

Carbon County 2010 Hazard Mitigation Plan

Prepared for:

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1. Introduction

1.1. Background

Across the United States, natural and human-caused disasters have led to increasing levels of deaths, injuries, property damage, and interruption of business and government services. The time, money, and efforts to recover from these disasters exhaust resources, diverting attention from important public programs and private agendas. Since 1955 there have been forty-four Presidential Disaster and Emergency Declarations in Pennsylvania, sixteen of which affected Carbon County. In addition to these Presidential Declarations, there have been fourteen Gubernatorial Proclamations of Disaster Emergency affecting Carbon County since 1954. The emergency management community, citizens, elected officials and other stakeholders in Carbon County, Pennsylvania recognize the impact of disasters on their community and support proactive efforts needed to reduce the impact of natural and human-caused hazards.

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

Accordingly, the Carbon County Hazard Mitigation Planning Team (HMPT), composed of government leaders from Carbon 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 man-made disasters in Carbon County;
- Qualifying the County for pre-disaster and post-disaster grant funding;
- Complying with state and federal legislative requirements related to local hazard mitigation planning;
- Demonstrating a firm local commitment to hazard mitigation principles; and
- Improving community resiliency following a disaster event.

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

Congress authorized the establishment of a Federal grant program to provide financial assistance to States and communities for flood mitigation planning and activities. The Federal

Emergency Management Agency (FEMA) has designated this Flood Mitigation Assistance (FMA).

1.3. Scope

The Carbon County 2010 HMP has been prepared to meet requirements set forth by the FEMA and (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.

1.4. Authority and Reference

Authority for this plan originates from the following federal sources:

- Robert T. Stafford Disaster Relief and Emergency Assistance Act, 42 U.S.C., Section 322, as amended;
- Code of Federal Regulations (CFR), Title 44, Parts 201 and 206; 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 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 PEMA guides and reference documents were used prepare this document:

- PEMA: *Hazard Mitigation Planning Made Easy!*
- PEMA Mitigation Ideas: *Potential Mitigation Measures by Hazard Type; A Mitigation Planning Tool for Communities*. March 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 create this plan:

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

2. Community Profile

2.1. *Geography and Environment*

Carbon County is a 388 square mile county located in eastern Pennsylvania about 90 miles northeast of Philadelphia and 90 miles west of New York City (Figure 2.1-1). It is bordered on the north by Luzerne County, on the east by Monroe County, on the west by Schuylkill County, and on the south by Lehigh and Northampton Counties.

Most of the land area of the County is hilly and the northern and eastern portions of the County are part of the Pocono Mountains region of the Commonwealth. Blue Mountain forms the southern boundary of Carbon. The County is drained by the Lehigh River and watersheds that drain into it except for a small area in western Packer Township and the Borough of Lansford that are drained by the Still Creek and Panther Creek into the Schuylkill River, and an areas in the northwest corner that drains into the Susquehanna River via the Catawissa Creek (CCCP, 1998). The watersheds of Carbon County are displayed in Figure 2.1-2.

Figure 2.1-1: Base map of Carbon County (Carbon County GIS Department, 2010).

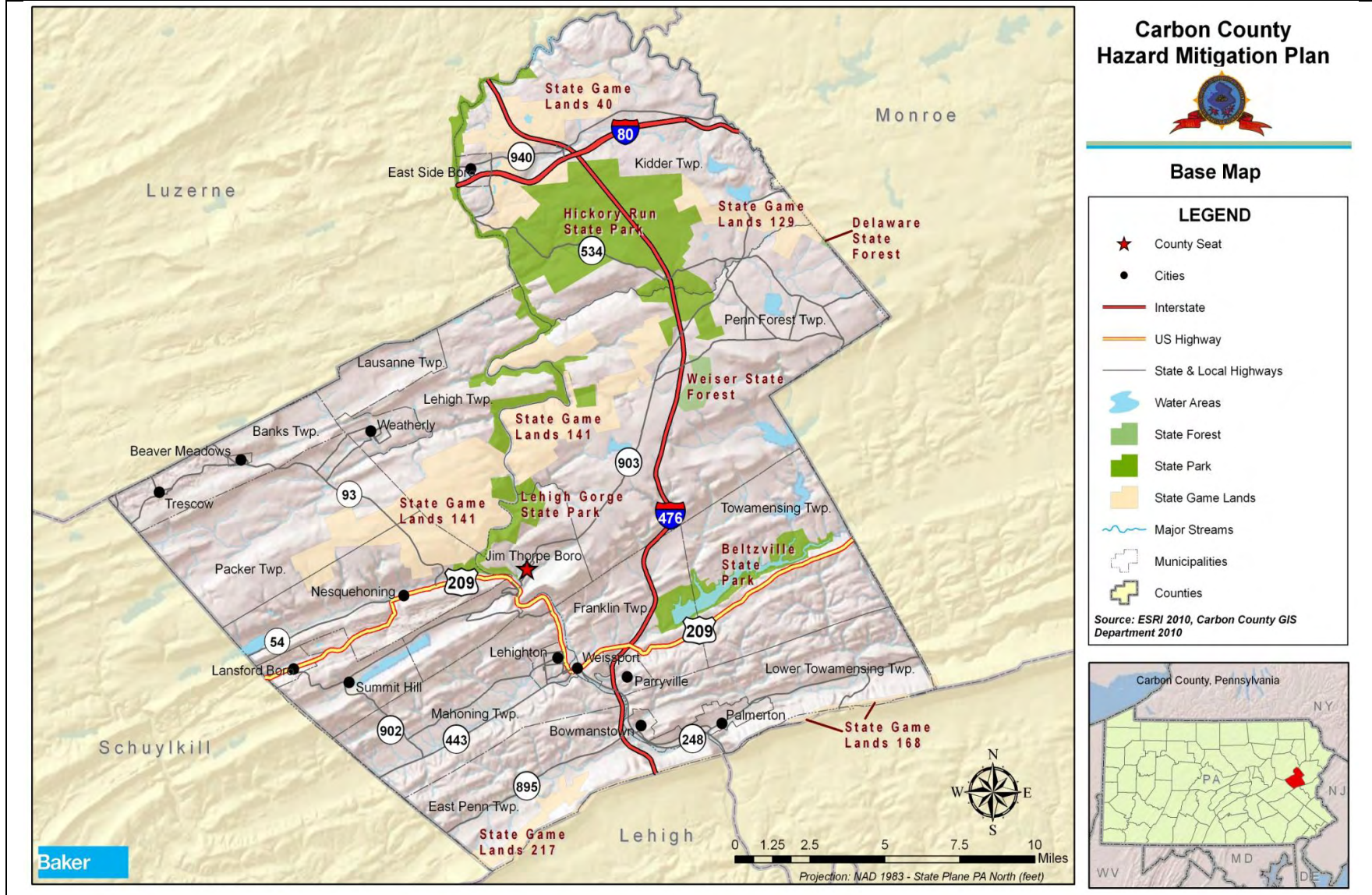
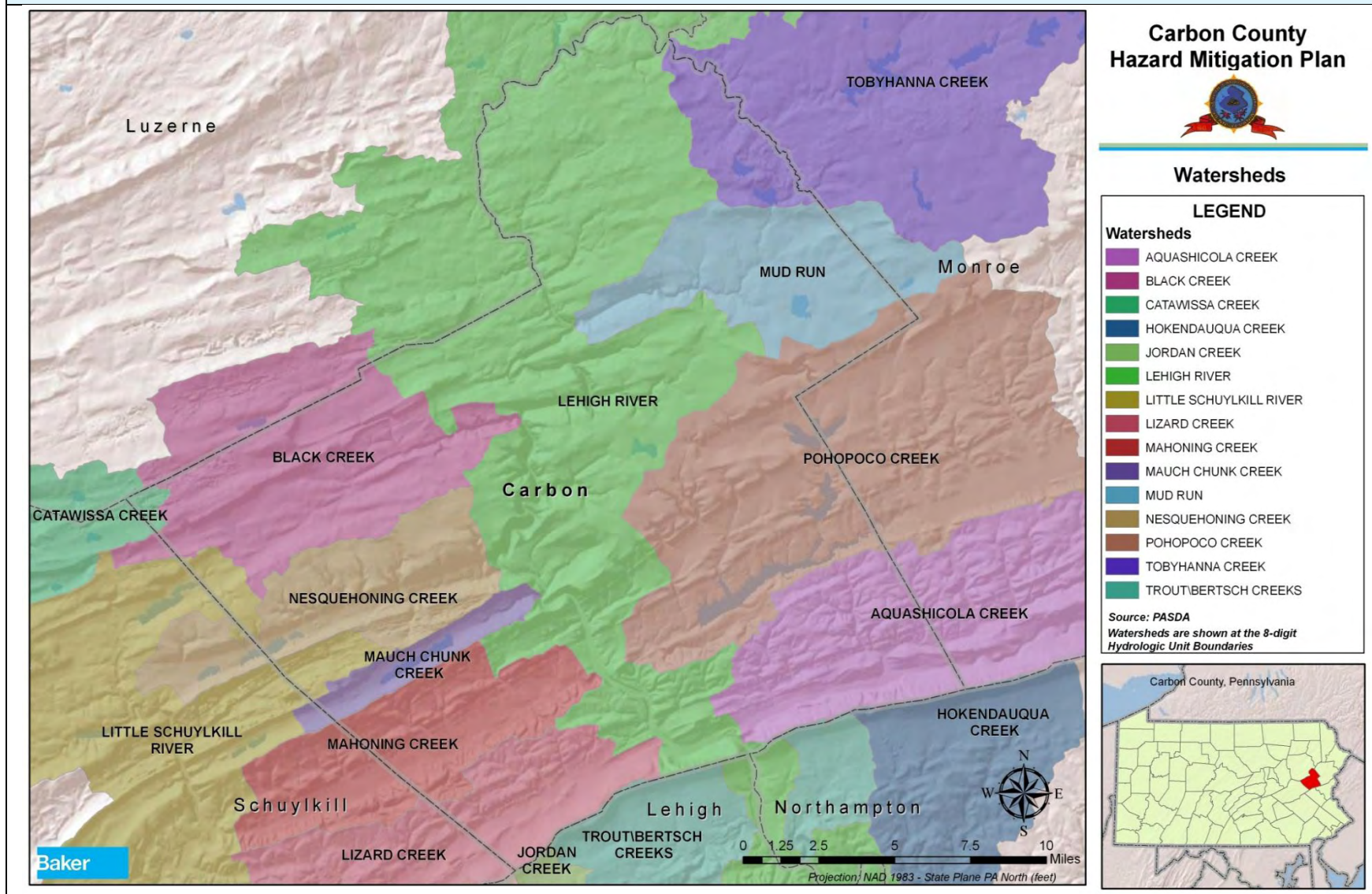


Figure 2.1-2: Watersheds of Carbon County.



2.2. Community Facts

Carbon County was created in 1843 from parts of Northampton and Monroe Counties and was named for its coal deposits. The discovery of anthracite coal and railroad transportation in the mid-1800s helped the County rise to prominence. During the coal industry's boom period, Carbon County ranked second only to Schuylkill County in terms of coal production (DCED, 2005). In addition, Carbon County was home of the first large-scale railroad built in America called the "Switchback" railroad which was designed to carry coal (Carbon County, 2002). Furthermore, a canal system was constructed along the Lehigh River to transport coal south to markets in Philadelphia.

Although coal mining was the prominent industry in Carbon County's history, the lumber industry and farming also attracted residents to Carbon County. However, the Great Depression and several large mining disasters caused the coal mining industry to weaken and the County to lose population until the 1970's when tourism began to grow in the County. Today, top employer industries in Carbon County are manufacturing, retail trade, health care and social assistance, and accommodation and food services (U.S. Census, 2007). The County also produces dairy and poultry products, manufactures fire equipment, die castings and garments (CCEMA, 2009).

Because of its vast natural resources, Carbon County has been and continues to grow in popularity as a tourist destination year-round. The County lies in the Pocono Mountain region of the state which draws many visitors. Many tourists flock to the County for sightseeing, historic tours, horseback riding, train rides, skiing, mountain biking, and water-skiing. In addition, the County contains the Lehigh River which is a popular whitewater rafting river. There are three Pennsylvania State Parks in Carbon County (Beltzville State Park, Lehigh Gorge State Park, and Hickory Run State Park) which offer recreational amenities and the Delaware and Lehigh Canal National Heritage Corridor runs from a north to south direction through the County also drawing visitors.

2.3. Population and Demographics

According to the 2000 Census, the population of Carbon County is 58,802. The Census estimates that in 2009, Carbon County's population increased to 63,865 people. Population density is highest in Beaver Meadows Borough with a 2000 Census population density of 3,746 people per square mile and 1,773 housing units per square mile. Table 2.3-1 provides a distribution of County population per municipality obtained from the U.S. Census Bureau, Population Estimates Program. Note that 2009 populations are estimated projections based on 2000 Census results. Unless otherwise indicated, the 2009 population estimates are used for various assessments throughout this HMP.

Carbon County 2010 Hazard Mitigation Plan

Table 2.3-1: List of municipalities in Carbon County with associated populations (U.S. Census).

MUNICIPALITY	2000 POPULATION	2009 ESTIMATED POPULATION	PERCENT CHANGE (%)
Banks Township	1,359	1,364	<1%
Beaver Meadows Borough	968	948	-2%
Bowmanstown Borough	895	889	-1%
East Penn Township	2,461	2,742	11%
East Side Borough	290	290	0%
Franklin Township	4,243	4,822	14%
Jim Thorpe Borough	4,804	4,883	2%
*Kidder Township	1,185	1,453	23%
Lansford Borough	4,230	4,140	-2%
Lausanne Township	218	251	15%
Lehigh Township	527	560	6%
Lehighon Borough	5,537	5,433	-2%
Lower Towamensing Township	3,173	3,538	12%
Mahoning Township	3,978	4,424	11%
Nesquehoning Borough	3,288	3,312	1%
Packer Township	986	1,091	11%
Palmerton Borough	5,248	5,212	-1%
Parryville Borough	478	509	6%
Penn Forest Township	5,439	7,625	40%
Summit Hill Borough	2,974	2,966	<1%
Towamensing Township	3,475	4,394	26%
Weatherly Borough	2,612	2,593	-1%
Weissport Borough	434	426	-2%
TOTAL	58,802	63,865	9%

*According to the Carbon County Office of Planning and Development, the population of Kidder Township increases substantially Thursday through Sunday of each week as a result of an influx of tourists and people with vacation homes in the area. The municipality's population increases to approximately 20,000 each extended weekend year-round with those who take advantage of tourist and recreational amenities in the community including skiing, sightseeing, white-water rafting etc. These temporary increases in population are not taken into account in the above table's population numbers.

The median income of households in Carbon County is \$46,727. This is approximately \$5,000 less than the national median household income (U.S. Census ACS, 2006-2008). Approximately eleven percent of the Carbon County population lives in poverty.

The median age of the County population is 41.4 years with almost eighty percent of the population under 18 years of age and seventeen percent 65 years or older. There are an estimated 32,903 housing units, seventy-eight percent of which are occupied with twenty one percent being vacant. The median value of an owner occupied home in the County is \$134,600. Ninety-six percent of the County population is White, 1.7 percent is Black, and less than one percent is African-American, Asian, Hispanic and American Indian (U.S. Census ACS, 2006-2008).

2.4. Land Use and Development

As seen in Table 2.3-1, Carbon County grew by 9% from 2000 to 2009. This is higher than the rate at which the County grew between 1990 and 2000 which was only 3.4%. Major factors contributing to growth in Carbon County are access to major highways, outdoor recreation amenities, increase in resort style and second home housing, and an influx of New York and New Jersey residents (CCCP, 2010).

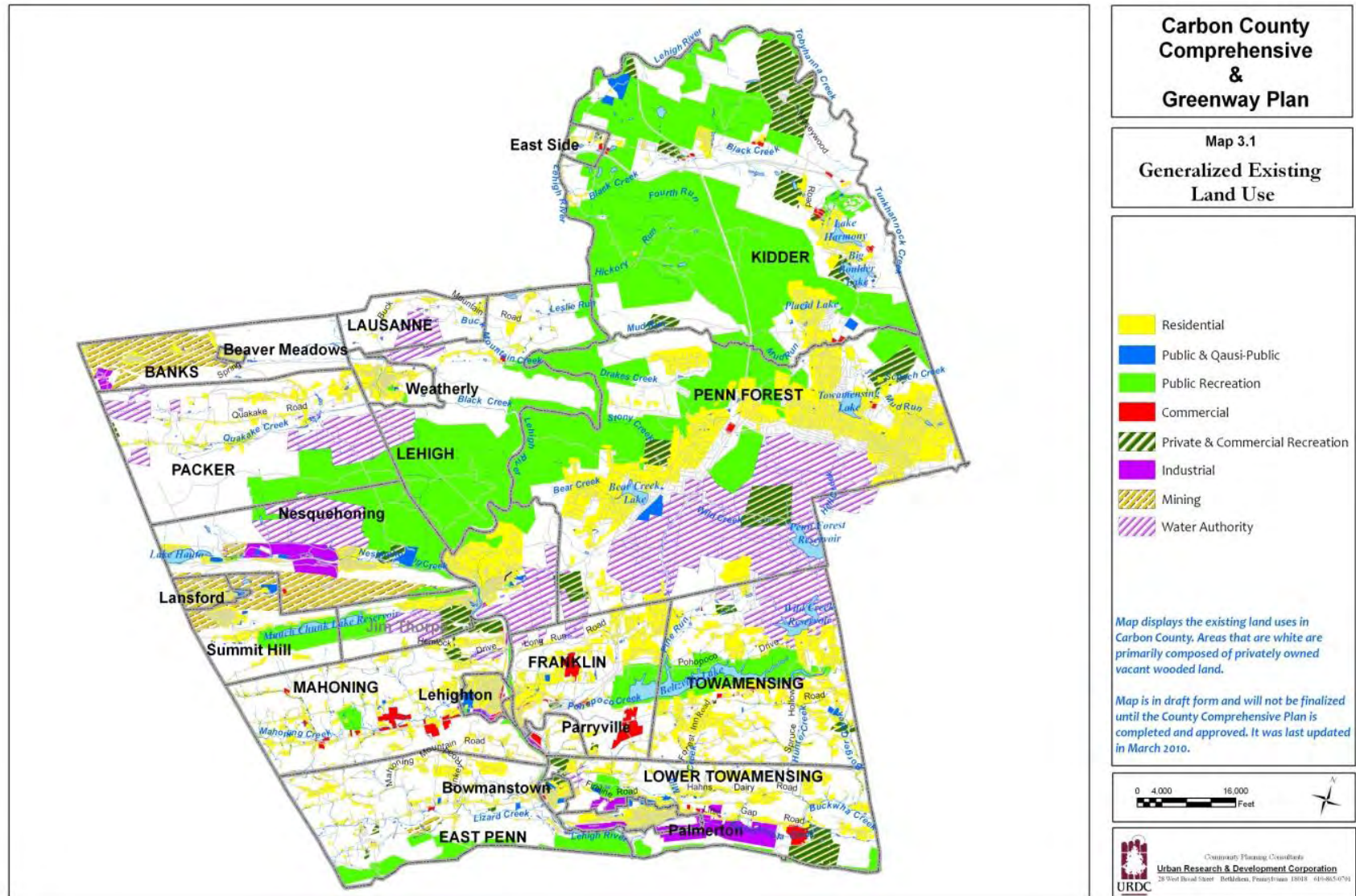
Most of the growth and development in the County has occurred east of the Lehigh River in Kidder Township, Penn Forest Township, and Towamensing Township. The northern and western portions of the County have experienced the slowest growth, as rugged terrain has inhibited development (DCED, 2005).

Residential land uses are generally low density, single-family homes (Figure 2.4-1). The boroughs tend to have higher population densities. A growing number of housing units in the County are seasonal housing.

Forest is the primary land cover, making up nearly three-quarters of the County's total land area (Figure 2.4-2). Of this, nearly 80 square miles of the County is state game land, state forest, and state park land. Forest acreage that is not part of a state park or state game land is primarily comprised of second-growth oak and northern hardwood forest.

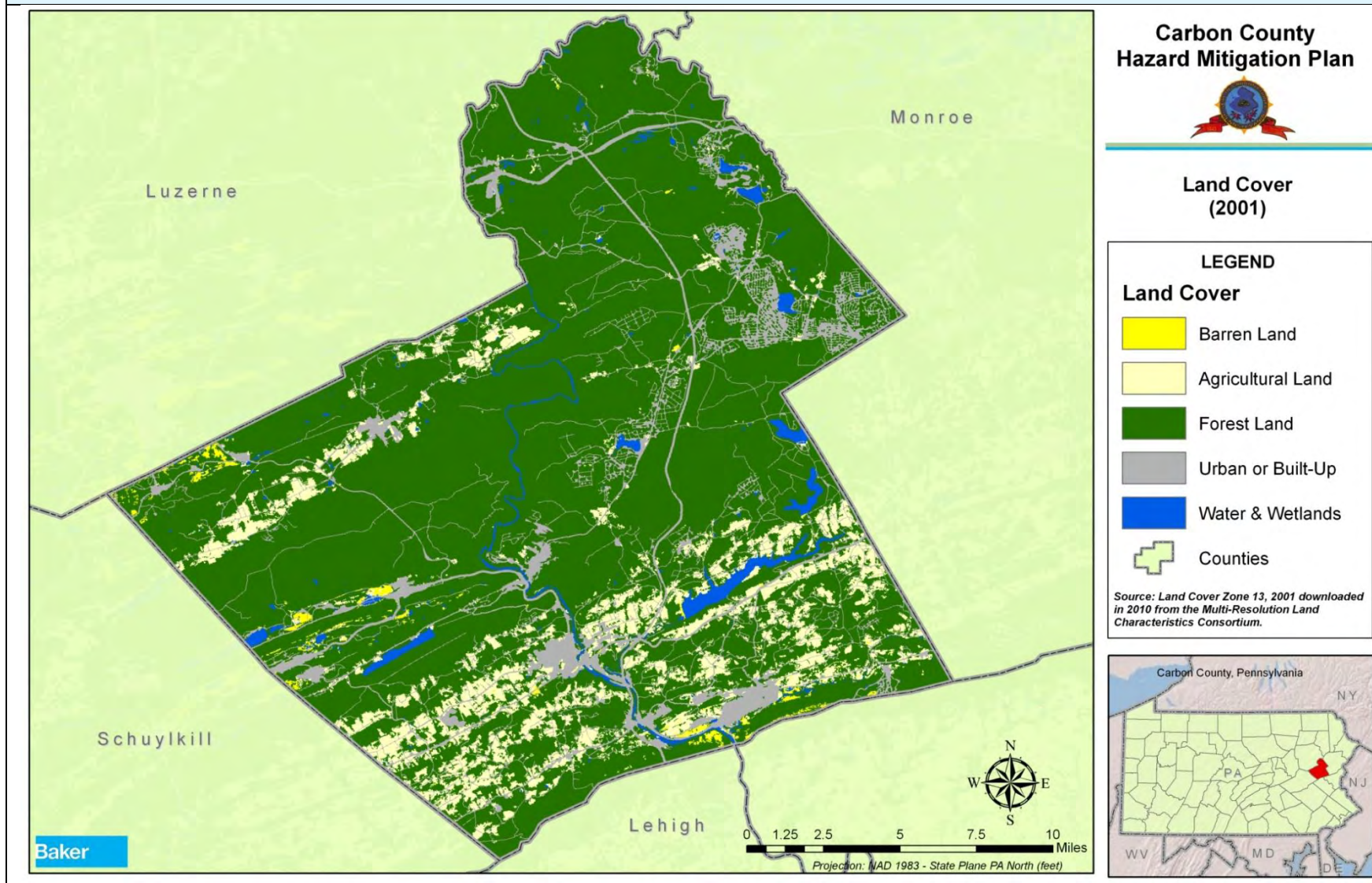
There are several major highways that traverse the County. Interstate 80 crosses the highway from east to west and the northeast extension of the Pennsylvania Turnpike (I-476) connects the County to the Wilkes-Barre-Scranton-Hazleton and Allentown-Bethlehem-East metropolitan areas.

Figure 2.4-1: Carbon County land use.



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Figure 2.4-2: Carbon County land cover (MRLC Consortium, 2001).



2.5. Data Sources and Limitations

The Carbon County tax assessment database was used as an inventory of parcels throughout the County and provided both building and land assessment values; the building assessment value was used to estimate losses. The list of critical facilities provided in **Appendix E – Critical Facilities** was developed based on information available from the Carbon County Emergency Management Agency (EMA) and the Carbon County GIS Department. This HMP also used the data collected and mapped by the Urban Research and Development Corporation, the organization completing the Carbon County 2010 Comprehensive Plan.

The countywide Digital Flood Insurance Rate Map (DFRIM), published on June 3, 2002, was downloaded from the FEMA Map Service Center. This data provides flood frequency and elevation information used in the flood hazard risk assessment. Other GIS datasets including *major streams, pipeline locations, and state-owned lands* were provided by the Carbon County GIS Department. Population data from the 2000 Census and 2009 estimated populations were obtained from the U.S. Census Bureau in 2010. The County is confident in the precision of the 2010 population values even though they are considered estimates. Data on the existing land use in Carbon County was generously provided by the Urban Research and Development Corporation.

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 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).

HAZUSHAZUS-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. This software was used to estimate losses for floods and hurricanes in Carbon 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. This includes law enforcement, emergency response, medical services, and mobile communications. Table 2.5-1 summarizes the critical facilities in Carbon 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								Grand Total
	Airport	Cell Tower	EMS	Fire Department	Hospital	Municipal Building	Police Department	School	
Banks Township		1		1		1			3
Beaver Meadows Borough		1		1		1	1		4
Bowmanstown Borough				1		1			2
East Penn Township				1		1	1	1	4
East Side Borough						1			1
Franklin Township	1	2	1	1		1	1	1	8
Jim Thorpe Borough		4	1	3		1	1	4	14
Kidder Township		10	1	1		1	1	1	15
Lansford Borough			1	1		1	1	1	5
Lausanne Township		1				1			2
Lehigh Township			1			1		1	3
Lehighton Borough		1	2	1	1	1	1	4	11
Lower Towamensing Township				1		1		2	4
Mahoning Township	1	3	3	1		1	1	1	11
Nesquehoning Borough		4	1	2		1	1	2	11
Packer Township	1					1			2
Palmerton Borough		1	1	2	1	1	1	4	11
Parryville Borough		1		1		1			3
Penn Forest Township		7	1	2		1			11
Summit Hill Borough		2	1	1		1	1	2	8
Towamensing Township		4	1	1		1	1	2	10
Weatherly Borough			1	1		1	1	2	6
Weissport Borough						1	1	1	3
Grand Total	3	42	16	23	2	23	14	29	152

Several data limitations were encountered during development of the 2010 HMP. Perhaps the most significant limitation is the absence of building point data for Carbon County. Building points typically allow for the identification of structures located within the danger zone of any given hazard. Without this information, estimating potential losses depended on examining the number of parcels within determined hazard areas without regard to where the structures are on the parcels. A parcel might partially intersect with a hazard area like the Special Flood Hazard Area, but it is unknown whether or not the structure(s) located on that parcel are in the section intersecting the hazard area.

Using parcels also does not allow for a specific analysis of the exact number and type of structures vulnerable to hazard events. The parcel layer provided by the Carbon County GIS Department contained generalized details on the primary land use of structures located on a given parcel, but did not include the number of structures on any given parcel; the number of parcels is not equal to the number of structures in the County. As a result, for flood, flash flood, and ice jam, landslide, and wildfire - the hazards whose vulnerability analysis focuses on the intersection of parcels and a hazard area - the exact number of structures that fall within a hazard area cannot be determined. Only the number of vulnerable parcels by generalized land use (i.e. single-family, multi-family, commercial, industrial, etc.) may be concretely discussed. This leads to a potential underestimation of vulnerability, particularly for mobile homes, which are often located within mobile home parks or on leased land. Every effort has been made to account for this issue by noting in each vulnerability assessment which municipalities are known to have mobile home parks that are a single parcel but host multiple mobile homes. Action 11 in the Mitigation Strategy addresses this data limitation and stresses the importance of the collection of building point data for the 2015 Plan update. It is important to note that while the exact number of vulnerable structures is unknown, feedback from the HMPT showed that the total loss estimates associated with the vulnerable parcels were correct.

Beyond the limitation of using parcel-level data to estimate potentially vulnerability and losses, estimating potential losses that may occur as a result of hazard events requires a full range of information and accurate data. There are a number of site-specific characteristics that reduce a given structure's vulnerability and consequential losses. Examples include first-floor elevation, the number of stories, construction type, foundation type and the age and condition of the structure. The property tax assessment database includes the building and land assessment value for each parcel but does not include information on key variables that impact vulnerability, such as the age and value of individual structures, specific information on building height, construction type and first floor elevations.

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 should also attempt to improve their ability to identify areas of increased vulnerability.

3. Planning Process

3.1. *Process and Participation Summary*

To begin the 2010 HMP process, the Hazard Mitigation Steering Committee (HMSC) identified individuals and organizations to invite to be a part of the HMPT. The Carbon County Office of Planning and Development sent meeting invitations to the Chief Executive Officer (CEO) and Emergency Management Coordinator (EMC) in each municipality as well as to adjacent county commissioners and other miscellaneous stakeholders such as agency representatives and non-profit organizations. The HMPT first assembled in June of 2010 to construct a plan in order to identify hazards that affect the County, assess potential damages from those hazard events, select actions to address the County's vulnerability to such hazards, and develop an implementation-strategy action plan in order to mitigate potential losses. During the first meeting, a Contact Information Sheet was collected from each attendee and a HMPT mailing list was created from this contact information. Section 3.2 provides a discussion of the HMPT as well as a table of members with their corresponding organization.

Municipal officials continued to receive written notification regarding all HMP meetings and other stakeholders were notified via email. 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 mail and email and 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. 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** along with all completed forms and surveys.

Table 3.1-1: Summary of participation from local municipalities during the 2010 Hazard Mitigation Planning Process.

MUNICIPALITY	MEETING				WORKSHEETS/SURVEYS/FORMS			
	KICK-OFF June 23, 2010	MITIGATION STRATEGY WORKSHOP July 13, 2010	HMP TELE- CONFERENCE July 27, 2010	PUBLIC MEETING August 4, 2010	CAPABILITY ASSESSMENT SURVEY	GOALS AND OBJECTIVES FORM	MITIGATION ACTION FORM	PROJECT EVALUATION FORM
Banks Township		✓		✓		✓	✓	
Beaver Meadows Borough			✓		✓			
Bowmanstown Borough	✓				✓			✓
East Penn Township	✓	✓		✓	✓	✓	✓	
East Side Borough			✓				✓	
Franklin Township	✓	✓		✓	✓	✓	✓	✓
Jim Thorpe Borough	✓	✓	✓	✓	✓	✓	✓	
Kidder Township	✓		✓	✓	✓			✓
Lansford Borough	✓				✓			
Lausanne Township			✓		✓			✓
Lehigh Township			✓		✓			
Lehighon Borough			✓	✓	✓			✓
Lower Towamensing Township	✓	✓		✓	✓	✓	✓	✓
Mahoning Township		✓	✓	✓	✓	✓	✓	✓
Nesquehoning Borough	✓	✓		✓	✓		✓	✓
Packer Township				✓				✓
Palmerton Borough			✓	✓	✓			✓
Parryville Borough	✓	✓	✓	✓	✓	✓	✓	
Penn Forest Township				✓	✓			
Summit Hill Borough			✓	✓	✓			✓

Table 3.1-1: Summary of participation from local municipalities during the 2010 Hazard Mitigation Planning Process.

