. In many cases, it appears that the cause is the utility companies' inability to meet the demands of an increasing population. Unfortunately, many of these outages have occurred in the winter months.

4.3.16.4. *Future Occurrence*

Minor power failure events (i.e. short outage) events may occur several times a year for any given area in the County, while major (i.e. widespread, long outage) events take place once every few years. Power failures are often occurrences during severe weather and therefore, should be expected during those events. Therefore the future occurrence of utility interruptions in Pike County should be considered *likely* as defined by the Risk Factor Methodology probability criteria (see Table 4.4-1).

4.3.16.5. *Vulnerability Assessment*

The entire county is vulnerable to utility interruptions. With more and more services requiring the use of electronics, the loss of electricity can create major problems to many more individuals. The demand for electricity has increased, but unfortunately the ability to produce that electricity has not increased. This is especially apparent during summer months, when people are trying to cope with high heat.

Emergency medical facilities, including retirement homes and senior centers, are particularly vulnerable to power outages. While back-up power generators are often used at these facilities, loss of electricity may result in hot or cold temperatures for which elderly populations are particularly vulnerable.

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 be used to assist local community officials in ranking and prioritizing those hazards that pose the most significant threat to their area based on a variety of factors deemed important by the planning team and other stakeholders involved in the hazard mitigation planning process. The RF system relies mainly on historical data, local knowledge, general consensus opinions 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 eleven hazards profiled in the 2012 HMP. Those categories include: *probability, impact, spatial extent, warning time* and *duration*. Each degree of risk was assigned a value ranging from 1 to 4. The weighting factor is shown in Table 4.4-1. 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 example equation:

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

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: Summary of Risk Factor approach used to rank hazard risk.				
Risk Assessment Category	Degree of Risk			Weight Value
	Level	Criteria	Index	
<b>PROBABILITY</b> <i>What is the likelihood of a hazard event occurring in a given year?</i>	UNLIKELY	LESS THAN 1% ANNUAL PROBABILITY	1	30%
	POSSIBLE	BETWEEN 1% & 49.9% ANNUAL PROBABILITY	2	
	LIKELY	BETWEEN 50% & 90% ANNUAL PROBABILITY	3	
	HIGHLY LIKELY	GREATER THAN 90% ANNUAL PROBABILITY	4	
<b>IMPACT</b> <i>In terms of injuries, damage, or death, would you anticipate impacts to be minor, limited, critical, or catastrophic when a significant hazard event occurs?</i>	MINOR	VERY FEW INJURIES, IF ANY. ONLY MINOR PROPERTY DAMAGE & MINIMAL DISRUPTION ON QUALITY OF LIFE. TEMPORARY SHUTDOWN OF CRITICAL FACILITIES.	1	30%
	LIMITED	MINOR INJURIES ONLY. MORE THAN 10% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR MORE THAN ONE DAY.	2	
	CRITICAL	MULTIPLE DEATHS/INJURIES POSSIBLE. MORE THAN 25% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR MORE THAN ONE WEEK.	3	
	CATASTROPHIC	HIGH NUMBER OF DEATHS/INJURIES POSSIBLE. MORE THAN 50% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR 30 DAYS OR MORE.	4	
<b>SPATIAL EXTENT</b> <i>How large of an area could be impacted by a hazard event? Are impacts localized or regional?</i>	NEGLIGIBLE	LESS THAN 1% OF AREA AFFECTED	1	20%
	SMALL	BETWEEN 1 & 10.9% OF AREA AFFECTED	2	
	MODERATE	BETWEEN 11 & 25% OF AREA AFFECTED	3	
	LARGE	GREATER THAN 25% OF AREA AFFECTED	4	
<b>WARNING TIME</b> <i>Is there usually some lead time associated with the hazard event? Have warning measures been implemented?</i>	MORE THAN 24 HRS	SELF-DEFINED	1	10%
	12 TO 24 HRS	SELF-DEFINED	2	
	6 TO 12 HRS	SELF-DEFINED	3	
	LESS THAN 6 HRS	SELF-DEFINED	4	
<b>DURATION</b> <i>How long does the hazard event usually last?</i>	LESS THAN 6 HRS	SELF-DEFINED	1	10%
	LESS THAN 24 HRS	SELF-DEFINED	2	
	LESS THAN 1 WEEK	SELF-DEFINED	3	
	MORE THAN 1 WEEK	SELF-DEFINED	4	

**4.4.2. Ranking Results**

Using the methodology described in Section 4.4.1, Table 4.4-2 lists the Risk Factor calculated for each of the sixteen potential hazards identified in the 2012 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.

Table 4.4-2: Ranking of hazard types based on Risk Factor methodology.							
HAZARD RISK	HAZARD NATURAL (N) or MAN-MADE (M)	RISK ASSESSMENT CATEGORY					RISK FACTOR
		PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION	
<b>HIGH</b>	Flood, Flash flood, Ice jam (N)	4	3	3	2	3	3.2
	Winter Storm (N)	4	2	3	4	3	3.1
	Wildfire (N)	4	2	4	2	3	3.1
	Drought (N)	2	2	4	1	4	2.5
	Transportation Accident	4	2	1	4	1	2.5
<b>MODERATE</b>	Utility Interruption (M)	3	1	2	4	4	2.3
	Hurricane, Tropical Storm, Nor'easter (N)	2	2	3	1	4	2.2
	Drowning (M)	4	1	1	4	1	2.2
	Environmental Hazards (M)	2	2	2	3	2	2.1
	Tornado and Windstorm (N)	2	2	2	4	1	2.1
	Pandemic (N)	1	2	3	1	4	2.0
	Urban Fire and Explosion (M)	2	2	1	4	2	2.0
<b>LOW</b>	Nuclear Incidents (M)	1	2	2	3	3	1.9
	Terrorism (M)	2	2	1	4	1	1.9
	Dam Failure (M)	1	3	1	4	1	1.9
	Earthquake (N)	1	1	2	4	1	1.5

Based on these results, there are five *high* risk hazards, seven *moderate* risk hazards and four *low* risk hazards in Pike County. Mitigation actions were developed for all high, moderate, and low risk hazards (see Section 6.4). The threat posed to life and property for moderate and high risk hazards is considered significant enough to warrant the need for establishing hazard-specific mitigation actions. Mitigation actions related to future public outreach and emergency service activities are identified to address low risk hazard events.

A risk assessment result for the entire county does not mean that each municipality is at the same amount of risk to each hazard. Table 4.4-3 shows the different municipalities in Pike

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County and whether their risk is greater than (>), less than (<), or equal to (=) the risk factor assigned to the County as a whole.

**Table 4.4-3: Calculated Countywide Risk Factor by Hazard and Comparative Jurisdictional Risk**

JURISDICTION	IDENTIFIED HAZARD AND CORRESPONDING COUNTYWIDE RISK FACTOR															
	<i>Flood, Flash Flood, Ice Jam</i>	<i>Winter Storm</i>	<i>Wildfire</i>	<i>Drought</i>	<i>Transportation Accident</i>	<i>Utility Interruption</i>	<i>Hurricane, Tropical Storm, Nor'easter</i>	<i>Drowning</i>	<i>Environmental Hazards</i>	<i>Tornado and Windstorm</i>	<i>Pandemic</i>	<i>Urban Fire and Explosion</i>	<i>Nuclear Incidents</i>	<i>Terrorism</i>	<i>Dam Failure</i>	<i>Earthquake</i>
	3.2	3.1	3.1	2.5	2.5	2.3	2.2	2.2	2.1	2.1	2.0	2.0	1.9	1.9	1.9	1.5
Blooming Grove Township	=	=	=	=	>	=	=	=	=	=	=	=	=	=	=	=
Delaware Township	=	=	=	=	=	=	=	=	>	=	=	<	=	=	>	=
Dingman Township	<	=	=	=	>	=	=	=	=	=	=	=	<	=	=	=
Greene Township	>	>	<	=	>	=	=	=	>	=	=	=	>	=	=	=
Lackawaxen Township	>	=	=	<	=	=	>	>	=	>	=	=	=	=	>	=
Lehman Township	=	=	=	=	>	>	=	>	=	>	=	>	=	=	=	=
Matamoras Borough	=	=	<	=	=	>	=	>	>	=	=	>	=	=	>	=
Milford Borough	=	=	=	=	=	=	=	=	=	=	=	>	=	=	=	=
Milford Township	=	=	=	=	>	=	=	=	>	=	=	=	=	=	=	=
Palmyra Township	=	=	=	=	>	=	=	>	=	=	=	=	=	=	=	=
Porter Township	=	>	=	=	=	=	>	<	<	>	=	=	=	=	=	=
Shohola Township	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=	=
Westfall Township	=	=	=	=	>	=	=	>	>	=	=	=	>	=	>	=

### 4.4.3. Potential Loss Estimates

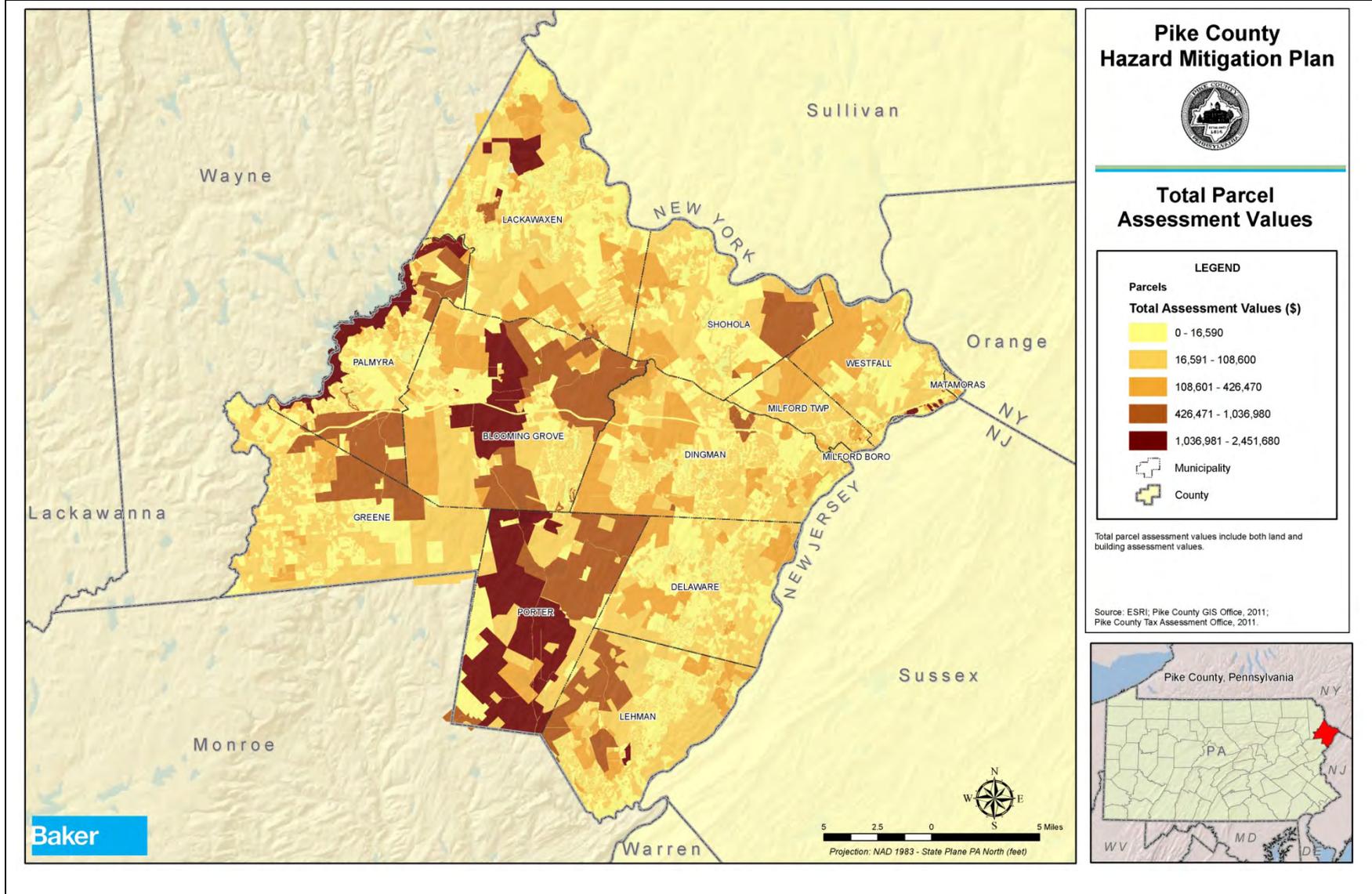
Based on various kinds of available data, potential loss estimates were established for flood, flash flood, and ice jam, tornado and windstorms, wildfires and winter storms. Estimates provided in this section are based on HAZUS-MH, version MR4, geospatial analysis, and previous events. Estimates are considered *potential* in that they generally represent losses that could occur in a countywide hazard scenario. In events that are localized, losses may be lower, while regional events could yield higher losses.

Potential loss estimates have four basic components, including:

- Replacement Value: Current cost of returning an asset to its pre-damaged condition, using present-day cost of labor and materials.
- Content Loss: Value of building's contents, typically measured as a percentage of the building replacement value.
- Functional Loss: The value of a building's use or function that would be lost if it were damaged or closed.
- Displacement Cost: The dollar amount required for relocation of the function (business or service) to another structure following a hazard event.

The parcel data used in this plan includes building values provided in the county tax assessment database. These values are representative of replacement value alone; content loss, functional loss, and displacement cost are not included. Figure 4.4-1 illustrates the range of parcel values in Pike County. The 74,625 parcels in Pike County have a cumulative assessed value of over \$1.4 billion for the parcels and the land. The average assessed value of these parcels and land is \$845 million. Lehman Township holds the largest amount of assets in the County with \$200 million. At the other end of the spectrum, Matamoras Borough has the potential to experience the least loss of all municipalities with just over \$21 million in building and land assessed value.

Figure 4.4-1: Pike County parcel assessed values (Pike County GIS Office, 2011; Pike County Tax Assessment Office, 2011).



The full suite of potential losses was able to be calculated for flood events using HAZUS-MH MR4, a standardized loss estimation software package available from FEMA. These studies provided estimates of total economic loss, building damage, content damage, and other economic impacts that can be used in local flood response and mitigation planning activity.

Using HAZUS-MH, total building-related losses for the 1% annual-chance flood event were estimated to be \$137 million. Approximately 65% of these building-related losses were incurred by residential occupancies; a further 26% of building-related losses were incurred by commercial properties. Approximately 2% of the building-related losses were incurred by industrial occupancies. Figure 4.4-2 shows the spatial distribution of total economic losses at the Census block level. These total economic losses incorporate both building-related losses and business interruption losses. Some of the highest economic losses are expected in Matamoras Borough and Westfall Township. Total economic loss, including replacement value, content loss, functional loss, and displacement cost was estimated at \$138 million for the entire County. The full HAZUS results report can be found in **Appendix F**.



For the remaining hazards where loss estimates could be determined, loss estimates are generalized based on the historical impact of the hazard. For droughts and nuclear incidents, the losses are largely agricultural; as a result, losses are expected to be some portion of Pike County's \$2.5 million in agricultural production, depending on the magnitude of the event. Losses associated with particular natural hazard events are sometimes reported to the NCDC with the event. The reporting time frame is 1950-2010. While these historic losses give a glimpse of potential losses in hazard events, they are not reported for all events and should be considered a broad estimate. Flood losses reported to NCDC total \$38.2 million and for any single event, range from \$20 thousand to \$23 million. Tornado and windstorm events in Pike County have had losses ranging from \$29 thousand to \$1 million depending on the magnitude of the events. These events have also led to two injuries. For winter storm events reported losses range from \$50,000-\$2.5 million per event. There were also three deaths and two injuries associated with Pike County winter storms during the NCDC reporting period.

#### 4.4.4. 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. As the fastest growing county in Pennsylvania, Pike County is expected to experience a variety of factors that will, in some areas, increase vulnerability to hazards while in other areas, vulnerability may stay static or even be reduced.

Population change and the age of the housing stock are main indicators of vulnerability change in Pike County. As discussed in Section 2.3, the total population of Pike County has increased by 23 percent from 2000 to 2010. The population change in the County can be seen in Figures 4.4-3 and 4.4-4. This overall change reflects areas of growth in all but two of the County's municipalities (US Census, 2011). Of the eleven municipalities that grew in this time period, three experienced growth of over 30 percent: Blooming Grove Township grew by 33.08%, Dingman Township grew by 35.71%, and Lehman Township grew by 41.89%. The two municipalities that lost population between 2000 and 2010 (Westfall Township and Milford Borough) did not lose large percentages (4.40% and 7.52% respectively).

Areas of higher density, in the larger municipalities and growing municipalities, face increased vulnerability and loss estimates in most hazard events. Lehman Township and Dingman Township experienced the largest absolute population growth with the highest percentage population increases and an increase of more than 3,000 people in each township. The increase in people results in increased vulnerability to hazards such as wildfires, floods, and winter storms as more people will be impacted.

Figure 4.4-4 shows areas of highest population growth between 2000 and 2010 within Pike County's municipalities. As discussed in Section 4.3.3.5 and shown in Table 4.3.3-6, some of this population growth in Pike County occurred in flood hazard areas. Blooming Grove Township, Delaware Township, Lehman Township, Matamoras Borough, Milford Township, and Palmyra Township saw an increase in population living in the 1%-annual-chance-floodplain between 2000 and 2010. The rest of the municipalities and the County as a whole saw a

decrease in the number of people living in the 1%-annual-chance-floodplain. In addition, only a handful of municipalities saw an increase in the number of people living in the 0.2%-annual-chance-floodplain including Matamoras Borough and Westfall Township.

In addition, remote and sparsely populated municipalities also face higher vulnerability to hazards because they do not have as easy access to care facilities or response personnel. For instance, the sparsely populated municipalities such as Porter Township (485 residents) face increased vulnerability to winter storms and urban fire and explosion due to isolation, access issues, and longer emergency response times.

Figure 4.4-3: Municipal population change in Pike County (US Census 2000 and 2010).

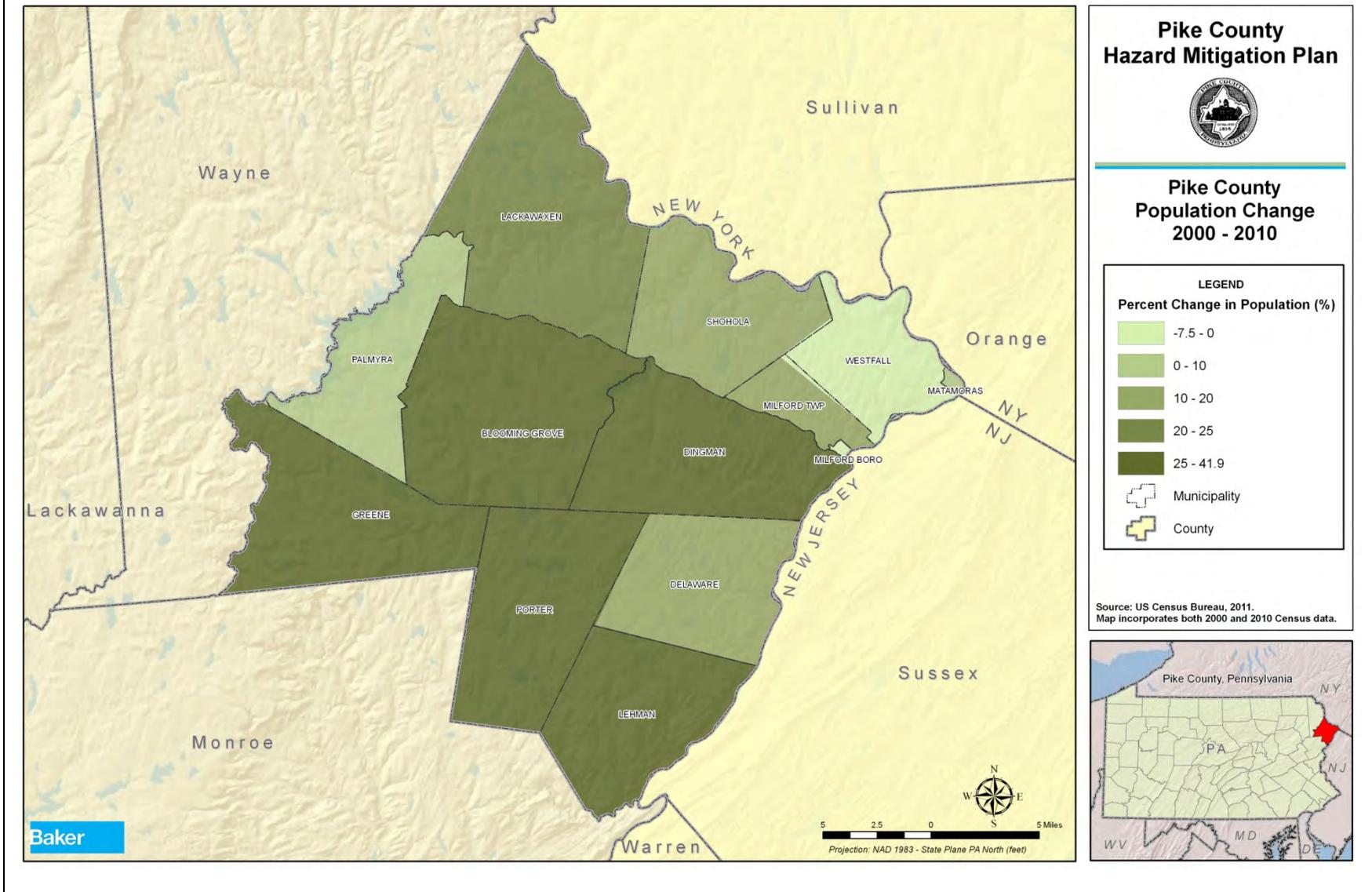
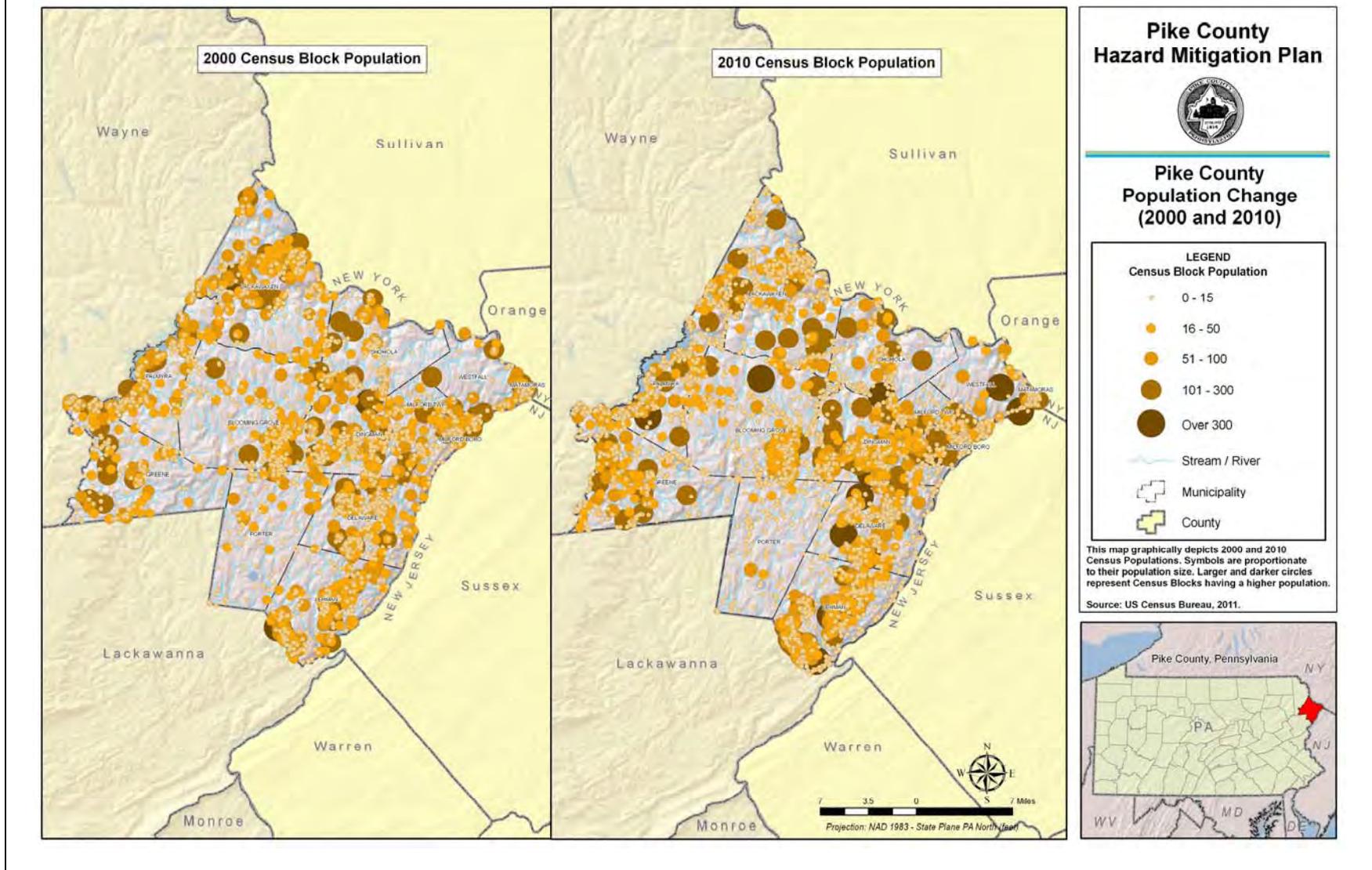


Figure 4.4-4: Municipal population change in Pike County (US Census 2000 and 2010).



Almost 15 percent of Pike County's population is over the age of 65. Older residents pose unique challenges when it comes to evacuation and/or mobility during the rescue and recovery processes that typically occur in the case of a hazard event. Officials may consider partnering with human services organizations to specifically plan for this vulnerable population.

The aging housing stock in Pike County is another source of current and future vulnerability in many hazard events. As discussed in Section 4.3.8.5, a moderate percentage of the housing stock, approximately 17 percent, was built before 1940. Pike County can experience gusts of wind up to 160 miles per hour during windstorms, tornadoes, hurricane, tropical storms, or nor'easters. The structure of these older houses may be more at risk of destruction under these strong wind conditions. These structures may also be at risk during flooding and winter storm events if the materials are either not strong enough to withstand the pressure or weight of the precipitation or are liable to leak, causing further risk of destruction to the house. Table 4.3.8-3 shows that the municipalities most vulnerable to these hazards, those with over 40 percent of structures built before 1940, are: Matamoras Borough and Milford Borough.

In 2006, Pike County adopted a Comprehensive Plan (Pike County Office of Community Planning, 2006). Several main goals of the plan are to manage growth within the County, protect natural resources, and to protect scenic and historic resources. The Comprehensive Plan also aims to steer commercial, industrial and residential growth to areas of existing development and facilities such as roads, water, and sewer, which would result in denser communities while keeping the same amount of open land in Pike County. Concentrating growth may help to reduce isolation-based vulnerability of communities with few access routes, no municipal water supply, and low cell phone reception. On the other hand, higher densities mean that more people are likely to be impacted in a hazard event should it strike those more populated areas. In addition, municipalities that experienced a large increase in population experience in the last ten years and are slated for more growth in the Comprehensive Plan may have a slightly higher risk to hazards such as transportation accidents, urban fire and explosion, environmental hazards, utility interruption, and dam failure.

## 5. Capability Assessment

### 5.1. Update Process Summary

Based on the above identified vulnerability analysis, Pike County can assess its current resources and begin to address the legal, regulatory, administrative, fiscal and other capabilities which it currently has at its disposal to address the potential hazards which make the County and its local municipalities vulnerable.

Pike 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 most important resources which provide the basis for addressing hazard potential and mitigation are the emergency services manpower, equipment, fiscal and other resources available within Pike County communities. At the County level, the Pike County Emergency Management Agency provides the leadership and resources to address hazard incidents.

The 2006 HMP identified the suite of resources available in the County to support hazard mitigation, including human, physical, technological, informational, and financial resources. It also indicated the presence of local plans, ordinances, and codes in applicable municipalities. Finally, the 2006 Capability Assessment specified local, state, and federal resources available for mitigation efforts.

The HMSC updated the 2006 Capability Assessment by distributing a *Capability Assessment Survey* distributed to all 13 municipalities and summarizing responses. In addition, the HMPT provided additional input into the 2011 Capability Assessment through feedback at meetings. The 2011 Capability Assessment provides an updated inventory of the most critical local planning tools available within each municipality and a summary of the fiscal and technical capabilities available through programs and organizations outside of the County. It also identifies emergency management capabilities and the processes used for implementation of the National Flood Insurance Program. In general, the County and its municipalities have been active in growing their capability in recent years with a 2006 County Comprehensive Plan, a draft 2011 Stormwater Management Plan, and a draft 2011 Emergency Operations Plan (EOP) update.

While the capability assessment serves as a good instrument for identifying local capabilities, it also provides a means for recognizing gaps and weaknesses that can be resolved through future mitigation actions. The results of this assessment lend critical information for developing an effective mitigation strategy.

### **5.2. Capability Assessment Findings**

#### **5.2.1. Emergency Management**

The Pike County Emergency Management Agency coordinates countywide emergency management efforts. Currently, 9-1-1 calls and emergency communications are handled by the Pike County Communications Center for all the municipalities except Lehman Township. Monroe County Control handles Lehman Township calls and provides dispatch services for Bushkill Fire and EMS. (PSP handles their own.) The Pike County 911 Center dispatches for 15 volunteer fire departments, 10 volunteer ambulance corps, two volunteer quick response services and four municipal police departments in addition to receiving the 911 calls for the geographic areas served by the Pennsylvania State Police. Under a mutual aid program for fire companies, available fire fighters and equipment are coordinated from all fire companies.

As of July 2006, there are 16 volunteer fire departments based within Pike County that provide service. In addition, the Greene-Dreher Fire Department from Wayne County provides service to part of Greene Township, Welcome Lake Fire Department from Wayne County provides service to the upper portion of Lackawaxen Township and the Lumberland Fire Department from Sullivan County, NY provides service to the Pond Eddy portion of Shohola and Westfall Townships.

EMS Service is provided by 15 Ambulance Services and 2 fire department QRS (quick response service) units. Of the 15 ambulance services, 8 are part of the fire service. Bushkill Emergency Corps which services Lehman Township is based in and dispatched by Monroe County. Hawley Ambulance serves a portion of Lackawaxen Township and is based in and dispatched by Wayne County. Newfoundland Ambulance is based in and dispatched by Wayne County as well. Tusten Ambulance and Lumberland Fire Department Ambulance are based in and dispatched by Sullivan County, NY. Port Jervis Ambulance is based in Orange County, NY.

The average fire department in Pike County has approximately 30 active members. The County and our local communities are similar to the rest of the state in that our communities have seen a regular and marked decline of volunteers over the past 20 years. It is estimated that there are no more than 500 active volunteers in the County between both fire and emergency medical services. Currently there are approx. 30 engines, 20 tankers, 5 ladder trucks and an assortment of rescue and support type vehicles. The most common pump sizes are 1,000 and 1,250 gallons per minute. However, there are some with capacities of 1,500 GPM to over 2,000 gallons per minute. Most engines are now carrying 750 or 1,000 gallons of water and the average tanker size is over 2,000 gallons. In addition, there is over 5 miles of large diameter (4" or 5") hose throughout the county.

In addition to the fire fighting abilities of the departments located in the County's municipalities, the Pennsylvania Bureau of Forestry, Delaware State Forest District #19 and the National Park Service, Delaware Water Gap National Recreation Area have employees working within the County who have as their responsibility fire fighting and other emergency services capabilities.

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Formed in May 2003, the Pike County Advanced Life Support (ALS) is comprised of paid paramedics and volunteer Emergency Medical Technician drivers. ALS goes beyond Basic Life Support in that paramedics can start intravenous solutions and administer drugs. Pike County ALS recently relocated from the Dingman Township Volunteer Fire Department firehouse on Log Tavern Road to the Milford Professional Park on Buist Road in Dingman Township. ALS is looking for a permanent central location in the County due to the importance of distance to and from hospitals. Hospitals are located in Port Jervis, NY; East Stroudsburg, PA; Honesdale, PA; Newton, NJ; and Scranton, PA.

Particular concerns of Pike County ALS include bringing together all EMS to discuss improving service in the County; improving funding to pay medics more and pay expenses; and increasing the number of medics and the number of stations in the County in order to expand service area. Additional ALS service in the County is provided from Honesdale, Bushkill, and Hamlin.

The Pike County Visioning Final Report issued in October 1999 and the Pike County Comprehensive Plan adopted in November 2006 both highlighted the challenge that Pike County communities are experiencing in regard to provision of services, including fire and emergency medical service, as a result of the tremendous population growth pressures which the County is experiencing and is projected to experience over the next 10 years.

The County relies almost entirely on volunteers to provide vital EMS and fire services for residents. A dozen all-volunteer fire companies serve the 13 municipalities in the county. Approximately 23 volunteer fire and ambulance companies provide protection throughout the County. These companies collectively have approximately 500 volunteers who provide emergency services throughout the county. Approximately 85 to 100% of the total funds used to run these companies come from private donations. Most of these companies are confronted with ongoing problems of retaining volunteers, raising sufficient funds to purchase and maintain adequate and updated equipment, and obtaining sufficient training. As the number of residents and residences increase and the number of volunteers decrease, fire services currently stretched to their limits, will be further stressed to provide adequate emergency protection for the County.

The problems for EMS services are very similar. The over-riding problem is lack of manpower to handle the volume of calls. EMS services in the County rely on volunteers, and the number of volunteers has been dropping largely due to liability issues, the risk of AIDS, higher training requirements, the increasingly mundane nature of the work (i.e., increasing number of "transportation calls" from an aging population and fewer emergency calls), and other related problems.

Both services are suffering from problems associated with the rapid and somewhat haphazard growth in the county, particularly in the private residential communities. Lack of standards for roads and signs has made it difficult and occasionally impossible to respond to life and property-threatening emergencies. EMS and fire program managers throughout the county feel that volunteerism needs to improve to adequately respond to the increasing call volumes.

Each municipality also has a designated local emergency management coordinator who possesses a unique knowledge of the impact hazard events have on their community. A significant amount of information used to develop this plan was obtained from the emergency management coordinators, many of whom participated as part of the HMPT.

The Emergency Management Services Code (PA Title 35) requires that all municipalities in the Commonwealth have a Local Emergency Operations Plan which is updated every two years. All thirteen jurisdictions in the County have a local EOP. A draft countywide EOP update also exists. The intent of the Countywide EOP update is for all of the municipalities to sign onto the county plan. Then they will be responsible for maintaining their individual resource listings and contact information.

### **5.2.2. Participation in the National Flood Insurance Program (NFIP)**

All jurisdictions in Pike County participate in the NFIP (see Table 5.2-1). The program is managed by local municipalities participating in the program through ordinance adoption and floodplain regulation while the Pike County Office of Community Planning provides an oversight and coordination role. Similarly, permitting processes needed for building construction and development in the floodplain are implemented at the municipal level through various ordinances (e.g. zoning, subdivision/land development and floodplain ordinances), but the Office of Community Planning provides technical assistance and guidance upon request.

Act 166 mandates municipal participation in and compliance with the NFIP. It also establishes higher regulatory standards for new or substantially improved structures which are used for the production or storage of dangerous materials (as defined by Act 166) by prohibiting them in the floodway. Additionally, Act 166 establishes the requirement that a Special Permit be obtained prior to any construction or expansion of any manufactured home park, hospital, nursing home, jail and prison if said structure is located within a special flood hazard area.

As new Digital Flood Insurance Rate Maps (DFIRMs) are published, the Pennsylvania State NFIP Coordinator housed at DCED, works with communities to ensure the timely and successful adoption of an updated floodplain management ordinance by reviewing and providing feedback on existing and draft ordinances. In addition, DCED provides guidance and technical support through Community Assistance Contacts (CAC) and Community Assistance Visits (CAV). There are no communities in Pike County currently participating in the NFIP Community Rating System (FEMA CIS, 2011).

FEMA Region III makes available to communities, an ordinance review checklist which lists required provisions for floodplain management ordinances. This checklist helps communities develop an effective floodplain management ordinance that meets federal requirements for participation in the NFIP.

The Pennsylvania Department of Community and Economic Development (DCED) provides communities, based on their CFR, Title 44, Section 60.3 level of regulations, with a suggested ordinance document to assist municipalities in meeting the minimum requirements of the NFIP

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along with the Pennsylvania Flood Plain Management Act (Act 166). These suggested or model ordinances contain provisions that are more restrictive than state and federal requirements. Suggested provisions include, but are not limited to:

- Prohibiting manufactured homes in the floodway.
- Prohibiting manufactured homes within the area measured 50 feet landward from the top-of bank of any watercourse within a special flood hazard area.
- Special requirements for recreational vehicles within the special flood hazard area.
- Special requirement for accessory structures.
- Prohibiting new construction and development within the area measured 50 feet landward from the top-of bank of any watercourse within a special flood hazard area.
- Providing the County Conservation District an opportunity to review and comment on all applications and plans for any proposed construction or development in any identified floodplain area.

Pike County received new digital flood insurance rate maps (DFIRMS) on October 6, 2000. The digital maps greatly enhanced mitigation capabilities as they relate to identifying flood hazards and were a significant improvement to the previous paper Flood Insurance Rate Maps. With the release of the maps in 2000, the Pike County Conservation District worked with all of the County's municipalities, FEMA and the PA Department of Community and Economic Development to assist with the update of municipal floodplain ordinances. All Pike County municipalities have adopted floodplain ordinances and/or provisions within their zoning ordinance to address the required standards of the FIRM program. However, few of the ordinances go beyond these minimum requirements, and those that do only do so in prohibiting new construction or development in the 1%-annual-chance-floodplain. Table 5.2-1 shows which municipalities in the County exceed NFIP minimum standards in their municipal floodplain ordinances. When new DFIRMS are released for the County in the future, the PA model Floodplain Ordinance will be recommended for use.

**Table 5.2-1: Results of analysis of standards in municipal floodplain ordinances (Pike County Office of Community Planning, 2011)**

COMMUNITY	MEET NFIP STANDARDS	EXCEED NFIP STANDARDS	PROVISIONS THAT EXCEED NFIP STANDARDS
Blooming Grove Township	✓		
Delaware Township	✓		
Dingman Township		✓	Prohibit new construction/development in 1%-annual-chance floodplain
Greene Township	✓		
Lackawaxen Township	✓		

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**Table 5.2-1: Results of analysis of standards in municipal floodplain ordinances (Pike County Office of Community Planning, 2011)**

COMMUNITY	MEET NFIP STANDARDS	EXCEED NFIP STANDARDS	PROVISIONS THAT EXCEED NFIP STANDARDS
Lehman Township	✓		
Matamoras Borough	✓		
Milford Borough	✓		
Milford Township		✓	Prohibit new construction/development in 1%-annual-chance floodplain
Palmyra Township		✓	Prohibit new construction/development in 1%-annual-chance floodplain
Porter Township	✓		
Shohola Township	✓		
Westfall Township	✓		

### 5.2.3. Planning and Regulatory Capability

Some of the most important planning and regulatory capabilities that can be utilized for hazard mitigation include comprehensive plans, building codes, floodplain ordinances, subdivision and land development ordinances, and zoning ordinances. These tools provide mechanisms for the implementation of adopted mitigation strategies. Table 5.2-2 summarizes their presence within each municipality.

**Table 5.2-2: Summary of planning tools adopted by each municipality in Pike County (HMP Capability Assessment Surveys, 2011; Pike County Office of Community Planning, 2011)**

COMMUNITY	COMPRE-HENSIVE PLAN	BUILDING CODE	FLOODPLAIN ORDINANCE - NFIP PARTICIPANT	SUBDIVISION & LAND DEVELOPMENT ORDINANCE	ZONING ORDINANCE
Blooming Grove Township	Yes	Yes	Yes	Yes	Yes
Delaware Township	Yes	Yes	Yes	Yes	Yes
Dingman Township	Yes	Yes	Yes	Yes	Yes
Greene Township	Yes	Yes	Yes	Yes	No
Lackawaxen Township	Yes, multi-jurisdictional	Yes	Yes	Yes	Yes
Lehman Township	Yes	Yes	Yes	Yes	Yes
Matamoras Borough	Yes, multi-jurisdictional	Yes	Yes	Yes	Yes
Milford Borough	Yes, multi-jurisdictional	Yes	Yes	Yes	Yes

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**Table 5.2-2: Summary of planning tools adopted by each municipality in Pike County (HMP Capability Assessment Surveys, 2011; Pike County Office of Community Planning, 2011)**

COMMUNITY	COMPRE-HENSIVE PLAN	BUILDING CODE	FLOODPLAIN ORDINANCE - NFIP PARTICIPANT	SUBDIVISION & LAND DEVELOPMENT ORDINANCE	ZONING ORDINANCE
Milford Township	Yes, multi-jurisdictional	Yes	Yes	Yes	Yes
Palmyra Township	Yes	Yes	Yes	Yes	Yes
Porter Township	Yes	Yes	Yes	Yes	Yes
Shohola Township	Yes, multi-jurisdictional	Yes	Yes	Yes	Yes
Westfall Township	Yes, multi-jurisdictional	Yes	Yes	Yes	Yes

Comprehensive Plans promote sound land use and regional cooperation among local governments to address planning issues. These plans serve as the official policy guide for influencing the location, type and extent of future development by establishing the basis for decision-making and review processes on zoning matters, subdivision and land development, land uses, public facilities and housing needs over time. The existing countywide Comprehensive Plan for Pike County was developed in 2006. County governments are required by law to adopt a comprehensive plan, while local municipalities may do so at their option. Future comprehensive plan updates and improvements will consider 2012 HMP findings. Several municipalities have joined to work towards multi-municipal comprehensive planning efforts in the County. Milford Borough and Milford Township completed a new multi-municipal plan which was adopted on November 6, 2006. Lackawaxen Township and Shohola Township, both municipalities which lie along the Upper Delaware River, also have completed and adopted a multi-municipal comprehensive plan as have Westfall and Matamoras.

Building codes regulate construction standards for new construction and substantially renovated buildings. Standards can be adopted that require resistant or resilient building design practices to address hazard impacts common to a given community. In 2003, the Commonwealth of Pennsylvania implemented Act 45 of 1999, the Uniform Construction Code (UCC), a comprehensive building code that establishes minimum regulations for most new construction, including additions and renovations to existing structures. All 13 municipalities in Pike County are required to adhere to the UCC. On December 10, 2009 the Commonwealth adopted regulations of the 2009 International Code Council's codes. The effective date of the regulations is December 31, 2009. Since all municipalities in Pike County are required to abide by the UCC they will be required to enforce the 2009 building code regulations for all building permits submitted after December 31, 2009. If a design or construction contract for proposed work was signed between December 31, 2006 and December 30, 2009 then the 2006 International Codes must be abided.