MUNICIPALITY	MEETING				WORKSHEETS/SURVEYS/FORMS			
	KICK-OFF June 23, 2010	MITIGATION STRATEGY WORKSHOP July 13, 2010	HMP TELE- CONFERENCE July 27, 2010	PUBLIC MEETING August 4, 2010	CAPABILITY ASSESSMENT SURVEY	GOALS AND OBJECTIVES FORM	MITIGATION ACTION FORM	PROJECT EVALUATION FORM
Towamensing Township	✓	✓		✓	✓		✓	
Weatherly Borough	✓			✓	✓	✓		✓
Weissport Borough		✓		✓		✓	✓	

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 HMP process. The 2010 Carbon County HMP was completed in August 2010. The 2010 HMP follows an outline developed by PEMA in 2009 which provides a standardized format for all local HMPs in the Commonwealth of Pennsylvania.

3.2. The Planning Team

The Hazard Mitigation Steering Committee for the 2010 HMP included:

- 1) Judy Borger, Director, Carbon County Office of Planning and Development
- 2) Mark Nalesnik, Director, Carbon County EMA
- 3) Taryn Murray, Planner, Michael Baker Jr., Inc.

The HMSC developed a well-diversified list of potential HMPT members which included municipal officials, state and Carbon County government representatives, adjacent county representative and other non-profit organizations. These individuals were invited to participate in the HMP 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 2010 countywide HMPT and actively participated in the planning process through attendance at meetings, completion of assessment surveys, or submission of comments. The HMPT consisted of state, county and local officials including municipal supervisors and council members, emergency management coordinators, as well as constables, firefighters, and conservation district representatives. Participants representing multiple jurisdictions are listed more than once.

Table 3.2-1: Stakeholders who participated in the planning process.	
MUNICIPALITY/ORGANIZATION	PARTICIPANT(S)
Banks Township	Walter Bobowski
Beaver Meadows Borough	Stephanie Gillette
Bowmanstown Borough	Emert W. Giddon
East Penn Township	Cory Smith, Robert Kleintop
East Side Borough	Jonathan Marotta
Franklin Township	Paul Kocher
Jim Thorpe Borough	John McGuire, Kyle Sheckler, Louis Hall, Wesley Johnson
Kidder Township	John Finnerty, Bob Dobosh
Lansford Borough	Robert M. Gaughan, Jack Soberick
Lausanne Township	Edward Klynowsky
Lehigh Township	Andy Strauss
Lehighon Borough	Nicole Tessitore, Lew Ginder
Lower Towamensing Township	Rory Koons
Mahoning Township	Deb Bender, George Stawnyczyk
Nesquehoning Borough	John P. McArdle, Mark Stromelo

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

MUNICIPALITY/ORGANIZATION	PARTICIPANT(S)
Packer Township	George Gerland, Tom Gerhard
Palmerton Borough	Rodger Danielson, Joe Kercsmar
Parryville Borough	Jeff Kocher, Gary Parker
Penn Forest Township	Alan Katz
Summit Hill Borough	Kira Michalik, Len Ogozalek, Paul McArdle Sr., Harry Miller
Towamensing Township	Tom Newman
Weatherly Borough	Jim Wetzel
Weissport Borough	Tim Rehrig, Arland Moyer Sr., Gene Kershner
Pennsylvania State Constables Association	Jeff Kocher
Carbon County Conservation District	Audrey Wargo
PA Department of Conservation and Natural Resources (DCNR)-Bureau of Forestry	Wesley Keller
Carbon County Emergency Management Agency	Megan Fredericks, Tom Newman

3.3. Meetings and Documentation

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

June 2, 2010 – Internal Hazard Mitigation Steering Committee meeting held at the Carbon County Office of Planning and Development to discuss project scope, schedule, goals and available resources.

June 23, 2010 – Community Kick-Off Meeting held at the Carbon County EMA to introduce the project to local municipalities, inform community representatives of the HMP process and schedule, and make a formal request for response to Capability Assessment Surveys.

July 13, 2010 – Mitigation Strategy Workshop Meeting held at the Carbon County EMA to review preliminary risk assessment results and develop mitigation goals, objectives, actions, and projects to be included in the HMP.

July 7, 2010 – HMP Teleconference via conference call for any jurisdiction that had been unable to attend a regularly scheduled meeting. The HMP process and importance was introduced. Identified hazards were reviewed and a description of the mitigation strategy was given. A formal request for response to Capability Assessment Surveys and Mitigation Action Forms was made; these materials were requested at earlier meetings and through invitation letters as well.

August 4, 2010 – Final Public Meeting – Public Meeting held to update the public about the HMP process and findings. The meeting was advertised in two local newspapers. Several

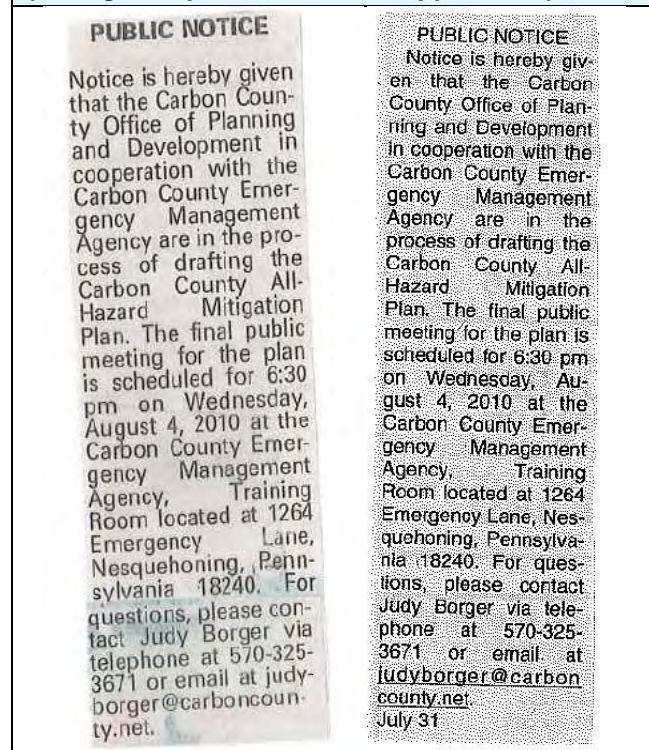
verbal comments were noted and attendees were informed about the timeline and their opportunity to review the entire plan on the County's website and provide written comments.

3.4. Public & Stakeholder Participation

Each municipality was given multiple opportunities to participate in the HMP 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 three tools listed below were distributed with meeting invitations or at meetings to solicit data, information, and comments from local municipalities in Carbon County. Responses to these worksheets and surveys are included in **Appendix C**:

- 1) **Capability Assessment Survey:**
Collects information on local planning, regulatory, administrative, technical, fiscal, political, and resiliency capabilities that can be included in the countywide mitigation strategy.
- 2) **Proposed Goals and Objectives Selection Form:** Proposes goals and objectives that the HMPT could select from to represent their community and provides the opportunity for communities to add additional goals and objectives.
- 3) **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 cost, and potential funding source(s).
- 4) **Mitigation Project Review Form:**
Allows communities that submitted hazard mitigation projects in 2007 to re-evaluate them to determine if they are still viable or if they have been completed or discontinued.

Figure 3.4-1: Public notice of HMP public meeting on August 4, 2010. Published in the *Standard Speaker* and the *Times News* (Enlarged copies available in Appendix C).



Community participation and comment was encouraged throughout the planning process. Newspaper notices were published in the Times News and the Standard Speaker on July 31, 2010 to notify the citizens of Carbon County of the public meeting held on August 4, 2010. A copy of this notice is shown in Figure 3.4-1. Additionally, notification of the HMP sent to representatives from neighboring counties is included in **Appendix C**.

Carbon County posted the 2010 Draft HMP on their website beginning **August 25, 2010** and accepted comments through **September 22, 2010**. The availability of the draft HMP was made public by placing a public notice the Times News and the Standard Speaker on **August 21, 2010**. Comments were to be submitted in writing to Judy Borger of the Carbon County Office of Planning and Development. **XX** comments were received during the 30-day comment period. Copies of all comments received are located in **Appendix B**.

3.5. Multi-Jurisdictional Planning

This HMP was developed using a multi-jurisdictional approach. With funding support from PEMA, County level departments had resources such as technical expertise and data which local jurisdictions lacked. Involvement from local municipalities was critical to the collection of local knowledge related to hazard events. Local municipalities also have the legal authority to enforce compliance with land use planning and development issues. The County undertook an intensive effort to involve all 23 municipalities in the planning process. Table 3.1-1 lists jurisdictional participation in the 2010 HMP.

Table 3.1-1 documents jurisdictional presence at the meetings described in Section 3.3 and other involvement from each jurisdiction throughout the planning process. Each municipality was emailed or mailed invitations to all meetings and if email addresses were available, received email reminders prior to each meeting. A HMP teleconference was held to give jurisdictions that had previously been unable to physically attend any other meeting an opportunity to participate. Surveys and forms were mailed or emailed to jurisdictions along with letters requesting that local information be provided. All twenty-three municipalities in the County participated in the plan thus achieving 100% participation.

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, local floodplain management ordinances, the Carbon County Comprehensive Plan (a plan update is currently in draft form), Carbon County Emergency Operations Plan, Carbon County Hazard Vulnerability Analysis (HVA) local Emergency Operation Plans, local zoning ordinances, local subdivision and land development ordinances, and local comprehensive 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 draft Carbon County Comprehensive Plan so that vulnerability pertaining to future development could be established. The County HVA provided direction for hazard identification as well as extensive information on past occurrences including anecdotal information. Floodplain management ordinance information was used to aid in the establishment of local capabilities in addition to participation in the NFIP.

4. Risk Assessment

4.1. Process Summary

This risk assessment provides a factual basis for activities proposed by the County in their mitigation strategy. Hazards that may affect Carbon County are identified and defined in terms of location and geographic extent, magnitude of impact, previous events and likelihood of future occurrence.

The HMSC identified natural and human-made hazards which have the potential to impact Carbon County. The occurrence of a past hazard event in the County provided an indication of future possible incidence, but the fact that a hazard event has not previously occurred did not exclude the hazard from further investigation. Similarly, limited past occurrences of hazard events did not solely warrant a hazard's inclusion in the plan. The HMSC then asked all attendees at the Kick-off Meeting to vote in a dot exercise for what they considered to be the most significant hazards for Carbon County.

All 34 hazards listed in PEMA's *Standard List of Hazards* (**Appendix I**) from the Commonwealth of Pennsylvania's All-Hazard Mitigation Planning Standard Operating Guide (SOG) were displayed, with illustrations, on the wall. HMPT members were asked to "vote" on hazards through a dot exercise, selecting hazards based on the importance and/or perceived potential impact each hazard had on their community. Based on the results of this exercise, information from the 2010 Pennsylvania State HMP update and past disaster declarations, the hazards selected for inclusion in the 2010 county HMP include: Flood, Flash Flood, and Ice Jam, Winter Storm, Wildfire, Transportation Accidents, Dam Failure, Utility Interruption, and Disorientation, Drought, Hurricane, Tropical Storm, and Nor'easter, Landslides and Nuclear Incidents.

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 Carbon 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. Only parcels with an assessed building value (i.e. non-vacant parcels) were included in the vulnerability and loss estimates in order to keep the focus of the Hazard Mitigation Plan on the impact of hazards on people and communities. A vulnerability analysis was performed which identifies land, facilities, or people that may be impacted by hazard events and describes what those events can do to physical, social and economic assets. For more information on data sources and limitations, please see Section 2.5.

Section 4.2.1 provides a summary of previous disaster declarations affecting Carbon County as well as a review of hazards identified as having the potential to impact the County in 2010. Drought, Flood, Flash Flood, and Ice Jam, Hurricane, Tropical Storm, and Nor'easter, Landslide, Wildfire, Winter Storm, Dam Failure, Disorientation, Nuclear Incidents, Transportation Accident, and Utility Interruption are included in the 2010 HMP. Only the most current and

credible sources were used to complete the hazard profiles included in Section 4.3; see citations and **Appendix A - Bibliography** for source details.

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 2009 that have affected Carbon County. Additional declarations beyond 2010 can be found on the FEMA website at: http://www.fema.gov/news/disasters_state.fema?id=42.

Table 4.2-1: Presidential Disaster and Emergency Declarations affecting Carbon County.		
DECLARATION NUMBER	DATE	EVENT
1649	June, 2006	Proclamation of Emergency - Flooding
3235	September, 2005	Proclamation of Emergency - Hurricane Katrina
1557	September, 2004	Tropical Depression Ivan
1497	September, 2003	Hurricane Isabel/Henri
3180	February, 2003	Severe Winter Storm
1294	September, 1999	Hurricane Floyd
1085	January, 1996	Severe Winter Storms
1093	January, 1996	Flooding
1015	January, 1994	Severe Winter Storms
3105	March, 1993	Blizzard
737	September, 1985	Flood
340	June, 1972	Flood (Agnes)
273	August, 1969	Flood
206	August, 1965	Drought
40	August, 1955	Flood (Diane)

In addition to these Presidentially-declared events, sixteen events warranted Gubernatorial Disaster Declarations or Proclamations. Table 4.2-2 lists Gubernatorial Disaster Declarations or Proclamations that have been issued for Carbon County between 1954 and 2009.

Table 4.2-2: Gubernatorial Disaster Declarations or Proclamations affecting Carbon County.	
DATE	EVENT
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, 2005	Proclamation of Emergency - Hurricane Katrina
February, 2002	Drought & Water Shortage

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

DATE	EVENT
July, 1999	Drought
April, 1997	Snowstorm
September, 1995	Drought
November, 1980	Drought Emergency
February, 1978	Blizzard
January, 1978	Heavy Snow
February, 1974	Truckers Strike
February, 1972	Heavy Snow
January, 1966	Heavy Snow
September, 1963	Drought

Carbon 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 Carbon County between 1954 and 2010.

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

DATE	EVENT
August, 2007	Hail
December, 2006	Severe Storms and Tornadoes
November, 2006	Severe Storms and Flooding
August, 2001	Flooding
July, 1991	Drought
September, 1989	Flood
September, 1985	Flood

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 Carbon County, were indirectly affected by Hurricane Katrina as a result of evacuee assistance.

4.2.2. Summary of Hazards

The HMPT was provided the *Standard List of Hazards* from the SOG to be considered for evaluation in the 2010 HMP. More information pertaining to hazard selection is available in Section 4.1. Following review of the comprehensive hazards list, eleven hazards were identified as the most significant to Carbon County. These hazards were considered in need of risk

assessment in the 2010 HMP. Table 4.2-4 contains a complete list and description of the eleven hazards which have the potential to affect Carbon County as identified through previous occurrences, expected future significance and input from those that participated in the 2010 planning process. Hazard profiles are included in Section 4.3 for each of these hazards.

Table 4.2-4: List and description of natural and human-made hazards profiled in the 2010 HMP.		
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).
	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).
	Landslide	A landslide is the downward and outward movement of slope-forming soil, rock and vegetation reacting to the force of gravity. Landslides may be triggered by both natural and human-caused changes in the environment, including heavy rain, rapid snow melt, steepening of slopes due to construction or erosion, earthquakes and changes in groundwater levels. Mudflows, mudslides, rockfalls, rockslides and rock topples are all forms of a landslide. Areas that are generally prone to landslide hazards include previous landslide areas, the bases of steep slopes, the bases of drainage channels, developed hillsides and areas recently burned by forest and brush fires.
	Wildfire	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

Table 4.2-4: List and description of natural and human-made hazards profiled in the 2010 HMP.

HAZARD TYPE	HAZARD	HAZARD DESCRIPTION
		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).
	Winter Storm	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.
Technological and Human-made Hazards	Dam Failure	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).
	Disorientation	Large numbers of people are attracted to Pennsylvania's rural areas for recreational purposes such as hiking, camping, hunting, and fishing. As a result, people can become lost or trapped in remote and rugged wilderness areas. Search and rescue may be required for people who suffer from medical problems or injuries and those who become accidentally or intentionally disoriented. Search and rescue efforts are focused in and around state forest and state park lands (DCNR, 2009).
	Nuclear Incidents	Nuclear accidents general 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, 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.
	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 4.2-4: List and description of natural and human-made hazards profiled in the 2010 HMP.

HAZARD TYPE	HAZARD	HAZARD DESCRIPTION
	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"> • 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). • Fuel or Resource Shortage – resulting from supply chain breaks or secondary to other hazard events, for example (Mercer County, PA, 2005). • 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). • Information Technology Failure – due to software bugs, viruses, or improper use (Rainer Jr., et al, 1991). • Ancillary Support Equipment – electrical generating, transmission, system-control, and distribution-system equipment for the energy industry (Hirst & Kirby, 1996). • 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). • Telecommunications System Failure – damage to data transfer, communications, and processing equipment, for example (FEMA, 1997). • Transmission Facility or Linear Utility Accident – liquefied natural gas leakages, explosions, facility problems, for example (United States Department of Energy, 2005). • Major Energy, Power, Utility Failure – interruptions of generation and distribution, power outages, for example (United States DOE, 2000).

4.3. Hazard Profiles and Vulnerability Analysis

NATURAL HAZARDS

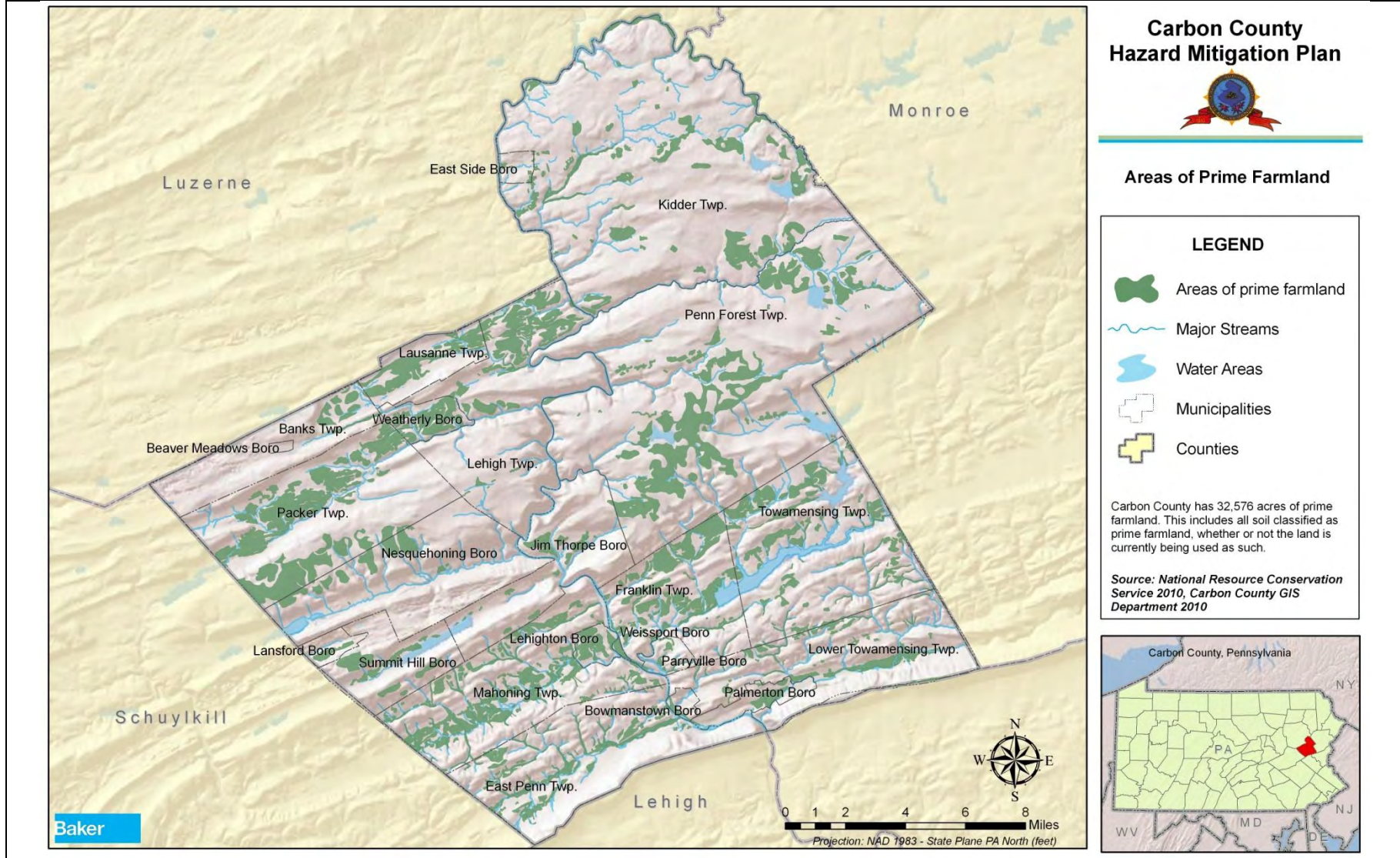
4.3.1. Drought

4.3.1.1. Location and Extent

Droughts are regional climatic events, so when these events occur in Carbon 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.

Areas with extensive agricultural land use are most vulnerable to drought. While Figure 4.3.1-1 shows that all of Carbon County has an equal occurrence of severe or extreme drought, the agricultural industry is often hardest hit. Figure 4.3.1-2 shows the location of prime farmlands in Carbon County.

Figure 4.3.1-1: Areas of prime farmland in Carbon County (NRCS, 2008).



4.3.1.2. Range of Magnitude

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

The Commonwealth uses five parameters to assess drought conditions:

- 1) Stream flows (compared to benchmark records)
- 2) Precipitation (measured as the departure from normal, 30 year average precipitation)
- 3) Reservoir storage levels in a variety of locations (especially three New York City reservoirs in upper Delaware River Basin)
- 4) Groundwater elevations in a number of counties (comparing to past month, past year and historic record)
- 5) The Palmer Drought Severity Index (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).

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

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

Seven Drought Emergencies have been declared in Carbon County since 1955. A worst case scenario for droughts occurred in 1985. The Governor declared a State of Drought Emergency from April until December in sixteen eastern Pennsylvania counties, including Carbon. The

declaration placed mandatory restrictions on water use in the region and provided penalties for violators (CCEMA, 2009).

4.3.1.3. Past Occurrence

Declared drought status for Carbon County from 1980 to 2009 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 for the years 1980 through 2009.

Table 4.3.1-2: Carbon County Declared Drought Status from 1980 to 2009 (PADEP, 2010).			
DATE	DROUGHT STATUS	DATE	DROUGHT STATUS
Nov 6, 1980 - Nov 18, 1980	Emergency (Western portion only)	Dec 3, 1998 - Dec 14, 1998	Watch
Nov 19, 1980 - Apr 20, 1982	Emergency	Dec 14, 1998 - Dec 16, 1998	Warning
Nov 10, 1982 - Feb 8, 1983	Warning	Jan 15, 1999 - Mar 15, 1999	Warning
Feb 8, 1983 - Mar 28, 1983	Warning	Mar 15, 1999 - Jun 10, 1999	Watch
Jan 23, 1985 - Apr 26, 1985	Warning	Jun 10, 1999 - Jul 20, 1999	Warning
Apr 26, 1985 - Dec 19, 1985	Emergency	Jul 20, 1999 - Sept 30, 1999	Emergency
Jul 7, 1988 - Dec 12, 1988	Watch	Sept 30, 1999 - May 5, 2000	Watch
Mar 3, 1989 - May 15, 1989	Warning	Nov 6, 2001 - Dec 5, 2001	Watch
Jun 28, 1991 - Jul 24, 1991	Watch	Dec 5, 2001 - Feb 12, 2002	Warning
Jul 24, 1991 - Apr 20, 1992	Emergency	Feb 12, 2002 - May 13, 2002	Emergency
Apr 20, 1992 - Jun 23, 1992	Warning	May 13, 2002 - Nov 7, 2002	Watch
Sept 1, 1995 - Sept 20, 1995	Warning	Apr 11, 2006 - Jun 30, 2006	Watch
Sept 20, 1995 - Nov 8, 1995	Emergency	Aug 8, 2007 - Sept 5, 2007	Watch
Nov 8, 1995 - Dec 18, 1995	Warning	Oct 5, 2007 - Jan 11, 2008	Watch
Oct 27, 1997 - Jan 16, 1998	Warning		

Carbon County also has record of a drought event prior to 1980. In 1964, two boroughs in Carbon County (Jim Thorpe and Weatherly) were affected by a drought. No drought declarations were issued by the Governor; however, emergency equipment was furnished to the two Boroughs from the emergency stockpile at Fort Indiantown Gap (CCEMA, 2009). This included emergency generators and filtering systems since emergency sources of water had to be tapped and purified. Also, in 1965 a presidential disaster declaration was issued for the Delaware River Basin. In addition, in 1963 a Gubernatorial Proclamation was issued for numerous communities in the Commonwealth in response to drought.

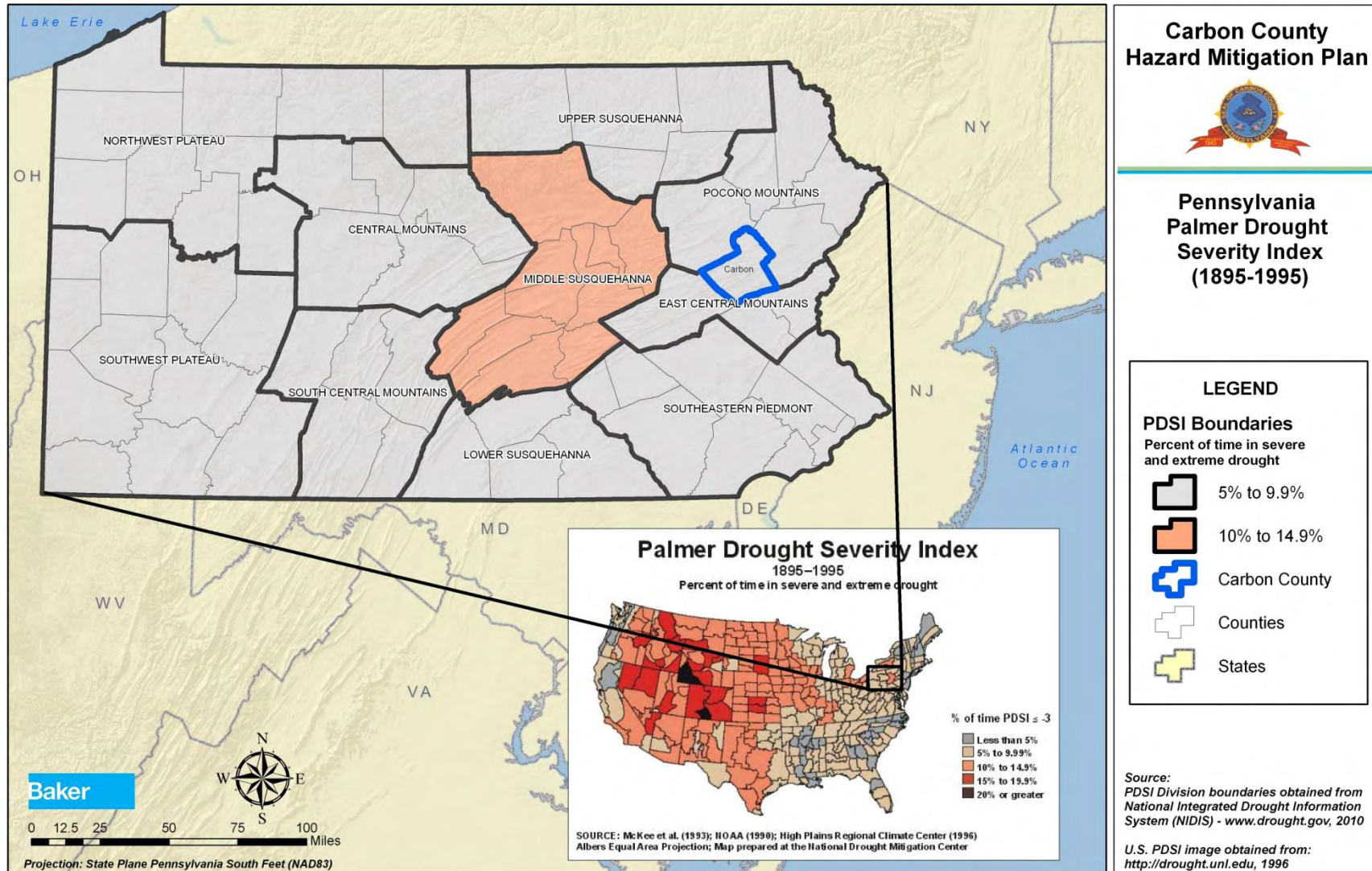
Table 4.2-1 shows that since 1955, there has been one Presidential Disaster Declarations issued (1965) in response to drought conditions within Carbon County and other areas of the Commonwealth. In addition, there were five Gubernatorial Declarations or Proclamation and

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 Carbon County. Based on national data from 1895 to 1995, Carbon 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. Therefore, the future occurrence of drought can be considered *possible*.

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



4.3.1.5. *Vulnerability Assessment*

The most significant losses resulting from drought events are typically found in the agriculture sector. In 1999 a Gubernatorial Proclamation was issued in part due to significant crop damage. Preliminary estimates by the Department of Agriculture indicated possible crop losses across the Commonwealth in excess of \$500 million. This estimate did not include a 20 percent decrease in dairy milk production which also resulted in million dollar losses (NCDC, 2009).

Therefore, drought events can severely impair the local economy with prolonged drought negatively impacting the livelihood of residents within agricultural communities particularly. Prime farmlands are depicted in Figure 4.3.1-1. Carbon County ranks 59th out of the 67 Commonwealth counties in agricultural production totaling \$8.9 million (USDA, 2007). The majority of sales came from crop sales which total \$7.8 million (87%) in 2007. Livestock sales make up the other 13% of sales.

Carbon County residents that use private domestic wells are more vulnerable to droughts because their wells can dry up. Table 4.3.1-3 shows the number of domestic wells per municipality. It is important to note that the well data was obtained from the Pennsylvania Groundwater Information System (PaGWIS). PaGWIS relies on voluntary submissions of well record data by well drillers therefore it is not a complete database of all domestic wells in the County.

Table 4.3.1-3: Number of domestic wells per municipality in Carbon County (PAGWIS, 2010).	
MUNICIPALITY	DOMESTIC WELLS
Banks Township	N/A
Beaver Meadows Borough	1
Bowmanstown Borough	4
East Penn Township	185
East Side Borough	7
Franklin Township	236
Jim Thorpe Borough	135
Kidder Township	428
Lansford Borough	N/A
Lausanne Township	17
Lehigh Township	27
Lehighon Borough	6
Lower Towamensing Township	173
Mahoning Township	326
Nesquehoning Borough	19
Packer Township	68
Palmerton Borough	5
Parryville Borough	9
Penn Forest Township	1803

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Summit Hill Borough	35
Towamensing Township	452
Weatherly Borough	6
Weissport Borough	N/A
TOTAL	3942

In addition, public water suppliers are also vulnerable periods of drought, particularly if they rely on groundwater wells and do not have backup water storage. There are thirteen public water suppliers that operate in the County or provide water to municipalities in the County. These include: Beaver Run Water Association, Bethlehem Water Department, Bethlehem Water Authority, Bowmanstown Water Authority, Hazleton City Water Authority, Klein Township Municipal Authority, Jim Thorpe Water Department, Lansford-Coaldale Joint Water Authority, Lehigh Water Authority, Nesquehoning Water Authority, Palmerton Water Authority, Summit Hill Water Authority, and Weatherly Borough Water Authority. Several water authorities have taken mitigative measures including:

- Bowmanstown Borough has retained an abandoned mine tunnel as an emergency water supply to back up its wells.
- Jim Thorpe Water Department added an additional water storage tank and are in the process of adding another storage tank and filtration plant.
- Lansford/Coaldale Joint Water Authority has installed deep wells with a filtration plant.
- Lehigh Water Authority completed a second pipeline across the Lehigh River which transmits water from the reservoir to the Borough.
- Nesquehoning Water Authority built a filtration system with three wells and a 500,000 gallon tank and two additional wells in the Hauto area.
- Palmerton Borough has five deep wells in operation.