Through administration of floodplain ordinances, municipalities can ensure that all new construction or substantial improvements to existing structures located in the floodplain are flood-proofed, dry-proofed, or built above anticipated flood elevations. Floodplain ordinances may also prohibit development in certain areas altogether. The NFIP establishes minimum ordinance requirements which must be met in order for that community to participate in the program. However, a community is permitted and in fact, encouraged, to adopt standards which exceed NFIP requirements. Through participation in the NFIP, all municipalities within the County have floodplain regulations in place. As discussed in Section 5.2.2, when municipalities in Pike County's update floodplain ordinances again, the PA model ordinance will be recommended.

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. All jurisdictions within Pike County have adopted and enforce a subdivision and land development ordinance.

Zoning ordinances allow for local communities to regulate the use of land in order to protect the interested and safety of the general public. Zoning ordinances can be designed to address unique conditions or concerns within a given community. They may be used to create buffers between structures and high-risk areas, limit the type or density of development and/or require land development to consider specific hazard vulnerabilities. Twelve of the 13 municipalities in Pike County have zoning regulations.

The Pennsylvania legislature enacted the Stormwater Management Act (Act 167 of 1978), commonly called Act 167. The Act enables the regulation of development and activities that cause accelerated runoff and encourages watershed-based planning and management of stormwater. The Department of Environmental Protection is the public agency charged with overseeing implementation of the Act 167 plans. Act 167 Stormwater Management Plans are intended to improve stormwater management practices, mitigate potential negative impacts from future land uses, and to improve the condition of impaired waterways. Pike County has completed Phase I of its Act 167 plan and is nearing completion of Phase II. Once the Act 167 Plan is approved, each municipality must adopt and implement ordinances and regulations needed to regulate development in a manner consistent with the Act 167 Plan. The new ordinance will replace any previously adopted stormwater management ordinances.

#### **5.2.4. Administrative and Technical Capability**

Administrative capability is described by an adequacy of departmental and personnel resources for the implementation of mitigation-related activities. Technical capability relates to an adequacy of knowledge and technical expertise of local government employees or the ability to contract outside resources for this expertise in order to effectively execute mitigation activities.

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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 Pike County have low-to-moderate administrative and technical staff needed to conduct hazard mitigation-activities. There seems to be sufficient emergency management staff across the County and a majority of municipalities have engineering capabilities. However, there seems to be a common lack of personnel for land surveying and scientific work related to community hazards. This result is not necessarily surprising since these tasks are typically contracted to outside providers. A majority of communities do not have their own personnel skilled in geographic information systems but the County GIS Office is able to support the municipalities with some GIS services. Only five communities have grant writers who could assist in Hazard Mitigation Assistance Program applications. All municipalities in the County have an identified emergency management coordinator, though one individual may share duties between two municipalities.

Other local organizations that could act as partners include the Pike County Conservation District, the County Council of Governments, municipal Environmental Advisory Councils (EACs), County economic development staff, and school districts.

In addition watershed associations and other environmental advocacy groups can provide support such as the Lackawaxen River Conservancy, the Twin and Walker Creek Watershed Conservancy, the Twin Lakes Conservancy, the Delaware Highlands Conservancy, and the Lake Wallenpaupack Watershed Management District. Most organizations of these types provide grass roots citizen support which can assist with education and outreach on important issues. Watershed volunteers can also provide important input on the science of water resources through monitoring programs. Watersheds can be planning and management areas for stream conservation and protection, stormwater management, water supply budgeting, watershed based zoning, and integrated resource planning. Getting citizen based groups such as watershed organizations involved with municipal planning in Hazard Mitigation efforts can provide a comprehensive approach to addressing hazard mitigation opportunities and can provide important education and outreach to the local residents.

State agencies which can provide technical assistance for mitigation activities include, but are not limited:

- Pennsylvania Department of Community and Economic Development
- Pennsylvania Department of Conservation and Natural Resources
- Pennsylvania Department of Environmental Protection

Federal agencies which can provide technical assistance for mitigation activities include, but are not limited to:

- Army Corp of Engineers
- Department of Housing and Urban Development
- Department of Agriculture
- Economic Development Administration
- Emergency Management Institute
- Environmental Protection Agency
- FEMA
- Small Business Administration

### 5.2.5. Fiscal Capability

A critical key to the implementation of any plan whether it be a county or municipal comprehensive plan, hazard mitigation plan or emergency preparedness plan is the financial resources to accomplish the priority projects identified. As listed above there are key areas where Pike County's capabilities could be strengthened with sufficient funding to address important preventative measures. Recently, in response to the challenges which serious growth issues pose for the communities, many of the municipalities have been moving forward with updates to their Municipal Comprehensive Plans and land use ordinances. The municipalities and the County have taken an active role in seeking funds for these planning efforts.

In addition, the implementation of mitigation actions requires time and fiscal resources. While some mitigation actions are less costly than others, it is important that money is available locally to implement policies and projects. Financial resources are particularly important if communities are trying to take advantage of state or federal mitigation grant funding opportunities that require local-match contributions. Based on survey results, most municipalities within the County perceive fiscal capability to be limited; however, four communities listed their capability to be moderate to high.

State programs which may provide financial support for mitigation activities include, but are not limited to:

- Community Conservation Partnerships Program
- Community Revitalization Program
- Floodplain Land Use Assistance Program
- Growing Greener Program
- Keystone Grant Program
- Local Government Capital Projects Loan Program
- Land Use Planning and Technical Assistance Program
- Pennsylvania Heritage Areas Program
- Pennsylvania Recreational Trails Program
- Shared Municipal Services

- Technical Assistance Program

The federal government offers a number of mitigation-related funding and training resources. FEMA has several programs detailed below that support hazard mitigation. It should be noted that these programs require local governments to have a hazard mitigation plan in order to be eligible to receive such grants.

### **Pre-Disaster Mitigation Grants**

The Pre-Disaster Mitigation (PDM) program provides funds to states, territories, Indian tribal governments, and communities for hazard mitigation planning and the implementation of mitigation projects prior to a disaster event. Funding these plans and projects reduces overall risks to the population and structures, while also reducing reliance on funding from actual disaster declarations. PDM grants are to be awarded on a competitive basis and without reference to state allocations, quotas, or other formula-based allocation of funds (FEMA, 2011c).

### **Hazard Mitigation Grant Program**

Provides grants to states and local governments to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the program is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster (FEMA, 2011b).

Hazard Mitigation Grant Program funding is only available to applicants that reside within a presidentially-declared disaster area. Eligible applicants:

- State and local governments
- Indian tribes or other tribal organizations
- Certain nonprofit organizations

Individual homeowners and businesses may not apply directly to the program; however, a community may apply on their behalf.

HMGP funds may be used to fund projects that will reduce or eliminate the losses from future disasters. Projects must provide a long-term solution to a problem, for example, elevation of a home to reduce the risk of flood damages as opposed to buying sandbags and pumps to fight the flood. In addition, a project's potential savings must be more than the cost of implementing the project. Funds may be used to protect either public or private property or to purchase property that has been subjected to, or is in danger of, repetitive damage. Examples of projects include, but are not limited to:

- Acquisition of real property for willing sellers and demolition or relocation of buildings to convert the property to open space use

- Retrofitting structures and facilities to minimize damages from high winds, earthquake, flood, wildfire, or other natural hazards
- Elevation of flood-prone structures
- Development and initial implementation of vegetative management programs
- Minor flood control projects that do not duplicate the flood prevention activities of other federal agencies
- Localized flood control projects, such as certain ring levees and floodwall systems, that are designed specifically to protect critical facilities
- Post-disaster building code related activities that support building code officials during the reconstruction process

### **Flood Mitigation Assistance Program**

The FMA program was created as part of the National Flood Insurance Reform Act (NFIRA) of 1994 (42 U.S.C. 4101) with the goal of reducing or eliminating claims under the National Flood Insurance Program. FEMA provides FMA funds to assist states and communities in implementing measures that reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insurable under the NFIP (FEMA, 2011a).

There are three types of FMA grants available to states and communities: planning, project, and technical assistance. Planning grants are given to prepare Flood Mitigation Plans. Only NFIP-participating communities with approved Flood Mitigation Plans can apply for FMA project grants. Project grants are available to implement measures to reduce flood losses, such as elevation, acquisition, or relocation of NFIP-insured structures. States are encouraged to prioritize FMA funds for applications that include repetitive-loss properties; these include structures with two or more losses each with a claim of at least \$1,000 within any ten-year period since 1978. Technical assistance grants are available to state governments to help them administer the FMA program and activities. Project grants may be awarded for up to 10% of the project cost.

### **Public Assistance**

The objective of this program is to provide assistance to states, local governments, and certain non-profit organizations to alleviate suffering and hardship resulting from major disasters or emergencies declared by the President (FEMA, 2011d). Through the Public Assistance Program, FEMA provides supplemental federal disaster grant assistance for the repair, replacement, or restoration of disaster-damaged publicly owned facilities and the facilities of certain private non-profit organizations. The federal share of assistance is not less than 75% of the eligible cost for emergency measures and permanent restoration. The grantee (usually the state) determines how the non-federal share (up to 25%) is split with the subgrantees (eligible applicants).

### **Repetitive Flood Claims (RFC) Program**

Provides funding to reduce or eliminate the long-term risk of flood damage to structures insured under the NFIP that have one or more claim payments for flood damage. RFC funds may only

be used for mitigation of structures in a state or community that cannot meet the requirements of the FMA program for either cost share or capacity to manage the activities.

In addition to these FEMA grants, the federal government, through the Emergency Management Institute, offers training in all aspects of emergency management, including hazard mitigation. The courses available at the Institute are free to local government staff.

Other federal resources include:

- Weatherization Assistance Program: Minimizes the adverse effects of high-energy costs on low-income, elderly, and handicapped citizens through client education activities and weatherization services like heating system modifications and insulation (US DOE, 2011).
- Section 108 Loan Guarantee Programs: Provides loan guarantees as security for federal loans for acquisition, rehabilitation, relocation, clearance, site preparation, special economic development activities, and construction of certain public facilities and housing (HUD, 2011).
- U.S. Department of Agriculture: Provides disaster assistance through the following:
  - The Emergency Conservation Program provides emergency funding for farmers to rehabilitate farmland damaged by natural disasters and for carrying out emergency water conservation measures during periods of severe drought.
  - The Non-insured Crop Disaster Assistance Program provides financial assistance for non-insurable crop losses and planting prevented by disasters.
- Emergency Watershed Protection Program: Undertake emergency measures, including the purchase of floodplain easements, for runoff retardation and soil erosion prevention to safeguard lives and property from floods, drought, and the products of erosion on any watershed whenever fire, flood, or any other natural occurrence is causing or has caused a sudden impairment of the watershed (NRCS, 2011). It is not necessary for a national emergency to be declared for an area to be eligible for assistance. The program objective is to assist sponsors and individuals in implementing emergency measures to relieve imminent hazards to life and property created by a natural disaster. Activities include providing financial and technical assistance to remove debris from streams, protect destabilized stream banks, establish cover on critically eroding lands, repairing conservation practices, and the purchase of floodplain easements. The program is designed for installation of recovery measures.

### 5.2.6. Political Capability

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 seen 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 to capture information on each jurisdiction’s political capability. Survey respondents were asked to identify examples of political capability, such as guiding development away from hazard areas, restricting public investments or capital improvements within hazard areas, or enforcing local development standards that go beyond minimum state or federal requirements (i.e. building codes, floodplain management ordinances, etc...). These examples were used to guide respondents in scoring their community on a scale of “unwilling” (0) to “very willing” (5) to adopt policies and programs that reduce hazard vulnerabilities. Of the 12 municipalities that responded, scores ranged from 0-5 with an average score of 4.09.

**5.2.7. Self-Assessment**

In addition to the inventory and analysis of specific local capabilities, the *Capability Assessment Survey* required each local jurisdiction to conduct its own self-assessment of its capability to effectively implement hazard mitigation activities. As part of this process, county and municipal officials were encouraged to consider the barriers to implementing proposed mitigation strategies in addition to the mechanisms that could enhance or further such strategies. In response to the survey questionnaire, local officials classified each of the capabilities as either “limited,” “moderate” or “high.” Table 5.2-3 summarizes the results of the self-assessment survey as a percentage of responses received. For example, 89% of communities who responded indicated their community had moderate community resiliency related to hazard mitigation activities that reduce hazard vulnerabilities.

<b>Table 5.2-3: Summary of self-assessment capability responses expressed as a percentage of responses received.</b>			
<b>CAPABILITY CATEGORY</b>	<b>LIMITED</b>	<b>MODERATE</b>	<b>HIGH</b>
Planning & Regulatory	11%	33%	56%
Administrative & Technical	11%	67%	22%
Fiscal	56%	22%	22%
Political	11%	67%	22%
Community Resiliency	0%	89%	11%

**5.2.8. Existing Limitations**

As mentioned, there are no communities in Pike County participating in the NFIP Community Rating System. However, all municipalities in the County have been designated as floodprone. Community participation in this program can provide premium reductions for properties located outside of Special Flood Hazard Areas of up to 10 percent and reductions for properties located in Special Flood Hazard Areas of up to 45 percent. These discounts can be obtained by undertaking public information, mapping and regulations, flood damage reduction and flood preparedness activities (FEMA, 2009).

Based on the capability assessment results and information from the Pike County Office of Community Planning, all of Pike County's jurisdictions have local land use controls. However, some of these have not been updated recently. With current growth pressures which the County is experiencing, the municipalities are now taking a more pro-active role in updating their comprehensive plans and land use ordinances to address this growth. In updating their ordinances, local governments can go farther to use land use regulations to direct development away from hazard-prone areas.

Numerous roads and intersections exist in the County where flooding issues repeatedly occur. Some of these roads and intersections are state routes. The County and local municipalities face challenges in mitigating flood events on state routes since these roads are owned and maintained by the Commonwealth of Pennsylvania. Local municipalities do not have the authority to independently carry out a mitigation project. In these situations, the Pennsylvania Department of Transportation must decide to undertake the project. Since the Department of Transportation is often most concerned with larger, critical transportation routes, smaller state roads and intersections which significantly affect a local community may not get the attention they need for the Commonwealth to take on a mitigation project.

Finally, limited funding is a critical barrier to the implementation of hazard mitigation activities. The County will need to rely on regional, state and federal partnerships for financial assistance.

## 6. Mitigation Strategy

### 6.1. Update Process Summary

Mitigation *goals* are general guidelines that explain what the County wants to achieve. Goals are usually expressed as broad policy statements representing desired long-term results. Mitigation *objectives* describe strategies or implementation steps to attain the identified goals. Objectives are more specific statements than goals; the described steps are usually measurable and can have a defined completion date. The 13 goals in the 2006 HMP are directly from the County's Comprehensive Plan. The 2006 HMP did not identify any objectives. The HMSC decided that the 13 goals should be reworked to make them more specific to hazard mitigation since several of them strictly had to do with solely with topics covered under comprehensive planning. The 13 goals were condensed into new hazard mitigation-specific goals and objectives were developed for each goal. A list of the 13 goals from the 2006 HMP as well as a review summary based on comments received from municipal representatives and other stakeholders who participated in the HMP update process is included in Table 6.1-1. These reviews are based on responses received from communities to the *Proposed Goals and Objectives Worksheet* and comments received from County officials. The *Proposed Goals and Objectives Worksheet* was provided to all municipal officials at the Risk Assessment / Mitigation Solutions Workshop and made available on the [www.PikeHMP.com](http://www.PikeHMP.com) website. **Appendix C**

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contains completed copies of the *Proposed Goals and Objectives Worksheets* received from municipal representatives and other stakeholders.

<b>Table 6.1-1: List and review summary of 2006 mitigation strategy goals.</b>
<b>Goal 1:</b> Enhance the services provided to the growing population of Pike County, through government and public participation that is responsive and accountable.
<b>Review:</b> The Hazard Mitigation Steering Committee reworded this goal to include the concept in the new 2012 Goal #3: Enhance and improve emergency services provided to the growing population of Pike County.
<b>Goal 2:</b> Conserve, maintain and enhance the historical, cultural and environmental resources.
<b>Review:</b> The Hazard Mitigation Steering Committee reworded this goal to include the concept in the new 2012 Goal #5: Conserve, protect and enhance existing natural and water resources.
<b>Goal 3:</b> Provide for properly managed and environmentally sound growth which will benefit the economy while retaining the County's rural character and natural beauty.
<b>Review:</b> The Hazard Mitigation Steering Committee reworded this goal to include the concept in the new 2012 Goal #1: Provide for properly managed and environmentally sound growth and disaster-resistant development.
<b>Goal 4:</b> Broaden existing and provide new services to Pike County.
<b>Review:</b> The Hazard Mitigation Steering Committee reworded this goal to include the concept in the new 2012 Goal #3: Enhance and improve emergency services provided to the growing population of Pike County.
<b>Goal 5:</b> Promote economic development while avoiding any negative impact on the natural beauty and resources of our community and environment.
<b>Review:</b> The Hazard Mitigation Steering Committee reworded this goal to include the concept in the new 2012 Goal #1: Provide for properly managed and environmentally sound growth and disaster-resistant development.
<b>Goal 6:</b> Manage Growth
<b>Review:</b> The Hazard Mitigation Steering Committee reworded this goal to include the concept in the new 2012 Goal #1: Provide for properly managed and environmentally sound growth and disaster-resistant development.
<b>Goal 7:</b> Address the Impacts of Growth
<b>Review:</b> The Hazard Mitigation Steering Committee reworded this goal to include the concept in the new 2012 Goal #1: Provide for properly managed and environmentally sound growth and disaster-resistant development.
<b>Goal 8:</b> Improve Quality of Future Development
<b>Review:</b> The Hazard Mitigation Steering Committee reworded this goal to include the concept in the new 2012 Goal #1: Provide for properly managed and environmentally sound growth and disaster-resistant development.
<b>Goal 9:</b> Protect Natural Resources

## Pike County 2012 Hazard Mitigation Plan

<b>Table 6.1-1: List and review summary of 2006 mitigation strategy goals.</b>	
<b>Review:</b>	The Hazard Mitigation Steering Committee reworded this goal to include the concept in the new 2012 Goal #5: Conserve, protect and enhance existing natural and water resources.
<b>Goal 10: Protect Water Resources</b>	
<b>Review:</b>	The Hazard Mitigation Steering Committee reworded this goal to include the concept in the new 2012 Goal #5: Conserve, protect and enhance existing natural and water resources.
<b>Goal 11: Encourage Education and Outreach</b>	
<b>Review:</b>	The Hazard Mitigation Steering Committee reworded this goal to include the concept in the new 2012 Goal #6: Increase awareness, understanding, and preparedness across all sectors by encouraging hazard risk, preparedness, and mitigation related education and outreach activities.
<b>Goal 12: Encourage and help to facilitate Multi-Municipal Planning</b>	
<b>Review:</b>	The Hazard Mitigation Steering Committee incorporated the concept of this goal into a new objective under the 2012 Goal #6.
<b>Goal 13: Establish County, Municipal and other Partnerships</b>	
<b>Review:</b>	The Hazard Mitigation Steering Committee incorporated the concept of this goal into a new objective under the 2012 Goal #6.

Actions provide more detailed descriptions of specific work tasks to help the County and its municipalities achieve the goals and objectives. There were thirty-six actions identified in the 2006 Pike County HMP. Many of existing mitigation actions have been carried over into the 2012 HMP as they are continuous actions, actions in progress, or actions that were not completed in the last five years but the HMPT would like to continue them into the 2012 HMPU so that they can work to complete them over the next five years. A list of these actions as well as a review and summary of their progress based on comments received from stakeholders involved in the HMPU process is included in Table 6.1-2. Actions were evaluated by the HMSC and municipal officials with the intent of producing a usable mitigation action plan in 2012 with actions and projects that could be completed over the next five years. Please note that the wording of some of the 2006 actions contained sensitive information regarding property location of repetitive loss properties and was generalized for Table 6.1-2. The original actions can be found in **Appendix C**.

<b>Table 6.1-2: List and review summary of 2006 mitigation actions.</b>	
ACTION	REVIEW
Municipal floodplain ordinance updates / Countywide Stormwater Plan (Phase I)	Regarding the first part of the action, the concept has been expanded to update ordinances to meet or exceed NFIP minimum standards. See Action #33. Regarding the second part of the action, the County also recently completed a draft of Phase I of its Stormwater Management

## Pike County 2012 Hazard Mitigation Plan

**Table 6.1-2: List and review summary of 2006 mitigation actions.**

ACTION	REVIEW
	Plan (Act 167 plan). Therefore this part of the action was completed and therefore will not be included in the 2012 HMPU.
Municipal floodplain ordinances / Countywide Stormwater Plan (Phase II)	As indicated above, the first part of the action has been continued into Action #33. However, regarding the second part of the action the County has not completed Phase II of its Stormwater Management Plan yet. Therefore this part of the action has been modified to focus on completing Phase II of the County's Act 167 Plan. See Action #1.
FIRM mapping update	The HMSC decided to modify the wording of this action to "Assess FIRM mapping and work to update areas of critical concern as it becomes necessary." See Action #2.
Lackawaxen River Stream Gauge installation (Lackawaxen Township)	The Township indicated that one gauge was installed with PP&L however the Township would like to continue the actions into the 2012 HMPU as they would like to install two more gauges. See Action #31.
Wallenpaupack Creek Restoration and Railroad Bridge Replacement / Realignment (Palmyra Township)	The municipality indicated that this project has been completed but monitoring for additional debris is necessary. The action has been modified to focus on creek debris removal. See Action #4.
TR342 - Tarkill Creek Box Culvert (Blooming Grove Township)	The municipality indicated that there has been no progress on this mitigation action since the 2006 HMP due to a lack of available local match funding and local administrative and technical capability. The HMSC determined this project to still be viable and therefore it is being continued into the 2012 HMPU. See Action #5.
TR410 - Spring Road Shohola Creek/County Bridge Bank re-inforcement (Blooming Grove Township)	The municipality indicated that this project has been completed. Therefore it will not be included in the 2012 HMPU.
Stream Debris Clean-up - Blooming Grove Creek and Shohola Creek (Blooming Grove Township)	The municipality indicated that this project is ongoing and routine. Therefore it is being continued into the 2012 HMPU. See Action #6.
Mountain View Road Flooding (Greene Township)	The municipality indicated that there has been no progress on this project due to a lack of available local match funding and local administrative and technical capability. The HMSC determined this project to still be viable. Therefore it is being continued into the 2012 HMPU. See Action #7.

## Pike County 2012 Hazard Mitigation Plan

<b>Table 6.1-2: List and review summary of 2006 mitigation actions.</b>	
<b>ACTION</b>	<b>REVIEW</b>
Sawmill Road French Mattress* (Greene Township)	The municipality indicated that this project has been completed. Therefore it is not being continued into the 2012 HMPU.
German Valley Road Sluice Pipe/French Mattress* (Greene Township)	The municipality indicated that a 24" sluice pipe was installed and the French mattress is not longer needed. Therefore this project is complete and is not being continued into the 2012 HMPU.
6' Dike and Bulkhead at Avenue R and 10th Street - Airport Park (Matamoras Borough)	The Township indicated that this project has not yet been completed due to a lack of local match funding and local administrative and technical capability but is still viable. Therefore the project is being continued into the 2012 HMPU. See action #8.
Raise the Delaware River Bank from Route 84 to the Mid Delaware Bridge, including Flood Gates (Matamoras Borough)	The Township indicated that this project has not yet been completed but is still viable. Therefore the project is being continued into the 2012 HMPU. See action #9.
Installation of early warning sirens (Lackawaxen Township / Matamoras Borough)	Lackawaxen Township indicated that three sirens have been installed on the Lackawaxen River. They indicated that they would like to continue the action into the 2012 HMPU as they would like to install two more sirens on the river. See Action #28.
Milford Borough repetitive loss structures** (12)	**It was determined that there are no structures that qualify as repetitive loss structures in Milford Borough however they were determined to be floodprone structures. The municipality indicated that there has been no progress on this project due to a lack of local match funding and local administrative and technical capability. The HMSC determined this project to still be viable and the action will be continued into 2012 HMPU under Action #22.
Twin Lakes Road Slide (Shohola Township)	This action was completed and therefore will not be included in the 2012 HMPU.
Pond Eddy - Rosas Switch Road Slide (Shohola Township)	This action was completed and therefore will not be included in the 2012 HMPU.

## Pike County 2012 Hazard Mitigation Plan

<b>Table 6.1-2: List and review summary of 2006 mitigation actions.</b>	
<b>ACTION</b>	<b>REVIEW</b>
Aumueller Bridge (Shohola Township)	The Township indicated that this project has not yet been completed but is still viable. Therefore the project is being continued into the 2012 HMPU. See action #11.
Westfall Township Repetitive Loss Structures - Road A (3)	The municipality indicated that there has been no progress on this action due to a lack of available local match funding and local administrative and technical capability. The HMSC determined this project to still be viable. Therefore it is being continued into the 2012 HMPU. See Action #10.
Westfall Township Repetitive Loss Structures - Road B (20)	The municipality indicated that there has been no progress on this action due to a lack of available local match funding and local administrative and technical capability. The HMSC determined this project to still be viable. Therefore it is being continued into the 2012 HMPU. See Action #10.
Park Road Engineering Study (Delaware Township)	The Township indicated that this project has not yet been completed but is still viable. Therefore the project is being continued into the 2012 HMPU. See action #12.
Portable Generators (Delaware Township)	The Township indicated that this project has not yet been completed but is still viable. Therefore the project is being continued into the 2012 HMPU. See action #13.
Emergency Access Roads Engineering Study (Delaware Township)	The Township indicated that this project has not yet been completed but is still viable. Therefore the project is being continued into the 2012 HMPU. See action #14.
State-Owned Roadway improvements (Dingman Township)	The municipality indicated that PennDOT has begun work on several roads and bridges in the Township but there are more that will need work. Therefore it is being continued into the 2012 HMPU. See Action #15.
Greene Township Repetitive Loss Structures (3)**	**It was determined that there are no structures that qualify as repetitive loss structures in Greene Township however they were determined to be floodprone structures. The municipality indicated that there has been no progress on this project

## Pike County 2012 Hazard Mitigation Plan

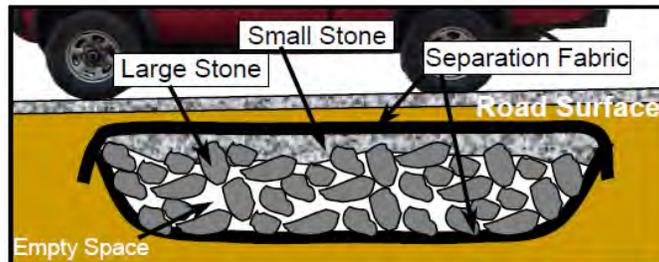
<b>Table 6.1-2: List and review summary of 2006 mitigation actions.</b>	
<b>ACTION</b>	<b>REVIEW</b>
	due to a lack of local match funding and local administrative and technical capability. The HMSC determined this project to still be viable and the action will be continued into 2012 HMPU under Action #22.
Old Greentown Road Roadway elevation/Sluice pipe enlargement (Greene Township)	The municipality indicated that there has been no progress on this mitigation action due to lack of available local match funding and local administrative and technical capability. The HMSC determined this project to still be viable. Therefore it is being continued into the 2012 HMPU. See Action #16.
Beaver Dam Road Sluice pipe enlargement (Greene Township)	The municipality indicated that the pipe was installed but additional work is necessary. The HMSC determined this project to still be viable and therefore it is being continued into the 2012 HMPU. See Action #17.
Bartelson Road Sluice pipe enlargement (Greene Township)	The municipality indicated that there has been no progress on this project due to a lack of available local match funding and local administrative and technical capability. The HMSC determined this project to still be viable. Therefore it is being continued into the 2012 HMPU. See Action #17.
Borough backup generator system (Matamoras Borough)	The Borough indicated that backup generators were purchased for the fire house and borough building and therefore this action is completed and not being included in the 2012 HMPU.
Secure evacuation shelters (Matamoras Borough)	The Township indicated that this project has not yet been completed but is still viable. Therefore the project is being continued into the 2012 HMPU. See action #19.
Visual River Gauge/EMA access secondary gauge (Matamoras Borough)	The Township indicated that this project has not yet been completed but is still viable. Therefore the project is being continued into the 2012 HMPU. See action #20.
Local Radio Station Announcement system installation (Pike County / Matamoras Borough)	This action was completed and therefore will not be included in the 2012 HMPU.
Porter Township repetitive loss structures (2)	The Township indicated that there has been no progress on this action due to a lack of available local match funding and local administrative and technical capability. Therefore the action is being continued into the 2012 HMPU. See Action #10.

## Pike County 2012 Hazard Mitigation Plan

**Table 6.1-2: List and review summary of 2006 mitigation actions.**

ACTION	REVIEW
State Owned Roadway Improvements SR434 and SR1012 (Shohola Township)	This action was completed and therefore will not be included in the 2012 HMPU.
Westfall Township structures (4)	The municipality indicated that there has been no progress on this project due to a lack of available local match funding and local administrative and technical capability. The HMSC determined this project to still be viable. Therefore it is being continued into the 2012 HMPU. See Action #10.
Bell Manor/I84 Berm along River (Westfall Township)	The municipality indicated that this action is in progress. The HMSC determined this project to still be viable. Therefore it is being continued into the 2012 HMPU. See Action #24.

\*A “french mattress” is a stormwater mitigation measure that consists of coarse rock wrapped in fabric through which water can freely pass. They are commonly installed under road beds to allow water passage through the roadbed.



Side view cut-away diagram of a French mattress (Penn State Center for Dirt & Gravel Road Studies)

### 6.2. Mitigation Goals and Objectives

Since the 2006 HMP contained no objectives and goals that were not specific to hazard mitigation planning, a new set of goals and objectives was adopted in 2011. Tables 6.1-1 explains how the existing goals were revised to incorporate their concepts into new goals and objectives. Table 6.2-1 shows the mitigation goals and objectives established for the 2012 HMPU. There are six goals and twelve objectives identified.

**Table 6.2-1: List of 2012 Mitigation Strategy Goals and Objectives.**

<b>GOAL 1</b>	Provide for properly managed and environmentally sound growth and disaster-resistant development.
<b>Objective 1.1</b>	Provide for better stormwater and floodplain management planning and implementation.

## Pike County 2012 Hazard Mitigation Plan

<b>Table 6.2-1: List of 2012 Mitigation Strategy Goals and Objectives.</b>	
<b>Objective 1.2</b>	Encourage and facilitate the development or revision of comprehensive plans and zoning/land-use ordinances to consider limiting development in high-hazard areas and reducing its impact.
<b>GOAL 2</b>	Reduce the potential impact of natural and human made hazards on property.
<b>Objective 2.1</b>	Identify and implement structural and property protection projects to reduce the impacts from flooding including acquisition, elevation and relocation projects.
<b>Objective 2.2</b>	Ensure that existing drainage systems such as pipes, culverts and channels are adequate and functioning properly.
<b>GOAL 3</b>	Enhance and improve emergency services provided to the growing population of Pike County.
<b>Objective 3.1</b>	Provide residents with adequate warning of potential floods and other weather related events.
<b>Objective 3.2</b>	Ensure that emergency response services and critical facilities are adequate and are not interrupted by hazards.
<b>GOAL 4</b>	Reduce vulnerability including loss of life and damage to assets from natural hazards and human-made hazards.
<b>Objective 4.1</b>	Identify and implement mitigation projects to reduce flooding, reduce/eliminate sewage leakage and inflow/infiltration problems.
<b>Objective 4.2</b>	Identify and evaluate the need for warning systems and storm shelters.
<b>GOAL 5</b>	Conserve, protect and enhance existing natural and water resources.
<b>Objective 5.1</b>	Provide appropriate safeguards for the preservation of the quality of stream corridors, watershed areas, and floodplains.
<b>Objective 5.2</b>	Ensure that streams and rivers are functioning properly to reduce flooding.
<b>GOAL 6</b>	Increase awareness, understanding, and preparedness across all sectors by encouraging hazard risk, preparedness, and mitigation related education and outreach activities.
<b>Objective 6.1</b>	Develop partnerships both at the local, state and federal government level as well as with local business, private communities, civic and volunteer organizations and other appropriate non-traditional partners to continue to develop a County-wide approach to identifying and implementing mitigation actions.
<b>Objective 6.2</b>	Develop and distribute public awareness materials about natural hazard risks, preparedness, and mitigation.

### 6.3. Identification and Analysis of Mitigation Techniques

Appendix 7 of the 2009 Standard Operating Guide developed by PEMA provides a comprehensive list of hazard mitigation ideas. Pike County used this guide to identify mitigation techniques and develop mitigation actions. There are six categories of mitigation actions which Pike considered in developing its Mitigation Action Plan. Those categories include:

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- **Prevention:** Government administrative or regulatory actions or processes that influence the way land and buildings are developed and built. These actions also include public activities to reduce hazard losses. Examples include planning, zoning, building codes, subdivision regulations, hazard specific regulations (such as floodplain regulations), capital improvement programs, and open-space preservation and stormwater regulations.
- **Property Protection:** Actions that involve modifying or removing existing buildings or infrastructure to protect them from a hazard. Examples include the acquisition, elevation and relocation of structures, structural retrofits, flood-proofing, storm shutters, and shatter-resistant glass. Most of these property protection techniques are considered to involve “sticks and bricks;” however, this category also includes insurance.
- **Public Education and Awareness:** Actions to inform and educate citizens, elected officials, and property owners about potential risks from hazards and potential ways to mitigate them. Such actions include hazard mapping, outreach projects, library materials dissemination, real estate disclosures, the creation of hazard information centers, and school age / adult education programs.
- **Natural Resource Protection:** Actions that, in addition to minimizing hazard losses also preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, forest and vegetation management, wetlands restoration or preservation, slope stabilization, and historic property and archeological site preservation.
- **Structural Project Implementation:** Mitigation projects intended to lessen the impact of a hazard by using structures to modify the environment. Structures include stormwater controls (culverts); dams, dikes, and levees; and safe rooms.
- **Emergency Services:** Actions that typically are not considered mitigation techniques but reduce the impacts of a hazard event on people and property. These actions are often taken prior to, during, or in response to an emergency or disaster. Examples include warning systems, evacuation planning and management, emergency response training and exercises, and emergency flood protection procedures.

Table 6.3-1 provides a matrix identifying the mitigation techniques used for the moderate and high risk hazards in the County. The specific actions associated with these techniques are included in Table 6.4-1.

Table 6.3-1: Mitigation techniques used for the moderate and high risk hazards in Pike County.						
HAZARD	MITIGATION TECHNIQUE					
	PREVENTION	PROPERTY PROTECTION	PUBLIC EDUCATION AND	NATURAL RESOURCE PROTECTION	STRUCTURAL PROJECT IMPLEMENTATION	EMERGENCY SERVICES

## Pike County 2012 Hazard Mitigation Plan

			AWARENESS			
Flood, Flash Flood, Ice Jam	✓	✓	✓	✓	✓	✓
Winter Storm	✓		✓			✓
Wildfire	✓		✓			✓
Drought	✓		✓			✓
Transportation Accident	✓		✓			✓
Utility Interruption	✓		✓			✓
Hurricane, Tropical Storm, Nor'easter	✓		✓			✓
Drowning	✓		✓			✓
Environmental Hazards	✓		✓			✓
Tornado and Windstorm	✓		✓			✓
Pandemic	✓		✓			✓
Urban Fire and Explosion	✓		✓			✓

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

A Risk Assessment / Mitigation Solutions Workshop was held on May 5, 2011 to develop a framework for the County Mitigation Action Plan (see meeting minutes in **Appendix C**). Following goals and objectives review and evaluation during the workshop, the group went over Mitigation Techniques using PEMA’s *Mitigation Ideas* document. Prior to the workshop, the municipalities were emailed a *2006 Project Evaluation Form* and asked to review their mitigation actions from the existing HMP. They were asked to review whether each project was completed, discontinued, is continuous, in progress/not yet complete, or if there has been no progress on the project. “Completed” or “discontinued,” actions/projects were not carried over to the 2012 Action Plan. It is important to note that many of the actions were consolidated if they were similar and generalized to remove location-specific information (i.e. Eliminate flooding at 123 Main Street) per FEMA guidance. The results of the evaluation can be found in **Appendix C**. In addition, all participants were given *Mitigation Action Forms* and asked to list new actions or projects to be included in the plan update. Municipalities not present at the workshop were emailed copies of the *Mitigation Action Form*.

Actions were selected for the 13 municipalities in one of the following ways: from a completed *2006 Project Evaluation Form*, from a completed *Mitigation Action Form*, or new actions developed by the HMSC based on results of the risk assessment and assigned based on identified needs and community comments received throughout the planning process. Table 6.4-1 contains the final list of fifty-three mitigation actions. At least one mitigation action was established for each moderate and high risk hazard in Pike County. More than one action is identified for several hazards. Every participating jurisdiction has at least one mitigation action. Each mitigation action is intended to address one or more of the goals and objectives identified in Section 6.2. Actions 2, 33, and 34 address continued compliance and improved participation in the NFIP.

**Table 6.4-1: List of 2012 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.**

<b>COMMUNITY:</b> Pike County	<b>ACTION:</b> Complete and implement Phase II of the Countywide Stormwater Management Plan (Act 167 Plan)
<b>ACTION NO:</b> 1	
<b>Category:</b>	Prevention
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, and Ice Jam
<b>Lead Agency/Department:</b>	Pike County Office of Community Planning
<b>Implementation Schedule:</b>	Within 2 years
<b>Funding Source:</b>	County; DEP
<b>COMMUNITY:</b> Pike County	<b>ACTION:</b> Assess 2000 Countywide FIRMs and make

## Pike County 2012 Hazard Mitigation Plan

Table 6.4-1: List of 2012 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
<b>ACTION NO: 2</b>	recommendations to FEMA for critical areas for next FIRM update.
<b>Category:</b>	Prevention; NFIP
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, and Ice Jam
<b>Lead Agency/Department:</b>	Pike County Office of Community Planning; Pike County EMA; Pike County GIS Office
<b>Implementation Schedule:</b>	ongoing
<b>Funding Source:</b>	FEMA/PEMA; County
<b>COMMUNITY:</b> Pike County	<b>ACTION:</b> Implement groundwater level wells monitoring to assess potable groundwater levels in drought periods.
<b>ACTION NO: 3</b>	
<b>Category:</b>	Prevention
<b>Hazard(s) Addressed:</b>	Drought
<b>Lead Agency/Department:</b>	Pike County Office of Community Planning; Pike County EMA
<b>Implementation Schedule:</b>	ongoing
<b>Funding Source:</b>	County
<b>COMMUNITY:</b> Palmyra Township	<b>ACTION:</b> Clean debris from Wallenpaupack Creek.
<b>ACTION NO: 4</b>	
<b>Category:</b>	Natural Resource Protection
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, Ice Jam
<b>Lead Agency/Department:</b>	Municipality
<b>Implementation Schedule:</b>	Ongoing
<b>Funding Source:</b>	Municipality; FEMA/PEMA
<b>COMMUNITY:</b> Blooming Grove Township	<b>ACTION:</b> Install new box culvert at TR342 - Tarkill Creek
<b>ACTION NO: 5</b>	
<b>Category:</b>	Structural Project Implementation
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam
<b>Lead Agency/Department:</b>	Municipality
<b>Implementation Schedule:</b>	2-3 years
<b>Funding Source:</b>	Municipality; FEMA/PEMA
<b>COMMUNITY:</b> Blooming Grove Township	<b>ACTION:</b> Clean up debris in Blooming Grove Creek and Shohola Creek

## Pike County 2012 Hazard Mitigation Plan

**Table 6.4-1: List of 2012 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.**

<b>ACTION NO: 6</b>	
<b>Category:</b>	Natural Resource Protection
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam
<b>Lead Agency/Department:</b>	Municipality
<b>Implementation Schedule:</b>	ongoing
<b>Funding Source:</b>	Municipality
<b>COMMUNITY:</b> Greene Township	<b>ACTION:</b> Investigate ways to mitigate flooding on Mountain View Road
<b>ACTION NO: 7</b>	
<b>Category:</b>	Property Protection
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, Ice Jam
<b>Lead Agency/Department:</b>	Municipality
<b>Implementation Schedule:</b>	2-5 years
<b>Funding Source:</b>	Municipality
<b>COMMUNITY:</b> Matamoras Borough	<b>ACTION:</b> Install a 6' Dike and Bulkhead at Avenue R and 10th Street - Airport Park.
<b>ACTION NO: 8</b>	
<b>Category:</b>	Structural Project Implementation
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam
<b>Lead Agency/Department:</b>	Municipality
<b>Implementation Schedule:</b>	2-5 years
<b>Funding Source:</b>	Municipality; FEMA/PEMA
<b>COMMUNITY:</b> Matamoras Borough, Westfall Township	<b>ACTION:</b> Raise the Delaware River Bank from Route 84 to the Mid Delaware Bridge, including Flood Gates
<b>ACTION NO: 9</b>	
<b>Category:</b>	Structural Project Implementation
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam
<b>Lead Agency/Department:</b>	Municipality
<b>Implementation Schedule:</b>	Within 5 years
<b>Funding Source:</b>	Municipality; FEMA/PEMA
<b>COMMUNITY:</b> Dingman Township, Lackawaxen Township,	<b>ACTION:</b> Mitigate repetitive loss properties within the municipality.