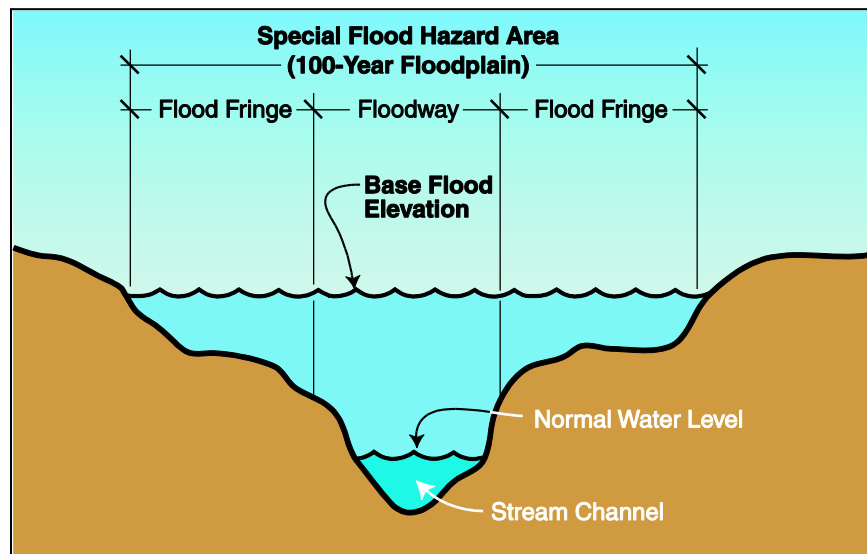
In addition, the Carbon County Drought Task Force was revitalized in 2007 and meets annually to discuss dry conditions throughout the County and to make sure drought contingency plans are up-to-date.

4.3.2. Flood, Flash Flood, Ice Jam

4.3.2.1. Location and Extent

Carbon County is located in the Central Delaware River Basin. This area, like many others in Pennsylvania, is flood prone because of the mountainous terrain and because most of the communities are located along streams and rivers valleys. 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. Floodplains are lowlands adjacent to rivers, streams and creeks that are subject to recurring floods. The size of the floodplain is described by the recurrence interval of a given flood. Flood recurrence intervals are explained in more detail in Section 4.3.2.4. 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* and identify *Base Flood Elevations*. Figure 4.3.2-1 illustrates these terms. The Special Flood Hazard Area serves as the primary regulatory boundary used by FEMA, the Commonwealth of Pennsylvania and Carbon County local governments.

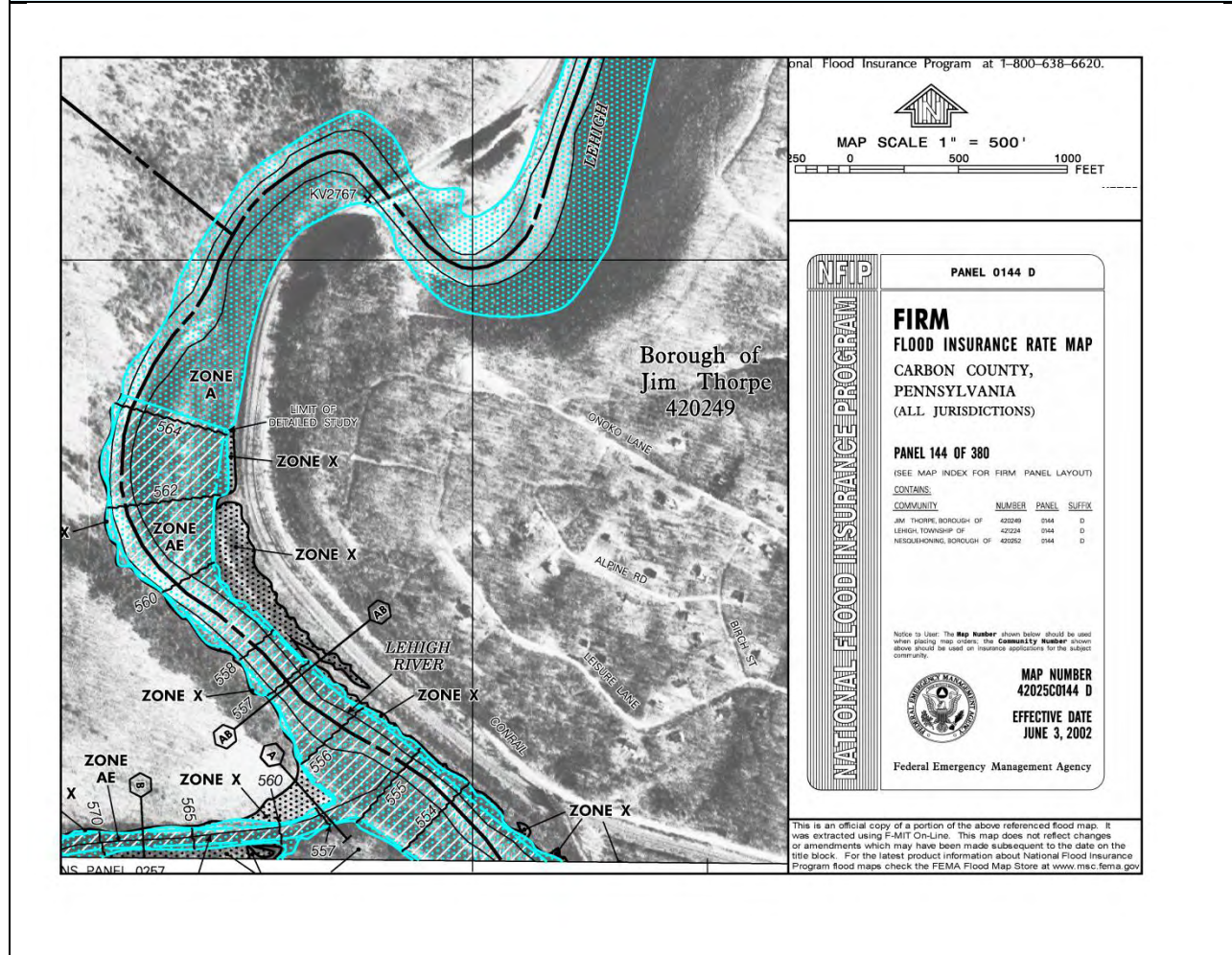
Figure 4.3.2-1: Diagram identifying Special Flood Hazard Area, 1% annual chance (100-Year) floodplain, floodway and flood fringe.



Countywide DFIRMs were published for Carbon County on June 3, 2002. All communities within the County are now shown on a single set of countywide FIRMs. Previous FIRMs and Flood Boundary and Floodway Maps (FBFM) were digitized to produce a DFIRM that is compatible with GIS. Prior to the publication of this digital data, flood hazard information from FEMA was available through paper FIRMs and Q3 data. An example of the mapping products published is shown in Figure 4.3.2-2. 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. Twenty-two of the twenty-three municipalities in the County were determined to have special flood hazard areas (SFHA). Beaver Meadows Borough does not have any SFHA.

Figure 4.3.2-2: FIRM Panel 42025C0144, effective June 3, 2002, showing flood hazard areas along the Lehigh River and Nesquehoning Creek in Jim Thorpe Borough.



Flood sources identified in the most recent mapping project include: Aquashicola Creek, Black Creek, Buckwha Creek, Dilldown Creek, Fireline Creek, Hazle Creek, Lehigh River, Lizard Creek, Mahoning Creek, Mauch Chunk Creek, Mill Creek, Mud Run, Nesquehoning Creek, Park Run, Pohopoco Creek, and Stewart Creek. Figure 4.3.2-3 shows the location of watercourses and flood zones in Carbon County. The location of approximate and detailed (including Base Flood Elevations) Special Flood Hazard Areas (1% annual chance zones) are shown.



4.3.2.2. *Range of Magnitude*

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

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

In Carbon 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 snowpack throughout contributing watersheds. Winter floods also have resulted from runoff of intense rainfall on frozen ground, and, on rare occasions, local flooding has been exacerbated by ice jams in rivers. Ice jam floods 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. Flood events caused by ice jams are limited primarily to the Lehigh River. Although specific data on ice jam incidents in the County is not available from the CCEMA or the National Climatic Data Center (NCDC), anecdotal evidence from county and municipal officials suggests that ice jams have occurred in the past on the river. Details pertaining to these events such as date and impact are not available.

Summer floods have occurred from intense rainfall on previously saturated soils. Summer thunderstorms deposit large quantities of rainfall over a short period of time that can result in flash flood events. In addition, the County occasionally experiences intense rainfall from tropical storms in late summer and early fall. A summer flood caused a worst case scenario flash flood on June 20, 2006 when several days of heavy rain throughout the Lehigh River Basin culminated with flooding along the main stem of the Lehigh River, causing Carbon County to be declared a disaster area. About 130 homes, fifteen businesses and 80 bridges, culverts, and roads in the County were damaged from the flood. Storm event totals for the County averaged eight to fifteen inches.

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.

4.3.2.3. Past Occurrence

Carbon County has a long history of flooding events. Flash flooding is the most common type of flooding that occurs in the County. Six of the seventeen Presidential Disaster and Emergency Declarations affecting Carbon County have been in response to hazard events related to flooding (see Table 4.2-1). Table 4.3.2-1 lists flood event information from 1993 to 2010 obtained from the NCDC. Estimated property damage was not available for flooding events. Other years with major flooding events prior to 1993 include 1933, 1935, 1936, 1942, 1946, 1955, 1967, 1971, and 1977 (CCEMA, 2009).

Table 4.3.2-1: Flood and flash flood events impacting Carbon County from 1993-2009 (NCDC, 2010). "Countywide" indicates several locations in the County were affected.	
DATE	LOCATION & DESCRIPTION
11/28/1993	Multiple Counties. Flood/Flash Flood.
6/26/1995	Franklin Township. Flood/Flash Flood – Heavy rain from thunderstorms forced the Long Run Creek out of its banks in Franklin Township. The stream flooded the yard of one home and washed out a section of Spruce Road onto Long Run Road.
1/19/1996	Multiple Counties. Flood/Flash Flood – All of Pennsylvania was declared a disaster area. Seventeen of 23 townships reported flood damage. In all 365 homes suffered major flood damage and 1,185 suffered minor flood damage. In addition 6 apartment buildings, 13 businesses, 34 roads, 51 sewer lines, 13 electrical systems and 3 parks were damaged by the flooding.
1/27/1996	Multiple Counties. Flood.
4/16/1996	Countywide. Flash Flood.
10/19/1996	Countywide. Flood - Heavy rain caused considerable highway and poor drainage flooding as well as flooding of some of the smaller creeks in Carbon County.
11/8/1996	Countywide. Flash Flood.
12/2/1996	Countywide. Flash Flood.
9/11/1997	Mahoning Township. Flood – Thunderstorms with heavy rain caused flooding along the tributaries of the Mahoning Creek within Mahoning Township.
6/21/1998	Southern Carbon County. Flash Flood - Nearly stationary thunderstorms with torrential downpours caused flash flooding in the southern part of Carbon County.
9/16/1999	Multiple Counties. Flash Flood – Hurricane Floyd caused widespread flash flooding throughout many Counties in the Commonwealth.
7/30/2000	Southeastern Carbon County. Flash Flood.
12/17/2000	Countywide. Flood - Widespread heavy rains of between 2.5 and 4.0 inches fell across the entire southern Poconos with Carbon County bearing the brunt of the flooding.
8/3/2001	Southwestern Carbon County. Flash Flood - Thunderstorms with torrential downpours caused flash flooding that damaged a bridge in East Penn Township.
6/19/2002	Northwestern Carbon County. Flash Flood.

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Table 4.3.2-1: Flood and flash flood events impacting Carbon County from 1993-2009 (NCDC, 2010). "Countywide" indicates several locations in the County were affected.

DATE	LOCATION & DESCRIPTION
6/26/2002	Northeastern Carbon County. Flood.
7/23/2002	Northeastern Carbon County. Flash Flood.
6/12/2003	Central and Eastern Carbon County. Flash Flood - A thunderstorm with torrential downpours caused flash flooding across east central Carbon County. Doppler Radar storm total estimates were between 3 and 4 inches, most of which fell within one hour.
6/20/2003	Countywide. Flood - Heavy rain led to poor drainage flooding and flooding of streams in the county.
6/22/2003	Countywide. Flood.
8/5/2003	Southern Carbon County. Flash Flood - Thunderstorms with torrential downpours caused flash flooding of streams in extreme southern Carbon County and extreme northern Lehigh County.
8/6/2003	Northern Carbon County. Flash Flood - Nearly stationary thunderstorms dropped a Doppler Radar storm total estimate of between 3 and 5 inches in western parts of Kidder Township and caused flooding along smaller streams including the Fawn Run.
9/23/2003	Multiple Counties. Flood - The heavy runoff led to flooding along the Aquashicola Creek and down county along the Lehigh River.
9/18/2004-09/19/2004	Countywide. Flash Flood – Remnants from Hurricane Ivan Storm caused heavy rain. Storm totals average around 5 inches and caused poor drainage, creek and river flooding throughout Carbon County. A 44-year-old man drowned. President George W. Bush declared the county a disaster area. Eighty-nine homes and four businesses were damaged. Seven public buildings and structures were damaged.
3/29/2005	Countywide. Flood.
4/2/2005	Countywide. Flood - The Mahoning Creek flooded in Lehigh and Mahoning Township. Pennsylvania State Route 443 was closed across Mahoning Township. Flooding along Lizard Creek in East Penn Township forced the closure of Pennsylvania State Route 895. Property damage was limited to basement flooding.
10/8/2005	Countywide. Flood.
5/30/2006	Northern Carbon County. Flash Flood.
6/1/2006	Nesquehoning. Flash Flood - Thunderstorms with torrential rains caused creek flooding in western Carbon County. Creeks overflowed across a few roadways in Lansford. Water accumulated up to three feet on some roadways in Lansford.
6/27/2006	Multiple Counties. Flash Flood - Several days of heavy rain throughout the Lehigh River Basin culminated with flooding along the main stem of the Lehigh River. President George W. Bush declared Carbon County a disaster area. Event totals in Carbon County averaged eight to twelve inches. In Carbon County about 130 homes, 15 businesses and 80 bridges, culverts and roads were damaged.
11/16/2006	Franklin and Penn Forest Townships, Beaver Meadows Borough. Flash Flood - Runoff from heavy rain led to flooding of streams in the central part of Carbon County in Franklin and Penn Forest Townships and also in Beaver Meadows Borough in the northwest part of the county.
3/2/2007	Multiple Counties. Flood.
4/15/2007	Eastern Carbon County. Flood.
8/25/2007	Lehigh. Flash Flood.
6/14/2008	Albrightsville. Flash Flood.
12/12/2008	Lehigh. Flood.

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Table 4.3.2-1: Flood and flash flood events impacting Carbon County from 1993-2009 (NCDC, 2010). "Countywide" indicates several locations in the County were affected.

DATE	LOCATION & DESCRIPTION
6/13/2009	Summit Hill. Flash Flood.
7/29/2009	Christmans. Flash Flood.
8/12/2009	Hickory Run. Flash Flood.

Table 4.3.2-2 provides further past occurrences of flood events from 1841-1987 from the County's Hazard Vulnerability Assessment.

Table 4.3.2-2: Carbon County records of flood and flash flood events impacting the county from 1841-1987 (CCEMA, 2009).

DATE	LOCATION AND/OR DESCRIPTION
June 9, 1841	Minor Flooding
August 1861	Minor Flooding
October 1869	Minor Flooding
August 1901	Minor Flooding
February 1901	Minor Flooding
February 1902	Minor Flooding
January 1925	Minor Flooding
August 23, 1933	Extensive damage and flooding occurred in Jim Thorpe which resulted in one fatality.
August 1955	A hurricane caused flooding and extensive damage in Weissport Borough. Several other areas incurred damages as a result of this flooding but not as extensive as Weissport Borough. A dike was constructed along the Lehigh River in Weissport as a result of this flood and an Emergency Declaration was issued.
September 22-23, 1955	Minor flooding occurred
August 1, 1969	A major flood occurred causing extensive damage in Jim Thorpe. Other areas of the country were impacted including Nesquehoning's Green Acres Industrial Park.
June 1972	Extensive damage and flooding occurred throughout the County and an Emergency Declaration was filed and issued.
September 1985	Hurricane Gloria caused major flooding in several areas of the County and major flooding occurred in Palmerton. A Disaster Assistance Center was opened in Palmerton.
September 1987	Major flooding occurred throughout the County and the County EOC was activated. Damage assessment was conducted in the Palmerton area to determine impact.

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. 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 were three repetitive loss properties in Carbon County, one of which was insured and all of which are identified as *single*

family (FEMA CIS). These repetitive loss properties are located in East Penn Township, Lower Towamensing Township, and Palmerton Borough. Table 4.3.2-3 shows the number of repetitive loss properties by municipality. There are no severe repetitive loss properties in Carbon County.

Table 4.3.2-3: Summary of the number and type of Repetitive Loss properties by municipality (FEMA, 2010).			
MUNICIPALITY	TYPE		SUM OF REPETITIVE LOSS PROPERTIES
	NON-RESIDENTIAL	SINGLE FAMILY	
Banks Township	0	0	0
Beaver Meadows Borough	0	0	0
Bowmanstown Borough	0	0	0
East Penn Township	0	1	1
East Side Borough	0	0	0
Franklin Township	0	0	0
Jim Thorpe Borough	0	0	0
Kidder Township	0	0	0
Lansford Borough	0	0	0
Lausanne Township	0	0	0
Lehigh Township	0	0	0
Lehighon Borough	0	0	0
Lower Towamensing Township	0	1	1
Mahoning Township	0	0	0
Nesquehoning Borough	0	0	0
Packer Township	0	0	0
Palmerton Borough	0	1	1
Parryville Borough	0	0	0
Penn Forest Township	0	0	0
Summit Hill Borough	0	0	0
Towamensing Township	0	0	0
Weatherly Borough	0	0	0
Weissport Borough	0	0	0
TOTAL	0	3	3

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

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

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

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

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

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

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

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

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

The minimum floodplain management requirements include:

- Review and permit all development in the SFHA;
- Elevate new and substantially improved residential structures above the Base Flood Elevation;
- Elevate or dry floodproof new and substantially improved non-residential structures;
- Limit development in floodways;

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- 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 Carbon County participate in CRS.

The following table lists the Carbon County municipalities participating in the NFIP. Note that all municipalities in the County participate in the program.

Table 4.3.2-4: Carbon County Municipal Participation in the National Flood Insurance Program.				
COMMUNITY	PARTICIPATION STATUS	CID	INITIAL FIRM IDENTIFIED	CURRENT EFFECTIVE MAP DATE
Banks Township	P	421452	10/01/1986	06/03/2002
Beaver Meadows Borough	P	420247	06/03/2002	06/03/2002
Bowmanstown Borough	P	420248	09/03/1982	06/03/2002
East Penn Township	P	421013	06/15/1977	06/03/2002
East Side Borough	P	422360	09/01/1986	06/03/2002
Franklin Township	P	421014	08/01/1977	06/03/2002
Jim Thorpe Borough	P	420249	08/15/1977	06/03/2002
Kidder Township	P	421453	02/02/1989	06/03/2002
Lansford Borough	P	420250	02/21/1982	06/03/2002
Lausanne Township	P	421454	03/18/1983	06/03/2002
*Lehigh Township	P	421224	01/14/1983	06/03/2002
Lehighon Borough	P	420251	09/15/1977	06/03/2002
Lower Towamensing Township	P	421455	11/15/1989	06/03/2002
Mahoning Township	P	421041	09/29/1978	06/03/2002
Nesquehoning Borough	P	420252	07/03/1990	06/03/2002
Packer Township	P	421456	09/01/1986	06/03/2002
Palmerton Borough	P	420253	09/15/1978	06/03/2002
Parryville Borough	P	420254	03/01/1978	06/03/2002
Penn Forest Township	P	421457	02/02/1989	06/03/2002
Summit Hill Borough	P	421451	12/14/1979	06/03/2002
Towamensing Township	P	421458	11/01/1986	06/03/2002
Weatherly Borough	P	420255	12/05/1989	06/03/2002
Weissport Borough	P	420256	02/02/1990	06/03/2002
*Erroneously listed as Thornhurst Township in FEMA's CIS				

4.3.2.4. Future Occurrence

In Carbon County, flooding occurs commonly and can occur during any season of the year. Therefore the future occurrence of floods in Carbon County can be characterized as *highly likely*. 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 DFIRM published on June 3, 2002 can be used to 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 4.3.2-5 shows a range of flood recurrence intervals and associated probabilities of occurrence.

Table 4.3.2-5: Recurrence intervals and associated probabilities of occurrence (FEMA, 2001).	
RECURRENCE INTERVAL	CHANCE OF OCCURRENCE IN ANY GIVEN YEAR (%)
10 year	10
50 year	2
100 year	1
500 year	0.2

4.3.2.5. Vulnerability Assessment

Carbon County is vulnerable to flooding that causes loss of lives, property damage, and road closures. For purposes of assessing vulnerability, the County focused on community assets that are located in the 1% annual chance floodplain. While greater and smaller floods are possible, information about the extent and depths for this floodplain is available for all municipalities countywide, thus providing a consistent basis for analysis. Flood vulnerability maps for each applicable local municipality, showing the 1% annual chance flood hazard area and addressable structures, critical facilities and transportation routes within it, are included in **Appendix D**. These maps were created using FEMA digital Q3 data from the current effective FIRMs.

Table 4.3.2-6 displays the total number of parcels and associated building assessment value for non-vacant parcels intersecting the SFHA. These parcels are identified by generalized land use and by municipality; "OTHER" land use incorporates a number of different land uses, particularly government, religious, institutional, and preserved farms. Just over 6%, or 1,989, of all non-vacant parcels in the County are located in the SFHA. Of the six identified parcel uses, the vast majority of parcels intersecting the SFHA are single-family parcels; this type of parcel accounts

for 74% of the vulnerable parcels. Palmerton Borough, Lower Towamensing Township, and Franklin Township each have over 200 parcels located in the SFHA and are the most vulnerable to flood losses. The total building assessed value of these parcels tops \$10 million in each municipality. On the other end of the spectrum, East Side Borough and Beaver Meadows Borough have no identified SFHA and therefore do not have parcels vulnerable to the 1 percent-annual-chance flood event.

The cumulative value of all non-vacant vulnerable parcels is \$109,836,150. This is 8% of the total building assessed value of all non-vacant parcels in the County.

Table 4.3.2-6 also displays the number of critical facilities that are located in the SFHA by jurisdiction. Approximately 66% of all critical facilities are located in the SFHA and are located in seven of the 23 municipalities in Carbon County. Palmerton and Weissport Boroughs have the most vulnerable critical facilities with three each. Weatherly Borough also has a higher proportion of critical facilities in the community with two critical facilities located in the SFHA. For more information on the flood vulnerability of each individual critical facility, please see

Appendix E.

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Table 4.3.2-6: Number of non-vacant parcels and critical facilities in the Special Flood Hazard Area (1% annual chance flood zone).

MUNICIPALITY	SINGLE-FAMILY PARCELS	MULTI-FAMILY PARCELS	MOBILE HOME PARCELS	COMMERCIAL PARCELS	INDUSTRIAL PARCELS	OTHER PARCELS	TOTAL NON-VACANT PARCELS	TOTAL BUILDING ASSESSMENT	TOTAL # OF CRITICAL FACILITIES IN SFHA
Banks Township	0	0	0	3	0	1	4	\$166,140	0
Beaver Meadows Borough	0	0	0	0	0	0	0	\$0	1
Bowmanstown Borough	51	4	0	6	0	3	64	\$2,783,590	0
East Penn Township	70	0	9*	5	0	22	106	\$5,359,448	0
East Side Borough	0	0	0	0	0	0	0	\$0	0
Franklin Township	164	1	11	13	1	18	208	\$11,839,989	0
Jim Thorpe Borough	71	3	1	7	1	4	87	\$6,502,440	0
Kidder Township	42	0	3	10	0	6	61	\$8,946,491	0
Lansford Borough	5	0	0	1	0	1	7	\$604,703	1
Lausanne Township	5	0	0	0	0	6	11	\$474,855	0
Lehigh Township	14	0	3	0	0	3	20	\$508,751	0
Lehighon Borough	25	1	0	23	5	6	60	\$4,824,260	0
Lower Towamensing Township	230	1	12*	12	4	18	277	\$10,327,710	1
Mahoning Township	124	3	6	18	1	26	178	\$12,613,437	0
Nesquehoning Borough	50	3	2	9	3	4	71	\$8,622,226	1
Packer Township	55	0	6	1	0	23	85	\$3,082,616	0
Palmerton Borough	188	13	3	39	0	8	251	\$10,919,962	3
Parryville Borough	29	0	3	4	0	5	41	\$1,408,470	0
Penn Forest Township	101	0	2	5	0	7	115	\$6,467,224	0
Summit Hill Borough	15	0	0	0	1	4	20	\$931,610	0
Towamensing Township	81	0	6	2	0	16	105	\$5,217,800	0
Weatherly Borough	43	4	0	14	0	3	64	\$3,333,805	2
Weissport Borough	128	6	2	13	0	5	154	\$4,900,623	3
TOTAL	1,491	39	69	185	16	189	1,989	\$109,836,150	12

* One or more of the vulnerable mobile home parcels in this jurisdiction is a mobile home park which has multiple mobile homes located on it.

It is important to note that according to the CCEMA, flood control projects in Weissport along the Lehigh River and in the Mauch Chunk Creek Watershed have served to greatly reduce damages and the threat to life and property loss (CCEMA, 2009).

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

4.3.3. Hurricane, Tropical Storm, Nor'easter

4.3.3.1. Location and Extent

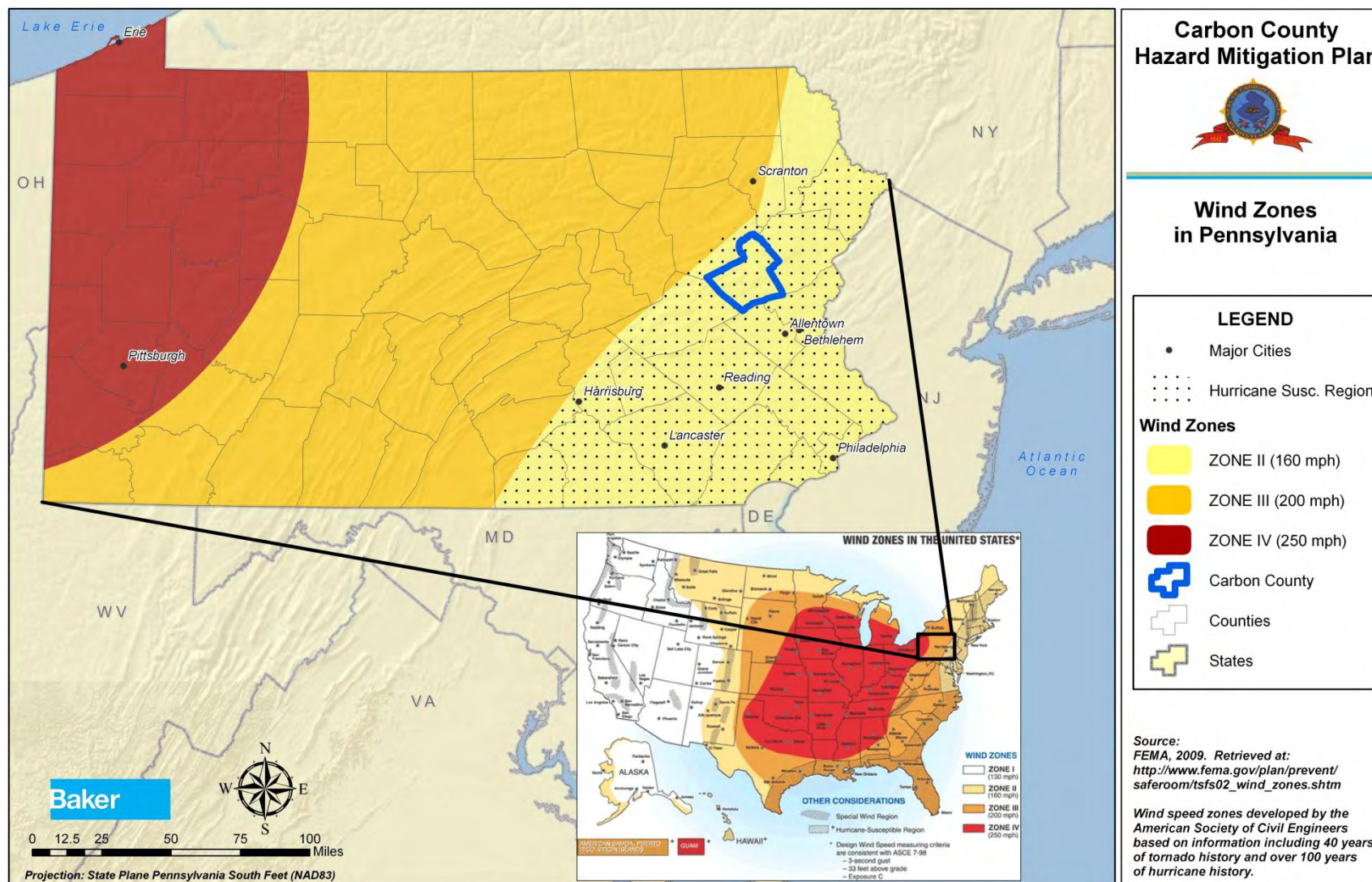
Tropical storms impacting Carbon County develop in tropical or sub-tropical waters found in the Atlantic Ocean, Gulf of Mexico, or Caribbean Sea. Cyclones with maximum sustained winds of less than 39 miles per hour (mph) are called tropical depressions. A tropical storm is a cyclone with maximum sustained winds between 39-74 mph. These storms sometimes develop into hurricanes with wind speeds in excess of 74 mph.

While Carbon County is located about 80 miles from the Atlantic Coast, tropical 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 Carbon County are equally subject to the impacts of hurricanes, tropical storms, and Nor'easters. Areas in Carbon County which are subject to flooding, wind, and winter storm damage are particularly vulnerable.

Figure 4.3.3-1 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.

Carbon 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. Carbon County also falls wholly within the identified Hurricane Susceptibility Region.

Figure 4.3.3-1: Design Wind Speed Zones for Carbon County (FEMA, 2009).



4.3.3.2. *Range of Magnitude*

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

The impact tropical storm or hurricane events have on an area is typically measured in terms of wind speed. Expected damage from hurricane force winds is measured using the Saffir-Simpson Scale. The Saffir-Simpson Scale categorizes hurricane intensity linearly based upon maximum sustained winds, barometric pressure, and storm surge potential (characteristic of tropical storms and hurricanes, but not a threat to Carbon County), which are combined to estimate potential damage. Table 4.3.3-1 lists Saffir-Simpson Scale categories with associated wind speeds and expected damages. Categories 3, 4, and 5 are classified as “major” hurricanes. While major hurricanes comprise only 20 of all tropical cyclones making landfall, they account for over 70 percent of the damage in the United States. The likelihood of these damages occurring in Carbon County is assessed in Section 4.3.3.4, *Future Occurrence*.

Table 4.3.3-1: 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 flooding events is included Section 4.3.2. Wind impacts in Carbon 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 CCEMA reports that the County has not experienced major damages from wind-related hazard events (CCEMA 2009). However, according to the NCDC, the largest magnitude winds recorded in Carbon County occurred in Lake Harmony, Kidder Township, in May 2001 and measured 69 knots with wind gusts estimated to be between 75 and 80 mph. This measurement falls within Storm Category 1 with expected damages being minimal and having no significant structural damage. This event was not associated with a tropical storm, but it serves as an example of the upper range of magnitude that can be expected to occur in the County. Nineteen people were injured when a tent collapsed at a local festival, and dozens of trees were uprooted as well damaging at least two vehicles, one of which was occupied. No deaths occurred.