## Pike County 2012 Hazard Mitigation Plan

Table 6.4-1: List of 2012 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
Matamoras Borough, Porter Township, Westfall Township	
<b>ACTION NO: 10</b>	
<b>Category:</b>	Property Protection
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam
<b>Lead Agency/Department:</b>	Municipality
<b>Implementation Schedule:</b>	Within 5 years
<b>Funding Source:</b>	Municipality; FEMA/PEMA; HMGP
<b>COMMUNITY:</b> Shohola Township	<b>ACTION:</b> Replace Allmueller Bridge with a new bridge that will not get washed out.
<b>ACTION NO: 11</b>	
<b>Category:</b>	Structural Project Implementation
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam
<b>Lead Agency/Department:</b>	Municipality
<b>Implementation Schedule:</b>	Within 5 years
<b>Funding Source:</b>	Municipality; FEMA/PEMA
<b>COMMUNITY:</b> Delaware Township	<b>ACTION:</b> Conduct an Engineering Study of bridges and culverts on Park Road
<b>ACTION NO: 12</b>	
<b>Category:</b>	Structural Project Implementation
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, & Ice Jam
<b>Lead Agency/Department:</b>	Municipality
<b>Implementation Schedule:</b>	Within 5 years
<b>Funding Source:</b>	Municipality; FEMA/PEMA
<b>COMMUNITY:</b> Delaware Township	<b>ACTION:</b> Purchase portable generators for support of reception centers in private communities during evacuations, isolation, and utility interruptions
<b>ACTION NO: 13</b>	
<b>Category:</b>	Emergency Services
<b>Hazard(s) Addressed:</b>	Utility Interruption
<b>Lead Agency/Department:</b>	Municipality
<b>Implementation Schedule:</b>	2-3 years
<b>Funding Source:</b>	Municipality; FEMA/PEMA

## Pike County 2012 Hazard Mitigation Plan

Table 6.4-1: List of 2012 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
<b>COMMUNITY:</b> Delaware Township	<b>ACTION:</b> Complete an Emergency Access Roads Engineering Study to ensure viability of response to communities during hazard events
<b>ACTION NO:</b> 14	
<b>Category:</b>	Emergency Services
<b>Hazard(s) Addressed:</b>	All
<b>Lead Agency/Department:</b>	Municipality
<b>Implementation Schedule:</b>	1-3 years
<b>Funding Source:</b>	Municipality; FEMA/PEMA
<b>COMMUNITY:</b> Dingman Township	<b>ACTION:</b> Conduct improvements on State-Owned roads that are repeatedly flooded
<b>ACTION NO:</b> 15	
<b>Category:</b>	Structural Project Implementation
<b>Hazard(s) Addressed:</b>	Flood, Flash flood, Ice Jam
<b>Lead Agency/Department:</b>	PennDOT; Municipality
<b>Implementation Schedule:</b>	2-4 years
<b>Funding Source:</b>	PennDOT; Municipality
<b>COMMUNITY:</b> Greene Township	<b>ACTION:</b> Elevate Old Greentown Road and enlarge sluice pipe
<b>ACTION NO:</b> 16	
<b>Category:</b>	Structural Project Implementation
<b>Hazard(s) Addressed:</b>	Flood, Flash flood, Ice Jam
<b>Lead Agency/Department:</b>	Municipality
<b>Implementation Schedule:</b>	2-3 years
<b>Funding Source:</b>	Municipality; FEMA/PEMA; Penn State Dirt and Gravel Road grants
<b>COMMUNITY:</b> Greene Township	<b>ACTION:</b> Repair, replace, or enlarge pipes in Beaver Dam, Bartelson, Old Greentown, Saw Mill, Mozzette, Mt. View, Misery, Lake Russell, and Creamery Roads.
<b>ACTION NO:</b> 17	
<b>Category:</b>	Structural Project Implementation
<b>Hazard(s) Addressed:</b>	Flood, Flash flood, Ice Jam
<b>Lead Agency/Department:</b>	Municipality
<b>Implementation Schedule:</b>	Within 5 years
<b>Funding Source:</b>	Municipality; FEMA/PEMA; Dirt and Gravel Road grants*

## Pike County 2012 Hazard Mitigation Plan

**Table 6.4-1: List of 2012 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.**

<b>COMMUNITY:</b> Porter Township	<b>ACTION:</b> Replace culvert on Whittaker Road
<b>ACTION NO:</b> 18	
<b>Category:</b>	Structural Project Implementation
<b>Hazard(s) Addressed:</b>	Flood, Flash flood, Ice Jam
<b>Lead Agency/Department:</b>	Municipality
<b>Implementation Schedule:</b>	2-3 years
<b>Funding Source:</b>	Municipality; FEMA/PEMA
<b>COMMUNITY:</b> Matamoras Borough	<b>ACTION:</b> Secure evacuation shelters to provide locations for the safety of Township residents during hazard events
<b>ACTION NO:</b> 19	
<b>Category:</b>	Emergency Services
<b>Hazard(s) Addressed:</b>	All
<b>Lead Agency/Department:</b>	Municipality
<b>Implementation Schedule:</b>	Within 5 years
<b>Funding Source:</b>	Municipality; FEMA/PEMA
<b>COMMUNITY:</b> Matamoras Borough	<b>ACTION:</b> Install a visual river gauge/EMA access secondary gauge on the mid-Delaware River bridge pier.
<b>ACTION NO:</b> 20	
<b>Category:</b>	Emergency Services
<b>Hazard(s) Addressed:</b>	Flood, flash flood, ice jam
<b>Lead Agency/Department:</b>	Municipality
<b>Implementation Schedule:</b>	Within 5 years
<b>Funding Source:</b>	Municipality; FEMA/PEMA
<b>COMMUNITY:</b> Milford Borough	<b>ACTION:</b> Replace and upgrade storm water system catch basins and covered piping in the Borough
<b>ACTION NO:</b> 21	
<b>Category:</b>	Structural Project Implementation
<b>Hazard(s) Addressed:</b>	Flood, flash flood, ice jam
<b>Lead Agency/Department:</b>	Municipality
<b>Implementation Schedule:</b>	Within 3 years
<b>Funding Source:</b>	Municipality; FEMA/PEMA

## Pike County 2012 Hazard Mitigation Plan

Table 6.4-1: List of 2012 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
<b>COMMUNITY:</b> Blooming Grove Township, Delaware Township, Dingman Township, Greene Township, Lackawaxen Township, Lehman Township, Matamoras Borough, Milford Borough, Milford Township, Palmyra Township, Porter Township, Shohola Township, Westfall Township	<b>ACTION:</b> Continue to target and prioritize at-risk structures for acquisition, relocation, and elevation
<b>ACTION NO:</b> 22	
<b>Category:</b>	Property Protection; Structural Project Implementation
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, and Ice Jam
<b>Lead Agency/Department:</b>	Municipalities
<b>Implementation Schedule:</b>	Ongoing
<b>Funding Source:</b>	Municipalities; FEMA/PEMA
<b>COMMUNITY:</b> Dingman Township	<b>ACTION:</b> Install a box culvert on TR 430 Tunnel Road
<b>ACTION NO:</b> 23	
<b>Category:</b>	Structural Project Implementation
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, and Ice Jam
<b>Lead Agency/Department:</b>	Municipality
<b>Implementation Schedule:</b>	1-3 years.
<b>Funding Source:</b>	Municipality; FEMA/PEMA
<b>COMMUNITY:</b> Matamoras Borough, Westfall Township	<b>ACTION:</b> Clean up islands of debris in the Delaware River near Benny Kill, on Mashipacong Island, and south of the I-84 bridge that resulted from high water and flooding in order to prevent future water blockages that create flooding and ice jams
<b>ACTION NO:</b> 24	
<b>Category:</b>	Natural Resource Protection
<b>Hazard(s) Addressed:</b>	Flood, Flash flood, Ice jam
<b>Lead Agency/Department:</b>	Municipalities, DRBC, USACOE
<b>Implementation Schedule:</b>	1-3 years
<b>Funding Source:</b>	Municipality; FEMA/PEMA
<b>COMMUNITY:</b> Matamoras Borough	<b>ACTION:</b> Purchase and install a camera system to monitor the Delaware River at different locations
<b>ACTION NO:</b> 25	

## Pike County 2012 Hazard Mitigation Plan

**Table 6.4-1: List of 2012 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.**

<b>Category:</b>	Emergency Services
<b>Hazard(s) Addressed:</b>	Flood, Flash flood, Ice jam
<b>Lead Agency/Department:</b>	Matamoras EMA
<b>Implementation Schedule:</b>	Within 3 years
<b>Funding Source:</b>	Municipality; FEMA/PEMA
<b>COMMUNITY:</b> Pike County	<b>ACTION:</b> Work with municipalities to become “Storm Ready” and “Firewise” communities
<b>ACTION NO:</b> 26	
<b>Category:</b>	Prevention
<b>Hazard(s) Addressed:</b>	Flood, flash flood, ice jam; Wildfire; Winter storm; Hurricane, tropical storm, nor’easter; Tornado and windstorm
<b>Lead Agency/Department:</b>	Pike County EMA, DCNR
<b>Implementation Schedule:</b>	ongoing
<b>Funding Source:</b>	County
<b>COMMUNITY:</b> Dingman Township, Greene Township, Lehman Township, Palmyra Township, Shohola Township, Westfall Township	<b>ACTION:</b> Complete stormwater and flooding projects submitted for inclusion in Phase II of the Countywide Act 167 Plan.
<b>ACTION NO:</b> 27	
<b>Category:</b>	Structural Project Implementation
<b>Hazard(s) Addressed:</b>	Flood, flash flood, and ice jam
<b>Lead Agency/Department:</b>	Municipalities
<b>Implementation Schedule:</b>	2-5 years
<b>Funding Source:</b>	Municipalities
<b>COMMUNITY:</b> Lackawaxen Township	<b>ACTION:</b> Install two additional warning sirens on the Lackawaxen River
<b>ACTION NO:</b> 28	
<b>Category:</b>	Emergency Services
<b>Hazard(s) Addressed:</b>	All
<b>Lead Agency/Department:</b>	Municipality
<b>Implementation Schedule:</b>	1-3 years

## Pike County 2012 Hazard Mitigation Plan

Table 6.4-1: List of 2012 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
<b>Funding Source:</b>	Municipality
<b>COMMUNITY:</b> Blooming Grove Township, Delaware Township, Dingman Township, Greene Township, Lackawaxen Township, Lehman Township, Matamoras Borough, Milford Borough, Milford Township, Palmyra Township, Porter Township, Shohola Township, Westfall Township	<b>ACTION:</b> Continue activities of the Pike County Road Task Force to address emergency preparedness, winter preparedness, and coordination of winter operations with school district officials
<b>ACTION NO: 29</b>	
<b>Category:</b>	Prevention; Public Education and Awareness
<b>Hazard(s) Addressed:</b>	Winter Storm; Transportation Accident
<b>Lead Agency/Department:</b>	County; Municipalities
<b>Implementation Schedule:</b>	Ongoing
<b>Funding Source:</b>	County/municipal staff time
<b>COMMUNITY:</b> Pike County	<b>ACTION:</b> Utilize the County's Marcellus Shale task force to prepare for and educate municipalities about updating ordinances and proper permitting for Marcellus Shale gas wells
<b>ACTION NO: 30</b>	
<b>Category:</b>	Public Education and Awareness; Prevention
<b>Hazard(s) Addressed:</b>	Environmental Hazards
<b>Lead Agency/Department:</b>	Pike County Office of Community Planning
<b>Implementation Schedule:</b>	1-2 years
<b>Funding Source:</b>	County
<b>COMMUNITY:</b> Lackawaxen Township	<b>ACTION:</b> Install water level detectors (stream gauges) on two bridges on the Lackawaxen River
<b>ACTION NO: 31</b>	
<b>Category:</b>	Emergency Services
<b>Hazard(s) Addressed:</b>	Flood, flash flood, ice jam
<b>Lead Agency/Department:</b>	Municipality
<b>Implementation Schedule:</b>	2-4 years
<b>Funding Source:</b>	Municipality; FEMA/PEMA
<b>COMMUNITY:</b> Pike County	<b>ACTION:</b> Develop a Pandemic Plan to assess the threat of pandemics in the County and prepare for them.
<b>ACTION NO: 32</b>	

## Pike County 2012 Hazard Mitigation Plan

**Table 6.4-1: List of 2012 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.**

<b>Category:</b>	Prevention
<b>Hazard(s) Addressed:</b>	Pandemic
<b>Lead Agency/Department:</b>	Pike County Office of Community Planning; Pike County EMA
<b>Implementation Schedule:</b>	Within 5 years
<b>Funding Source:</b>	County
<b>COMMUNITY:</b> Pike County	<b>ACTION:</b> Work with communities to adopt DCED model floodplain ordinance which exceeds NFIP standards by: <ul style="list-style-type: none"> <li>• Prohibiting manufactured homes in the floodway.</li> <li>• Prohibiting manufactured homes within the area measured 50 feet landward from the top-of bank of any watercourse within a special flood hazard area.</li> <li>• Including special requirements for recreational vehicles within the special flood hazard area.</li> <li>• Including special requirement for accessory structures.</li> <li>• Prohibiting new construction and development within the area measured 50 feet landward from the top-of bank of any watercourse within a special flood hazard area.</li> </ul>
<b>ACTION NO:</b> 33	
<b>Category:</b>	Prevention; NFIP
<b>Hazard(s) Addressed:</b>	Flood, flash flood, ice jam
<b>Lead Agency/Department:</b>	Pike County Office of Community Planning
<b>Implementation Schedule:</b>	Ongoing
<b>Funding Source:</b>	County staff time
<b>COMMUNITY:</b> Pike County	<b>ACTION:</b> Increase awareness of and participation in FEMA's Community Rating System (CRS) Program.
<b>ACTION NO:</b> 34	
<b>Category:</b>	Prevention; NFIP
<b>Hazard(s) Addressed:</b>	Flood, flash flood, ice jam
<b>Lead Agency/Department:</b>	Pike County Office of Community Planning
<b>Implementation Schedule:</b>	Within 5 years
<b>Funding Source:</b>	County; FEMA/PEMA
<b>COMMUNITY:</b> Pike County	<b>ACTION:</b> Work with municipalities to provide performance standards in local land use ordinances for development projects particularly in hazard areas
<b>ACTION NO:</b> 35	
<b>Category:</b>	Prevention
<b>Hazard(s) Addressed:</b>	All

## Pike County 2012 Hazard Mitigation Plan

**Table 6.4-1: List of 2012 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.**

<b>Lead Agency/Department:</b>	Pike County Office of Community Planning
<b>Implementation Schedule:</b>	Ongoing
<b>Funding Source:</b>	County
<b>COMMUNITY:</b> Pike County	<b>ACTION:</b> Develop a County Task Force to identify ways to incentivize volunteer fire fighting, address equipment and facility upgrades, provide training opportunities for emergency service providers, and upgrade EMS service in eastern and central areas of Pike County
<b>ACTION NO:</b> 36	
<b>Category:</b>	Prevention; Emergency Services
<b>Hazard(s) Addressed:</b>	Wildfire; Urban fire and explosion
<b>Lead Agency/Department:</b>	Pike County EMA
<b>Implementation Schedule:</b>	1-2 years
<b>Funding Source:</b>	County
<b>COMMUNITY:</b> Pike County	<b>ACTION:</b> Work with watershed associations and municipal officials to coordinate water conservation and sewage management programs in local communities
<b>ACTION NO:</b> 37	
<b>Category:</b>	Public Education and Awareness
<b>Hazard(s) Addressed:</b>	Drought
<b>Lead Agency/Department:</b>	Pike County EMA
<b>Implementation Schedule:</b>	Ongoing
<b>Funding Source:</b>	County
<b>COMMUNITY:</b> Pike County	<b>ACTION:</b> Work with partner organizations to develop informational releases about hazard mitigation for newspapers, websites, circulars, and property owners association newsletters
<b>ACTION NO:</b> 38	
<b>Category:</b>	Public Education and Awareness
<b>Hazard(s) Addressed:</b>	All
<b>Lead Agency/Department:</b>	Pike County Office of Community Planning; Pike County EMA
<b>Implementation Schedule:</b>	Ongoing
<b>Funding Source:</b>	County
<b>COMMUNITY:</b> Pike County	<b>ACTION:</b> Work with the municipalities to develop educational materials regarding the risk of drowning to distribute to resorts, hotels, and other vacation areas
<b>ACTION NO:</b> 39	
<b>Category:</b>	Public Education and Awareness

## Pike County 2012 Hazard Mitigation Plan

**Table 6.4-1: List of 2012 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.**

<b>Hazard(s) Addressed:</b>	Drowning
<b>Lead Agency/Department:</b>	Pike County Office of Community Planning; Pike County EMA
<b>Implementation Schedule:</b>	1-3 years
<b>Funding Source:</b>	County
<b>COMMUNITY:</b> Pike County	<b>ACTION:</b> Seek school district participation in the U.S. Department of Education's "shake-out drills"
<b>ACTION NO:</b> 40	
<b>Category:</b>	Public Education and Awareness; Prevention
<b>Hazard(s) Addressed:</b>	Earthquake
<b>Lead Agency/Department:</b>	Pike County school districts; Pike County EMA
<b>Implementation Schedule:</b>	1-2 years
<b>Funding Source:</b>	County; PEMA/FEMA
<b>COMMUNITY:</b> Milford Township	<b>ACTION:</b> Purchase an emergency backup generator
<b>ACTION NO:</b> 41	
<b>Category:</b>	Emergency Services
<b>Hazard(s) Addressed:</b>	Utility Interruption
<b>Lead Agency/Department:</b>	Municipality
<b>Implementation Schedule:</b>	1-2 years
<b>Funding Source:</b>	PEMA/FEMA
<b>COMMUNITY:</b> Lehman Township	<b>ACTION:</b> Increase public awareness of residents about flooding hazards through articles in Township and private community newsletters
<b>ACTION NO:</b> 42	
<b>Category:</b>	Public Education and Awareness
<b>Hazard(s) Addressed:</b>	Flood, flash flood, ice jam
<b>Lead Agency/Department:</b>	Township EMC; Home Owners Associations
<b>Implementation Schedule:</b>	ongoing
<b>Funding Source:</b>	EMA funding; Tax revenues; PEMA/FEMA
<b>COMMUNITY:</b> Lehman Township	<b>ACTION:</b> Implement Stormwater BMPs along Mink Pond Road
<b>ACTION NO:</b> 43	
<b>Category:</b>	Structural Project

## Pike County 2012 Hazard Mitigation Plan

Table 6.4-1: List of 2012 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
<b>Hazard(s) Addressed:</b>	Flood, flash flood, ice jam
<b>Lead Agency/Department:</b>	Township Board of Supervisors
<b>Implementation Schedule:</b>	1 year
<b>Funding Source:</b>	Tax revenues; PEMA/FEMA
<b>COMMUNITY:</b> Lehman Township	<b>ACTION:</b> Conduct stormwater management engineering study for Winona Falls Road / Lehman Community Park and implement recommendations
<b>ACTION NO:</b> 44	
<b>Category:</b>	Structural Project; Prevention
<b>Hazard(s) Addressed:</b>	Flood, flash flood, ice jam
<b>Lead Agency/Department:</b>	Township Board of Supervisors
<b>Implementation Schedule:</b>	1-3 years
<b>Funding Source:</b>	EMA funding; Tax revenues; PEMA/FEMA
<b>COMMUNITY:</b> Pike County	<b>ACTION:</b> Continue annual inspections and necessary maintenance and repairs at Kintz Creek Dam, Skyview Lake Dam, and the Taylor Pond Dam.
<b>ACTION NO:</b> 45	
<b>Category:</b>	Structural Project; Prevention
<b>Hazard(s) Addressed:</b>	Dam Failure
<b>Lead Agency/Department:</b>	Pike County Commissioners
<b>Implementation Schedule:</b>	Annually
<b>Funding Source:</b>	County; PEMA/FEMA
<b>COMMUNITY:</b> Pike County	<b>ACTION:</b> Identify and coordinate with appropriate partners and agencies to arrange for data collection of flood and structure data necessary to perform a level 2 HAZUS analysis for the next hazard mitigation plan update (i.e. Building Value, Lowest Floor Elevation, Building Type, Occupancy Type, Foundation Type, Number of Stories and Square Footage).
<b>ACTION NO:</b> 46	
<b>Category:</b>	Prevention; Public Education and Awareness
<b>Hazard(s) Addressed:</b>	Flood, flash flood, and ice jam
<b>Lead Agency/Department:</b>	Office of Community Planning; Pike County EMA
<b>Implementation Schedule:</b>	Within 2 years
<b>Funding Source:</b>	County; PEMA/FEMA
<b>COMMUNITY:</b> Pike County	<b>ACTION:</b> Work with three school districts in Pike County to develop a list of mitigation actions for school facilities to include in the next HMP update.
<b>ACTION NO:</b> 47	

## Pike County 2012 Hazard Mitigation Plan

**Table 6.4-1: List of 2012 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.**

<b>Category:</b>	Prevention; Structural Projects
<b>Hazard(s) Addressed:</b>	All
<b>Lead Agency/Department:</b>	Delaware Valley School District, East Stroudsburg Area School District, Wallenpaupack Area School District, Office of Community Planning; Pike County EMA
<b>Implementation Schedule:</b>	Immediately
<b>Funding Source:</b>	County; PEMA/FEMA
<b>COMMUNITY:</b> Pike County	<b>ACTION:</b> Work with three school districts in Pike County to ensure that their disaster response plans are made available to the County Communications Center on an annual basis and that they are up to date.
<b>ACTION NO:</b> 48	
<b>Category:</b>	Prevention; Structural Projects
<b>Hazard(s) Addressed:</b>	All
<b>Lead Agency/Department:</b>	Delaware Valley School District, East Stroudsburg Area School District, Wallenpaupack Area School District, Office of Community Planning; Pike County EMA
<b>Implementation Schedule:</b>	Annually
<b>Funding Source:</b>	County; PEMA/FEMA
<b>COMMUNITY:</b> Pike County	<b>ACTION:</b> Inspect and audit school facilities to determine that adequate emergency power and emergency water systems are in place so that school facilities can function as emergency shelters during hazard events.
<b>ACTION NO:</b> 49	
<b>Category:</b>	Emergency Services
<b>Hazard(s) Addressed:</b>	All
<b>Lead Agency/Department:</b>	East Stroudsburg Area School District; Pike County EMA
<b>Implementation Schedule:</b>	Within 2 years
<b>Funding Source:</b>	County; PEMA/FEMA
<b>COMMUNITY:</b> Pike County	<b>ACTION:</b> Install a dry hydrant on the access road between the school campus and Lake Wallenpaupack.
<b>ACTION NO:</b> 50	
<b>Category:</b>	Emergency Services
<b>Hazard(s) Addressed:</b>	Wildfire; Urban Fire and Explosion
<b>Lead Agency/Department:</b>	Wallenpaupack Area School District, Pike County EMA
<b>Implementation Schedule:</b>	1-3 years
<b>Funding Source:</b>	County; PEMA/FEMA

## Pike County 2012 Hazard Mitigation Plan

Table 6.4-1: List of 2012 mitigation actions with information including community or communities affected, action category, hazard addressed, action description, lead agency/department and general implementation schedule.	
<b>COMMUNITY:</b> Pike County	<b>ACTION:</b> Install a new radio communication system on campus to communicate early warning information about hazards and emergency information between all campuses and offices.
<b>ACTION NO:</b> 51	
<b>Category:</b>	Emergency Services
<b>Hazard(s) Addressed:</b>	All
<b>Lead Agency/Department:</b>	Delaware Valley School District, Pike County EMA
<b>Implementation Schedule:</b>	1-3 years
<b>Funding Source:</b>	County; PEMA/FEMA
<b>COMMUNITY:</b> Pike County	<b>ACTION:</b> County to work with municipalities to develop databases to track development in the SFHA.
<b>ACTION NO:</b> 52	
<b>Category:</b>	Prevention; Property Protection
<b>Hazard(s) Addressed:</b>	Flood, Flash Flood, and Ice Jam
<b>Lead Agency/Department:</b>	Pike County Office of Community Planning; Pike County EMA
<b>Implementation Schedule:</b>	Work to begin immediately with action to be completed by first or second year of plan maintenance
<b>Funding Source:</b>	County
<b>COMMUNITY:</b> Pike County	<b>ACTION:</b> Hold a workshop to educate and train municipalities about annual FEMA funding sources and the grant application process.
<b>ACTION NO:</b> 53	
<b>Category:</b>	Public Education and Awareness
<b>Hazard(s) Addressed:</b>	All
<b>Lead Agency/Department:</b>	Pike County Office of Community Planning; Pike County EMA
<b>Implementation Schedule:</b>	Within 2 years
<b>Funding Source:</b>	County; PEMA/FEMA
<p>*Pike County administers a Dirt and Gravel Road Maintenance Program for its municipalities. The program is funded through the PA State Conservation Commission to provide “safe, efficient, and environmentally sound maintenance of sections of Dirt and Gravel Roads identified as sources of dust and sediment pollution to waterways.” The program has funded over \$1 million in projects in Pike County that include streambank stabilization and stormwater culvert repair and replacement.</p>	

Table 6.4-1 lists fifty-three mitigation actions, many of which will require substantial time commitments from staff at the County and local municipalities. Those that participated in the development of the 2012 HMP believe that each of these actions is attainable and can pragmatically be implemented over the next five-year cycle. While all of these activities will be

pursued over the next five years, the reality of limited time and resources requires the identification of high priority mitigation actions. Prioritization allows the individuals and organizations involved to focus their energies and ensure progress on mitigation activities.