The worst case hurricane, tropical storm, or Nor'easter event in Carbon County is Hurricane Agnes, which struck Pennsylvania in 1972 and resulted in a Presidential Disaster Declaration. After making first landfall as a minimal hurricane near Panama City, FL, Agnes weakened and exited back into the Atlantic off the North Carolina coast. However, the storm skirted along the coast, made a second landfall near New York City as a tropical storm and merged with an extratropical low pressure system over northern Pennsylvania. This brought extremely heavy rains to Pennsylvania. The major impact of this storm was its lingering economic damage, when Pennsylvania incurred \$2.1 billion in damage and 48 deaths statewide. Fire and flood destroyed 68,000 homes and 3,000 businesses, leaving 220,000 Pennsylvanians homeless.

4.3.3.3. *Past Occurrence*

Previous tropical storm and hurricane events that have impacted Carbon County are listed in Table 4.3.3-2 with descriptions where available. With the exception of Tropical Depression Ernesto and Hurricane Gloria, Presidential Disaster Declarations were issued for all of these events.

Table 4.3.3-2: Previous tropical storm events affecting Carbon County.		
YEAR	EVENT	DESCRIPTION
2006	Tropical Depression Ernesto	
2005	Hurricane Katrina	
2004	Tropical Depression Ivan	Countywide flooding and flash flooding with Palmerton Borough and Penn Forest, East Penn and Kidder Townships experiencing the most damage. One fatality.
2003	Hurricane Henri	
2003	Hurricane Isabel	
1999	Hurricane Floyd	Countywide flooding including flash flooding.
1985	Hurricane Gloria	Countywide flooding occurred with major damage in Palmerton Borough.
1972	Hurricane Agnes	
1955	Hurricane Diane	Countywide flooding occurred with extensive damage in Weissport Borough.

4.3.3.4. Future Occurrence

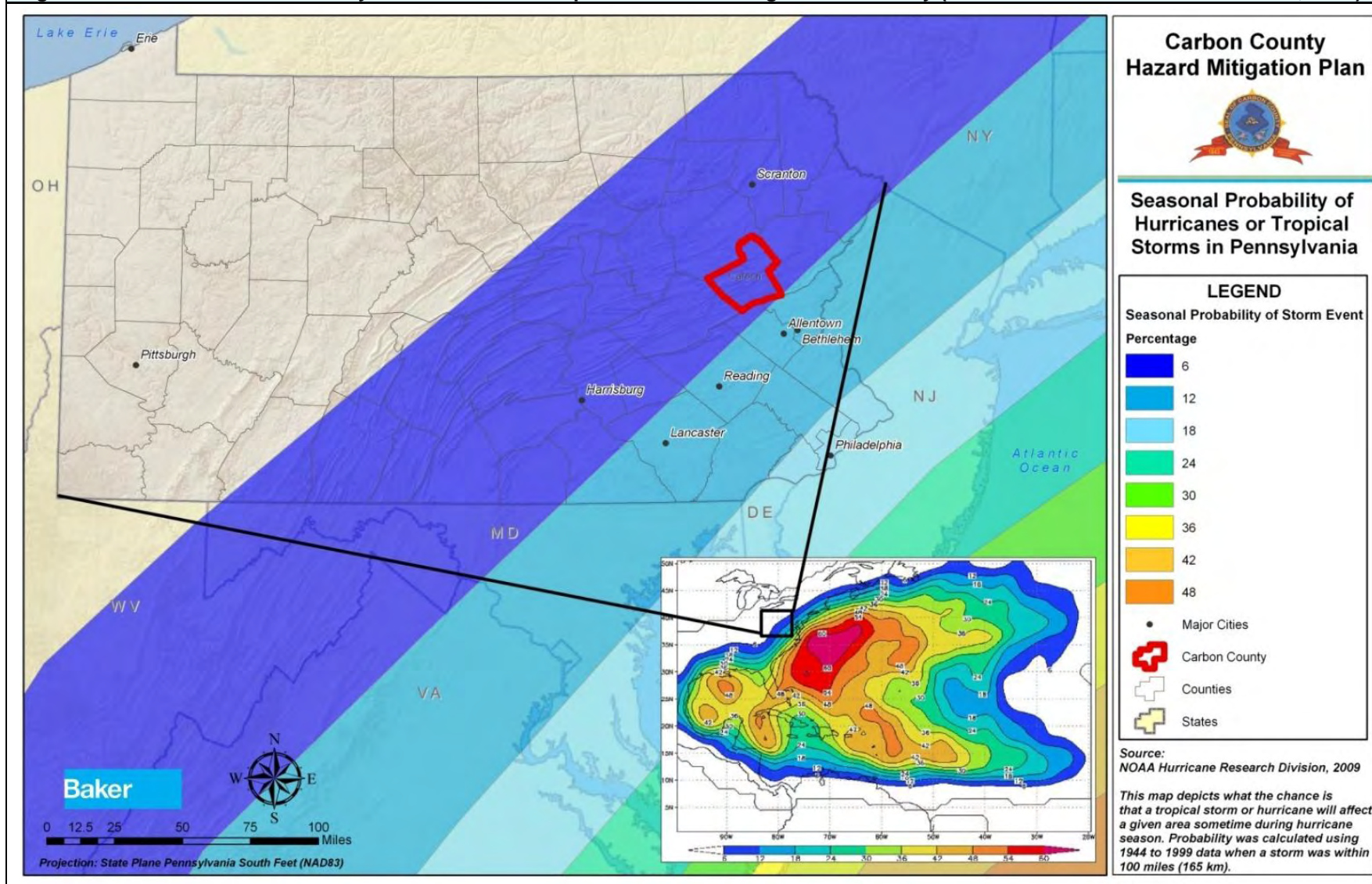
Although hurricanes and tropical storms can cause flood events consistent with 1 percent- and 2 percent- level frequency, their probability of occurrence is measured relative to wind speed. Table 4.3.3-3 shows the probability of winds that reach the strength of tropical storms and hurricane conditions in Carbon County and surrounding areas based on a statistical sample region of more than 30,000 square miles over a period of 46 years.

Table 4.3.3-3: Annual probability of tropical storm and hurricane strength wind speeds for Carbon County (FEMA, 2000).		
WIND SPEED (mph)	CORRESPONDING SAFFIR-SIMPSON TROPICAL STORM/HURRICANE CATEGORIES	ANNUAL PROBABILITY OF OCCURRENCE (%)
45-77	Tropical Storms and Category 1 Hurricanes	91.59
78-118	Category 1 to 2 Hurricanes	8.32
119-138	Category 3 to 4 Hurricanes	0.0766
139-163	Category 4 to 5 Hurricanes	0.0086
164-194	Category 5 Hurricanes	0.00054
195+	Category 5 Hurricanes	0.00001

Table 4.3.3-1 includes wind speeds for all types of storms and is not specific to cyclonic winds. In Carbon County and surrounding areas, the annual probability for winds that equal the strength of tropical storms (over 39 mph) is over 90 percent. The probability for winds at category 1 or 2 hurricane strength (78-118 mph) is greater than 8 percent in any given year. Using Table 4.3.3-1, these wind speeds correspond to *minimal* or *moderate* expected damages. The annual probability of winds exceeding 118 mph is less than 0.1.

The National Oceanic and Atmospheric Administration Hurricane Research Division published the map included as Figure 4.3.3-2 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 approximately a 6 percent chance of Carbon County experiencing a tropical storm or hurricane event between June and November of any given year.

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



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4.3.3.5. *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 4.3.2.5.

In terms of severe wind-related vulnerabilities, the primary concern, as mentioned in Section 4.3.3.2, is manufactured housing. While the Carbon County Tax Assessor identifies 690 parcels in the County with mobile homes located on them, this does not provide the number of mobile homes in the county, and, thus, cannot give a clear indication of the potential vulnerability and losses of this structure type. Instead, the estimated number of manufactured housing units per jurisdiction was extracted from HAZUS-MH MR4. As shown in Table 4.3.3-4, Lower Towamensing Township has the most manufactured housing units with 315. East Penn and Franklin Townships are particularly vulnerable to the wind effects of hurricanes, tropical storms, and Nor'easters, with 266 and 261 estimated manufactured housing units each, respectively. Nesquehoning and Beaver Meadows Boroughs have fewer than ten units of manufactured housing units, so it is expected that these jurisdictions will not be as vulnerable to the wind impacts of hurricanes, tropical storms, or Nor'easters.

Additional loss estimation information from hurricane, tropical storm and nor'easters in Carbon County is provided in Section 4.4.3. Potential Loss Estimates.

Table 4.3.3-4: Manufactured housing units per municipality in Carbon County (HAZUS-MH MR4, 2010).			
MUNICIPALITY	MANUFACTURED HOUSING	MUNICIPALITY	MANUFACTURED HOUSING
Banks Township	28	Lower Towamensing Township	315
Beaver Meadows Borough	9	Mahoning Township	219
Bowmanstown Borough	22	Nesquehoning Borough	4
East Penn Township	266	Packer Township	26
East Side Borough	41	Palmerton Borough	71
Franklin Township	261	Parryville Borough	53
Jim Thorpe Borough	39	Penn Forest Township	70
Kidder Township	69	Summit Hill Borough	13
Lansford Borough	27	Towamensing Township	136
Lausanne Township	34	Weatherly Borough	21
Lehigh Township	62	Weissport Borough	21
Lehighon Borough	38	TOTAL	896

4.3.4. **Landslide**

4.3.4.1. *Location and Extent*

Rockfalls, rockslides, block glide, debris slide, earth flow, mud flow, and other slope failures usually occur in areas of Carbon County with moderate to steep slopes and high precipitation.

Many slope failures are associated with precipitation events – periods of sustained above-average precipitation, specific rainstorms, or snowmelt events. Areas experiencing erosion, decline in vegetation cover, and earthquakes are also susceptible to landslides. Human activities that contribute to slope failure include altering the natural slope gradient, increasing soil water content, and removing vegetation cover.

The U.S. Geological Survey identifies Carbon County as falling into three distinct zones of landslide susceptibility and incidence. Figure 4.3.4-1 shows areas of low, moderate, and high landslide susceptibility as determined by the U.S. Geological Survey. The majority of Carbon County has a low to moderate susceptibility to landslides. However, the southeastern portion of the county and a small area in along the Luzerne County border have a *Combo-High* susceptibility, meaning these areas have a high susceptibility to landsliding with low incidence of occurrence. Over 42% of the total land area of the County is classified as Combo-High susceptibility and include all or a portion of the jurisdictions listed in Table 4.3.4-1.

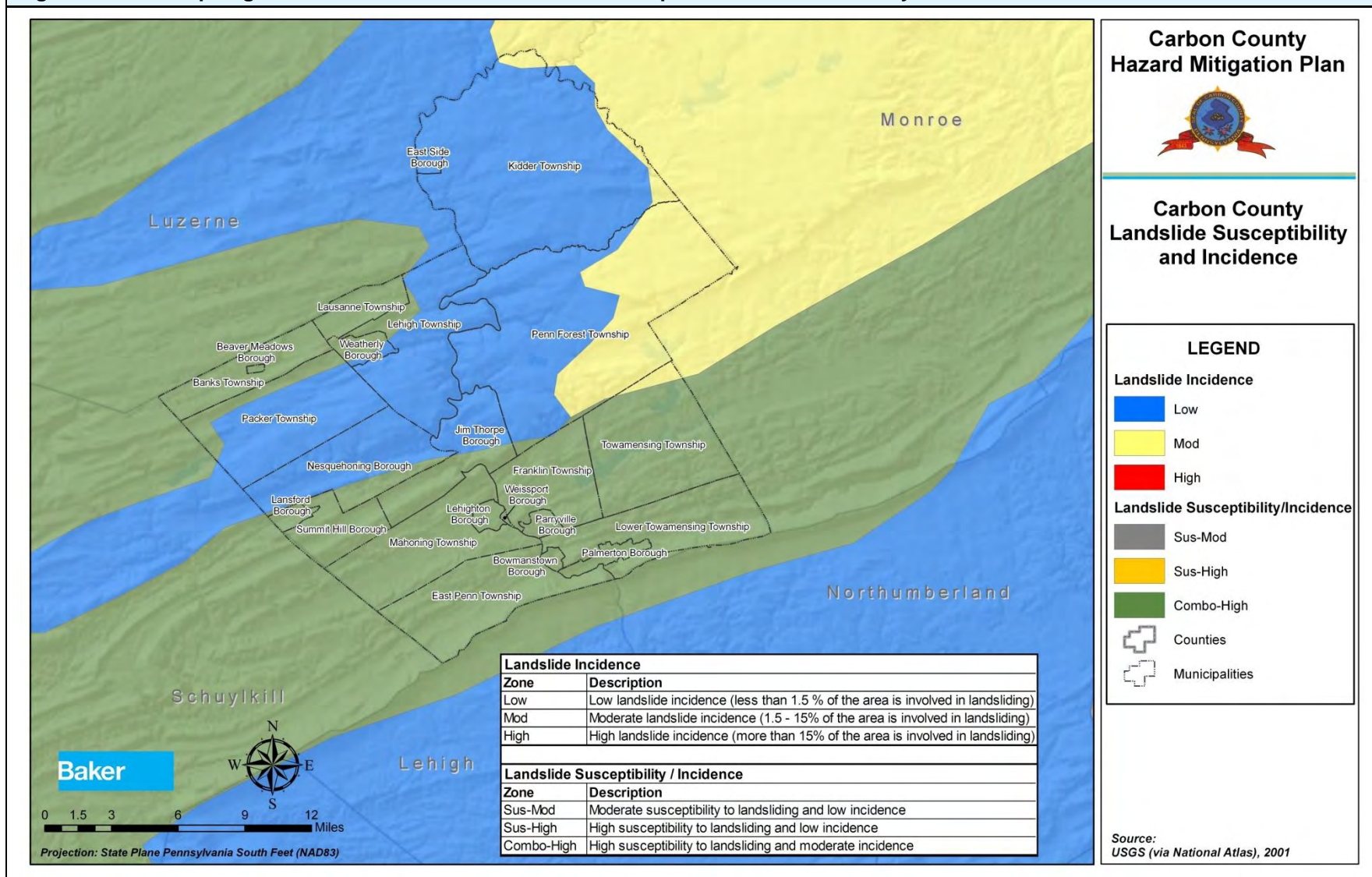
Table 4.3.4-1: Municipalities located in whole or in part in Combo-High Landslide Zones (USGS, 2001).

Banks Township	Lausanne Township	Palmerton Borough
Beaver Meadows Borough	Lehigh Township	Parryville Borough
Bowmanstown Borough	Lehigh Township	Penn Forest Township
East Penn Township	Lower Towamensing Township	Summit Hill Borough
Franklin Township	Mahoning Township	Towamensing Township
Jim Thorpe Borough	Nesquehoning Borough	Weatherly Borough
Lansford Borough	Packer Township	Weissport Borough

Specific areas in the county that are known to have experienced landslides are:

- Mansion House Hill;
- Route 209 in Jim Thorpe Borough and Mahoning Township;
- State Route 248 between Parryville Borough and Bowmanstown Borough; and
- State Route 248 between Palmerton Borough and Lehigh Gap.

Figure 4.3.4-1: Map of general landslide hazard areas and municipalities in Carbon County.



4.3.4.2. *Range of Magnitude*

Landslides cause damage to transportation routes, utilities, and buildings and create travel delays and other side effects. Fortunately, deaths and injuries due to landslides are rare in Pennsylvania. Almost all of the known deaths due to landslides have occurred when rockfalls or other slides along highways have involved vehicles. Storm-induced debris flows are the only other type of landslide likely to cause death and injuries. As residential and recreational development increases on and near steep mountain slopes, the hazard from these rapid events will also increase. Most Pennsylvania landslides are moderate to slow moving and damage things rather than people.

The Pennsylvania Department of Transportation and large municipalities incur substantial costs due to landslide damage and to extra construction costs for new roads in known landslide-prone areas. A 1991 estimate showed an average of \$10 million per year is spent on landslide repair contracts across the Commonwealth and a similar amount is spent on mitigation costs for grading projects (DCNR, 2010).

No serious injury, death or substantial property damage has occurred in Carbon County as a result of a landslide incident. Typically the worst level of damage caused by landslides in the county results in minor property damage often to vehicles, damage to roads resulting temporary road closures, and minor personal injury. A possible worst-case scenario would be if there was a large landslide on Route 209 in Jim Thorpe or Mahoning Township. This road is a main access point to the Pennsylvania Turnpike's Northeast Extension; a rockfall on Route 209 has the potential to cause material damage and injury as well as economic losses because the County's commerce would be interrupted for an unknown period of time.

4.3.4.3. *Past Occurrence*

No comprehensive list of landslide incidents is available at this time, as there is no formal reporting system in place in the County or the Commonwealth. Areas within the County that have a known history of landslides are listed in Section 4.3.4.1. Based on anecdotal information from the County and municipal officials, minor landslides occur each year, typically during periods of heavy rains. These events have caused minor damages and personal injuries, but no deaths.

4.3.4.4. *Future Occurrence*

Based on historical events, landslide events resulting in loss of life and property damage are unlikely in Carbon County. However, with mixed susceptibility to landslides, the probability of landslides occurring in the county is *possible*. However, mismanaged intense development in steeply sloped areas could increase the frequency of occurrence.

4.3.4.5. *Vulnerability Assessment*

With the exception of the areas such as those mentioned in Section 4.3.4.1, communities in Carbon County are not particularly vulnerable to landslides. However, transportation routes throughout the County located at the base or crest of cliffs should be considered vulnerable to this hazard. An inventory of these areas is not available.

Table 4.3.4-2 displays the total number of parcels and associated building assessment value for non-vacant parcels intersecting the landslide combo-high zone, which is the zone of highest risk in Carbon County. These parcels are identified by generalized land use and by municipality; “OTHER” land use incorporates a number of different land uses, particularly government, religious, institutional, and preserved farms. Approximately 64% of the County’s non-vacant parcels intersect with the landslide combo-high zone. Of the potentially vulnerable parcels, nearly 90% are single-family parcels. “Other” parcels are the next most vulnerable type of parcel with 782 vulnerable non-vacant parcels. In terms of jurisdictional vulnerability, Lansford and Palmerton Boroughs have the most vulnerable non-vacant parcels with over 2,000 parcels located in the combo-high zone each. In fact, over half of the municipalities in the County have over 1,000 parcels potentially vulnerable to landslide hazards. East Side Borough and Kidder Township have no identified vulnerable non-vacant parcels. Five municipalities have vulnerable parcels with building assessment values of over \$80 million: Towamensing Township, Franklin Township, Mahoning Borough, Palmerton Borough, and Lehigh Township. The total building assessed value of the potentially vulnerable parcels is \$770,476,329.

Table 4.3.4-2 also displays the number of critical facilities that are located in the landslide combo-high zone by jurisdiction. Approximately 66% of all critical facilities are located in the landslide combo-high zone. The vulnerable critical facilities are located across nineteen of the 23 municipalities in the County. Lehigh Township and Mahoning Borough and Towamensing Township have the most vulnerable critical facilities with over ten each. For a complete list of critical facilities and their vulnerability to landslide hazards, please see **Appendix E**. It is important to note that the vulnerability of each individual parcel and critical facility will depend on a number of factors including slope, topography, and underlying geology and soil.

Table 4.3.4-2: Number of non-vacant parcels and critical facilities in the Landslide Hazard Area (combination-high landslide zone).

MUNICIPALITY	SINGLE-FAMILY PARCELS	MULTI-FAMILY PARCELS	MOBILE HOME PARCELS	COMMERCIAL PARCELS	INDUSTRIAL PARCELS	OTHER PARCELS	TOTAL NON-VACANT PARCELS	TOTAL BUILDING ASSESSMENT	TOTAL # OF CRITICAL FACILITIES IN LANDSLIDE COMBO-HIGH
Banks Township	532	36	8	19	16	9	620	\$ 17,950,479	3
Beaver Meadows Borough	283	85	2	15	0	6	391	\$ 8,727,264	4
Bowmanstown Borough	289	31	6	16	0	13	355	\$ 12,006,180	2
East Penn Township	813	3	70*	19	1	109	1015	\$ 49,285,568	4
East Side Borough	0	0	0	0	0	0	0	\$ -	0
Franklin Township	1550	5	83*	53	3	45	1739	\$ 91,762,628	8
Jim Thorpe Borough	1079	24	5	69	1	35	1213	\$ 42,268,278	5
Kidder Township	0	0	0	0	0	0	0	\$ -	0
Lansford Borough	1822	25	2	123	4	35	2011	\$ 29,111,395	5
Lausanne Township	103	0	11	3	1	21	139	\$ 5,471,979	2
Lehigh Township	63	0	14	2	0	16	95	\$ 3,174,650	1
Leighton Borough	1717	44	9	166	5	47	1988	\$ 80,908,845	11
Lower Towamensing Township	1049	9	84*	36	9	60	1247	\$ 58,143,590	4
Mahoning Township	1407	14	72	68	1	131	1693	\$ 88,671,251	11
Nesquehoning Borough	1	0	0	3	1	1	6	\$ 5,670,175	0
Packer Township	136	0	21	1	1	24	183	\$ 7,913,861	0
Palmerton Borough	1877	30	5	134	2	37	2085	\$ 84,176,625	11
Parryville Borough	182	7	10	6	0	18	223	\$ 7,764,502	3
Penn Forest Township	16	0	3	1	0	2	22	\$ 1,079,565	1
Summit Hill Borough	1203	128	3	46	3	50	1433	\$ 39,035,328	7
Towamensing Township	1609	3	101*	31	0	78	1822	\$ 94,507,831	10
Weatherly Borough	862	50	13	36	2	40	1003	\$ 37,945,712	6

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Table 4.3.4-2: Number of non-vacant parcels and critical facilities in the Landslide Hazard Area (combination-high landslide zone).									
MUNICIPALITY	SINGLE-FAMILY PARCELS	MULTI-FAMILY PARCELS	MOBILE HOME PARCELS	COMMERCIAL PARCELS	INDUSTRIAL PARCELS	OTHER PARCELS	TOTAL NON-VACANT PARCELS	TOTAL BUILDING ASSESSMENT	TOTAL # OF CRITICAL FACILITIES IN LANDSLIDE COMBO-HIGH
Weissport Borough	128	6	2	13	0	5	154	\$ 4,900,623	3
TOTAL	16,721	500	524	860	50	782	19,437	\$770,476,329	101
* One or more of the vulnerable mobile home parcels in this jurisdiction is a mobile home park which has multiple mobile homes located on it.									

4.3.5. Wildfire

4.3.5.1. 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 more than 70 percent of Carbon County is covered by either Northern Hardwood or Mixed Oak forests and state natural areas make up over 20% of the County's total land area (see Figure 2.4-2 for land cover illustration), the potential geographic extent of wildfires is quite large. 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. Most fires are caused by human carelessness or negligence, especially debris burning. However, some are precipitated by lightning strikes and, in rare instances, spontaneous combustion.

4.3.5.2. Range of Magnitude

Wildfire events can range from small fires that can be managed by local firefighters to large fires impacting many acres of land. Large events may require evacuation from one or more communities and necessitate regional or national firefighting support. The impact of a severe wildfire can be devastating. A wildfire has the potential to kill people, livestock, fish and wildlife. They often destroy property, valuable timber, forage and recreational and scenic values. In addition to the risk wildfires pose to the general public and 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.

The impact of a severe wildfire can be devastating. While some fires are not human-caused and are part of natural succession processes, a wildfire can kill people, livestock, fish and wildlife. They often destroy property, valuable timber, forage and recreational and scenic values. 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 may 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.

4.3.5.3. Past Occurrence

Anecdotal accounts indicate that Carbon County has had a long history of wildfires. From the 1860s until the 1960s, many acres of the County burned yearly. The cause of these wildfires was usually either the engine sparks or overheated breaks of railroads (Carbon County Comprehensive Plan, 1998).

More recently, there have been 276 wildfire events reported to the Pennsylvania Department of Conservation and Natural Resources (DCNR) – Bureau of Forestry from 2002-2008 as show in Table 4.3.5-1 below. While this list 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 Carbon County. Carbon County ranks third in the total number of wildfires per county in Pennsylvania during this time period. Of all the jurisdictions, Lower Towamensing and Penn Forest Townships have experienced the most wildfires with 37 each. However, the Lehigh Township has experienced the largest number of acres burned as a result of wildfires. 2008 saw the most reported wildfire events at 68, but the largest number of acres burned in 2006, when over 316 acres burned.

YEAR	MUNICIPALITY	AREA (acres)	YEAR	MUNICIPALITY	AREA (acres)
2002	Summit Hill Borough	0.10	2006	Nesquehoning Borough	2.00
2002	Mahoning Township	4.00	2006	Towamensing Township	0.50
2002	Lansford Borough	0.10	2006	Penn Forest Township	1.00
2002	Penn Forest Township	0.10	2006	Mahoning Township	15.50
2002	Lower Towamensing Township	0.75	2006	Lausanne Township	0.50
2002	Weatherly Borough	0.25	2006	Jim Thorpe Borough	0.50
2002	Mahoning Township	0.25	2006	Lower Towamensing Township	0.25
2002	Packer Township	0.25	2006	Nesquehoning Borough	0.25
2002	Penn Forest Township	0.75	2006	Mahoning Township	0.75
2002	Packer Township	0.25	2006	Packer Township	0.13
2002	East Penn Township	0.25	2006	East Penn Township	0.10
2002	East Penn Township	0.10	2006	East Penn Township	0.13
2002	Nesquehoning Borough	0.10	2006	Towamensing Township	0.13
2002	Lausanne Township	0.50	2006	Bowmanstown Borough	1.80
2002	Jim Thorpe Borough	0.10	2006	Nesquehoning Borough	17.75
2002	Jim Thorpe Borough	0.75	2006	Mahoning Township	0.13
2002	Franklin Township	0.10	2006	Penn Forest Township	0.13
2002	Nesquehoning Borough	3.50	2006	Summit Hill Borough	2.00
2002	Packer Township	2.00	2006	Towamensing Township	2.75
2002	Jim Thorpe Borough	2.50	2006	Kidder Township	0.13
2002	Nesquehoning Borough	0.10	2006	Banks Township	0.13

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Table 4.3.5-1: List of wildfire events reported in Carbon County from 2002-2008

YEAR	MUNICIPALITY	AREA (acres)	YEAR	MUNICIPALITY	AREA (acres)
2002	Penn Forest Township	0.10	2006	Lehigh Township	0.13
2002	Palmerton Borough	0.10	2006	Nesquehoning Borough	0.13
2002	Kidder Township	0.10	2006	Lehigh Township	250.00
2002	Weatherly Borough	1.50	2006	Weatherly Borough	0.13
2002	East Penn Township	0.10	2006	Kidder Township	0.06
2002	Lower Towamensing Township	0.10	2006	Kidder Township	0.06
2002	Lower Towamensing Township	1.00	2006	Mahoning Township	0.13
2002	Lower Towamensing Township	2.00	2006	Franklin Township	0.13
2002	Mahoning Township	0.10	2006	Penn Forest Township	0.13
2002	Kidder Township	2.00	2006	Mahoning Township	0.13
2002	Kidder Township	0.10	2006	Packer Township	3.50
2002	Lower Towamensing Township	0.10	2006	Lehigh Township	10.00
2002	Mahoning Township	0.10	2007	East Penn Township	0.25
2002	Penn Forest Township	0.50	2007	Mahoning Township	1.00
2003	Penn Forest Township	0.75	2007	East Penn Township	0.25
2003	Mahoning Township	5.00	2007	Lehigh Township	0.25
2003	East Penn Township	0.25	2007	Towamensing Township	0.32
2003	Lower Towamensing Township	4.90	2007	Kidder Township	0.32
2003	Franklin Township	1.50	2007	Towamensing Township	0.75
2003	Lower Towamensing Township	1.20	2007	Jim Thorpe Borough	0.12
2003	Summit Hill Borough	0.75	2007	Kidder Township	0.12
2003	Penn Forest Township	0.50	2007	Penn Forest Township	0.12
2003	Kidder Township	1.50	2007	Summit Hill Borough	6.00
2003	Beaver Meadows Borough	0.01	2007	Weatherly Borough	0.25
2003	Banks Township	0.02	2007	Jim Thorpe Borough	0.12
2003	Lower Towamensing Township	0.10	2007	Kidder Township	0.25
2003	Penn Forest Township	1.00	2007	Jim Thorpe Borough	0.12
2003	Towamensing Township	0.10	2007	Franklin Township	1.00
2003	Palmerton Borough	0.10	2007	Franklin Township	0.75
2003	Banks Township	0.10	2007	Penn Forest Township	0.12
2003	Penn Forest Township	0.10	2007	Penn Forest Township	0.12
2004	Kidder Township	0.10	2007	Lehigh Township	12.00

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Table 4.3.5-1: List of wildfire events reported in Carbon County from 2002-2008

YEAR	MUNICIPALITY	AREA (acres)	YEAR	MUNICIPALITY	AREA (acres)
2004	Lower Towamensing Township	0.25	2007	Penn Forest Township	0.12
2004	Kidder Township	0.25	2007	Penn Forest Township	0.25
2004	Lehigh Township	0.10	2007	Penn Forest Township	0.12
2004	Kidder Township	0.10	2007	Penn Forest Township	0.12
2004	Penn Forest Township	0.10	2007	Banks Township	0.25
2004	Lower Towamensing Township	0.10	2007	Franklin Township	0.12
2004	Nesquehoning Borough	0.10	2007	Kidder Township	0.25
2004	Kidder Township	0.50	2007	Penn Forest Township	0.12
2004	Penn Forest Township	0.10	2007	Penn Forest Township	0.06
2004	Kidder Township	1.50	2007	Summit Hill Borough	0.25
2004	Kidder Township	0.20	2007	Lower Towamensing Township	0.50
2004	Jim Thorpe Borough	0.02	2007	Lansford Borough	0.25
2004	Penn Forest Township	0.10	2007	Lower Towamensing Township	0.07
2004	Palmerton Borough	0.10	2007	Packer Township	0.00
2004	Towamensing Township	0.25	2007	Nesquehoning Borough	0.50
2004	Packer Township	0.55	2007	Lansford Borough	0.25
2004	Towamensing Township	0.25	2007	Jim Thorpe Borough	32.00
2004	Lehigh Township	0.25	2008	Lower Towamensing Township	0.25
2004	Penn Forest Township	0.10	2008	Lower Towamensing Township	0.25
2004	Lower Towamensing Township	2.00	2008	Lower Towamensing Township	5.00
2005	Towamensing Township	0.10	2008	Lower Towamensing Township	0.50
2005	Lehigh Township	0.10	2008	Kidder Township	0.25
2005	Penn Forest Township	0.25	2008	Lehigh Township	0.60
2005	Lehigh Township	0.50	2008	Mahoning Township	0.75
2005	Mahoning Township	12.00	2008	Lower Towamensing Township	0.50
2005	Franklin Township	0.75	2008	Lower Towamensing Township	0.75
2005	Franklin Township	0.25	2008	Lower Towamensing Township	0.75
2005	Towamensing Township	0.24	2008	Lower Towamensing Township	0.10
2005	Mahoning Township	0.75	2008	Lausanne Township	8.00
2005	Kidder Township	0.13	2008	Lansford Borough	0.25
2005	Banks Township	0.75	2008	Franklin Township	0.10

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Table 4.3.5-1: List of wildfire events reported in Carbon County from 2002-2008