Mitigation actions were evaluated using the seven criteria which frame the *PASTEEL* method. These feasibility criteria include:

- **Political:** Does the action have public and political support?
- **Administrative:** Is there adequate staffing and funding available to implement the action in a timely manner?
- **Social:** Will the action be acceptable by the community or will it cause any one segment of the population to be treated unfairly?
- **Technical:** How effective will the action be in avoiding or reducing future losses?
- **Economic:** What are the costs and benefits of the action and does it contribute to community economic goals?
- **Environmental:** Will the action provide environmental benefits and will it comply with local, state and federal environmental regulations?
- **Legal:** Does the community have the authority to implement the proposed measure?

The *PASTEEL* method use political, administrative, social, technical, economic, environmental and legal considerations as a basis means of evaluating which of the identified actions should be considered most critical. Economic considerations are particularly important in weighing the costs versus benefits of implementing one action prior to another.

FEMA mitigation planning requirements indicate that any prioritization system used shall include a special emphasis on the extent to which benefits are maximized according to a cost-benefit review of the proposed projects. To do this in an efficient manner that is consistent with FEMA's guidance on using cost-benefit review in mitigation planning, the *PASTEEL* method was adapted to include a higher weighting for two elements of the *economic* feasibility factor – Benefits of Action and Costs of Action. This method incorporates concepts similar to those described in Method C of FEMA 386-5: Using Benefit Cost Review in Mitigation Planning (FEMA, 2007).

Those participating in the 2012 HMPU provided comments which allowed for the prioritization of the mitigation actions listed in Table 6.4-1 using the seven *PASTEEL* criteria. In order to evaluate and prioritize the mitigation actions, participants identified *favorable* and *less favorable* factors for each action. Table 6.4-2 summarizes the evaluation methodology and provides the results of this evaluation for all fifty-three mitigation actions. The first results column includes a summary of the feasibility factors, placing equal weight on all factors. The second results column reflects feasibility scores with benefits and costs weighted more heavily; and therefore, given greater priority. A weighting factor of three was used for each benefit and cost element. Therefore, a "+" benefit factor rating equals three pluses and a "-" benefit factor rating equals three minuses in the total prioritization score. All but one of the actions received scores where their positive factors outweighed their negative factors. Action 9, which involves creating a berm

along the Delaware River received more negative factors because of the cost of such a large construction project, the impact (sediment etc) on communities downriver, and the challenge of obtaining public support for the project.

## Pike County 2012 Hazard Mitigation Plan

**Figure 6.4-2: Summary of mitigation action prioritization using PA STEEL methodology.**

MITIGATION ACTIONS		PA STEEL CRITERIA CONSIDERATIONS																				SUMMARY (EQUAL WEIGHTING)	SUMMARY (BENEFITS & COSTS PRIORITIZED)				
		(+) Favorable						(-) Less favorable						(N) Not Applicable													
		P Political			A Administrative			S Social		T Technical			E Economic			E Environmental			L Legal								
NO.	NAME	Political Support	Local Champion	Public Support	Staffing	Funding Allocation	Maintenance / Operations	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	Benefit of Action (x3)	Cost of Action (x3)	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT / Waste Site	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws	State Authority	Existing Local Authority	Potential Legal Challenge			
1	Complete and implement Phase II of the Countywide Stormwater Management Plan (Act 167 Plan)	+	+	+	-	+	-	+	+	+	+	+	+	+	+	+	N	+	+	+	+	+	+	+	N	19 (+) 2 (-) 2 (N)	23 (+) 2 (-) 2 (N)
2	Assess 2000 Countywide FIRMs and make recommendations to FEMA for critical areas for next FIRM update.	+	+	+	-	N	N	N	+	+	+	+	+	+	+	+	N	+	+	+	+	+	+	+	N	17 (+) 1 (-) 5 (N)	21 (+) 1 (-) 5 (N)
3	Implement groundwater level wells monitoring to assess potable groundwater levels in drought periods	+	+	+	-	-	-	+	+	+	N	+	+	+	+	N	+	N	N	+	+	+	+	N	15 (+) 3 (-) 5 (N)	19 (+) 3 (-) 5 (N)	
4	Clean debris from Wallenpaupack creek	+	+	+	-	-	-	+	+	+	-	+	+	+	N	-	+	+	N	+	+	+	+	N	15 (+) 5 (-) 3 (N)	19 (+) 5 (-) 3 (N)	
5	Install new box culvert at TR342 – Tarkill Creek	+	+	+	-	-	-	+	+	+	-	+	+	+	N	-	+	+	N	+	+	+	+	N	15 (+) 5 (-) 3 (N)	19 (+) 5 (-) 3 (N)	

## Pike County 2012 Hazard Mitigation Plan

**Figure 6.4-2: Summary of mitigation action prioritization using PA STEEL methodology.**

MITIGATION ACTIONS		PA STEEL CRITERIA CONSIDERATIONS																				SUMMARY (EQUAL WEIGHTING)	SUMMARY (BENEFITS & COSTS PRIORITIZED)			
		(+) Favorable      (-) Less favorable      (N) Not Applicable																								
		P Political			A Administrative			S Social		T Technical			E Economic				E Environmental				L Legal					
NO.	NAME	Political Support	Local Champion	Public Support	Staffing	Funding Allocation	Maintenance / Operations	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	Benefit of Action (x3)	Cost of Action (x3)	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT / Waste Site	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws	State Authority	Existing Local Authority	Potential Legal Challenge		
6	Clean up debris in Blooming Grove Creek and Shohola Creek	+	+	+	-	N	-	+	+	+	-	+	+	+	N	N	+	+	N	+	+	+	+	N	15 (+) 3 (-) 5 (N)	19 (+) 3 (-) 5 (N)
7	Investigate ways to mitigate flooding on Mountain View Road	+	+	+	N	-	N	+	+	+	-	+	+	+	N	-	+	+	N	+	+	+	+	N	15 (+) 3 (-) 5 (N)	19 (+) 3 (-) 5 (N)
8	Install a 6' Dike and Bulkhead at Avenue R and 10 <sup>th</sup> Street – Airport Park	+	+	+	-	-	-	+	+	-	-	+	+	+	+	-	+	+	N	+	+	+	+	N	15 (+) 6 (-) 2 (N)	19 (+) 6 (-) 2 (N)
9	Raise the Delaware River Bank from Route 84 to the Mid Delaware Bridge, including Flood Gates	+	+	-	-	-	-	-	+	-	-	-	-	-	+	-	-	-	N	+	+	+	+	-	8 (+) 12 (-) 1 (N)	8 (+) 18 (-) 1 (N)
10	Mitigate repetitive loss properties within the municipality	+	+	+	-	-	N	+	+	+	-	N	+	+	+	-	+	N	N	N	+	+	+	-	13 (+) 5 (-) 5 (N)	17 (+) 5 (-) 5 (N)
11	Replace Allmueller Bridge with a new bridge that will not	+	+	+	-	-	-	+	+	+	-	N	+	+	+	-	+	N	N	N	+	+	+	N	13 (+) 5 (-)	17 (+) 5 (-)

## Pike County 2012 Hazard Mitigation Plan

**Figure 6.4-2: Summary of mitigation action prioritization using PA STEEL methodology.**

MITIGATION ACTIONS		PA STEEL CRITERIA CONSIDERATIONS																				SUMMARY (EQUAL WEIGHTING)	SUMMARY (BENEFITS & COSTS PRIORITIZED)				
		P Political						A Administrative			S Social		T Technical			E Economic				E Environmental				L Legal			
NO.	NAME	Political Support	Local Champion	Public Support	Staffing	Funding Allocation	Maintenance / Operations	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	Benefit of Action (x3 )	Cost of Action (x3)	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT / Waste Site	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws	State Authority	Existing Local Authority	Potential Legal Challenge			
			get washed out																								
12	Conduct an Engineering Study of bridges and culverts on Park Road	+	+	+	N	-	N	+	+	+	N	+	+	+	+	-	+	N	N	N	+	+	+	N	14 (+) 2 (-) 7 (N)	18 (+) 2 (-) 7 (N)	
13	Purchase portable generators for support of reception centers in private communities during evacuations, isolation, and utility interruptions	+	N	N	N	-	-	+	+	+	N	N	+	+	+	-	N	N	N	N	+	+	+	N	10 (+) 3 (-) 10 (N)	14 (+) 3 (-) 10 (N)	
14	Complete an Emergency Access Roads Engineering Study to ensure viability of response to communities during hazard events	+	+	+	N	-	N	+	+	+	N	+	+	+	+	-	+	N	N	N	+	+	+	N	14 (+) 2 (-) 7 (N)	18 (+) 2 (-) 7 (N)	
15	Conduct improvements on State-Owned roads that are repeatedly flooded	+	+	+	-	-	-	+	+	+	-	+	+	+	+	-	+	+	N	+	+	+	+	N	16 (+) 5 (-) 2 (N)	20 (+) 5 (-) 2 (N)	

## Pike County 2012 Hazard Mitigation Plan

**Figure 6.4-2: Summary of mitigation action prioritization using PA STEEL methodology.**

MITIGATION ACTIONS		PA STEEL CRITERIA CONSIDERATIONS																				SUMMARY (EQUAL WEIGHTING)	SUMMARY (BENEFITS & COSTS PRIORITIZED)			
		P Political			A Administrative			S Social		T Technical			E Economic				E Environmental				L Legal					
NO.	NAME	Political Support	Local Champion	Public Support	Staffing	Funding Allocation	Maintenance / Operations	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	Benefit of Action (x3)	Cost of Action (x3)	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT / Waste Site	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws	State Authority	Existing Local Authority	Potential Legal Challenge		
		16	Elevate Old Greentown Road and enlarge sluice pipe	+	+	+	-	-	-	+	+	+	-	+	+	+	+	-	+	+	N	+	+	+	+	N
17	Repair, replace, or enlarge pipes in Beaver Dam, Bartelson, Old Greentown, Saw Mill, Mozzette, Mt. View, Misery, Lake Russell, and Creamery Roads	+	+	+	-	-	-	+	+	+	-	+	+	+	+	-	+	+	N	+	+	+	+	N	16 (+) 5 (-) 2 (N)	20 (+) 5 (-) 2 (N)
18	Replace culvert on Whittaker Road	+	+	+	-	-	-	+	+	+	-	+	+	+	+	-	+	+	N	+	+	+	+	N	16 (+) 5 (-) 2 (N)	20 (+) 5 (-) 2 (N)
19	Secure evacuation shelters to provide locations for the safety of Township residents during hazard events	+	N	N	N	-	N	+	+	+	N	N	+	+	+	-	N	N	N	N	+	+	+	N	10 (+) 2 (-) 11 (N)	14 (+) 2 (-) 11 (N)
20	Install a visual river gauge/EMA access secondary gauge on the mid-	+	+	+	-	-	-	+	+	+	-	+	+	+	+	-	+	+	N	+	+	+	+	N	16 (+) 5 (-) 2 (N)	20 (+) 5 (-) 2 (N)

## Pike County 2012 Hazard Mitigation Plan

**Figure 6.4-2: Summary of mitigation action prioritization using PA STEEL methodology.**

MITIGATION ACTIONS		PA STEEL CRITERIA CONSIDERATIONS																				SUMMARY (EQUAL WEIGHTING)	SUMMARY (BENEFITS & COSTS PRIORITIZED)			
		P Political			A Administrative			S Social		T Technical			E Economic			E Environmental				L Legal						
NO.	NAME	Political Support	Local Champion	Public Support	Staffing	Funding Allocation	Maintenance / Operations	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	Benefit of Action (x3)	Cost of Action (x3)	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT / Waste Site	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws	State Authority	Existing Local Authority	Potential Legal Challenge		
			Delaware River bridge pier																							
21	Replace and upgrade storm water system catch basins and covered piping in the Borough	+	+	+	-	-	-	+	+	+	-	+	+	-	+	-	+	+	N	+	+	+	+	N	15 (+) 6 (-) 2 (N)	17 (+) 8 (-) 2 (N)
22	Identify and implement structural and property protection projects to reduce the impacts from flooding including acquisition, elevation and relocation projects	+	+	+	-	-	-	+	+	+	+	+	+	+	+	-	+	N	N	+	+	+	+	-	16 (+) 5 (-) 2 (N)	20 (+) 5 (-) 2 (N)
23	Install a box culvert on TR 430 Tunnel Road	+	+	+	-	-	-	+	+	+	-	+	+	+	+	-	+	+	N	+	+	+	+	N	16 (+) 5 (-) 2 (N)	20 (+) 5 (-) 2 (N)
24	Clean up islands of debris in the Delaware River near Benny Kill, on Mashipacong Island, and south of the I-84	+	+	+	-	-	-	+	+	+	-	+	+	+	+	-	+	+	N	+	+	+	+	N	16 (+) 5 (-) 2 (N)	20 (+) 5 (-) 2 (N)

## Pike County 2012 Hazard Mitigation Plan

**Figure 6.4-2: Summary of mitigation action prioritization using PA STEEL methodology.**

MITIGATION ACTIONS		PA STEEL CRITERIA CONSIDERATIONS																				SUMMARY (EQUAL WEIGHTING)	SUMMARY (BENEFITS & COSTS PRIORITIZED)			
		(+) Favorable      (-) Less favorable      (N) Not Applicable																								
		P Political			A Administrative			S Social		T Technical			E Economic			E Environmental				L Legal						
NO.	NAME	Political Support	Local Champion	Public Support	Staffing	Funding Allocation	Maintenance / Operations	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	Benefit of Action (x3)	Cost of Action (x3)	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT / Waste Site	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws	State Authority	Existing Local Authority	Potential Legal Challenge		
	bridge that resulted from high water and flooding in order to prevent future water blockages that create flooding and ice jams																									
25	Purchase and install a camera system to monitor the Delaware River at different locations	+	+	+	+	-	-	+	+	+	-	+	+	+	+	-	+	+	N	+	+	+	+	N	17 (+) 4 (-) 2 (N)	21 (+) 4 (-) 2 (N)
26	Work with municipalities to become "Storm Ready" and "Firewise" communities	+	+	+	N	N	N	+	+	+	-	+	+	+	+	N	+	+	N	+	+	+	+	N	16 (+) 1 (-) 6 (N)	20 (+) 1 (-) 6 (N)
27	Complete stormwater and flooding projects submitted for inclusion in Phase II of the Countywide Act 167 Plan	+	+	+	-	-	-	+	+	+	-	+	+	+	+	-	+	+	N	+	+	+	+	N	16 (+) 5 (-) 2 (N)	20 (+) 5 (-) 2 (N)
28	Install two additional warning sirens on the Lackawaxen River	+	+	+	+	-	N	+	+	+	N	+	+	+	+	-	N	N	N	N	+	+	+	N	14 (+) 2 (-) 7 (N)	18 (+) 2 (-) 7 (N)

## Pike County 2012 Hazard Mitigation Plan

**Figure 6.4-2: Summary of mitigation action prioritization using PA STEEL methodology.**

MITIGATION ACTIONS		PA STEEL CRITERIA CONSIDERATIONS																				SUMMARY (EQUAL WEIGHTING)	SUMMARY (BENEFITS & COSTS PRIORITIZED)			
		(+) Favorable						(-) Less favorable						(N) Not Applicable												
		P Political			A Administrative			S Social		T Technical			E Economic			E Environmental			L Legal							
NO.	NAME	Political Support	Local Champion	Public Support	Staffing	Funding Allocation	Maintenance / Operations	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	Benefit of Action (x3)	Cost of Action (x3)	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT / Waste Site	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws	State Authority	Existing Local Authority	Potential Legal Challenge		
29	Continue activities of the Pike County Road Task Force to address emergency preparedness, winter preparedness, and coordination of winter operations with school district officials	+	+	+	+	N	-	+	+	+	N	+	+	+	+	N	N	N	N	N	+	+	+	N	14 (+) 1 (-) 8 (N)	18 (+) 1 (-) 8 (N)
30	Utilize the County's Marcellus Shale task force to prepare for and educate municipalities about updating ordinances and proper permitting for Marcellus Shale gas wells	+	+	+	N	N	N	+	+	+	-	+	+	+	+	N	+	N	N	+	+	+	+	-	15 (+) 2 (-) 6 (N)	19 (+) 2 (-) 6 (N)
31	Install water level detectors (stream gauges) on two bridges on the Lackawaxen River	+	+	+	+	-	-	+	+	+	N	+	+	+	+	-	+	+	N	+	+	+	+	N	17 (+) 3 (-) 3 (N)	21 (+) 3 (-) 3 (N)
32	Develop a Pandemic Plan to assess the threat of pandemics in the County and	+	+	+	+	-	-	+	+	+	+	+	+	+	+	-	N	N	N	N	+	+	+	N	15 (+) 3 (-)	19 (+) 3 (-)

## Pike County 2012 Hazard Mitigation Plan

**Figure 6.4-2: Summary of mitigation action prioritization using PA STEEL methodology.**

MITIGATION ACTIONS		PA STEEL CRITERIA CONSIDERATIONS																				SUMMARY (EQUAL WEIGHTING)	SUMMARY (BENEFITS & COSTS PRIORITIZED)				
		(+) Favorable      (-) Less favorable      (N) Not Applicable																									
		P Political			A Administrative			S Social		T Technical			E Economic			E Environmental				L Legal							
NO.	NAME	Political Support	Local Champion	Public Support	Staffing	Funding Allocation	Maintenance / Operations	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	Benefit of Action (x3)	Cost of Action (x3)	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT / Waste Site	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws	State Authority	Existing Local Authority	Potential Legal Challenge			
	prepare for them																									5 (N)	5 (N)
33	Work with communities to adopt DCED model floodplain ordinance which exceeds NFIP standards by: <ul style="list-style-type: none"> <li>• Prohibiting manufactured homes in the floodway.</li> <li>• Prohibiting manufactured homes within the area measured 50 feet landward from the top-of bank of any watercourse within a special flood hazard area.</li> <li>• Including special requirements for recreational vehicles within the special flood hazard area.</li> <li>• Including special</li> </ul>	+	+	+	N	N	N	+	+	+	+	+	+	+	+	N	+	N	N	N	+	+	+	N	15 (+) 0 (-) 8 (N)	19 (+) 0 (-) 8 (N)	

## Pike County 2012 Hazard Mitigation Plan

**Figure 6.4-2: Summary of mitigation action prioritization using PA STEEL methodology.**

MITIGATION ACTIONS		PA STEEL CRITERIA CONSIDERATIONS																				SUMMARY (EQUAL WEIGHTING)	SUMMARY (BENEFITS & COSTS PRIORITIZED)			
		P Political			A Administrative			S Social		T Technical			E Economic			E Environmental				L Legal						
NO.	NAME	Political Support	Local Champion	Public Support	Staffing	Funding Allocation	Maintenance / Operations	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	Benefit of Action (x3)	Cost of Action (x3)	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT / Waste Site	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws	State Authority	Existing Local Authority	Potential Legal Challenge		
			requirement for accessory structures. <ul style="list-style-type: none"> <li>Prohibiting new construction and development within the area measured 50 feet landward from the top-of bank of any watercourse within a special flood hazard area</li> </ul>																							
34	Increase awareness of and participation in FEMA's Community Rating System (CRS) Program	+	+	+	N	N	N	+	+	+	+	+	+	+	+	N	+	N	N	N	+	+	+	N	15 (+) 0 (-) 8 (N)	19 (+) 0 (-) 8 (N)
35	Work with municipalities to provide performance standards in local land use ordinances for development projects particularly in hazard areas	+	+	+	N	N	N	+	+	+	+	+	+	+	+	N	+	N	N	N	+	+	+	N	15 (+) 0 (-) 8 (N)	19 (+) 0 (-) 8 (N)

## Pike County 2012 Hazard Mitigation Plan

**Figure 6.4-2: Summary of mitigation action prioritization using PA STEEL methodology.**

MITIGATION ACTIONS		PA STEEL CRITERIA CONSIDERATIONS																				SUMMARY (EQUAL WEIGHTING)	SUMMARY (BENEFITS & COSTS PRIORITIZED)			
		(+) Favorable						(-) Less favorable						(N) Not Applicable												
		P Political			A Administrative			S Social		T Technical			E Economic			E Environmental			L Legal							
NO.	NAME	Political Support	Local Champion	Public Support	Staffing	Funding Allocation	Maintenance / Operations	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	Benefit of Action (x3)	Cost of Action (x3)	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT / Waste Site	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws	State Authority	Existing Local Authority	Potential Legal Challenge		
36	Develop a County Task Force to identify ways to incentivize volunteer fire fighting, address equipment and facility upgrades, provide training opportunities for emergency service providers, and upgrade EMS service in eastern and central areas of Pike County	+	+	+	N	N	N	+	+	+	-	+	+	+	+	N	+	N	N	+	+	+	+	N	15 (+) 1 (-) 7 (N)	19 (+) 1 (-) 7 (N)
37	Work with watershed associations and municipal officials to coordinate water conservation and sewage management programs in local communities	+	+	+	N	N	N	+	+	+	-	+	+	+	+	N	+	N	N	+	+	+	+	N	15 (+) 1 (-) 7 (N)	19 (+) 1 (-) 7 (N)
38	Work with partner organizations to develop informational releases about hazard mitigation for newspapers, websites, circulars, and property	+	+	+	N	N	N	+	+	+	-	+	+	+	+	N	+	N	N	+	+	+	+	N	15 (+) 1 (-) 7 (N)	19 (+) 1 (-) 7 (N)

## Pike County 2012 Hazard Mitigation Plan

**Figure 6.4-2: Summary of mitigation action prioritization using PA STEEL methodology.**

MITIGATION ACTIONS		PA STEEL CRITERIA CONSIDERATIONS																				SUMMARY (EQUAL WEIGHTING)	SUMMARY (BENEFITS & COSTS PRIORITIZED)				
		(+) Favorable										(-) Less favorable					(N) Not Applicable										
		P Political			A Administrative			S Social		T Technical			E Economic			E Environmental					L Legal						
NO.	NAME	Political Support	Local Champion	Public Support	Staffing	Funding Allocation	Maintenance / Operations	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	Benefit of Action (x3)	Cost of Action (x3)	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT / Waste Site	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws	State Authority	Existing Local Authority	Potential Legal Challenge			
	owners association newsletters																										
39	Work with the municipalities to develop educational materials regarding the risk of drowning to distribute to resorts, hotels, and other vacation areas	+	+	+	N	N	N	+	+	+	-	+	+	+	+	N	+	N	N	+	+	+	+	N		15 (+) 1 (-) 7 (N)	19 (+) 1 (-) 7 (N)
40	Seek school district participation in the U.S. Department of Education's "shake-out drills"	+	+	+	N	N	N	+	+	+	-	+	+	+	+	N	+	N	N	+	+	+	+	N		15 (+) 1 (-) 7 (N)	19 (+) 1 (-) 7 (N)
41	Purchase an emergency backup generator	+	N	N	N	-	-	+	+	+	N	N	+	+	+	-	N	N	N	N	+	+	+	N		10 (+) 3 (-) 10 (N)	14 (+) 3 (-) 10 (N)
42	Increase public awareness of residents about flooding hazards through articles in Township and private	+	+	+	N	N	N	+	+	+	-	+	+	+	+	N	+	N	N	+	+	+	+	N		15 (+) 1 (-) 7 (N)	19 (+) 1 (-) 7 (N)

## Pike County 2012 Hazard Mitigation Plan

**Figure 6.4-2: Summary of mitigation action prioritization using PA STEEL methodology.**

MITIGATION ACTIONS		PA STEEL CRITERIA CONSIDERATIONS																				SUMMARY (EQUAL WEIGHTING)	SUMMARY (BENEFITS & COSTS PRIORITIZED)			
		(+) Favorable						(-) Less favorable						(N) Not Applicable												
NO.	NAME	P Political			A Administrative			S Social		T Technical			E Economic			E Environmental					L Legal					
		Political Support	Local Champion	Public Support	Staffing	Funding Allocation	Maintenance / Operations	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	Benefit of Action (x3)	Cost of Action (x3)	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT / Waste Site	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws	State Authority	Existing Local Authority			Potential Legal Challenge
	community newsletters																									
43	Implement Stormwater BMPs along Mink Pond Road	+	+	+	-	-	-	+	+	+	-	+	+	+	+	-	+	+	N	+	+	+	+	N	16 (+) 5 (-) 2 (N)	20 (+) 5 (-) 2 (N)
44	Conduct stormwater management engineering study for Winona Falls Road / Lehman Community Park and implement recommendations	+	+	+	-	-	N	+	+	+	N	+	+	+	-	+	N	N	N	+	+	+	N	14 (+) 3 (-) 6 (N)	18 (+) 3 (-) 6 (N)	
45	Continue annual inspections and necessary maintenance and repairs at Kintz Creek Dam, Skyview Lake Dam, and the Taylor Pond Dam.	+	+	+	-	-	-	+	+	+	+	N	+	+	+	-	+	N	N	+	+	+	+	N	15 (+) 4 (-) 4(N)	19 (+) 4 (-) 4(N)
46	Identify and coordinate with appropriate partners and agencies to arrange for data	+	+	+	-	-	N	+	+	+	N	+	+	+	+	-	N	N	N	N	+	+	+	N	13 (+) 3 (-)	17 (+) 3 (-)

## Pike County 2012 Hazard Mitigation Plan

**Figure 6.4-2: Summary of mitigation action prioritization using PA STEEL methodology.**

MITIGATION ACTIONS		PA STEEL CRITERIA CONSIDERATIONS																				SUMMARY (EQUAL WEIGHTING)	SUMMARY (BENEFITS & COSTS PRIORITIZED)			
		(+) Favorable						(-) Less favorable						(N) Not Applicable												
NO.	NAME	P Political			A Administrative			S Social		T Technical			E Economic			E Environmental				L Legal						
		Political Support	Local Champion	Public Support	Staffing	Funding Allocation	Maintenance / Operations	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	Benefit of Action (x3)	Cost of Action (x3)	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT / Waste Site	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws	State Authority	Existing Local Authority	Potential Legal Challenge		
	collection of flood and structure data necessary to perform a level 2 HAZUS analysis for the next hazard mitigation plan update (i.e. Building Value, Lowest Floor Elevation, Building Type, Occupancy Type, Foundation Type, Number of Stories and Square Footage)																								7(N)	7(N)
47	Work with three school districts in Pike County to develop a list of mitigation actions for school facilities to include in the next HMP update	+	+	+	N	N	N	+	+	+	N	+	+	+	+	N	N	N	N	+	+	+	+	N	14 (+) 0 (-) 9(N)	18 (+) 0 (-) 9(N)
48	Work with three school districts in Pike County to ensure that their disaster response plans are made available to the County Communications Center on	+	+	+	N	N	N	+	+	+	N	+	+	+	+	N	N	N	N	+	+	+	+	N	14 (+) 0 (-) 9(N)	18 (+) 0 (-) 9(N)

## Pike County 2012 Hazard Mitigation Plan

**Figure 6.4-2: Summary of mitigation action prioritization using PA STEEL methodology.**

MITIGATION ACTIONS		PA STEEL CRITERIA CONSIDERATIONS																				SUMMARY (EQUAL WEIGHTING)	SUMMARY (BENEFITS & COSTS PRIORITIZED)			
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NO.	NAME	P Political			A Administrative			S Social		T Technical			E Economic			E Environmental					L Legal					
		Political Support	Local Champion	Public Support	Staffing	Funding Allocation	Maintenance / Operations	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	Benefit of Action (x3)	Cost of Action (x3)	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT / Waste Site	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws	State Authority	Existing Local Authority			Potential Legal Challenge
	an annual basis and that they are up to date																									
49	Inspect and audit school facilities to determine that adequate emergency power and emergency water systems are in place so that school facilities can function as emergency shelters during hazard events	+	+	+	-	-	-	+	+	+	N	+	+	+	+	-	N	N	N	N	+	+	+	N	13 (+) 4 (-) 7(N)	17 (+) 4 (-) 7(N)
50	Install a dry hydrant on the access road between the school campus and Lake Wallenpaupack	+	+	+	N	-	+	+	+	+	N	+	+	+	+	-	N	N	N	+	+	+	+	N	15 (+) 2 (-) 6(N)	19 (+) 2 (-) 6(N)
51	Install a new radio communication system on campus to communicate early warning information about hazards and emergency information between all	+	+	+	+	-	+	+	+	+	N	+	+	+	+	-	N	N	N	N	+	+	+	N	15 (+) 2 (-) 6(N)	19 (+) 2 (-) 6(N)

## Pike County 2012 Hazard Mitigation Plan

**Figure 6.4-2: Summary of mitigation action prioritization using PA STEEL methodology.**

MITIGATION ACTIONS		PA STEEL CRITERIA CONSIDERATIONS																				SUMMARY (EQUAL WEIGHTING)	SUMMARY (BENEFITS & COSTS PRIORITIZED)			
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NO.	NAME	P Political			A Administrative			S Social		T Technical			E Economic			E Environmental					L Legal					
		Political Support	Local Champion	Public Support	Staffing	Funding Allocation	Maintenance / Operations	Community Acceptance	Effect on Segment of Population	Technically Feasible	Long-Term Solution	Secondary Impacts	Benefit of Action (x3)	Cost of Action (x3)	Contributes to Economic Goals	Outside Funding Required	Effect on Land / Water	Effect on Endangered Species	Effect on HAZMAT / Waste Site	Consistent w/ Community Environmental Goals	Consistent w/ Federal Laws	State Authority	Existing Local Authority			Potential Legal Challenge
	campuses and offices																									
52	County to work with municipalities to develop databases to track development in the SFHA	+	+	+	-	-	+	+	+	+	N	+	+	+	+	-	N	N	N	+	+	+	+	N	15 (+) 3 (-) 5(N)	19 (+) 3 (-) 5(N)
53	Hold a workshop to educate and train municipalities about annual FEMA funding sources and the grant application process	+	+	+	+	-	N	+	+	+	N	+	+	+	+	-	N	N	N	N	+	+	+	N	14 (+) 2 (-) 7(N)	18 (+) 2 (-) 7(N)

## **7. Plan Maintenance**

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

Monitoring, evaluating and updating this plan, is critical to maintaining its value and success in Pike 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 HMSC reviewed the 2006 plan maintenance section and updated it thus making it different from the 2006 maintenance procedures in several aspects. For example, while the 2006 HMP states that a review of the plan will be done after a major disaster declaration, the 2012 HMPU specifies that the review will occur within 30 days of the disaster declaration. This HMPU also states that an update of the plan maintenance activities will be given to the County's Planning Commission on an annual basis. This HMPU also includes County responsibilities for considering projects for mitigation grants and support of municipalities when applying for mitigation grants. Finally, the 2012 HMPU elaborates upon how this plan may be integrated into other planning mechanisms in the County.

### **7.2. Monitoring, Evaluating and Updating the Plan**

Hazard mitigation planning in Pike County is a function of both the Pike County Office of Community Planning and the Pike County Emergency Management Agency. These agencies coordinate and manage the preparation, maintenance, and updating of the County's Hazard Mitigation Plan in concert with the Pike County Comprehensive Plan, and any other County or local emergency related planning.

The HMSC established for the 2012 HMPU is designated to administer the plan maintenance processes of monitoring, evaluation and updating with support and representation from all 13 participating municipalities. The County Emergency Management Coordinator with the cooperation of the Assistant Director of the Office of Community Planning will lead the HMSC in all associated plan maintenance requirements, including annual reviews.

The HMSC, in cooperation with the County's Local Emergency Planning Committee will meet on an annual basis or within 30 days after any disaster declaration to specifically discuss the effectiveness of the plan and provide for any needed updates. The Pike County Emergency Management Coordinator is responsible for contacting committee members and for organizing the meetings. The meetings will be held each year approximately on the anniversary of the first plan approval date. Municipal involvement will continue to be the responsibility of the County Pike County Emergency Management Coordinator. The Pike County Emergency Management Coordinator is responsible for monitoring the progress of the mitigation actions during the year by maintaining contact with the participating municipalities through phone calls, meetings or

## *Pike County 2012 Hazard Mitigation Plan*

mailings. Municipalities will also be asked to provide feedback on changing hazard vulnerabilities within their community. The Pike County Emergency Management Coordinator will document and report the findings to the committee at the annual meeting. The Pike County Emergency Management Coordinator will continue efforts to work with municipalities to improve the regional planning process. The Pike County Office of Community Planning will provide technical planning assistance in this effort. An update on the Hazard Mitigation Plan will be given to the Pike County Planning Commission at a minimum of once a year and the topic will be placed on the Planning Commission Agenda.

During the annual meetings, the HMSC will evaluate a variety of issues including whether:

- the goals of the plan address current and expected conditions
- the nature, magnitude or type of risks have changed
- current resources are appropriate for implementing the plan
- there are implementation problems or coordination issues with other agencies
- outcomes have occurred as expected
- agencies and other partners participated as originally proposed

Additional meetings may be scheduled as needed to complete the annual evaluation process. The planning committee will prepare an annual report that summarizes the findings of the evaluation and identifies any proposed amendments to the plan. Proposed plan amendments may take one of two forms – plan supplement or plan update. A plan supplement may include data updates, analysis updates, addition of new participating municipalities, addition of, or revision to, municipal projects, mapping updates or other revisions of a minor nature. A plan update is required when proposed changes include revised goal statements, revised project prioritization methodology, addition of hazards for detailed study, revision to the mitigation strategy (other than new municipal projects) or other revisions that represent a significant adjustment to the coordination relationship between involved parties. The Pike County Emergency Management Coordinator will submit the annual report including any proposed plan supplement or plan update to the municipalities. Proposed plan updates would need to be adopted by the participating municipalities with appropriate opportunity for public input.

The Pike County Emergency Management Coordinator is responsible for leading implementation of County mitigation actions and tracking implementation of municipal mitigation actions. Upon each HMPU evaluation, the County EMC 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 Pike County Office of Community Planning can provide technical and planning assistance to the municipalities in seeking funding for projects and/or for integrating mitigation actions into planning and regulatory documents at the local level. The HMSC will also support local and county officials in applying for post-disaster mitigation funds when they are available. All state and federal mitigation funding provided to the County or local municipalities will be reported in subsequent plan updates. In addition, new plans and programs being developed within the County will be evaluated as to the ability and necessity to incorporate the 2012 HMPU into them.

The plan will also be updated every five years after the original plan adoption date as required by the Disaster Mitigation Act of 2000. As with the annual update, the HMSC will coordinate the effort. Again, representatives from the Pike County Planning Commission and its Office of Community Planning should also be included in this 5-year review and update to provide technical and planning assistance. The monitoring, evaluating and updating responsibilities will be similar to those described in the annual update section. The five year update will incorporate the findings of the annual updates and will include any refinements made during the annual plan update process. Successful implementation of mitigation actions and impacts of those actions will be identified. The planning committee will use the five year plan review to build upon the original plan by obtaining and including information not readily available at the time. The Pike County Emergency Management Coordinator will be responsible for all aspects of municipal involvement including meetings, mailings and press releases. The planning committee will prepare a draft plan and provide the opportunity for the public, municipalities and County to review and comment on the plan. The planning committee will review the comments received and make changes as appropriate. Municipalities and the County will be requested to adopt the plan. Upon adoption, the planning committee will forward the plan to the Pike County Emergency Management Coordinator for review and submit the plan to the Pike County Board of Commissioners and municipal boards of supervisors for approval.

### ***7.3. Incorporation into Other Planning Mechanisms***

Since 2006, the County HMP was incorporated into several municipal comprehensive plans. Blooming Grove Township, Lackawaxen Township, Palmyra Township, Porter Township, and Shohola Township all reference the 2006 HMP in their comprehensive plans. Moving forward, the HMSC believes that the 2012 HMPU will be highly useful when updating and developing other planning mechanisms in the County. Specific documents that the HMSC will actively incorporate information from the 2012 HMPU into include:

- Pike County Comprehensive Plan: Section 4.4.4, Future Development and Vulnerability, will provide information for the development of the next County Comprehensive Plan in 2016 by making available specific risk and vulnerability information for the entire county but more specifically the potential areas of growth.
- Pike County Emergency Operations Plan: The 2012 HMPU will provide information on risk and vulnerability that will be extremely important to consider and incorporate into the next County EOP. Probability and vulnerability can direct emergency management efforts and response.
- Pike County Hazard Vulnerability Analysis: Pike County Emergency Management Coordinator will consider the County's Hazard Mitigation Plan during its biennial review of the County Hazard Vulnerability Analysis. The County EMA's HVA and the County HMPU are mutually beneficial plans that are used together to better understand risk and vulnerability. Just as the existing County HVA was used to supplement the development of this plan, the 2012 HMPU will be used to aid in goal and objective development, hazard identification, and risk assessment in the next County HVA.

- **Municipal Local Land Use Regulations:** The Hazard Mitigation Plan provides an opportunity to contribute to local land use regulations to steer development away from hazard-prone areas.
- **Act 167 Stormwater Management Plan:** This plan is currently under development. The results of the 2012 HMPU vulnerability analysis, particularly for flooding, will be taken into consideration when finalizing this stormwater management plan.

### **7.4. *Continued Public Involvement***

The public involvement process during evaluation and update of the plan will be similar to that followed during the development of the 2012 HMPU. The HMSC will hold various workshops and meetings. Additionally, the County will post updates on its website (<http://www.pikepa.org>). The plan will be made available for review and comment at the Pike County Emergency Management Coordinator's Office, Pike County Board of Commissioners Office, and the Pike County Office of Community Planning. The HMSC will review the comments received and make changes as appropriate during the next update of the HMPU.

## **8. Plan Adoption**

The Plan was submitted to the Pennsylvania State Hazard Mitigation Officer and forwarded to FEMA for final review and approval-pending-adoption on December 5, 2011. FEMA granted approval-pending-adoption on January 17, 2012. Full approval from FEMA was received on *<Month Day, Year>*.

This section of the plan includes copies of the local adoption resolutions passed by Pike County and its municipal governments as well as a completed Local Mitigation Plan Review Crosswalk. Adoption resolution templates are provided to assist the County and municipal governments with recommended language for future adoption of the HMP.

Copy - PIKE COUNTY - EMP  
- PLANNING

PEMA E/A - T. Camillocci / B. MENDOL

HARD COPY FILE  
ELECTRONIC COPY FILE  
JFO - S. VARNALL  
PEMA - K. WOLKO

U.S. Department of Homeland Security  
Region III  
One Independence Mall, Sixth Floor  
615 Chestnut Street  
Philadelphia, PA 19106-4404



**FEMA**

Mr. Thomas S. Hughes  
State Hazard Mitigation Officer  
Pennsylvania Emergency Management Agency  
2605 Interstate Drive  
Post Office Box 3221  
Harrisburg, Pennsylvania 17105-3221

JAN 26 2012

Dear Mr. Hughes:

The Federal Emergency Management Agency (FEMA) has completed our review of the Pike County, Pennsylvania, Hazards Mitigation Plan, based on the standards contained in 44 CFR, Part 201, as authorized by the Disaster Mitigation Act of 2000 (DMA2K). These criteria address the planning process, hazard identification and risk assessment, mitigation strategy and plan maintenance requirements.

The plan received a "satisfactory" rating for all required criteria and is approvable. However prior to formal approval, each participating jurisdiction in the County is required to provide FEMA an adoption resolution.

We commend you for your dedication demonstrated in supporting the DMA2K and the County's commitment to reduce future disaster losses.

If you have questions, please contact Tess Grubb at (215) 931-5528.