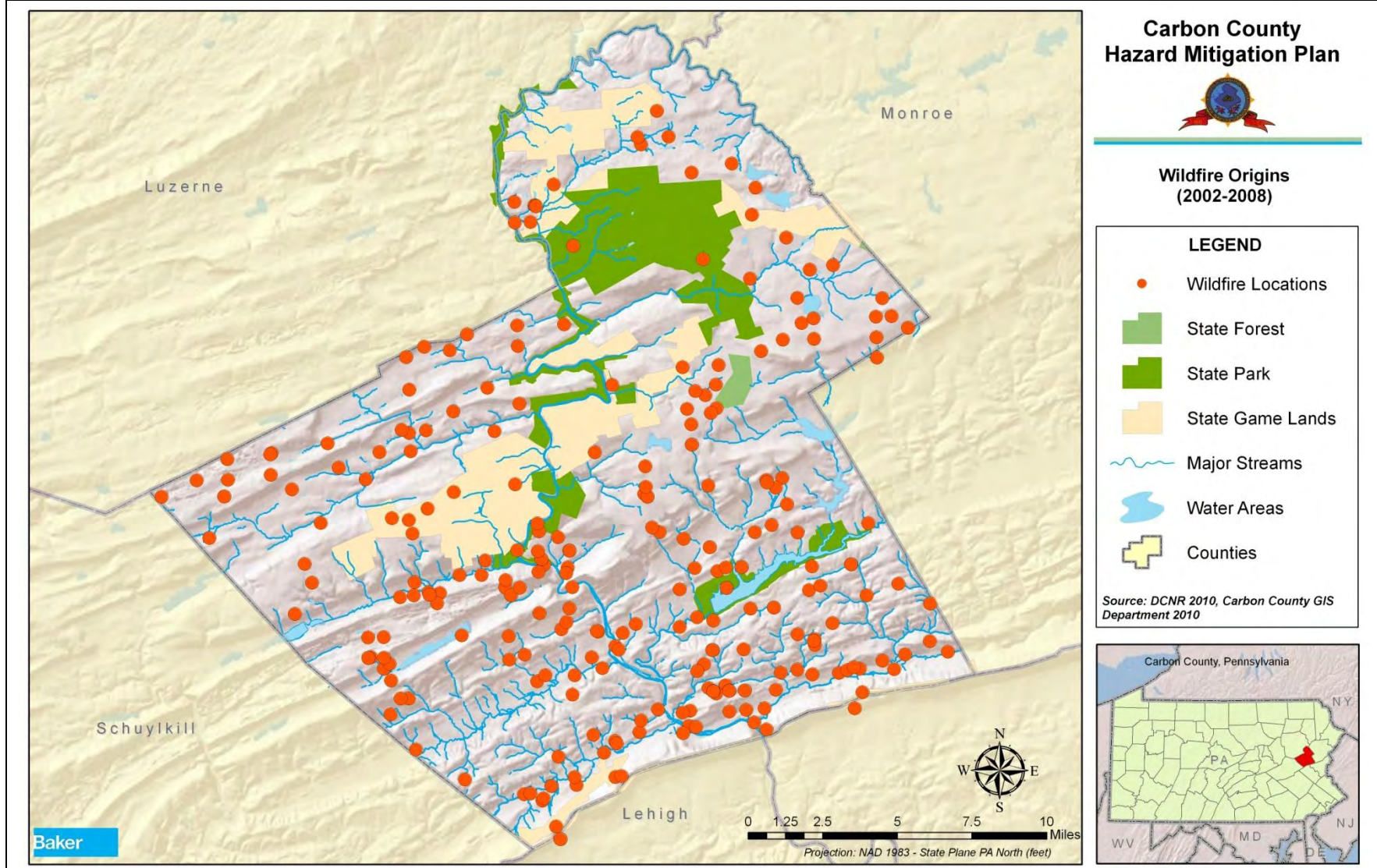
YEAR	MUNICIPALITY	AREA (acres)	YEAR	MUNICIPALITY	AREA (acres)
2005	Nesquehoning Borough	0.75	2008	Kidder Township	0.10
2005	Palmerton Borough	0.01	2008	East Penn Township	0.50
2005	Franklin Township	0.25	2008	East Penn Township	0.10
2005	Jim Thorpe Borough	0.25	2008	Lower Towamensing Township	7.50
2005	Penn Forest Township	0.13	2008	Lansford Borough	0.00
2005	Franklin Township	0.25	2008	Penn Forest Township	0.50
2005	Lower Towamensing Township	0.75	2008	Weatherly Borough	0.50
2005	Weatherly Borough	0.13	2008	Parryville Borough	0.50
2005	Penn Forest Township	0.13	2008	Franklin Township	0.25
2005	Nesquehoning Borough	16.00	2008	Franklin Township	0.25
2005	Penn Forest Township	0.25	2008	Franklin Township	0.10
2005	Lehigh Township	1.00	2008	Lower Towamensing Township	0.50
2005	Summit Hill Borough	1.00	2008	Jim Thorpe Borough	1.00
2005	Towamensing Township	0.25	2008	Lower Towamensing Township	10.00
2005	East Penn Township	0.25	2008	Kidder Township	0.10
2005	East Penn Township	0.10	2008	East Penn Township	0.50
2005	Jim Thorpe Borough	0.75	2008	East Penn Township	0.10
2005	Penn Forest Township	0.25	2008	East Penn Township	0.75
2005	Jim Thorpe Borough	0.50	2008	Towamensing Township	0.25
2005	Packer Township	0.75	2008	Penn Forest Township	0.50
2005	Franklin Township	0.10	2008	Towamensing Township	0.75
2005	Nesquehoning Borough	0.25	2008	Towamensing Township	0.25
2005	Kidder Township	0.10	2008	Towamensing Township	0.50
2005	Lower Towamensing Township	0.10	2008	Towamensing Township	0.10
2005	Lower Towamensing Township	0.10	2008	Penn Forest Township	0.50
2005	Jim Thorpe Borough	0.10	2008	Penn Forest Township	1.00
2005	Jim Thorpe Borough	0.15	2008	Mahoning Township	0.25
2005	East Penn Township	0.10	2008	Banks Township	0.75
2005	Kidder Township	0.50	2008	Kidder Township	0.25
2005	East Penn Township	0.10	2008	Towamensing Township	0.10
2005	East Penn Township	0.10	2008	Lansford Borough	0.50
2005	East Penn Township	0.10	2008	Banks Township	0.50
2005	Lehigh Township	0.10	2008	Penn Forest Township	0.25
2005	Mahoning Township	0.10	2008	Franklin Township	0.25

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Table 4.3.5-1: List of wildfire events reported in Carbon County from 2002-2008					
YEAR	MUNICIPALITY	AREA (acres)	YEAR	MUNICIPALITY	AREA (acres)
2005	Franklin Township	0.10	2008	Penn Forest Township	0.10
2005	East Penn Township	0.10	2008	Franklin Township	0.25
2005	Lower Towamensing Township	0.10	2008	Kidder Township	0.50
2005	Lower Towamensing Township	0.10	2008	Penn Forest Township	1.00
2005	Lower Towamensing Township	1.60	2008	Palmerton Borough	0.10
2005	Nesquehoning Borough	0.10	2008	Lehigh Township	0.25
2005	Lausanne Township	6.75	2008	Jim Thorpe Borough	0.50
2006	Summit Hill Borough	0.13	2008	Lausanne Township	2.00
2006	Jim Thorpe Borough	0.13	2008	Beaver Meadows Borough	0.10
2006	Penn Forest Township	0.13	2008	Summit Hill Borough	0.50
2006	Lower Towamensing Township	1.00	2008	Towamensing Township	0.50
2006	Lower Towamensing Township	0.13	2008	Lower Towamensing Township	0.50
2006	Mahoning Township	1.00	2008	Palmerton Borough	0.25
2006	Jim Thorpe Borough	0.25	2008	Banks Township	0.25
2006	Towamensing Township	0.25	2008	Beaver Meadows Borough	0.10
2006	Packer Township	0.50	2008	Lansford Borough	0.10
2006	Lower Towamensing Township	0.25	2008	Packer Township	0.75
2006	Summit Hill Borough	0.13	2008	Lower Towamensing Township	0.10
2006	Franklin Township	0.13	2008	Nesquehoning Borough	0.50
2006	Nesquehoning Borough	1.00	2008	Lower Towamensing Township	0.25

Figure 4.3.5-1 maps the origins of the wildfire events listed in the tables above. The map shows that previous occurrences of wildfires have occurred throughout the entire County instead of concentrated in a single jurisdiction or area of the County.

Figure 4.3.5-1: Wildfire origins in Carbon County between 2002 and 2008. (DCNR-BOF 2009)



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4.3.5.4. *Future Occurrence*

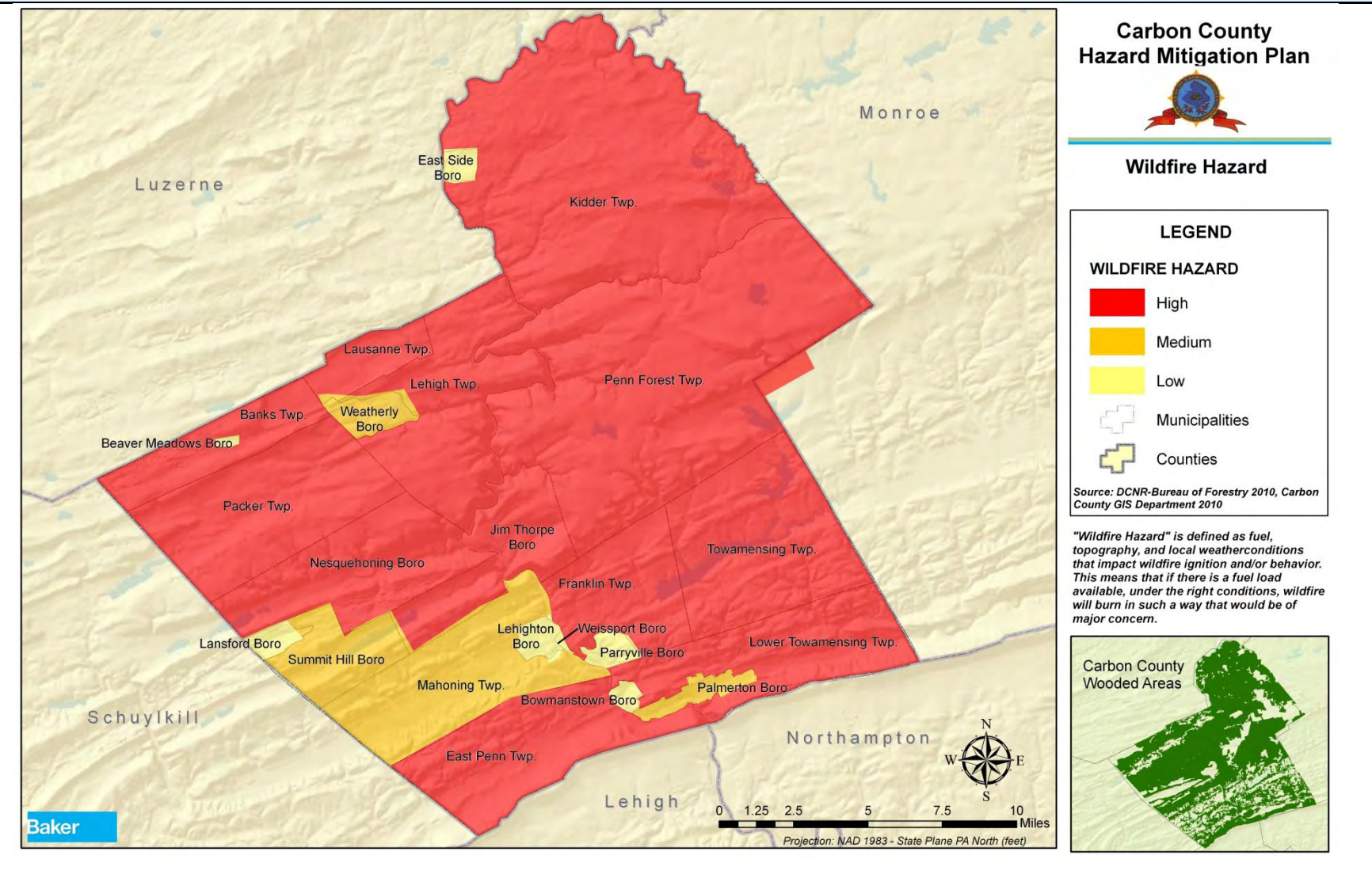
Over the five year period between 2003 and 2007, 18,132 acres of state forest have burned in Pennsylvania and at least 532 acres of land have burned in Carbon County. Previous events indicate that wildfire events will continue to occur yearly. Weather conditions like drought can increase the likelihood 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 Carbon County is *highly likely* in any given year. However, the likelihood of one of those fires attaining significant size and intensity is unpredictable and highly dependent on environmental conditions and firefighting response.

4.3.5.5. *Vulnerability Assessment*

The Pennsylvania Bureau of Forestry has conducted an independent wildfire hazard risk assessment for the various municipalities across Carbon County. Results of that assessment are shown in Figure 4.3.5-2. *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, the majority of municipalities within Carbon County have a *high wildfire hazard* potential. Weatherly Borough, Summit Hill Borough, Mahoning Borough, and Palmerton Borough are considered to have *medium wildfire hazard potential*. East Side Borough, Beaver Meadows Borough, Lansford Borough, Lehighton Borough, Weissport Borough, Parryville Borough, and Bowmanstown Borough are considered to have *low wildfire hazard potential*.

Figure 4.3.9-2: Wildfire hazard potential per municipality in Carbon County.



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The vulnerability assessment for wildfires is based on the aforementioned wildfire hazard classification. For this assessment, all parcels and critical facilities that are located within the jurisdictions identified by DCNR-Bureau of Forestry as being “High-Hazard” are considered vulnerable to wildfire events. Table 4.3.5-2 illustrates the vulnerable parcels by municipality and by type. Single-family parcels are the most vulnerable to wildfire hazards, with nearly 18,000 vulnerable parcels located throughout the county. Parcels in the “OTHER” category are also vulnerable to wildfire events. This category incorporates government, religious, and other institutional parcels as well as preserved farms. Penn Forest Township has the largest number of vulnerable parcels with 6,578 parcels located in the wildfire high-hazard area. Lausanne has the fewest vulnerable parcels with 139. Using the building assessment value of the vulnerable parcels, potential losses are estimated to approach \$957.7 million dollars.

Approximately 57% of all critical facilities are located in areas that are vulnerable to wildfire hazards. Jim Thorpe and Kidder Township have the highest concentration of vulnerable critical facilities with fourteen and fifteen, respectively. Of the municipalities with vulnerable critical facilities, Lausanne Township has the fewest with only three that are vulnerable to wildfires. For a complete list of critical facilities and their vulnerability to wildfire hazards, please see **Appendix E**.

Table 4.3.5-2: Number of parcels and critical facilities in the Wildfire Hazard Area.

MUNICIPALITY	SINGLE-FAMILY PARCELS	MULTI-FAMILY PARCELS	MOBILE HOME PARCELS	COMMERCIAL PARCELS	INDUSTRIAL PARCELS	OTHER PARCELS	TOTAL PARCELS	TOTAL BUILDING ASSESSMENT	TOTAL # CRITICAL FACILITIES IN WILDFIRE HIGH-HAZARD AREA
Banks Township	532	36	8	19	16	9	620	\$17,950,479	3
Beaver Meadows Borough	0	0	0	0	0	0	0	0	0
Bowmanstown Borough	0	0	0	0	0	0	0	0	0
East Penn Township	813	3	70*	19	1	109	1015	\$49,285,568	4
East Side Borough	0	0	0	0	0	0	0	0	0
Franklin Township	1550	5	84*	53	3	45	1740	\$91,784,138	8
Jim Thorpe Borough	2043	36	28	112	1	59	2279	\$88,124,539	14
Kidder Township	1926	7	20	76	3	30	2062	\$146,714,282	15
Lansford Borough	0	0	0	0	0	0	0	0	0
Lausanne Township	103	0	11	3	1	21	139	\$5,471,979	2
Lehigh Township	188	0	24	3	0	31	246	\$8,939,308	3
Lehigh Township	0	0	0	0	0	0	0	0	0
Lower Towamensing Township	1049	9	84*	36	9	60	1247	\$58,143,590	4
Mahoning Township	0	0	0	0	0	0	0	0	0
Nesquehoning Borough	1395	42	4	57	14	34	1546	\$57,778,482	11
Packer Township	353	2	36	5	1	64	461	\$19,522,002	2
Palmerton Borough	0	0	0	0	0	0	0	0	0
Parryville Borough	0	0	0	0	0	0	0	0	0

Table 4.3.5-2: Number of parcels and critical facilities in the Wildfire Hazard Area.

MUNICIPALITY	SINGLE-FAMILY PARCELS	MULTI-FAMILY PARCELS	MOBILE HOME PARCELS	COMMERCIAL PARCELS	INDUSTRIAL PARCELS	OTHER PARCELS	TOTAL PARCELS	TOTAL BUILDING ASSESSMENT	TOTAL # CRITICAL FACILITIES IN WILDFIRE HIGH-HAZARD AREA
Penn Forest Township	6358	3	90	69	2	56	6578	\$317,219,998	11
Summit Hill Borough	0	0	0	0	0	0	0	0	0
Towamensing Township	1651	3	101*	31	0	79	1865	\$96,723,437	10
Weatherly Borough	0	0	0	0	0	0	0	0	0
Weissport Borough	0	0	0	0	0	0	0	0	0
TOTAL	17,961	146	560	483	51	597	19,798	\$957,657,802	87
* At least one of the vulnerable mobile home parcels in these jurisdictions is a mobile home park which has multiple mobile homes located on it.									

The CCEMA estimates that the numerous and ever-expanding private developments that are being built in heavily wooded areas, especially in Kidder and Penn Forest Townships, present a higher risk and vulnerability to residents and property. Fires that occur in these areas are especially hard to extinguish because there is no municipal water supply with which to fight fires in these outlying areas.

At the same time, though, Carbon County is Pennsylvania's most active jurisdiction in the Firewise Program. This program addresses the risk of homes in the wildland/urban interface to wildfire. It encourages building, landscape, and design standards that decrease the risk of ignition for homes in fire-prone areas. The County hosts four of Pennsylvania's six Firewise Communities:

- Bear Creek Lakes, Jim Thorpe, 2003
- Hickory Run Land & Homeowners Association, Jim Thorpe, 2004
- Penn Forest Streams, Jim Thorpe, 2003
- Towamensing Trails, Albrightsville, 2009

In addition, East Penn Township, Jim Thorpe Borough, and Kidder Township are interested in becoming Firewise Communities (See Action 63 in the Mitigation Strategy).

4.3.6. Winter Storm

4.3.6.1. Location and Extent

Winter storms are regional events. Every county in the Commonwealth is subject to severe winter storms, including Carbon.

Within Carbon County there are slight variations in the average amount of snowfall that is received throughout different parts of the County because of terrain differences. Generally, the average annual snowfall in the County increases from south to north (see Figure 4.3.6-1).

4.3.6.2. Range of Magnitude

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

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

- **Heavy Snowstorm:** Accumulations of four inches or more in a six-hour period, or six inches or more in a twelve-hour period.

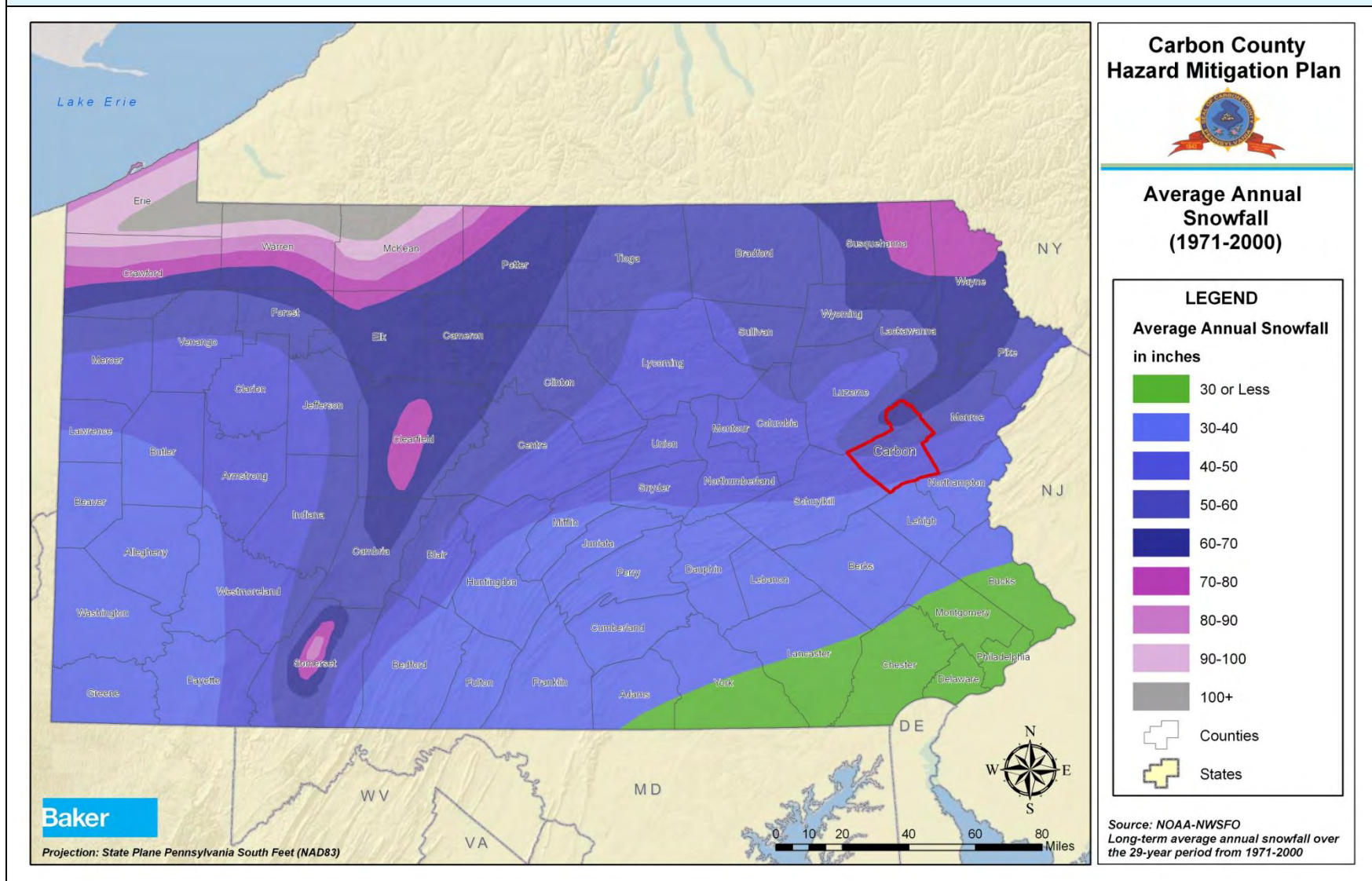
- **Sleet Storm:** Significant accumulations of solid pellets which form from the freezing of raindrops or partially melted snowflakes causing slippery surfaces posing hazards to pedestrians and motorists.
- **Ice Storm:** Significant accumulations of rain or drizzle freezing on objects (trees, power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

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

Figure 4.3.6-1 shows mean annual snowfall in Carbon County to be between 40 and 70+ inches. Five of the seventeen Presidential Disaster and Emergency Declarations affecting Carbon have been in response to hazard events related to winter storms (see Table 4.2-1). In addition to the events described above, other winter storm events, including those associated with Disaster Declarations, are listed in **Appendix G**.

The worst case scenario of a winter storm in Carbon County occurred on January 5, 2005. A major winter storm hit Carbon County and a state of emergency was declared for the Carbon and Monroe Counties. Heavy ice build-up resulted in power outages and nearly three-quarters of the County was without power at one point. Downed trees prevented work crews and emergency responders from getting to certain areas for several days to a week (CCEMA, 2009). The County Emergency Operations Center was activated and coordinated shelters, essential travel, and evacuations.

Figure 4.3.6-1: Mean Annual Snowfall for Pennsylvania and Carbon County (NOAA –NWSFO).



4.3.6.3. *Past Occurrence*

Carbon County and the Commonwealth of Pennsylvania have a long history of severe winter weather. Significant winter storm events that have affected Carbon County since 1994 are listed in **Appendix G – Carbon County Winter Storms**. The NCDC data on past occurrence for winter storm events since 1994 is the only comprehensive list of data available for the county aside from information from past disaster declarations. Many of the winter storms have been localized storms that have only affected Carbon County and Monroe County. This is because of the generally higher elevations and terrain of these two counties in the Pocono Mountain region of the Commonwealth. Prior to 1994, the County experienced significant winter storms in 1972, 1977, 1978, and 1993 (CCEMA, 2009).

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

One of these devastating winter storms occurred in early January 1994 with record snowfall depths in many areas of the Commonwealth, strong winds, and sleet/freezing rains. Numerous storm-related power outages were reported and as many as 600,000 residents were without electricity, in some cases for several days at a time. A ravaging ice storm followed which closed major arterial roads and downed trees and power lines. Utility crews from a five-state area were called to assist in power restoration repairs. Officials from PPL Corporation stated that this was the worst winter storm in the history of the company; related damage-repair costs exceeded \$5,000,000.

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

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

4.3.6.4. *Future Occurrence*

Winter storms are a regular, annual occurrence in Carbon County and should be considered *highly likely*. Approximately thirty-five winter storm events occur across Pennsylvania and about 16 occur in Carbon County annually. Table 4.3.6-2 shows the probability of receiving

measurable snowfall by month in Carbon County. These probabilities are based on data collected over a minimum of 22 years.

Table 4.3.6-1: Probability of Measurable Snowfall in Carbon County by Snow Station (NCDC, 2007).			
MONTH	PROBABILITY (%)		
	Kresgeville 2 W Station	Lehighton Station	Palmerton Station
January	100	100	97.1
February	100	97.8	98.6
March	72.7	83.7	84.3
April	8.7	16	27.6
May	0	0	0
June	0	0	0
July	0	0	0
August	0	0	0
September	0	0	0
October	0	0	2.7
November	48	25	54.8
December	100	79.6	88.2

4.3.6.5. Vulnerability Assessment

Based on the information available, all communities in Carbon County are essentially equally vulnerable to the direct impacts of winter storms. Residents of the mountainous areas of the County may be more susceptible, especially when emergency medical assistance is required. In addition, some rural areas of the County are susceptible to isolation caused by winter storms including: Lehigh, Lower Towamensing, Kidder, and Penn Forest Townships. Kidder and Penn Forest Townships have heavily wooded private developments which make emergency response to the areas difficult when roadways blocked by downed trees and wires (CCEMA, 2009).

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

4.3.7. Dam Failure

4.3.7.1. Location and Extent

The Dam Failure profile can be found in **Appendix H**.

4.3.7.2. Range of Magnitude

The Dam Failure profile can be found in **Appendix H**.

4.3.7.3. Past Occurrence

The Dam Failure profile can be found in **Appendix H**.

4.3.7.4. Future Occurrence

The Dam Failure profile can be found in **Appendix H**.

4.3.7.5. Vulnerability Assessment

The Dam Failure profile can be found in **Appendix H**.

4.3.8. Disorientation

4.3.8.1. Location and Extent

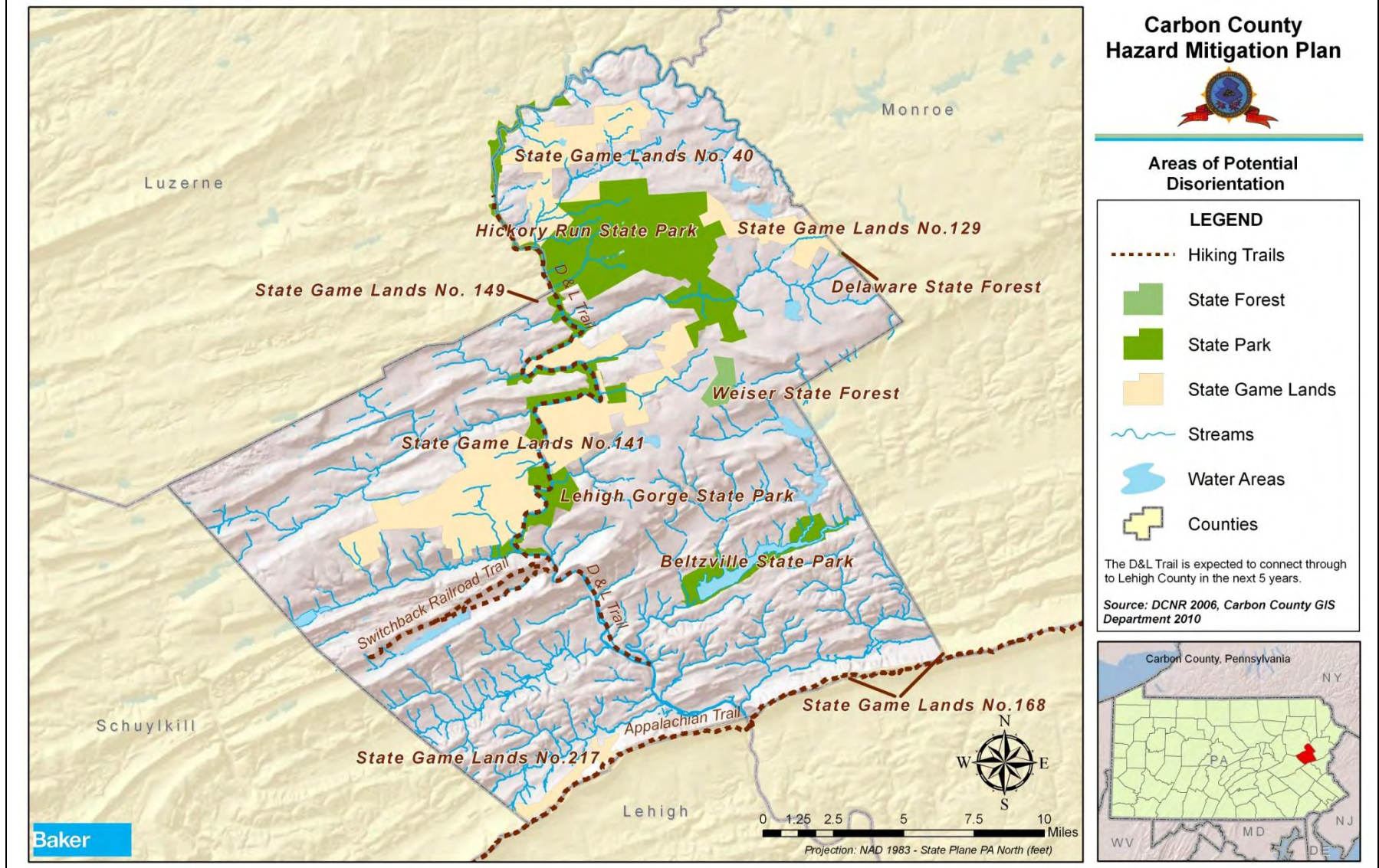
Large numbers of people are attracted to Pennsylvania's rural areas for recreational purposes and as a result people can become lost or trapped in remote and rugged wilderness areas. Search and rescue may be required for people who suffer from medical problems or injuries and those who become accidentally or intentionally disoriented. Search and rescue efforts are often focused in and around state forest and state park lands (DCNR 2009).

Carbon County is largely rural and heavily wooded with steep mountains and numerous rivers and streams. Popular outdoor recreational activities include biking, rock-climbing, hiking hunting, fishing, boating. Nearly 75 percent of Carbon County's land area is forested and includes 80 square miles of the County designated as state game land, state forest, national forest and state park land as shown in Figure 4.3.8-1. A section of the Appalachian Trail also passes through the County, specifically through East Penn Township and Palmerton Borough.

4.3.8.2. Range of Magnitude

A wide variety of factors can contribute to outcome of a search and rescue mission but the most common dangers associated with disorientation in are lack of food, water, shelter and medical care. Carbon County generally has a constant abundance of water and during the warmer summer months, shelter is less of a necessity than during winter months when extreme temperatures can pose a more serious threat. Age, physical fitness, and familiarity with the area can also have a bearing on the outcome. The worst case scenario associated with disorientation involves serious injury or death.

Figure 4.3.8-1: Carbon County areas potentially vulnerable to disorientation.



4.3.8.3. *Past Occurrence*

Each year several people become lost in Carbon County's wilderness areas. Associated Search and Rescue (SAR) operations use resources such as man-hours and equipment. Annual reports by PEMA state that there have been 58 SAR operations in the County between January 2000 and June 2009 (CEEMA, 2009). According to available information no deaths have reported as a result of disorientation in the County.

While a detailed, comprehensive list of incidents involving disorientation and SAR is not available, Valley Search & Rescue, a volunteer SAR organization has made available a call history that includes numerous events in Carbon County between 2005 and 2010. These events are listed below in Table 4.3.8-1.

Table 4.3.8-1: SAR events in Carbon County between 2005 and 2010 involving Valley Search & Rescue (VSAR, 2010).		
LOCATION	DATE	VSAR DESCRIPTION
Palmerton Borough	5/9/2010	Missing 20 year old male last seen on an ATV. Resources included equipment trailer, ATV, 4 K-9 and 13 support personnel. Subject found in good health.
Indian Mountain Lakes	10/14/2009	Two missing teenagers. Resources included 1 K-9 and 2 support personnel.
Indian Mountain	10/14/2010	Two missing teenagers. Resources included full team dispatch: multiple support personnel and K-9 units and command trailer.
Hickory Run State Park	9/30/2008	Subject located.
Jim Thorpe Borough	9/25/2008	Missing 57 year old male camper. Resources included 2 support personnel and 4 standby.
Towamensing Township	9/19/2008	Missing 4 year old male. Resources included 6 support personnel.
Franklin Township, Beltzville Lake	3/9/2008	Missing 11 year old male.
Weatherly Borough, Eurana Park	2/25/2008	Missing 52 year old male, 5 days. Resources included 6 support personnel and K-9. Subject found.
Jim Thorpe Borough	2/22/2008	Unknown subject data. Resources included 4 support personnel.
Mahoning Township, Summit Hill	1/4/2008	Missing 40 year old male. Unknown psychological disorder. Resources included 6 support personnel.
Jim Thorpe, Mauch Chunk Lake	7/12/2007	Missing male hiker, 10 days. Resources included 2 support personnel.
Nesquehoning Borough	7/25/2005	Missing young male hiker, possible injury. Resources included 4 support personnel

4.3.8.4. *Future Occurrence*

It is impossible to predict when and where disorientation may occur. During times when activities such as hunting, hiking, biking and camping increase, so does the likelihood of individuals becoming disoriented. Carbon County continues to gain popularity as a tourist and recreational destination and therefore the probability of future occurrence is expected to increase proportionately. Based on available past occurrence data the probability of the County experiencing a disorientation incident is *likely*.

4.3.8.5. *Vulnerability Assessment*

Individuals are most likely to become disorientated in areas of vast, open wilderness. Children and the elderly are more vulnerable to the exposure of elements. Bikers, hunters, hikers and All-terrain vehicle (ATV) riders have been the most common victims of disorientation according to the CCEMA. Many outdoor, recreational activities commonly associated with disorientation take place during the warmer months of spring and summer and pose a somewhat lesser risk because of the average temperature range during these seasons. The most dangerous period to become lost outdoors is during the winter months when heat and shelter are vital. Carbon County often experiences winter storms and temperatures below freezing.

CCEMA estimates that the cost of disorientation and associated SAR is between \$50,000 and \$60,000 each year.

While prevention is the best solution to disorientation, lessening the impacts of this hazard by identifying and quickly locating individuals that have become lost or injured is equally important. There are several resources available on a state and local level for responding to SAR events. The DCNR is the primary coordinator for SAR operations efforts on state lands within Pennsylvania. The agency is responsible for over two million acres of forest land and currently has 140 people trained as search managers and search responders (DCNR, 2009).

Valley Search & Rescue is a volunteer organization based in Lehigh Valley, Pennsylvania just outside Carbon County that provides training and SAR assistance upon request.

The Pennsylvania Search and Rescue Council (PSARC) is made up of representatives from DCNR, PEMA, law enforcement, emergency managers and responders, and others. PSARC sets training and operational standards to SAR teams throughout the Commonwealth in addition to mission response coordination, and providing SAR prevention and response education to local officials and the public (PSARC 2010).

4.3.9. **Nuclear Incidents**

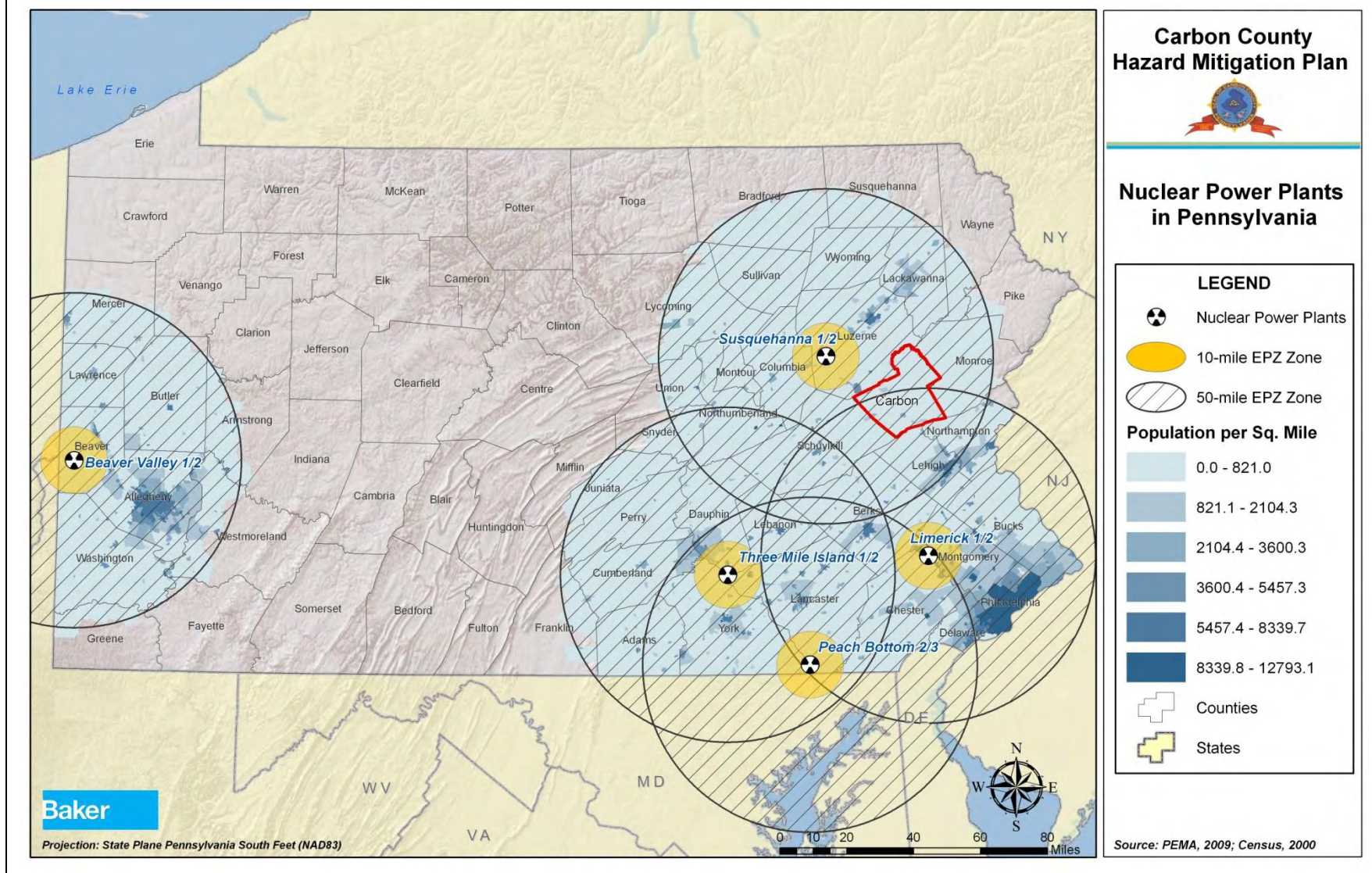
4.3.9.1. *Location and Extent*

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 4.3.9-1, Carbon County is not located within the ten-mile Plume Exposure Pathway EPZ of any nuclear facility. However, it is completely within the fifty-mile Ingestion Exposure Pathway EPZ for the Susquehanna Steam Electric Station, located approximately twenty miles northwest of the County border, in Salem Township, Luzerne County, Pennsylvania. In addition, the bottom portion of the County's land area is located within the Ingestion Exposure Pathway EPZ of the Limerick Generating Station, located approximately forty miles to the southeast in Limerick Township, Montgomery County, PA. The remaining three nuclear plants in Pennsylvania are more than fifty miles away from Carbon 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 Carbon County.

Figure 4.3.9-1: Carbon County's location in relation to the 10-mile and 50-mile EPZs of Pennsylvania Nuclear Power Plants.



4.3.9.2. 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 Carbon 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 Carbon County, include the long-term effects of radioactive contamination in the environment and in agricultural products. Carbon 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 (CCEMA, 2009). 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. Areas underlain by limestone and some types of glacial sediments are particularly susceptible to contamination.

A worst-case scenario for Carbon County would be if a General Emergency occurred at Susquehanna Steam Electric Station that leaked sufficient radiation to create longer-term damage in the form of contaminated water, soil, and food supplies in the County.

4.3.9.3. *Past Occurrence*

To date, Carbon County has not been directly affected by a nuclear incident. 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.

4.3.9.4. *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*.

4.3.9.5. Vulnerability Assessment

Carbon County is located entirely within the Ingestion Pathway EPZ of the Susquehanna Steam Electric Station, and 75% of the County's population is located within the Ingestion Pathway EPZ of the Limerick Generating Station. As a result, the entire County is vulnerable to the contamination effects possible in a nuclear incident.

As stated in Section 4.3.9.2, the County's primary vulnerability to nuclear incidents comes in the form of food, soil, and water contamination. In terms of vulnerable land, the 20,035 acres of farmland held in Carbon County's 207 farms is vulnerable to radiological contamination in a nuclear incident. In 2007, the market value of all agricultural products of these farms exceeded \$8.9 million. Additionally, Carbon County hosts 32,576 acres of what the National Resources Conservation Service (NRCS) considers "Prime Farmland," whether or not this land is currently being used to grow crops, that could become contaminated.

Water contamination is also a concern in nuclear incidents. There are thirteen public water suppliers that operate in or provide water to the County. These include: Beaver Run Water Association, Bethlehem Water Department, Bethlehem Water Authority, Bowmanstown Water Authority, Hazleton City Water Authority, Klein Township Municipal Authority, Jim Thorpe Water Department, Lansford-Coaldale Joint Water Authority, Lehighton Water Authority, Nesquehoning Water Authority, Palmerton Water Authority, Summit Hill Water Authority, and Weatherly Borough Water Authority. These water supplies, coupled with the County's 3,942 domestic drinking water wells, are all vulnerable to the effects of a nuclear incident.

While unlikely that all agricultural products would be lost in the event of a nuclear incident, the County can expect some portion of that \$8.9 million 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. For example, the incident at Three Mile Island occurred in the off-season; as a result, the Pennsylvania Department of Agriculture estimated that agricultural losses for the entire Commonwealth were not more than \$1 million.

4.3.10. Transportation Accident

4.3.10.1. Location and Extent

For the purposes of this plan, transportation accidents are defined as incidents involving highway, air and rail travel. Within Carbon County, there are over 26 miles of turnpike, 288 miles of state and federal highway, 404 miles of secondary and municipal roads, 70 miles of rail line, and 124 bridge in the County (PennDOT, 2009; FHA, 2010). The major transportation networks in Carbon County include Interstates 476 and 80, US Route 209, State Routes 54, 93, 248, 443, 534, 895, 902, 903, and 940 are important for the movement of goods and people (Figure 4.3.8-1). Figure 4.3.8-2 illustrates the average annual daily traffic for Carbon County roads.

There are also several railroads that operate in the County, several of which that transport freight of all types including hazardous materials through the County. The Reading Blue Mountain and Northern Railroad Company operates a line along the Lehigh Gorge and provides

passenger service through Lehigh Gorge Scenic Railway passenger train rides. The Norfolk Southern Railway Company also operates a line that runs through the County from Weatherly Borough, along the Lehigh River to Palmerton. The Chestnut Ridge Railway Company runs a private railway line that begins in Palmerton. The Carbon County Railroad Commission also oversees a short railroad line, the C&S Railroad, which services local industries. There is potential for major accidents on any of these railways

Carbon County has two small airports: the Carbon County Airport Authority (Jake Arner Memorial Airport) located in Mahoning Township and the privately owned Beltsville Airport located in Franklin Township. There is also a Medevac Heliport in Lehigh Township and a PennStar Medical Helicopter stationed at the Carbon County Airport. Furthermore, there are heliports at the DCNR Bureau of Forestry Fire Station in Penn Forest Township and the Blue Mountain Health System Gnadon Huetten Hospital (CCEMA, 2009). A five-mile radius around each airport can be considered a high-risk area since most aviation incidents occur near landing or take-off sites.

4.3.10.2. Range of Magnitude

Significant transportation accidents can result in death or serious injury or extensive property loss or damage. Road and railway accidents in particular have the potential to result in hazardous materials release as well if the accident involves a vehicle carrying hazardous materials.

A worst case scenario for transportation accidents occurred in the County on November 21, 1999 when a bus carrying Penn State students crashed on Interstate 80 in Kidder Township. Over 200 passengers were involved in the accident which resulted in 107 injuries and 2 fatalities.

Figure 4.3.8-1: Carbon County transportation system (ESRI, 2010; Carbon County GIS Department, 2010; URDC, 2010).

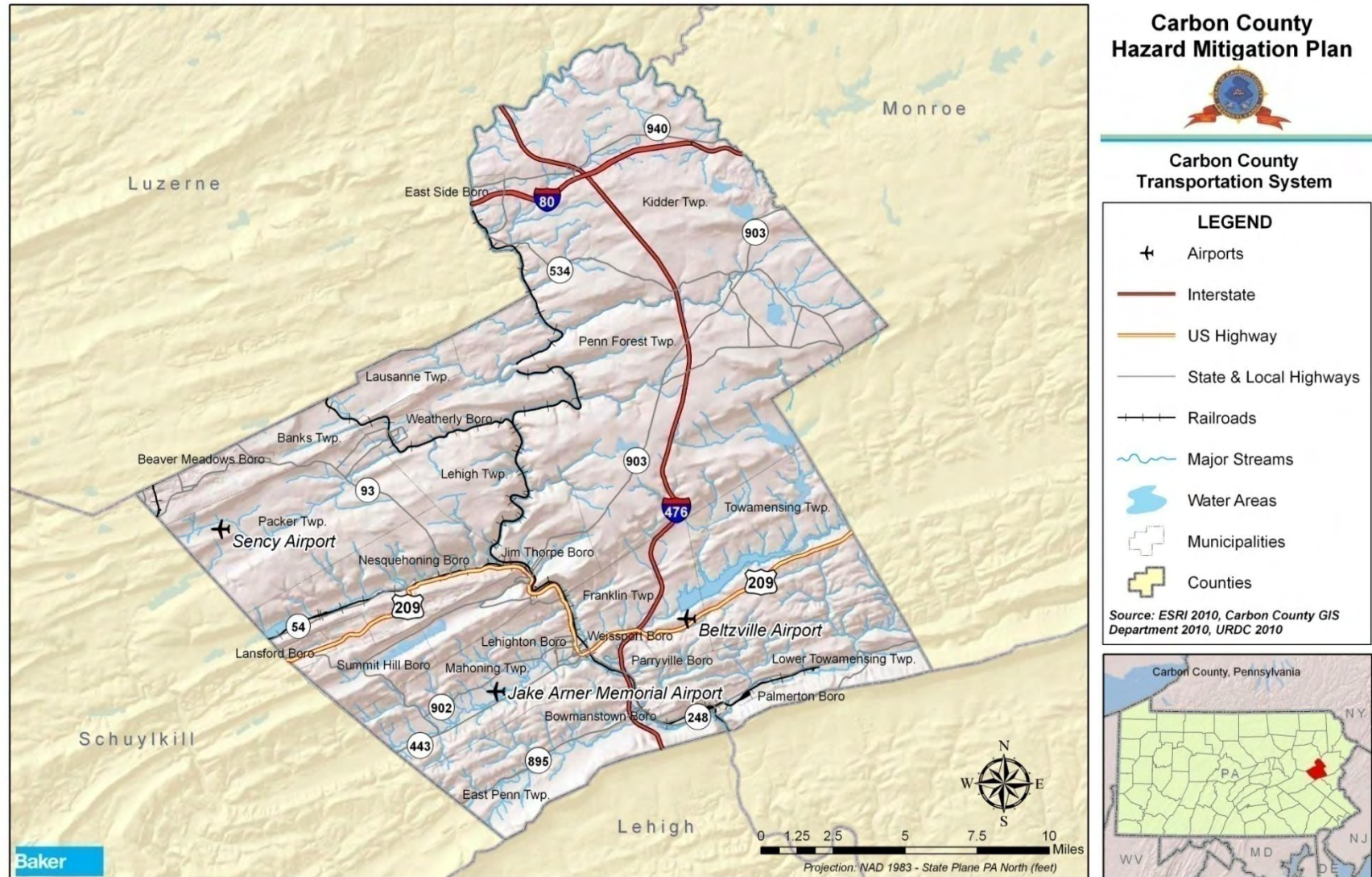
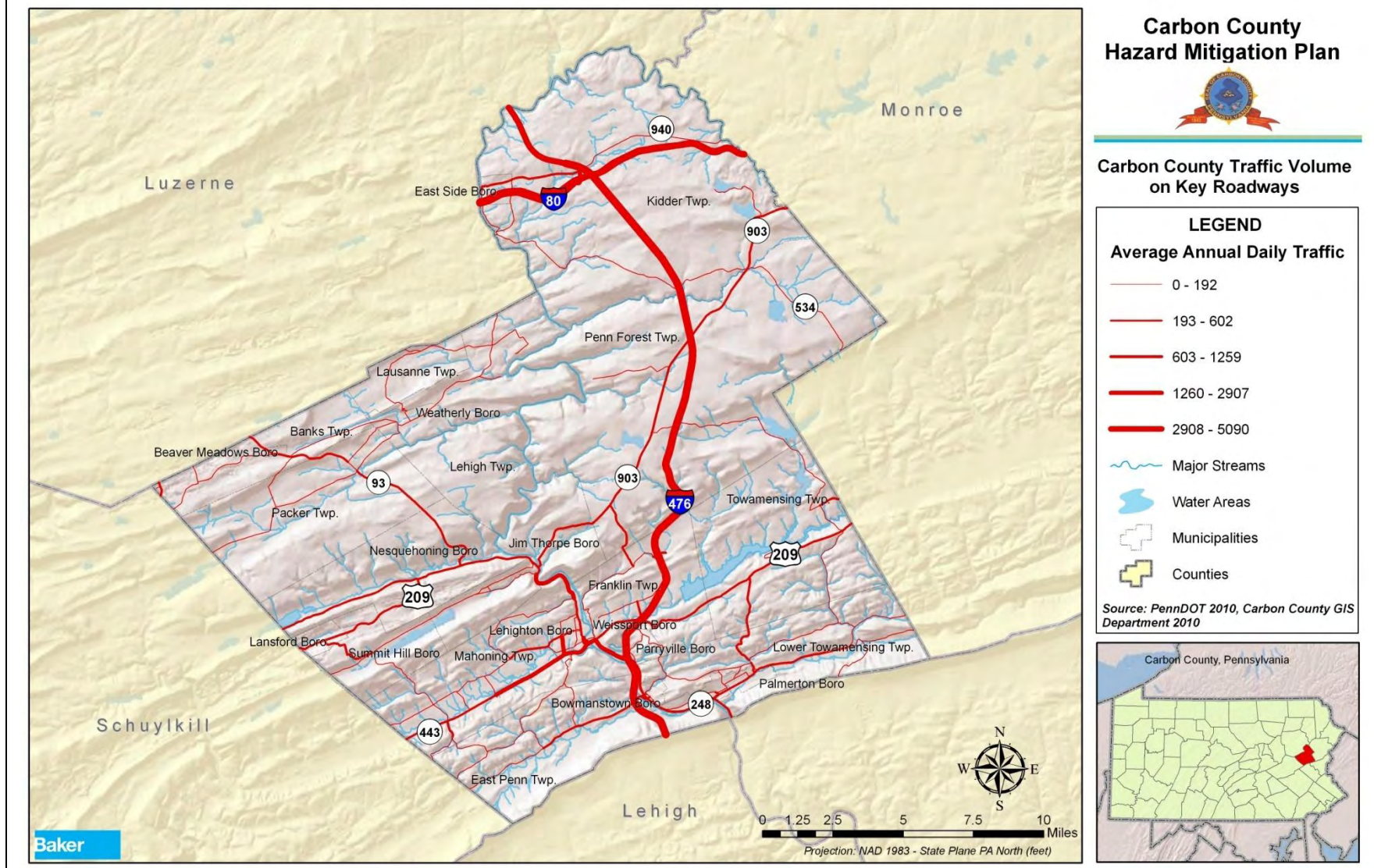


Figure 4.3.8-2: Average annual daily traffic on key roadways in Carbon County (PennDOT, 2010; Carbon County GIS Department, 2010).



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4.3.10.3. Past Occurrence

The most common transportation accidents in the County involve highway incidents involving motor vehicles. The County's most serious transportation concerns involve Interstates 476 and 80 which have the highest average annual daily traffic.

Table 4.3.8.3-1 below summarizes five-year vehicular crash data from 2004-2008 for Carbon County.

Table 4.3.8.3-1: Total number of crashes, traffic deaths, and pedestrian deaths for Carbon County from 2004 – 2008 (PENNDOT, 2008).			
YEAR	TOTAL CRASHES	TOTAL TRAFFIC DEATHS	TOTAL PEDESTRIAN DEATHS
2004	758	13	0
2005	795	14	1
2006	763	17	2
2007	731	13	0
2008	704	16	0

Table 4.3.8.3-2 summarizes transportation accidents of significance that occurred in Carbon County from 1989 to 2008.

Table 4.3.8.3-2: Transportation accidents of significance in Carbon County (CEMA, 2009).	
Date	LOCATION AND DESCRIPTION
1989	Mahoning Township - Small aircraft crash at Carbon County Airport
February 5, 1990	Jim Thorpe - A garbage truck filled to capacity lost control and crashed into a home resulting in two injuries and one fatality
1994	Packer Township - Small aircraft crash occurred near Broad Mount resulting in two fatalities
1996	Penn Forest Township - Emergency landing made by glider pilot
1997	Mahoning Township - Cessna 150 crash due to mechanical and pilot error
November 21, 1999	Kidder Township - Penn State Bus accident on 1-80 results in 2 fatalities and numerous injuries
November 30, 2001	Penn Forest Township - School bus accident resulting in multiple injuries
May 15, 2005	Franklin Township - Bus accident occurred on PA Turnpike resulting in 27 minor injuries
July 12, 2005	Kidder Township - Small aircraft emergency landed on the Turnpike
November 8, 2005	Franklin Township - Small aircraft crashed due to engine failure
December 25, 2005	Nesquehoning - Ice from a tractor trailer traveling on Route 209 hit a vehicle and resulted in one fatality
May 23, 2007	Towamensing Township – Small aircraft crashed near Woods Campground
October 2008	Mahoning Township - A two vehicle accident resulted in three fatalities

There have been several train derailments and incidents in past years with only the railroad equipment and property sustaining damage or loss. There have been no deaths or injuries due to railroad or train incidents.

4.3.10.4. *Future Occurrence*

The County's population has decreased slightly over the last decade so it can be assumed that local traffic has declined slightly as well. However the trucking industry is expected to continue to grow increasing the number of long haul trucks operating in the County on a daily basis. Transportation incidents 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*.

The average rate of aviation accidents nation-wide is 8.47 accidents per 100,000 flight hours. Therefore, the likelihood of an aviation incident in the County is considered low.

4.3.10.5. *Vulnerability Assessment*

According to the 2009 Carbon County Hazard Vulnerability Assessment, major highways in Carbon County where accidents are most likely to occur are:

State Routes:

- 93 – Nesquehoning, Packer Township, Beaver Meadows, Banks Township
- 209 – Passes through the entire County
- 902 – Mahoning Township, Summit Hill
- 903 – Jim Thorpe, Kidder, Penn Forest
- 443 – Lehigh Township, Mahoning Township
- 248 – Franklin Township, Parryville, Bowmanstown, Palmerton
- 895 – East Penn Township

Interstates:

- 476 – Northeast Extension of the PA Turnpike
- 80 – Kidder Township

Like highway incidents, rail incidents can impact populations living near rail lines. These include the following municipalities that have rail lines passing through them: East Side Borough, Kidder Township, Penn Forest Township, Lehigh Township, Weatherly Borough, Lausanne Township, Banks Township, Jim Thorpe Borough, Nesquehoning Borough, Mahoning Township, Franklin Township, Weissport Borough, Parryville Borough, Bowmanstown Borough, East Penn Township, Lower Towamensing Township, Palmerton Borough.

Carbon County is also susceptible to airplane accidents due to the proximity of several International Airports. Carbon County is in the Air Traffic Patterns for landing approaches and take-offs for Lehigh Valley, Wilkes Barre/Scranton and Newark International Airports (CCEMA, 2009).

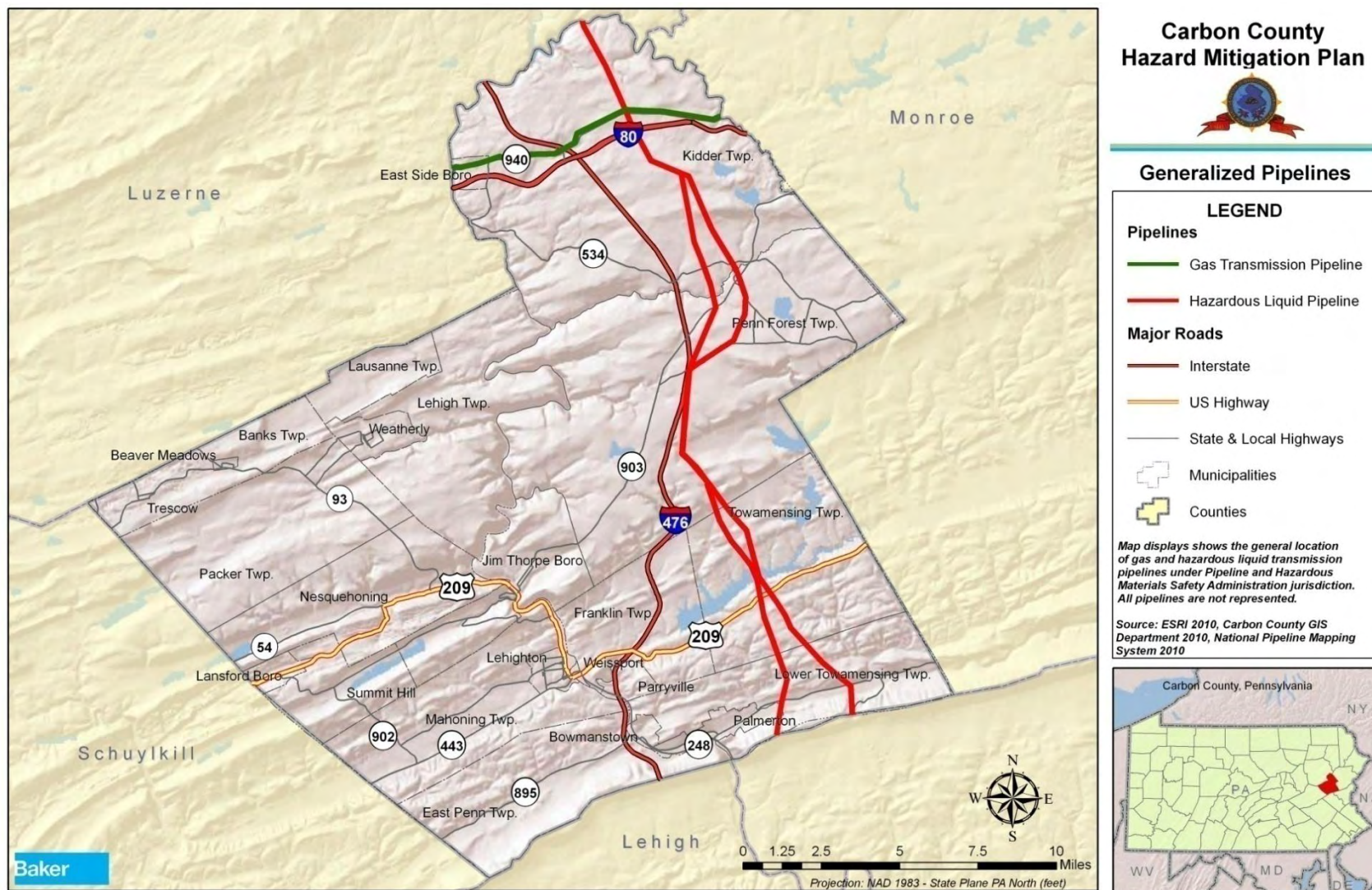
4.3.11. Utility Interruption

4.3.11.1. Location and Extent

Utility interruptions in Carbon County focus 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 water, oil, or gas lines. Carbon County has 78 miles of hazardous liquid pipeline (Figure 4.3.9-1). Carbon County has nine miles of gas pipelines. 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 4.3.9-1: Distribution of hazardous liquid and gas transmission pipeline miles in Carbon County (National Pipeline Mapping System, 2010).



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4.3.11.2. *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 Carbon County occurred during the winter ice storm of 2005. Downed trees and wires from the heavy ice formation caused power outages throughout the entire County for prolonged periods of time and in some municipalities the power was out for over a week (CCEMA, 2009).

4.3.11.3. *Past Occurrence*

In Carbon County minor power outages occur annually, about 4-5 times per year. They are most often associated with winter storms and wind storms.

4.3.11.4. *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 Carbon County should be considered *highly likely*.

4.3.11.5. *Vulnerability Assessment*

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.

Carbon County is in Pennsylvania Power and Light's (PPL) service territory. PPL recently implemented a new dispatch communications system called Mobile Operations Management (MOM). This system links every Pennsylvania Power and Lighting crew to a central emergency response coordination center. This technology has reduced average outage times in Pennsylvania from an average of 108 minutes between 2004 and 2008 to 71 minutes in 2009.

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 2010 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:

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

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	
PROBABILITY <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 & 10% ANNUAL PROBABILITY	2	
	LIKELY	BETWEEN 10 & 100% ANNUAL PROBABILITY	3	
	HIGHLY LIKELY	100% ANNUAL PROBABILITY	4	
IMPACT <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	
SPATIAL EXTENT <i>How large of an area could be impacted by a hazard event? Are impacts localized or regional?</i>	NEGLECTIBLE	LESS THAN 1% OF AREA AFFECTED	1	20%
	SMALL	BETWEEN 1 & 10% OF AREA AFFECTED	2	
	MODERATE	BETWEEN 10 & 50% OF AREA AFFECTED	3	
	LARGE	BETWEEN 50 & 100% OF AREA AFFECTED	4	
WARNING TIME <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	
DURATION <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 nineteen potential hazards identified in the 2010 HMP. Hazards identified as *high* risk have risk factors greater than 2.5. Risk Factors ranging from 1.9 to 2.4 were deemed *moderate* risk hazards. Hazards with Risk Factors less than 1.5 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	
HIGH	Flood, Flash Flood, Ice Jam (N)	4	2	3	3	3	3.0
	Winter Storm (N)	4	2	4	1	3	3.0
	Wildfire (N)	4	1	3	4	2	2.7
MODERATE	Utility Interruption (M)	4	1	2	3	2	2.4
	Dam Failure (M)	1	3	2	4	4	2.4
	Nuclear Incident (M)	1	3	2	4	4	2.4
	Drought (N)	2	1	4	1	4	2.2
	Hurricane, Tropical Storm, Nor'easter (N)	2	2	3	1	3	2.2
	Transportation Accidents (M)	4	1	1	4	1	2.2
LOW	Disorientation (M)	3	1	1	4	1	1.9
	Landslide (N)	2	1	2	4	1	1.9

Based on these results, there are three *high* risk hazards, six *moderate* risk hazards and two *low* risk hazards in Carbon 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 (i.e. disorientation and landslide).