Sincerely,

Eugene K. Gruber  
Mitigation Division Director

cc: Roger K. Maltby, Pike County Emergency Management Coordinator

# PIKE COUNTY COMMISSIONERS

PIKE COUNTY ADMINISTRATION BUILDING  
506 BROAD STREET  
MILFORD, PA 18337  
570-296-7613  
FAX: 570-296-6055

RICHARD A. CARIDI  
MATTHEW M. OSTERBERG  
KARL A. WAGNER JR. } COMMISSIONERS



GARY R. ORBEN  
CHIEF CLERK

THOMAS F. FARLEY, ESQUIRE  
COUNTY SOLICITOR

## RESOLUTION NO. 12-04 PIKE COUNTY 2012 HAZARD MITIGATION PLAN ADOPTION

**WHEREAS**, the municipalities of Pike 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**, Pike 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 Pike County 2012 Hazard Mitigation Plan has been developed by the Pike County Office of Community Planning and the Pike County Emergency Management Agency in cooperation with other County departments, local municipal officials, and the citizens of Pike County, and

**WHEREAS**, a public involvement process consistent with the requirements of DMA 2000 was conducted to develop the Pike County 2012 Hazard Mitigation Plan, and

**WHEREAS**, the Pike County 2012 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 Pike County Commissioners, governing body for the County of Pike, that:

- The Pike County 2012 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 Pike County 2012 Hazard Mitigation Plan are hereby directed to implement the recommended activities assigned to them.

**ADOPTED**, this 25<sup>th</sup> day of January, 2012.



BOARD OF PIKE COUNTY COMMISSIONERS

Richard A. Caridi, Chairman

Matthew M. Osterberg, Vice Chairman

Karl A. Wagner Jr., Commissioner

Attest:

Gary R. Orben, Chief Clerk

**Pike County 2012 Hazard Mitigation Plan  
Municipal Adoption Resolution**

Resolution No. 2-2012  
Blooming Grove Township, Pike County, Pennsylvania

**WHEREAS**, Blooming Grove Township, Pike 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**, Blooming Grove Township 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 Pike County 2012 Hazard Mitigation Plan has been developed by the Pike County Office of Community Planning and the Pike County Emergency Management Agency in cooperation with other county departments, and officials and citizens of Blooming Grove Township, and

**WHEREAS**, a public involvement process consistent with the requirements of DMA 2000 was conducted to develop the Pike County 2012 Hazard Mitigation Plan, and

**WHEREAS**, the Pike County 2012 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 Blooming Grove Township:

- The Pike County 2012 Hazard Mitigation Plan is hereby adopted as the official Hazard Mitigation Plan of Blooming Grove Township, and
- The respective officials and agencies identified in the implementation strategy of the Pike County 2012 Hazard Mitigation Plan are hereby directed to implement the recommended activities assigned to them.

**ADOPTED**, this 21 day of February, 2012

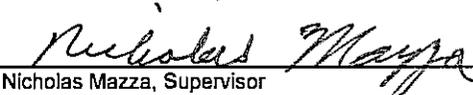
ATTEST:

  
Jo Anna M. Donahue, Secretary-Treasurer

BLOOMING GROVE TOWNSHIP

By   
Randy Schmalzle, Chairman

By   
Helen Ann Yale, Co-Chairman

By   
Nicholas Mazza, Supervisor

**Pike County 2012 Hazard Mitigation Plan  
Municipal Adoption Resolution**

Resolution No. 2012-02  
*Delaware Township, Pike County, Pennsylvania*

**WHEREAS**, the Delaware Township, Pike 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 *Delaware Township* 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 Pike County 2012 Hazard Mitigation Plan has been developed by the Pike County Office of Community Planning and the Pike County Emergency Management Agency in cooperation with other county departments, and officials and citizens of *Delaware Township*, and

**WHEREAS**, a public involvement process consistent with the requirements of DMA 2000 was conducted to develop the Pike County 2012 Hazard Mitigation Plan, and

**WHEREAS**, the Pike County 2012 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 *Delaware Township*:

- ▶ The Pike County 2012 Hazard Mitigation Plan is hereby adopted as the official Hazard Mitigation Plan of the *Delaware Township*, and
- ▶ The respective officials and agencies identified in the implementation strategy of the Pike County 2012 Hazard Mitigation Plan are hereby directed to implement the recommended activities assigned to them.

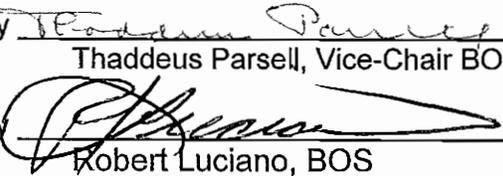
**ADOPTED**, this 14th day of March, 2012

ATTEST:

*Delaware Township*

  
\_\_\_\_\_  
Thomas M. Ryan, Chair BOS

By   
\_\_\_\_\_  
Thaddeus Parsell, Vice-Chair BOS

By   
\_\_\_\_\_  
Robert Luciano, BOS

Resolution No. 2012-03

**Dingman Township, Pike County, Pennsylvania**

**Pike County 2012 Hazard Mitigation Plan**

**WHEREAS**, the Township of Dingman, Pike 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 Township of Dingman 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 Pike County 2012 Hazard Mitigation Plan has been developed by the Pike County Office of Community Planning and the Pike County Emergency Management Agency in cooperation with other county departments, and officials and citizens of Dingman Township, and

**WHEREAS**, a public involvement process consistent with the requirements of DMA 2000 was conducted to develop the Pike County 2012 Hazard Mitigation Plan, and

**WHEREAS**, the Pike County 2012 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 Township of Dingman:

- The Pike County 2012 Hazard Mitigation Plan is hereby adopted as the official Hazard Mitigation Plan of Dingman Township, and
- The respective officials and agencies identified in the implementation strategy of the Pike County 2012 Hazard Mitigation Plan are hereby directed to implement the recommended activities assigned to them.

**ADOPTED**, this 21 day of February, 2012

ATTEST:

Karen Kleif



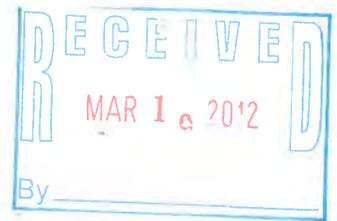
**DINGMAN TOWNSHIP  
BOARD OF SUPERVISORS**

By

By

By

**Pike County 2012 Hazard Mitigation Plan  
Municipal Adoption Resolution**



Resolution No. 12-05  
Greene Township, Pike County, Pennsylvania

**WHEREAS**, the *Township of Greene*, Pike 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 *Township of Greene* 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 Pike County 2012 Hazard Mitigation Plan has been developed by the Pike County Office of Community Planning and the Pike County Emergency Management Agency in cooperation with other county departments, and officials and citizens of *Greene Township*, and

**WHEREAS**, a public involvement process consistent with the requirements of DMA 2000 was conducted to develop the Pike County 2012 Hazard Mitigation Plan, and

**WHEREAS**, the Pike County 2012 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 *Township of Greene*:

- ▶ The Pike County 2012 Hazard Mitigation Plan is hereby adopted as the official Hazard Mitigation Plan of the *Township of Greene*, and
- ▶ The respective officials and agencies identified in the implementation strategy of the Pike County 2012 Hazard Mitigation Plan are hereby directed to implement the recommended activities assigned to them.

ADOPTED, this 7 day of March, 2012

ATTEST:

Greene Township

Judith Keamer  
Secretary

By Maryellen Kullback  
By [Signature]  
By Edmund H. [Signature]

**Pike County 2012 Hazard Mitigation Plan  
Municipal Adoption Resolution**

Resolution No. 01-12  
Lackawaxen Township, Pike County, Pennsylvania

**WHEREAS**, the Lackawaxen Township, Pike 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 Lackawaxen Township 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 Pike County 2012 Hazard Mitigation Plan has been developed by the Pike County Office of Community Planning and the Pike County Emergency Management Agency in cooperation with other county departments, and officials and citizens of Lackawaxen Township, and

**WHEREAS**, a public involvement process consistent with the requirements of DMA 2000 was conducted to develop the Pike County 2012 Hazard Mitigation Plan, and

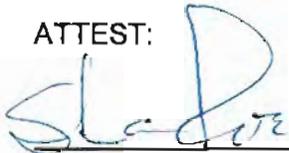
**WHEREAS**, the Pike County 2012 Hazard Mitigation Plan recommends mitigation activities that will reduce losses to life and property affected by both natural and human-made hazards that face the County and its municipal governments,

**NOW THEREFORE BE IT RESOLVED** by the governing body for the Lackawaxen Township:

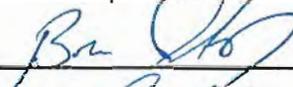
- ▶ The Pike County 2012 Hazard Mitigation Plan is hereby adopted as the official Hazard Mitigation Plan of the Lackawaxen Township, and
- ▶ The respective officials and agencies identified in the implementation strategy of the Pike County 2012 Hazard Mitigation Plan are hereby directed to implement the recommended activities assigned to them.

**ADOPTED**, this 5th day of March, 2012

ATTEST:

  
\_\_\_\_\_

Lackawaxen Township  
Board of Supervisors

By   
\_\_\_\_\_

By   
\_\_\_\_\_

By   
\_\_\_\_\_



**Pike County 2012 Hazard Mitigation Plan  
Municipal Adoption Resolution**

**Resolution No. 271  
Lehman Township, Pike County, Pennsylvania**

**WHEREAS**, the Township of Lehman, Pike 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 Township of Lehman acknowledges the requirements for 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 Pike County 2012 Hazard Mitigation Plan has been developed by the Pike County Office of Community Planning and the Pike County Emergency Management Agency in cooperation with other county departments, and officials and citizens of Lehman Township, and

**WHEREAS**, a public involvement process consistent with the requirements of DMA 2000 was conducted to develop the Pike County 2012 Hazard Mitigation Plan, and

**WHEREAS**, the Pike County 2012 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 Township of Lehman:

- The Pike County 2012 Hazard Mitigation Plan is hereby adopted as the official Hazard Mitigation Plan of the Township of Lehman, and
- The respective officials and agencies identified in the implementation strategy of the Pike County 2012 Hazard Mitigation Plan are hereby directed to implement the recommended activities assigned to them.

ADOPTED, this 14<sup>th</sup> day of February, 2012

TOWNSHIP OF LEHMAN



John P. Sivick, Chairman

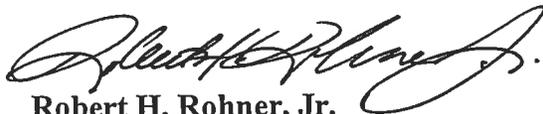


Richard C. Vollmer, V-Chairman



Paul D. Menditto, Supervisor

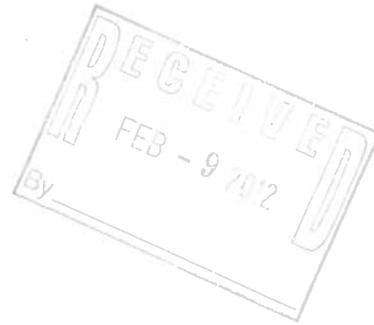
ATTEST:



Robert H. Rohner, Jr.  
Secretary/Treasurer



**Pike County 2012 Hazard Mitigation Plan  
Municipal Adoption Resolution**



Resolution No. 2012-01  
*Borough of Matamoras, Pike County, Pennsylvania*

**WHEREAS**, the *Borough of Matamoras*, Pike 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 of Matamoras* 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 Pike County 2012 Hazard Mitigation Plan has been developed by the Pike County Office of Community Planning and the Pike County Emergency Management Agency in cooperation with other county departments, and officials and citizens of the *Borough of Matamoras*, and

**WHEREAS**, a public involvement process consistent with the requirements of DMA 2000 was conducted to develop the Pike County 2012 Hazard Mitigation Plan, and

**WHEREAS**, the Pike County 2012 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 of Matamoras*:

- The Pike County 2012 Hazard Mitigation Plan is hereby adopted as the official Hazard Mitigation Plan of the *Borough of Matamoras* and
- The respective officials and agencies identified in the implementation strategy of the Pike County 2012 Hazard Mitigation Plan are hereby directed to implement the recommended activities assigned to them.

**ADOPTED**, this 7<sup>th</sup> day of February, 2012

**ATTEST:**  
Nancy Buchanan  
Nancy Buchanan, Secretary

**Borough of Matamoras**  
By Dayne Losee  
Dayne Losee, President

By Janet Clark  
Janet Clark, Mayor

**PIKE COUNTY HAZARD MITIGATION PLAN  
Municipal Adoption Resolution**

**RESOLUTION 2012-4  
Milford Borough, Pike County, Pennsylvania**

**WHEREAS**, Milford Borough, Pike County, Pennsylvania is most vulnerable to natural and human-made hazards, which may result in loss of life & property, economic hardship and threats to public health and safety, and

**WHEREAS**, Section 322 of the Disaster Mitigation Act of 2000 (DMA2000) requires state and local governments to develop and to submit for approval to the President the mitigation plan that outlines processes for identifying their respective hazards, risks, and vulnerabilities, and

**WHEREAS**, Milford Borough acknowledges the requirements of Section 322 of DMA 2000 to have an approved Hazard Mitigation Plan as prerequisite to receiving the post-disaster Hazard Mitigation Grant Program Funds, and

**WHEREAS**, the Pike County 2012 Hazard Mitigation Plan has been developed by Pike Office of Community Planning and Pike County Emergency Management Agency in co-operation with other county departments, officials and citizens of Milford Borough, and

**WHEREAS**, a public involvement process consistent with requirements of DMA 2000 was conducted to develop the Pike County 2012 Hazard Mitigation Plan, and

**WHEREAS**, the Pike County 2012 Hazard Mitigation Plan recommends mitigation activities that will reduce losses to life and property affected by natural and human-made hazards that face the County, and its municipal governments,

**NOW THEREFORE BE IT RESOLVED**, by the governing body for the Milford Borough:

- **The Pike County 2012 Hazard Mitigation Plan is hereby adopted as the official Hazard Mitigation Plan of the Milford Borough, and**
- **The respective officials and agencies identified in the implementation strategy of the Pike County 2012 Hazard Mitigation Plan are hereby directed to implement the recommended activities assigned to them.**

**ADOPTED**, this 5<sup>th</sup> day of March 2012.

**ATTEST:**

*[Signature]*  
**SECRETARY**

**MILFORD BOROUGH COUNCIL**

*[Signature]*  
**PRESIDENT**

*[Signature]*  
**MAYOR**

# **Pike County 2012 Hazard Mitigation Plan**

## **Municipal Adoption Resolution**

### **Resolution No. 02-07-2012**

#### **Palmyra Township, Pike County, Pennsylvania**

***WHEREAS***, the Township of Palmyra, Pike 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 Township of Palmyra 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 Pike County 2012 Hazard Mitigation Plan has been developed by the Pike County Office of Community Planning and the Pike County Emergency Management Agency in cooperation with the other county departments, and officials and citizens of Palmyra Township, and

***WHEREAS***, a public involvement process consistent with the requirements of DMA 2000 was conducted to develop the Pike County 2012 Hazard Mitigation Plan, and

***WHEREAS***, the Pike County 2012 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 Township of Palmyra

- *The Pike County 2012 Hazard Mitigation Plan is hereby adopted as the official Hazard Mitigation Plan of Palmyra Township, and*
- *The respective officials and agencies identified in the implementation strategy of the Pike County 2012 Hazard Mitigation Plan are hereby directed to implement the recommended activities assigned to them.*

**ADOPTED**, this 7<sup>th</sup> day of February, 2012.

**PALMYRA TOWNSHIP, PIKE COUNTY**

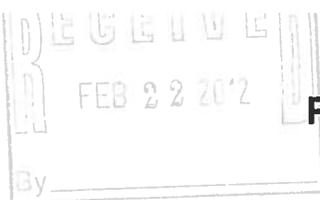
By: Thomas A. Simois

E. E.

\_\_\_\_\_

**ATTEST:**

Jean M. Rose



**Pike County 2012 Hazard Mitigation Plan  
Municipal Adoption Resolution**

Resolution No. 2012-061  
Porter Township, Pike County, Pennsylvania

**WHEREAS**, the *Township of Porter*, Pike 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 *Township of Porter*, 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 Pike County 2012 Hazard Mitigation Plan has been developed by the Pike County Office of Community Planning and the Pike County Emergency Management Agency in cooperation with other county departments, and officials and citizens of *Porter Township*, and

**WHEREAS**, a public involvement process consistent with the requirements of DMA 2000 was conducted to develop the Pike County 2012 Hazard Mitigation Plan, and

**WHEREAS**, the Pike County 2012 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 *Township of Porter*.

- ▶ The Pike County 2012 Hazard Mitigation Plan is hereby adopted as the official Hazard Mitigation Plan of the *Township of Porter*, and
- ▶ The respective officials and agencies identified in the implementation strategy of the Pike County 2012 Hazard Mitigation Plan are hereby directed to implement the recommended activities assigned to them.

**ADOPTED**, this 6th day of February, 2012

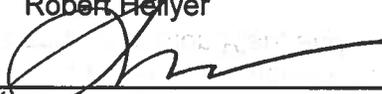
ATTEST:

  
\_\_\_\_\_

PORTER TOWNSHIP

By   
William Powell, Chairman

By   
Robert Healy

By   
Theresa Koch

**Pike County 2012 Hazard Mitigation Plan  
Municipal Adoption Resolution**

Resolution No. 2012-02  
Shohola Township, Pike County, Pennsylvania

**WHEREAS**, Shohola Township, Pike 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 Shohola Township Board of Supervisors 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 Pike County 2012 Hazard Mitigation Plan has been developed by the Pike County Office of Community Planning and the Pike County Emergency Management Agency in cooperation with other county departments, and officials and citizens of Shohola Township and

**WHEREAS**, a public involvement process consistent with the requirements of DMA 2000 was conducted to develop the Pike County 2012 Hazard Mitigation Plan, and

**WHEREAS**, the Pike County 2012 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 Shohola Township:

- ▶ The Pike County 2012 Hazard Mitigation Plan is hereby adopted as the official Hazard Mitigation Plan of Shohola Township and
- ▶ The respective officials and agencies identified in the implementation strategy of the Pike County 2012 Hazard Mitigation Plan are hereby directed to implement the recommended activities assigned to them.

**ADOPTED**, this 9<sup>th</sup> day of February, 2012

ATTEST:

Shohola Township Board of Supervisors

Christa Burns

By [Signature]

By [Signature]

By [Signature]

**Pike County 2012 Hazard Mitigation Plan  
Municipal Adoption Resolution**

Resolution No. 2012-1

Westfall Township, Pike County, Pennsylvania

**WHEREAS**, the *Township of Westfall*, Pike 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 Township of Westfall 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 Pike County 2012 Hazard Mitigation Plan has been developed by the Pike County Office of Community Planning and the Pike County Emergency Management Agency in cooperation with other county departments, and officials and citizens of Westfall Township, and

**WHEREAS**, a public involvement process consistent with the requirements of DMA 2000 was conducted to develop the Pike County 2012 Hazard Mitigation Plan, and

**WHEREAS**, the Pike County 2012 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 *Township of Westfall*

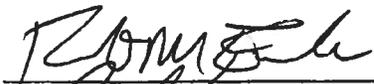
- The Pike County 2012 Hazard Mitigation Plan is hereby adopted as the official Hazard Mitigation Plan of the *Township* and
- The respective officials and agencies identified in the implementation strategy of the Pike County 2012 Hazard Mitigation Plan are hereby directed to implement the recommended activities assigned to them.

**ADOPTED**, this 7<sup>th</sup> day of February, 2012

ATTEST:



Westfall Township

By   
By   
By 

Pike County 2012 Hazard Mitigation Plan
County Adoption Resolution

Resolution No. \_\_\_\_\_
Pike County, Pennsylvania

WHEREAS, the municipalities of Pike 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, Pike 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 Pike County 2012 Hazard Mitigation Plan has been developed by the Pike County Office of Community Planning and the Pike County Emergency Management Agency in cooperation with other county departments, local municipal officials, and the citizens of Pike County, and

WHEREAS, a public involvement process consistent with the requirements of DMA 2000 was conducted to develop the Pike County 2012 Hazard Mitigation Plan, and

WHEREAS, the Pike County 2012 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 Pike that:

- The Pike County 2012 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 Pike County 2012 Hazard Mitigation Plan are hereby directed to implement the recommended activities assigned to them.

ADOPTED, this \_\_\_\_\_ day of \_\_\_\_\_, 2012

ATTEST:

PIKE COUNTY COMMISSIONERS

\_\_\_\_\_

By \_\_\_\_\_

By \_\_\_\_\_

By \_\_\_\_\_

Pike County 2012 Hazard Mitigation Plan
Municipal Adoption Resolution

Resolution No. \_\_\_\_\_

<Borough/Township of Municipality Name>, Pike County, Pennsylvania

WHEREAS, the <Borough/Township of Municipality Name>, Pike 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 Pike County 2012 Hazard Mitigation Plan has been developed by the Pike County Office of Community Planning and the Pike County Emergency Management Agency 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 Pike County 2012 Hazard Mitigation Plan, and

WHEREAS, the Pike County 2012 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 Pike County 2012 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 Pike County 2012 Hazard Mitigation Plan are hereby directed to implement the recommended activities assigned to them.

ADOPTED, this \_\_\_\_\_ day of \_\_\_\_\_, 2012

ATTEST:

<BOROUGH/TOWNSHIP OF MUNICIPALITY NAME>

By \_\_\_\_\_
By \_\_\_\_\_
By \_\_\_\_\_

## **9. Appendices**

- Appendix A – Bibliography*
- Appendix B – Local Mitigation Plan Review Crosswalk*
- Appendix C – Meeting and Other Participation Documentation*
- Appendix D – Local Municipality Flood Vulnerability Maps*
- Appendix E – Critical Facilities*
- Appendix F – HAZUS Reports*
- Appendix G – Dam Failure Hazard Profile (Section 4.3.9)*