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, hurricane, tropical storm, and Nor'easter, landslide, wildfire, drought, nuclear incident, disorientation, and winter storms. Loss estimates were not able to be determined for utility interruptions, dam failures, and transportation accidents. Estimates provided in this section are based on HAZUS-MH, version MR4, geospatial analysis, cumulative assessed values for parcels located in hazard-specific risk areas, 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.

Many of the potential loss estimates provided in the 2010 HMP are based on 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.

Table 4.4-3 shows the total number of non-vacant parcels by generalized parcel type per municipality in the County and their associated building assessed value. All loss estimates were based on the cumulative building value of all structures on a given parcel, not the land value. Based on this valuation, the 31,264 non-vacant parcels in Carbon County are cumulatively worth \$1.36 billion. The average building assessed value of non-vacant parcels is \$59,175,807. As expected for the two largest municipalities in the County, Kidder Township has the potential to experience the most loss, with assessed values exceeding \$317.2 million, while Penn Forest Township has the next-highest assessed value at \$146.7 million. At the other end of the spectrum, East Side Borough and Weissport Borough have the potential to experience the least loss of all municipalities with less than \$5 million in building assessed value each.

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Table 4.4-3: Total number of non-vacant parcels by type per municipality in Carbon County.

MUNICIPALITY	SINGLE-FAMILY PARCELS	MULTI-FAMILY PARCELS	MOBILE HOME PARCELS	COMMERCIAL PARCELS	INDUSTRIAL PARCELS	OTHER PARCELS	TOTAL NON-VACANT PARCELS	TOTAL BUILDING ASSESSMENT
Banks Township	532	36	8	19	16	9	620	\$17,950,479
Beaver Meadows Borough	283	85	2	15	0	6	391	\$8,727,264
Bowmanstown Borough	289	31	6	16	0	13	355	\$12,006,180
East Penn Township	813	3	70*	19	1	109	1015	\$49,285,568
East Side Borough	87	1	5*	7	0	1	101	\$3,759,942
Franklin Township	1550	5	84*	53	3	45	1740	\$91,784,138
Jim Thorpe Borough	2043	36	28	112	1	59	2279	\$88,124,539
Kidder Township	1926	7	20	76	3	30	2062	\$146,714,282
Lansford Borough	1822	25	2	123	4	35	2011	\$29,111,395
Lausanne Township	103	0	11	3	1	21	139	\$5,471,979
Lehigh Township	188	0	24	3	0	31	246	\$8,939,308
Lehighon Borough	1717	44	9	166	5	47	1988	\$80,908,845
Lower Towamensing Township	1049	9	84*	36	9	60	1247	\$58,143,590
Mahoning Township	1407	14	72	68	1	131	1693	\$88,671,251
Nesquehoning Borough	1395	42	4	57	14	34	1546	\$57,778,482
Packer Township	353	2	36	5	1	64	461	\$19,522,002
Palmerton Borough	1877	30	5	134	2	37	2085	\$84,176,625
Parryville Borough	182	7	10	6	0	18	223	\$7,764,502
Penn Forest Township	6358	3	90	69	2	56	6578	\$317,219,998
Summit Hill Borough	1203	128	3	46	3	50	1433	\$39,035,328
Towamensing Township	1651	3	101*	31	0	79	1865	\$96,723,437
Weatherly Borough	887	51	14	36	2	42	1032	\$44,323,812
Weissport Borough	128	6	2	13	0	5	154	\$4,900,623
TOTAL	27,843	568	690	1113	68	982	31,264	\$1,361,043,569

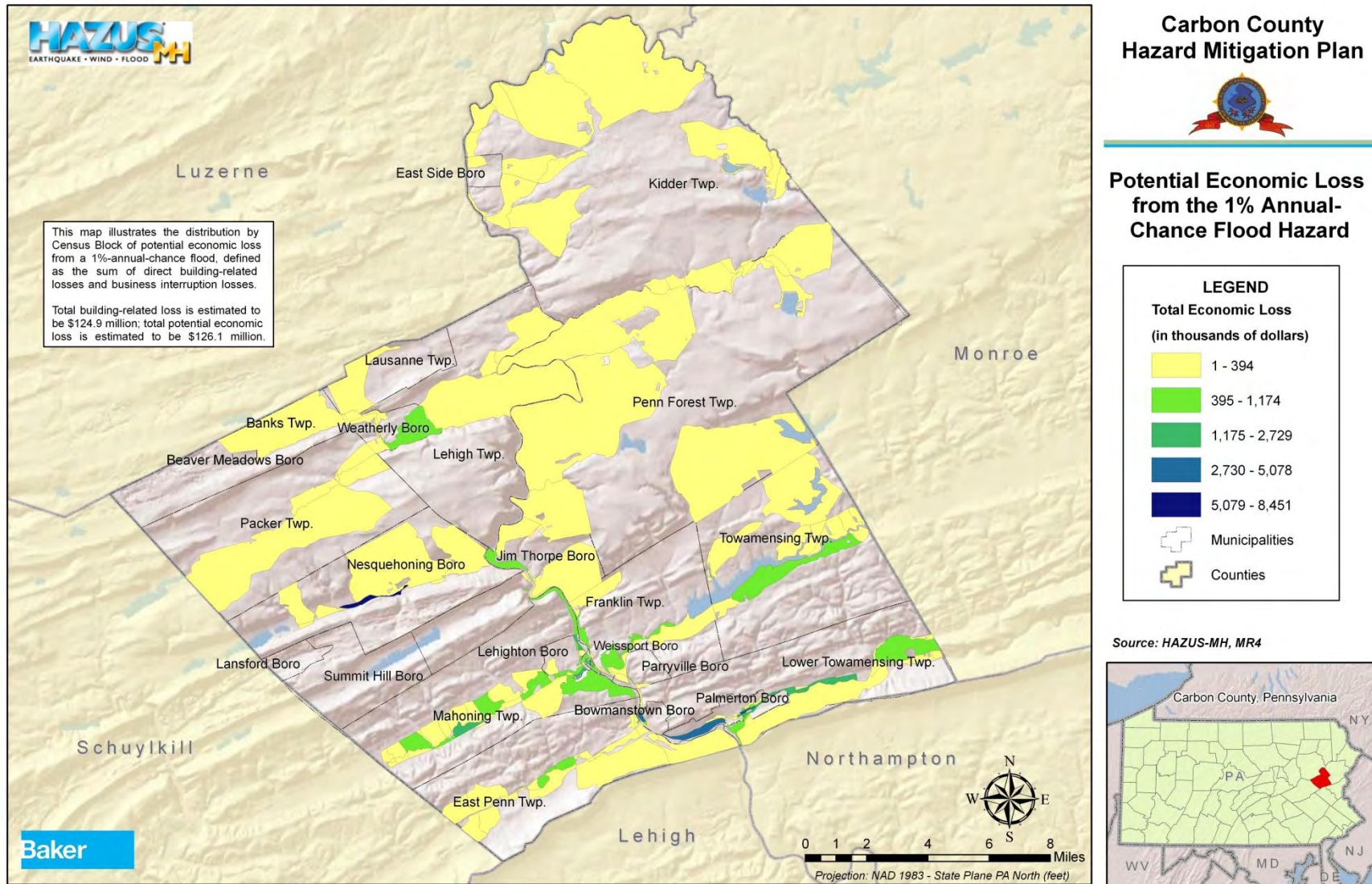
* One or more of the mobile home parcels in this jurisdiction is a mobile home park which has multiple mobile homes located on it.

While many potential loss estimates are based solely on assessed value, the full suite of potential losses was able to be calculated for flood and hurricane 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 \$124.9 million. Approximately 40% of these building-related losses were incurred by residential occupancies; a further 36% of building-related losses were incurred by commercial properties. Figure 4.4-1 shows the spatial distribution of building-related losses at the Census block level. Some of the highest economic losses are expected in Nesquehoning, Bowmanstown, and Palmerton Boroughs. Total economic loss, including replacement value, content loss, functional loss, and displacement cost was estimated at \$126.1 million for the entire County. The full HAZUS results report can be found in **Appendix F**.

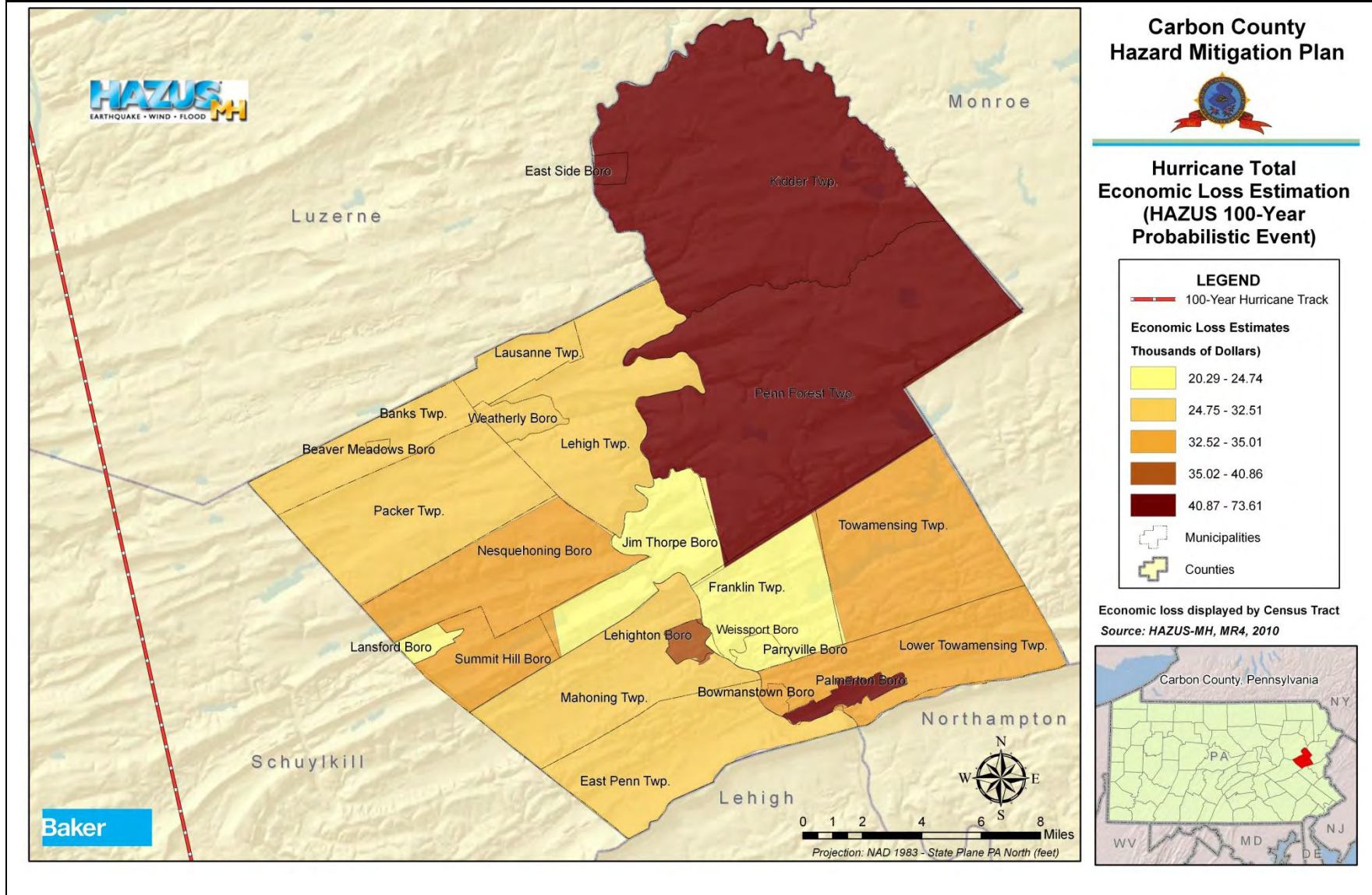
Additional estimated loss information derived from county GIS data is available in applicable vulnerability assessment sections of each hazard profile in Section 4.3.

Figure 4.4-1: Distribution by Census block of the potential total economic loss expected from a 1% annual-chance flood event in Carbon County.



HAZUS hurricane results focus on wind damage from a probabilistic 100-year hurricane event, not the flooding that often accompanies coastal storms in Pennsylvania. As seen in Figure 4.4-2, the center of circulation for the 100-year probabilistic hurricane does not pass over the County. Because of Carbon County's inland position, it is unsurprising that the total economic losses associated with hurricane wind damages are only \$400,000. Of the total economic losses, \$376,800 is building-related. Figure 4.4-2 shows the spatial distribution of economic losses in the 100-year hurricane event by Census Tract. The municipalities expected to experience the most loss are East Side Borough, Kidder Township, Penn Forest Township, and Palmerton Borough. The full HAZUS results report can be found in **Appendix F**.

Figure 4.4-2: Distribution by Census tract of the potential total economic loss expected from a 100-year probabilistic hurricane event in Carbon County.



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As described in their respective hazard profiles, geospatial analysis was used to estimate losses for landslides and wildfire hazards. Loss estimates for landslide hazards are associated with the building assessed value of non-vacant parcels that intersect the landslide combo-high zone identified by the USGS. Using this parameter, the total building assessed value of the potentially vulnerable parcels is \$770,476,329. Similarly, wildfire loss estimates were calculated by looking at non-vacant parcels that intersect the areas designated as having a high wildfire hazard according to DCNR. This analysis showed that the total potential losses are estimated to exceed \$957 million.

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 Carbon County's \$8.9 million in agricultural production, depending on the magnitude of the event. In disorientation events, the CCEMA estimates that annual losses are between \$50,000-60,000. These losses are usually shared by the County's many volunteer fire and emergency services groups. For winter storm events, only a small portion of the past events enumerated in **Appendix G** have deaths, injuries, or losses associated with them, but those that do had losses ranging \$100,000-\$15 million per event; over the sixteen-year reporting period for the NCDL, there were also five deaths and 68 injuries associated with winter storms.

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. Carbon 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.

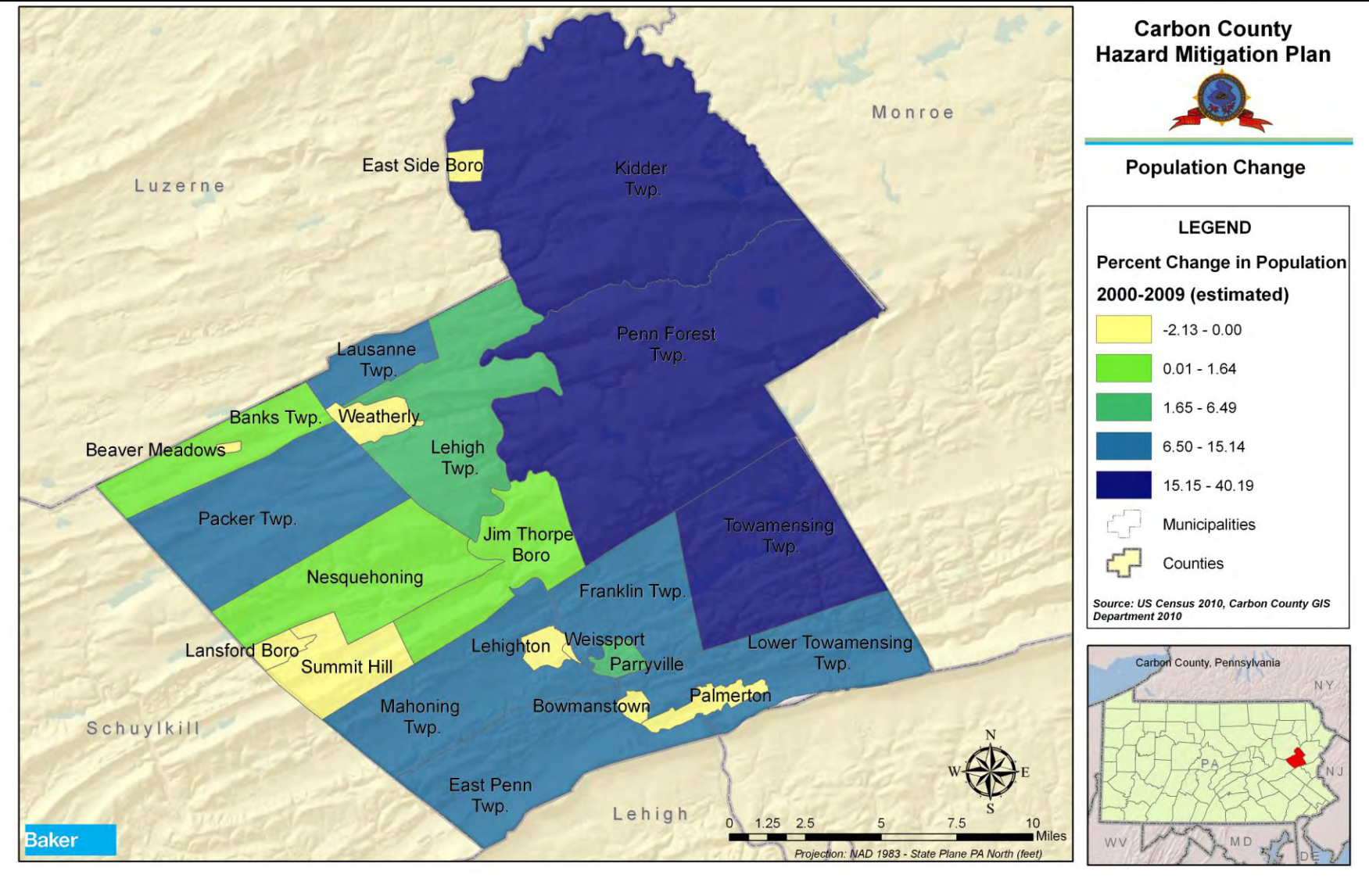
Population change is perhaps the most significant indicator of changes in vulnerability in the future. As discussed in Section 2.3., the total population of Carbon County has grown 9% from 2000-2009, nearly triple the 1990-2000 growth rate of 3.4%. This growth has largely been due to development pressure from New York and New Jersey to the west and increasing housing prices in the Lehigh Valley to the south. This growth has not been evenly distributed in the County, though. Figure 4.4.-1 shows the 2000-2009 percent change in population in Carbon County. The municipalities that have experienced the most growth are Kidder, Penn Forest, and Towamensing Townships with growth rates ranging from 15-40%. In addition, Kidder and Penn Forest Townships have a large weekender population, meaning that the populations of these townships have the potential to increase significantly from Thursday-Sunday, year-round. This population growth and its associated development will likely create increases in loss estimates, as more people will be living in areas prone to hazards, especially flooding, winter storms, and wildfires.

The Carbon County Office of Planning and Development expects that PennDOT and the Pennsylvania Turnpike Commission's plan to add an additional Pennsylvania Turnpike Interchange in Penn Forest Township has the potential to spur growth and increase development around the access point. According to the Pennsylvania Turnpike Commission,

this EZ-Pass only exit will be located at Route 903 between Mile Marker 74 and 95, and is designed to shorten travel time for commuters, ease traffic congestion at nearby interchanges, and provide additional access to the recreational opportunities in northeastern Carbon County. This project is expected to be completed by Fall 2013.

The smaller boroughs like Beaver Meadows, Lehighton, Lansford, and Weissport have experienced population losses. These losses, coupled with physical development constraints in the western portion of the county like rugged terrain and steep slopes, cause risk to remain constant in these areas of the county. Additionally, the 20% of all County land held in state forests, state parks, and state gamelands will also stabilize risk in the County.

Figure 4.4-3: Population change in Carbon County from 2000-2009 (US Census, 2010).



As of August 2010, the Carbon County Office of Planning and Development is engaged in a comprehensive planning process that will help to better define where growth will occur in the County. To date, there are no identified key growth areas in the 2010 plan, and the expectation is that Carbon County will continue to be primarily rural. However, the Office of Planning and Development expects that growth and development will continue in the townships where population growth has been highest and where there are growing resort communities, particularly Kidder and Penn Forest Townships.

While increases in population may increase risk and vulnerability, Carbon County's 2010 Comprehensive Plan will incorporate a greenways element for the first time, thus solidifying the value and location of natural areas and green infrastructure that may serve to maintain or reduce the risk and vulnerability in the county. The greenways portion of the Comprehensive Plan will place an emphasis on the maintenance of a variety of protected and recreational space. It is important to note that as of August 2010, the specific greenway locations had not been determined, but the proposed greenways and green infrastructure to be maintained include:

- The main trails in the County, including the Appalachian Trail, Lehigh River Water Trail, Delaware and Lehigh Trail, Delaware River Water Trail, Switchback Trail, and Glen Onoko Falls;
- Environmentally sensitive areas like the 1 percent annual chance floodplain, wetlands, surface water, and existing natural areas;
- Protected open space like State Forests, State Gamelands, State, County, and Municipal Parks;
- Farmland, including protected easements, Agricultural Security Areas, and primary agricultural land;
- Steep slopes 15% or greater;
- Ridge tops and scenic viewsheds; and
- Important Natural Areas like Important Bird Areas, Important Mammal areas, and Wildlife habitat and migration patterns.

In addition, Carbon County recognizes the development pressure it is experiencing and has worked to preserve land through the PA Act 319, otherwise known as the Clean and Green Act (1074). This voluntary program allows owners of agricultural, agricultural reserve, or forest reserve land to apply for preferential assessment of their land. The landowners must preserve a minimum of ten acres of land and must maintain the original use of the land indefinitely or face a penalty of roll-back taxes. In Carbon County, 2.2% of all parcels have been preserved using this legislation. The preserved land is geographically concentrated in the southern section of the County, especially in Summit Hill Borough, Mahoning Township, East Penn Township, Towamensing Township, and Lower Towamensing Township. This preservation will likely decrease or stabilize these communities' hazard vulnerability.

5. Capability Assessment

5.1. Process Summary

Carbon 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.

During the 2010 HMP process, local plans, ordinances, and codes were identified for each municipality. Through responses to the *Capability Assessment Survey* distributed to all of the County's municipalities and input from the HMSC and the HMPT, the 2010 HMP provides an 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 NFIP.

While the capability assessment serves as a good instrument for identifying local capabilities for, 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 CCEMA coordinates countywide emergency management efforts. Each municipality 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. The Emergency Management Services Code (PA Title 35) requires that all municipalities in the Commonwealth have a Local Emergency Operations Plan (EOP) which is updated every two years. All 23 municipalities in Carbon County have or are in the process of updating their local EOP. A countywide EOP also exists. Municipalities are not required to sign on to the County EOP, because County staff prefers to keep municipal emergency management coordinators actively engaged at a more local level.

5.2.2. Participation in the NFIP

All 23 municipalities in Carbon County are participants 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 Carbon County Office of Planning and Development 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).

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 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.

Act 166 mandates municipal participation in and compliance with the NFIP. It also establishes higher regulatory standards for hazardous materials and high risk land uses. 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).

Carbon County municipalities are currently utilizing 2002 Digital Flood Insurance Rate Maps (DFIRMS). The digital maps greatly enhanced mitigation capabilities as they relate to identifying flood hazards and is a significant improvement to the previously effective paper Flood Insurance Rate Maps. Residents and municipal officials are provided with mapping assistance from the Carbon County GIS Department and the Carbon County Office of Planning and Development upon request.

There are no communities in Carbon County currently participating in the NFIP Community Rating System (FEMA CIS, 2010).

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 5.2-1 summarizes their presence within each municipality.

Table 5.2-1: Summary of planning tools adopted by each municipality in Carbon County (HMP Capability Assessment Surveys, 2010; Carbon County Office of Planning and Development , 2010)					
COMMUNITY	COMPRE- HENSIVE PLAN	BUILDING CODE	FLOODPLAIN ORDINANCE - NFIP PARTICIPANT	SUBDIVISION & LAND DEVELOPMENT ORDINANCE	ZONING ORDINANCE
Banks Township	No	Yes	Yes	Yes	Yes
Beaver Meadows Borough	Yes	Yes	Yes	Yes	Yes
Bowmanstown Borough	Yes	Yes	Yes	Yes	Yes

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Table 5.2-1: Summary of planning tools adopted by each municipality in Carbon County (HMP Capability Assessment Surveys, 2010; Carbon County Office of Planning and Development , 2010)

COMMUNITY	COMPRE-HENSIVE PLAN	BUILDING CODE	FLOODPLAIN ORDINANCE - NFIP PARTICIPANT	SUBDIVISION & LAND DEVELOPMENT ORDINANCE	ZONING ORDINANCE
East Penn Township	Yes and Part of Regional Plan Under Development	Yes	Yes	Yes	Yes
East Side Borough	Yes	Yes	Yes	Yes	Yes
Franklin Township	Part of Regional Plan Under Development	Yes	Yes	Yes	Yes
Jim Thorpe Borough	Part of Regional Plan Under Development	Yes	Yes	Yes	Yes
Kidder Township	Under Development	Yes	Yes	Yes	Yes
Lansford Borough	Yes and Part of Regional Plan Under Development	Yes	Yes	Yes	Yes
Lausanne Township	Yes	Yes	Yes	Yes	Yes
Lehigh Township	Yes	Yes	Yes	Yes	Yes
Lehighton Borough	Yes and Part of Regional Plan Under Development	Yes	Yes	Yes	Yes
Lower Towamensing Township	Under Development	Yes	Yes	Yes	Yes
Mahoning Township	Part of Regional Plan Under Development	Yes	Yes	Yes	Yes
Nesquehoning Borough	Under Development	Yes	Yes	Yes	Yes
Packer Township	No	Yes	Yes	Yes	Yes
Palmerton Borough	Yes	Yes	Yes	Yes	Yes
Parryville Borough	Yes	Yes	Yes	Yes	Yes
Penn Forest Township	Under Development	Yes	Yes	Yes	Yes
Summit Hill Borough	Yes and Part of Regional Plan Under Development	Yes	Yes	Yes	Yes
Towamensing Township	Under Development	Yes	Yes	Yes	Yes
Weatherly Borough	Yes	Yes	Yes	Yes	Yes
Weissport Borough	Part of Regional Plan Under Development	Yes	Yes	Yes	Yes

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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 Carbon County was developed in 1998. Carbon County is currently in the process of updating their comprehensive plan. In addition, two regions of the County are also in the process of developing regional comprehensive plans. These include the Central Region (Franklin, East Penn and Mahoning Townships, and Weissport and Lehigh Boroughs) and the Western Region (Jim Thorpe, Summit Hill, and Lansford Boroughs). 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 2010 HMP findings.

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 23 municipalities in Carbon 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 Carbon 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.

Subdivision and land development ordinances 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 Carbon 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. All jurisdictions within Carbon County have adopted and enforce a zoning ordinance.

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. 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 Carbon County have moderate administrative and technical staff needed to conduct hazard mitigation-activities. There seems to be sufficient emergency management staff across the County and several municipalities have grant writing 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. Many communities do not have their own personnel skilled in geographic information systems but have identified that the County GIS Department is able to provide these services. All municipalities in the County, except for Jim Thorpe and Lehighton Boroughs, have an identified emergency management coordinator.

Other local organizations that could act as partners include the Carbon County Conservation District, the Penn State Cooperative Extension, the Carbon County Fire Chiefs, the Carbon County Groundwater Guardians, the Carbon County Citizen Corps Council, business development organizations such as the Carbon County Chamber of Commerce, and historical or cultural agencies such as the Mauch Chunk Historical Society of Carbon County.

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

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

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

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

5.2.5. Fiscal Capability

The decision and capacity to implement mitigation-related activities is often strongly dependent on the presence of local financial resources. While some mitigation actions are less costly than others, it is important that money is available locally to implement policies and projects.

Financial resources are particularly important if communities are trying to take advantage of state or federal mitigation grant funding opportunities that require local-match contributions. Based on survey results, most municipalities within the County perceive fiscal capability to be limited.

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; and
- Technical Assistance Program.

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

- Community Development Block Grants (CDBG);
- Disaster Housing Program;
- Emergency Conservation Program;
- Emergency Management Performance Grants (EMPG);
- Emergency Watershed Protection Program;
- Hazard Mitigation Grant Program (HMGP);
- Flood Mitigation Assistance Program;
- Non-insured Crop Disaster Assistance Program;
- Pre-Disaster Mitigation Program;

- Repetitive Flood Claims Program (RFC);
- Section 108 Loan Guarantee Programs;
- Severe Repetitive Loss Grant Program (SRL); and
- Weatherization Assistance Program.

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. As this is a notably sensitive subject for local government employees, participation in this section of the *Capability Assessment Survey* was low. Of the nineteen municipalities that responded, scores ranged from 2-5 with an average score of 3.8.

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 5.2-2 summarizes the results of the self-assessment survey as a percentage of responses received. For example, 15% of communities who responded indicated their community had limited fiscal capabilities related to hazard mitigation activities that reduce hazard vulnerabilities.

Table 5.2-2: Summary of self-assessment capability responses expressed as a percentage of responses received.			
CAPABILITY CATEGORY	LIMITED	MODERATE	HIGH
Planning & Regulatory	3%	12%	5%
Administrative & Technical	6%	12%	2%
Fiscal	15%	5%	0%
Political	5%	11%	4%
Community Resiliency	5%	14%	1%

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5.2.8. Existing Limitations

As mentioned, there are no communities in Carbon County participating in the NFIP Community Rating System. However, 22 of the 23 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, eight municipalities in the County have an adopted stormwater management plan or ordinance. Two municipalities indicated that a stormwater management plan is under development. A stormwater management plan is designed to address flooding associated with stormwater runoff. These plans typically focus on design and construction measures that are intended to reduce the impact of more frequently occurring minor urban flooding. The presence of a stormwater management plan would greatly enhance mitigation capabilities needed to address flood and transportation hazards.

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.

East Penn Township, Kidder Township, and Jim Thorpe Borough indicated that they are looking into participating in the Firewise program. Additionally, other communities in the County are identified as vulnerable to wildfire hazards. The Pennsylvania Firewise Community Program assists planned and existing communities in implementing management practices which reduce the risk of wildfire events. Firewise communities are those that avoid potential fire emergencies by addressing and correcting fire hazards and preparing for the threat of a wildfire event (DCNR Firewise). Improved participation in this program will reduce the loss of lives, property and resources to wildfires by building and maintaining communities using practices that are compatible with their natural surroundings.

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. 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 while mitigation *actions* and mitigation *projects* are very specific and measurable. Five goals and fifteen objectives were identified during the HMP development process.

A Mitigation Strategy Workshop was held on July 13, 2010. A list of proposed goals and objectives was handed out to the HMPT. Each stakeholder was asked to select goals and objectives on the worksheet that they felt most adequately represented the goals and objectives of Carbon County and their jurisdiction. They were also given the opportunity to add other goals and objectives as needed. The final list of goals and objectives is available in Table 6.2-1. During the workshop, attendees were provided with a standard list of Mitigation Techniques and asked to complete at least one *Mitigation Action Form* taking into consideration previously selected goals and objectives. The Mitigation Action Plan, provided in Table 6.4-1, contains at least one action and/or project for each jurisdiction in the planning area. The completed *Carbon County Proposed Goals and Objectives Selection Forms* and *Mitigation Action Forms* are available in **Appendix C** along with meeting minutes from the Mitigation Strategy Workshop.

During the winter of 2006-2007, 15 of the county's 23 municipalities submitted Hazard Mitigation Projects to the Carbon County Office of Planning and Development. Because of the length of time that has elapsed between project submission and the finalization of this HMP, each jurisdiction that submitted a project(s) was asked to complete a *Mitigation Action Status Update Worksheet* on their Mitigation Projects so that the HMPT could determine which projects were still viable and note any that had been completed or discontinued.

Mitigation actions and projects were then evaluated using PA STEEL. Table 6.4-2 contains this evaluation. The final list of actions and projects is contained in the Mitigation Action Plan in Table 6.4-1.

6.2. Mitigation Goals and Objectives

Based on results of the goals and objectives selection exercise and input from the HMSC, a list of five goals and fifteen corresponding objectives was developed. Table 6.2-1 details the mitigation goals and objectives established for the 2010 HMP.

Carbon County 2010 Hazard Mitigation Plan

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

GOAL 1	Reduce vulnerability including loss of life and damage to assets from natural hazards.
Objective 1A	Identify and evaluate potential protection measures for existing critical facilities with the highest relative vulnerability in the 1 percent annual chance floodplain.
Objective 1B	Ensure that existing drainage systems such as pipes, culverts and channels are adequate and functioning properly.
Objective 1C	Evaluate the means of managing stranded travelers during the winter storms.
Objective 1D	Reduce wildfire potential through planning and outreach.
Objective 1E	Implement structural projects to reduce the impacts from flooding.
GOAL 2	Increase Public Awareness regarding natural and manmade hazard risks, preparedness and mitigation.
Objective 2A	Promote partnerships between the municipalities and the County to continue to develop a County-wide approach to identifying and implementing mitigation actions.
Objective 2B	Provide public education to increase awareness of hazards and opportunities for mitigation.
GOAL 3	Improve emergency warning and response procedures and capabilities.
Objective 3A	Provide residents with adequate warning of potential floods and other weather related events.
Objective 3B	Ensure that emergency response services and critical facilities functions are not interrupted or are minimally interrupted by natural hazards.
Objective 3C	Improve coordination and communication disaster response organizations, emergency management entities, and local and county governments.
Objective 3D	Increase awareness by residents (i.e. through public outreach/education) of actions to take during an emergency.
GOAL 4	Protect existing natural resources.
Objective 4A	Ensure the adequacy of erosion and sedimentation control practices throughout the County.
Objective 4B	Work to preserve steeply sloping areas, sinkhole areas, floodplains, wetlands, etc.
GOAL 5	Promote disaster-resistant future development and increase participation in the NFIP.
Objective 5A	Encourage and facilitate the development or revision of comprehensive plans and zoning, land-use and floodplain management ordinances to consider limiting development in high-hazard areas.
Objective 5B	Provide adequate and consistent enforcement of ordinances and codes within and between jurisdictions.

6.3. Identification and Analysis of Mitigation Techniques

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

- **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 moderate and high risk hazards in Carbon County.

HAZARD	MITIGATION TECHNIQUE					
	PREVENTION	PROPERTY PROTECTION	PUBLIC EDUCATION AND AWARENESS	NATURAL RESOURCE PROTECTION	STRUCTURAL PROJECT IMPLEMENTATION	EMERGENCY SERVICES
Flood, Flash Flood, Ice Jam	✓	✓	✓	✓	✓	✓
Winter Storm	✓	✓	✓			✓
Wildfire	✓	✓	✓	✓		✓
Utility Interruption	✓	✓	✓		✓	✓
Dam Failure	✓	✓	✓		✓	✓
Nuclear Incident	✓		✓			✓
Transportation Accidents	✓	✓	✓			✓
Disorientation	✓		✓			✓
Landslide	✓	✓	✓	✓	✓	✓

6.4. Mitigation Action Plan

A Mitigation Strategy Workshop was held on July 13, 2010 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 Mitigation Workshop, the group went over Mitigation Techniques using PEMA's *Mitigation Ideas* document. Prior to the Mitigation Workshop, the HMSC developed a list of potential mitigation actions to be reviewed during the workshop. Mitigation Action Plan worksheets were given to all participants. Potential mitigation actions developed by the HMSC were reviewed and participants were asked to provide at least one hazard related mitigation action for each municipality. Participants were given the option of taking part in the existing list of potential actions developed by the HMSC or providing new actions of their choosing specific to their community.

The final list of 71 mitigation actions is made up of actions developed by the HMSC along with actions developed by municipalities and other stakeholders at the Mitigation Strategy Workshop. In addition, the list includes 2007 actions and projects that municipalities listed as still viable on their *Mitigation Action Status Update Worksheets*.

Table 6.4-1 lists actions which were developed at the Mitigation Strategy Workshop and at other times during the planning process based on identified needs and community comments received. At least one mitigation action was established for each moderate and high risk hazard in Carbon 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 14 and 48 address continued compliance and improved participation in the NFIP.

Carbon County 2010 Hazard Mitigation Plan

Table 6.4-1: Carbon County Mitigation Action Plan

COMMUNITY: Bowmanstown Borough	ACTION: Complete Lime Street in order to provide emergency access to Meadowcrest Subdivision.
ACTION NO: 1	
Category:	Emergency Services
Hazard(s) Addressed:	Drought; Flood, Flash Flood, & Ice Jam; Hurricane, Tropical Storm, & Nor'easter; Landslide; Wildfire; Winter Storm; Dam Failure; Disorientation; Nuclear Incidents; Transportation Accident; Utility Interruption
Lead Agency/Department:	Bowmanstown Borough; County
Implementation Schedule:	2 years
Funding Source:	DCED/Community Development Block Grant; County
COMMUNITY: Lehighon Borough	ACTION: Provide emergency generators at multiple facilities which can afford shelter during an emergency.
ACTION NO: 2	
Category:	Emergency Services
Hazard(s) Addressed:	Drought; Flood, Flash Flood, & Ice Jam; Hurricane, Tropical Storm, & Nor'easter; Landslide; Wildfire; Winter Storm; Dam Failure; Disorientation; Nuclear Incidents; Transportation Accident; Utility Interruption
Lead Agency/Department:	Lehighon Borough
Implementation Schedule:	As funds becomes available
Funding Source:	FEMA/HMGP; PEMA
COMMUNITY: Weatherly Borough	ACTION: Build another bridge across Hazle Creek in the Borough in order to provide an emergency access route in the event the current bridge over Hazle Creek becomes damaged or unusable.
ACTION NO: 3	
Category:	Emergency Services
Hazard(s) Addressed:	Drought; Flood, Flash Flood, & Ice Jam; Hurricane, Tropical Storm, & Nor'easter; Landslide; Wildfire; Winter Storm; Dam Failure; Disorientation; Nuclear Incidents; Transportation Accident; Utility Interruption
Lead Agency/Department:	Weatherly Borough
Implementation Schedule:	In progress, in planning stage.
Funding Source:	FEMA/HMGP; PEMA
COMMUNITY: Lansford Borough, Summit Hill Borough, Penn Forest Township and Jim Thorpe Borough	ACTION: Complete and implement Western Carbon County Comprehensive Plan.
ACTION NO: 4	
Category:	Prevention

Carbon County 2010 Hazard Mitigation Plan

Table 6.4-1: Carbon County Mitigation Action Plan

Hazard(s) Addressed:	Drought; Flood, Flash Flood, & Ice Jam; Hurricane, Tropical Storm, & Nor'easter; Landslide; Wildfire; Winter Storm; Dam Failure; Disorientation; Nuclear Incidents; Transportation Accident; Utility Interruption
Lead Agency/Department:	Lansford Borough, Summit Hill Borough, Penn Forest Township and Jim Thorpe Borough
Implementation Schedule:	Ongoing
Funding Source:	Lansford Borough, Summit Hill Borough, Penn Forest Township and Jim Thorpe Borough
COMMUNITY: Mahoning Township	ACTION: Conduct youth outreach campaign aimed at existing hazard and hazard mitigation education.
ACTION NO: 5	
Category:	Public Education and Awareness
Hazard(s) Addressed:	Drought; Flood, Flash Flood, & Ice Jam; Hurricane, Tropical Storm, & Nor'easter; Landslide; Wildfire; Winter Storm; Dam Failure; Disorientation; Nuclear Incidents; Transportation Accident; Utility Interruption
Lead Agency/Department:	Mahoning Township
Implementation Schedule:	Ongoing
Funding Source:	FEMA/HMGP
COMMUNITY: Parryville Borough	ACTION: Work with County Planning and EMA to identify mitigation projects within the community.
ACTION NO: 6	
Category:	Prevention
Hazard(s) Addressed:	Drought; Flood, Flash Flood, & Ice Jam; Hurricane, Tropical Storm, & Nor'easter; Landslide; Wildfire; Winter Storm; Dam Failure; Disorientation; Nuclear Incidents; Transportation Accident; Utility Interruption
Lead Agency/Department:	Parryville Borough; Carbon County Office of Planning and Development; Carbon County Emergency Management Agency
Implementation Schedule:	1 year
Funding Source:	NA
COMMUNITY: Towamensing Township	ACTION: Extend coverage of community warning system to entire township
ACTION NO: 7	
Category:	Emergency Services
Hazard(s) Addressed:	Drought; Flood, Flash Flood, & Ice Jam; Hurricane, Tropical Storm, & Nor'easter; Landslide; Wildfire; Winter Storm; Dam Failure; Disorientation; Nuclear Incidents; Transportation Accident; Utility Interruption
Lead Agency/Department:	Towamensing Township

Carbon County 2010 Hazard Mitigation Plan

Table 6.4-1: Carbon County Mitigation Action Plan

Implementation Schedule:	3-4 years
Funding Source:	FEMA/HMGP
COMMUNITY: Carbon County; Banks Township; Beaver Meadows Borough; Bowmanstown Borough; East Penn Township; East Side Borough; Franklin Township; Jim Thorpe Borough; Kidder Township; Lansford Borough; Lausanne Township; Lehigh Township; Lehigh Township; Lower Towamensing Township; Mahoning Township; Nesquehoning Borough; Packer Township; Palmerton Borough; Parryville Borough; Penn Forest Township; Summit Hill Borough; Towamensing Township; Weatherly Borough; Weissport Borough	ACTION: Hold public forum to educate public about types of hazard mitigation that can be done on an individual basis.
ACTION NO: 8	
Category:	Public Education and Awareness
Hazard(s) Addressed:	Drought; Flood, Flash Flood, & Ice Jam; Hurricane, Tropical Storm, & Nor'easter; Landslide; Wildfire; Winter Storm; Dam Failure; Disorientation; Nuclear Incidents; Transportation Accident; Utility Interruption
Lead Agency/Department:	Carbon County EMA
Implementation Schedule:	1 year
Funding Source:	FEMA/HMGP; PEMA
COMMUNITY: Carbon County; Banks Township; Beaver Meadows Borough; Bowmanstown Borough; East Penn Township; East Side Borough; Franklin Township; Jim Thorpe Borough; Kidder Township; Lansford Borough; Lausanne Township; Lehigh Township; Lehigh Township; Lower Towamensing Township; Mahoning Township; Nesquehoning Borough; Packer Township; Palmerton Borough; Parryville Borough; Penn Forest Township; Summit Hill Borough; Towamensing Township; Weatherly Borough; Weissport Borough	ACTION: Identify critical transportation arteries and evaluate means to open roads for emergency access.

Table 6.4-1: Carbon County Mitigation Action Plan

ACTION NO: 9	
Category:	Prevention; Emergency Services
Hazard(s) Addressed:	Drought; Flood, Flash Flood, & Ice Jam; Hurricane, Tropical Storm, & Nor'easter; Landslide; Wildfire; Winter Storm; Dam Failure; Disorientation; Nuclear Incidents; Transportation Accident; Utility Interruption
Lead Agency/Department:	Carbon County EMA; Carbon County Office of Planning and Development
Implementation Schedule:	2 years.
Funding Source:	County
COMMUNITY: Carbon County; Banks Township; Beaver Meadows Borough; Bowmanstown Borough; East Penn Township; East Side Borough; Franklin Township; Jim Thorpe Borough; Kidder Township; Lansford Borough; Lausanne Township; Lehigh Township; Lehigh Township; Lower Towamensing Township; Mahoning Township; Nesquehoning Borough; Packer Township; Palmerton Borough; Parryville Borough; Penn Forest Township; Summit Hill Borough; Towamensing Township; Weatherly Borough; Weissport Borough	ACTION: Evaluate and list alternatives to reconstruction of structures that sustain damages from natural hazards more than or equal to 50% of value. Make information available to public.
ACTION NO: 10	
Category:	Property Protection
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam; Hurricane, Tropical Storm, & Nor'easter; Landslide; Wildfire; Winter Storm; Dam Failure
Lead Agency/Department:	Carbon County EMA, Carbon County Office of Planning and Development
Implementation Schedule:	3 years.
Funding Source:	County; FEMA/HMGP

Table 6.4-1: Carbon County Mitigation Action Plan

COMMUNITY: Carbon County; Banks Township; Beaver Meadows Borough; Bowmanstown Borough; East Penn Township; East Side Borough; Franklin Township; Jim Thorpe Borough; Kidder Township; Lansford Borough; Lausanne Township; Lehigh Township; Lehighton Borough; Lower Towamensing Township; Mahoning Township; Nesquehoning Borough; Packer Township; Palmerton Borough; Parryville Borough; Penn Forest Township; Summit Hill Borough; Towamensing Township; Weatherly Borough; Weissport Borough	ACTION: Investigate the feasibility of collecting building points for the County.
ACTION NO: 11	
Category:	Prevention
Hazard(s) Addressed:	Drought; Flood, Flash Flood, & Ice Jam; Hurricane, Tropical Storm, & Nor'easter; Landslide; Wildfire; Winter Storm; Dam Failure; Disorientation; Nuclear Incidents; Transportation Accident; Utility Interruption
Lead Agency/Department:	Carbon County EMA, Carbon County Office of Planning and Development
Implementation Schedule:	5 years
Funding Source:	County
COMMUNITY: Jim Thorpe Borough; Nesquehoning Borough	ACTION: Install flood gates at Tippetts Dam.
ACTION NO: 12	
Category:	Structural Projects
Hazard(s) Addressed:	Dam Failure; Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	DEP
Implementation Schedule:	As funds become available.
Funding Source:	DEP, FEMA/HMGP, PEMA

Table 6.4-1: Carbon County Mitigation Action Plan

COMMUNITY: Carbon County; Banks Township; Beaver Meadows Borough; Bowmanstown Borough; East Penn Township; East Side Borough; Franklin Township; Jim Thorpe Borough; Kidder Township; Lansford Borough; Lausanne Township; Lehigh Township; Lehigh Township; Lower Towamensing Township; Mahoning Township; Nesquehoning Borough; Packer Township; Palmerton Borough; Parryville Borough; Penn Forest Township; Summit Hill Borough; Towamensing Township; Weatherly Borough; Weissport Borough	ACTION: Foster increased cooperation and communication between Carbon County and the four significant out-of-county high-hazard dams that could impact Carbon through education, outreach, and dam failure scenarios or exercises, as appropriate.
ACTION NO: 13	
Category:	Public Education and Awareness
Hazard(s) Addressed:	Dam Failure; Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Carbon County EMA
Implementation Schedule:	3 years
Funding Source:	FEMA/HMGP; PEMA
COMMUNITY: Banks Township; Beaver Meadows Borough; Bowmanstown Borough; East Penn Township; East Side Borough; Franklin Township; Jim Thorpe Borough; Kidder Township; Lansford Borough; Lausanne Township; Lehigh Township; Lehigh Township; Lower Towamensing Township; Mahoning Township; Nesquehoning Borough; Packer Township; Palmerton Borough; Parryville Borough; Penn Forest Township; Summit Hill Borough; Towamensing Township; Weatherly Borough; Weissport Borough	ACTION: Increase awareness of and participation in FEMA's Community Rating System (CRS) Program.
ACTION NO: 14	
Category:	Prevention - National Flood Insurance Program
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam; Hurricane, Tropical Storm, & Nor'easter

Carbon County 2010 Hazard Mitigation Plan

Table 6.4-1: Carbon County Mitigation Action Plan

Lead Agency/Department:	Carbon County Office of Planning and Development
Implementation Schedule:	Begin review of CRS requirements in 2010. Adopt measures when appropriate to attain CRS credit through 2015.
Funding Source:	NA
COMMUNITY: East Side Borough	ACTION: Investigate ways to prevent homes on Bridge, State, and Washington Streets from flooding.
ACTION NO: 15	
Category:	Property Protection
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam; Hurricane, Tropical Storm, & Nor'easter
Lead Agency/Department:	East Side Borough
Implementation Schedule:	In progress
Funding Source:	County
COMMUNITY: Nesquehoning Borough	ACTION: Replace pipes and re-grade Rhume Run from the mouth at Nesquehoning Creek to the headwaters.
ACTION NO: 16	
Category:	Structural Projects
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	DEP; USACE
Implementation Schedule:	As funds become available.
Funding Source:	DEP; FEMA/HMGP; PEMA
COMMUNITY: Bowmanstown Borough	ACTION: Extend pipe at Franklin and Fireline Road culvert to the stream at the back of the property located at 643-651 Fireline Road in order to prevent flooding.
ACTION NO: 17	
Category:	Structural Projects
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Bowmanstown Borough
Implementation Schedule:	Contingent upon obtaining final homeowner's approval for access
Funding Source:	NA
COMMUNITY: East Penn Township	ACTION: Increase the size of the culvert on SR 895 on west side of Smithlane Road.
ACTION NO: 18	
Category:	Structural Projects
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	East Penn Township

Carbon County 2010 Hazard Mitigation Plan

Table 6.4-1: Carbon County Mitigation Action Plan

Implementation Schedule:	As funds become available.
Funding Source:	East Penn Township; FEMA/HMGP
COMMUNITY: East Penn Township	ACTION: Increase the size of the culvert on SR 895 in front of Pleasant Trees Care Home (between Dinkey Road and Friendship Road).
ACTION NO: 19	
Category:	Structural Project
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	East Penn Township
Implementation Schedule:	As funds become available
Funding Source:	East Penn Township; FEMA/HMGP
COMMUNITY: East Penn Township	ACTION: Raise SR 895 for short section between Church Hill Road and a little before Germans Road.
ACTION NO: 20	
Category:	Emergency Services
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	PENNDOT; East Penn Township
Implementation Schedule:	3 years
Funding Source:	PENNDOT; East Penn Township
COMMUNITY: East Penn Township	ACTION: Increase the number of pipes or pipe size (or raise road) on Ben Salem Road (between Evergreen and Harris Roads
ACTION NO: 21	
Category:	Structural Projects
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	East Penn Township
Implementation Schedule:	As funds become available.
Funding Source:	East Penn Township; FEMA/HMGP
COMMUNITY: East Penn Township	ACTION: Install storm drains on Germans Road, west of Sand Quarry Road to Bake Oven Road to prevent flooding between Schleicher's Trailer Park and Bake Oven Road.
ACTION NO: 22	
Category:	Structural Projects; Property Protection
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	East Penn Township
Implementation Schedule:	3 years

Carbon County 2010 Hazard Mitigation Plan

Table 6.4-1: Carbon County Mitigation Action Plan

Funding Source:	East Penn Township
COMMUNITY: Jim Thorpe Borough	ACTION: Install/replace/repair culverts Borough-wide.
ACTION NO: 23	
Category:	Structural Projects
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Jim Thorpe Borough
Implementation Schedule:	As funds become available.
Funding Source:	Jim Thorpe Borough; FEMA/HMGP
COMMUNITY: Jim Thorpe Borough	ACTION: Undertake stormwater management in the Borough.
ACTION NO: 24	
Category:	Prevention
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Jim Thorpe Borough
Implementation Schedule:	1 year
Funding Source:	Jim Thorpe Borough
COMMUNITY: Jim Thorpe Borough	ACTION: Install/replace/repair culverts previously identified problem areas.
ACTION NO: 25	
Category:	Structural Projects
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Jim Thorpe Borough
Implementation Schedule:	As funds become available.
Funding Source:	Jim Thorpe Borough; FEMA/HMGP
COMMUNITY: Kidder Township	ACTION: Develop and implement a comprehensive watershed study and plan for Mud Run Creek Watershed.
ACTION NO: 26	
Category:	Natural Resource Protection
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Kidder Township
Implementation Schedule:	Perform action if and when countywide Act 167 plan is initiated
Funding Source:	DEP

Carbon County 2010 Hazard Mitigation Plan

Table 6.4-1: Carbon County Mitigation Action Plan

COMMUNITY: Lansford Borough	ACTION: Dredging of Panther Creek near Edgemont Road and Oak Streets and along Dock Street area.
ACTION NO: 27	
Category:	Natural Resource Protection
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Lansford Borough; DEP, USACE
Implementation Schedule:	As funds become available.
Funding Source:	Lansford Borough; DEP, USACE
COMMUNITY: Lansford Borough	ACTION: Install new storm water collection drains to stormwater system at W. Patterson and Cortright Streets and W. Bertsch Street extended near Boyer's parking lot entrance.
ACTION NO: 28	
Category:	Structural Project
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Lansford Borough
Implementation Schedule:	As funds become available.
Funding Source:	Lansford Borough
COMMUNITY: Lansford Borough	ACTION: Regrade and repair 23 additional stormwater inlet culverts.
ACTION NO: 29	
Category:	Natural Resource Protection
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Lansford Borough
Implementation Schedule:	As funds become available.
Funding Source:	Lansford Borough
COMMUNITY: Lausanne Township	ACTION: Perform flood control along South and North Stagecoach Road.
ACTION NO: 30	
Category:	Structural Projects
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Lausanne Township
Implementation Schedule:	In progress, some repair work done.
Funding Source:	FEMA/HMGP; PEMA
COMMUNITY: Lehighton Borough	ACTION: Clean streets and protect piers and abutments of various bridges and culverts within the Borough to prevent flooding and/or structure failure.

Carbon County 2010 Hazard Mitigation Plan

Table 6.4-1: Carbon County Mitigation Action Plan

ACTION NO: 31	
Category:	Natural Resource Protection
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Lehighton Borough
Implementation Schedule:	Repairs over Lehigh Drive Bridge and Bridge Street over Mahoning Creek in progress. Rip rap needs to be completed.
Funding Source:	NA
COMMUNITY: Lehighton Borough	ACTION: Construct adequate culvert in Gypsy Hill Road to stop flooding.
ACTION NO: 32	
Category:	Structural Projects
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Lehighton Borough
Implementation Schedule:	In progress, one of two culverts completed.
Funding Source:	Lehighton Borough
COMMUNITY: Lehighton Borough	ACTION: Repair catch basins throughout the Borough to eliminate local flooding.
ACTION NO: 33	
Category:	Structural Projects
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Lehighton Borough
Implementation Schedule:	Annually
Funding Source:	Lehighton Borough
COMMUNITY: Lower Towamensing Township	ACTION: Redirect water from Hunter's Creek to the Buckwha Creek in order to alleviate flooding problems.
ACTION NO: 34	
Category:	Structural Projects
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	FEMA, USACE
Implementation Schedule:	5 years +
Funding Source:	FEMA
COMMUNITY: Lower Towamensing Township	ACTION: Dredge the 1,000 feet of the Aquashicola Creek that currently remain undredged from the 1998 Army Corps dredging project.
ACTION NO: 35	

Carbon County 2010 Hazard Mitigation Plan

Table 6.4-1: Carbon County Mitigation Action Plan

Category:	Structural Project
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	USACE
Implementation Schedule:	As funds become available.
Funding Source:	USACE; DEP; Lower Towamensing Township
COMMUNITY: Lower Towamensing Township	ACTION: Conduct an evaluation of Drift Road to determine how to resolve flooding and run-off problems.
ACTION NO: 36	
Category:	Prevention
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Lower Towamensing Township
Implementation Schedule:	In progress
Funding Source:	Lower Towamensing Township
COMMUNITY: Mahoning Township	ACTION: Widen obsolete narrow bridges on township and state roads which cross various small streams and restrict water passage during high water conditions.
ACTION NO: 37	
Category:	Property Protection
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Mahoning Township
Implementation Schedule:	As funds become available.
Funding Source:	FEMA/HMGP; PEMA
COMMUNITY: Mahoning Township	ACTION: Clean and repair catch basins and storm water control piping along and under roadways.
ACTION NO: 38	
Category:	Structural Projects
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Mahoning Township
Implementation Schedule:	Ongoing; Have installed new and made repairs to several catch basins within Township.
Funding Source:	Mahoning Township
COMMUNITY: Nesquehoning Borough	ACTION: Remove gravel bars, vegetation and silt deposits from Nesquehoning Creek from the Jim Thorpe-Nesquehoning Borough Line to Tippetts Dam.
ACTION NO: 39	
Category:	Natural Resource Protection

Carbon County 2010 Hazard Mitigation Plan

Table 6.4-1: Carbon County Mitigation Action Plan	
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	DEP; Carbon County Conservation District
Implementation Schedule:	As funds become available.
Funding Source:	DEP; FEMA/HMGP; PEMA
COMMUNITY: Nesquehoning Borough	ACTION: Replace pipes and construct a stormwater collection system along SR 54 to prevent flooding on the north side of SR 54.
ACTION NO: 40	
Category:	Structural Projects
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Nesquehoning Borough
Implementation Schedule:	As funds become available.
Funding Source:	Nesquehoning Borough; FEMA/HMGP; PEMA
COMMUNITY: Palmerton Borough	ACTION: Investigate ways to mitigate flooding of at identified problem locations.
ACTION NO: 41	
Category:	Prevention
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Palmerton Borough; County
Implementation Schedule:	2 years
Funding Source:	FEMA/HMGP; PEMA
COMMUNITY: Summit Hill Borough	ACTION: Repair storm drains that collapse due to flooding or washing out of roads during storms.
ACTION NO: 42	
Category:	Structural Projects
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Summit Hill Borough
Implementation Schedule:	Annually
Funding Source:	Summit Hill Borough
COMMUNITY: Weatherly Borough	ACTION: Increase the height of the banks of the Hazle Creek that runs through the Borough's downtown.
ACTION NO: 43	
Category:	Natural Resource Protection
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam

Carbon County 2010 Hazard Mitigation Plan

Table 6.4-1: Carbon County Mitigation Action Plan

Lead Agency/Department:	DEP; Weatherly Borough, Carbon County Conservation District
Implementation Schedule:	As funds become available
Funding Source:	FEMA/HMGP, DEP
COMMUNITY: Weatherly Borough	ACTION: Divert stormwater from SR 4006 that is currently flowing onto private property lands approximately 2,000 feet from the entrance to the Borough on Plane Street, to a storm sewer system to reach Hazle Creek.
ACTION NO: 44	
Category:	Structural Projects
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Weatherly Borough, DEP
Implementation Schedule:	As funds become available.
Funding Source:	DEP
COMMUNITY: Weatherly Borough	ACTION: Install a storm sewer system to control stormwater from High Street, Jefferson Street, Franklin Street, and Dunningan Street.
ACTION NO: 45	
Category:	Structural Projects
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Weatherly Borough
Implementation Schedule:	As funds become available.
Funding Source:	Weatherly Borough
COMMUNITY: East Penn Township	ACTION: Elevate Blue Mountain Road (road to fire department).
ACTION NO: 46	
Category:	Structural Projects; Emergency Response
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	East Penn Township; PENNDOT
Implementation Schedule:	As funds become available.
Funding Source:	NA
COMMUNITY: Franklin Township	ACTION: Map location of pipes, culverts and channels and perform routine maintenance.
ACTION NO: 47	
Category:	Prevention; Structural Projects
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Franklin Township Public Works Department

Carbon County 2010 Hazard Mitigation Plan

Table 6.4-1: Carbon County Mitigation Action Plan	
Implementation Schedule:	2 years
Funding Source:	FEMA/HMGP, PEMA, County
COMMUNITY: Weissport Borough	ACTION: Identify mitigation projects within the community that would reduce flood vulnerability of critical facilities.
ACTION NO: 48	
Category:	Prevention/Property Protection - National Flood Insurance Program
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam
Lead Agency/Department:	Weissport Borough; DEP; USACE
Implementation Schedule:	Ongoing
Funding Source:	Weissport Borough
COMMUNITY: Weatherly Borough	ACTION: Install retaining walls or overflow systems to divert stormwater flowing from the old water reserve dam located on the mountain north of the Borough, under the railroad tracks to the Hazle Creek. This will prevent flooding of the electric substation.
ACTION NO: 49	
Category:	Structural Projects
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam; Dam Failure; Utility Interruption
Lead Agency/Department:	Weatherly Borough
Implementation Schedule:	As funds become available.
Funding Source:	FEMA/HMGP, PEMA
COMMUNITY: Franklin Township	ACTION: Correction of water run-off problems on various Township roads to prevent washouts during heavy rains.
ACTION NO: 50	
Category:	Structural Projects
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam; Transportation Accident
Lead Agency/Department:	Franklin Township Public Works Department
Implementation Schedule:	Ongoing
Funding Source:	FEMA/HMGP; PEMA
COMMUNITY: Mahoning Township	ACTION: Re-build road shoulder and install retaining walls at stream crossings where shoulders and guardrails have been routinely washed out.
ACTION NO: 51	
Category:	Structural Projects
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam; Transportation Accident
Lead Agency/Department:	Mahoning Township
Implementation Schedule:	Ongoing; Re-built shoulders and paved shoulders on various roads within the Township

Carbon County 2010 Hazard Mitigation Plan

Table 6.4-1: Carbon County Mitigation Action Plan

Funding Source:	Mahoning Township
COMMUNITY: Summit Hill Borough	ACTION: Correct water run-off problems within other areas of the Borough to prevent washouts of roads during storms.
ACTION NO: 52	
Category:	Structural Projects
Hazard(s) Addressed:	Flood, Flash Flood, & Ice Jam; Transportation Accident
Lead Agency/Department:	Summit Hill Borough
Implementation Schedule:	Annually
Funding Source:	Summit Hill Borough
COMMUNITY: Lansford Borough	ACTION: Regrading and repair of hillside, adjacent to pool pump house at rear of Lansford Pool.
ACTION NO: 53	
Category:	Structural Projects; Natural Resource Protection
Hazard(s) Addressed:	Landslide
Lead Agency/Department:	Lansford Borough; Carbon County Conservation District
Implementation Schedule:	As funds become available.
Funding Source:	NA
COMMUNITY: Bowmanstown Borough	ACTION: Install a ¼ mile section of guardrail along the west side of White Street (heading toward Palmerton) in order to provide driver and pedestrian safety.
ACTION NO: 54	
Category:	Structural Projects
Hazard(s) Addressed:	Transportation Accident
Lead Agency/Department:	Bowmanstown Borough; PENNDOT
Implementation Schedule:	As funds become available.
Funding Source:	Bowmanstown Borough
COMMUNITY: Mahoning Township	ACTION: Install traffic lights and other necessary traffic control devices at high accident intersections.
ACTION NO: 55	
Category:	Structural Projects
Hazard(s) Addressed:	Transportation Accident
Lead Agency/Department:	Mahoning Township
Implementation Schedule:	Ongoing; New traffic light at Normal Square and four-way stop at New Mahoning Intersection.
Funding Source:	Mahoning Township

Table 6.4-1: Carbon County Mitigation Action Plan

COMMUNITY: Jim Thorpe Borough, Lansford Borough, Lehigh Township, Packer Township, Penn Forest Township, Summit Hill Borough, Weatherly Borough	ACTION: Trim trees along roads electrical distribution system to prevent power outages during storms.
ACTION NO: 56	
Category:	Property Protection
Hazard(s) Addressed:	Utility Interruption
Lead Agency/Department:	PPL
Implementation Schedule:	Ongoing
Funding Source:	NA
COMMUNITY: Lower Towamensing Township	ACTION: Clear large trees adjacent to PPL power lines on Summer Mountain Road.
ACTION NO: 57	
Category:	Property Protection
Hazard(s) Addressed:	Utility Interruption
Lead Agency/Department:	Lower Towamensing Township
Implementation Schedule:	As funds become available.
Funding Source:	Lower Towamensing Township
COMMUNITY: Lehigh Township	ACTION: Improve access to electric transmission line along the Lehigh River.
ACTION NO: 58	
Category:	Property Protection
Hazard(s) Addressed:	Utility Interruption
Lead Agency/Department:	Lehigh Township
Implementation Schedule:	2 years
Funding Source:	NA
COMMUNITY: Lehigh Township	ACTION: Purchase of an emergency generator to operate raw water pump station.
ACTION NO: 59	
Category:	Emergency Services
Hazard(s) Addressed:	Utility Interruption
Lead Agency/Department:	Lehigh Township Water Authority
Implementation Schedule:	As funds become available.

Carbon County 2010 Hazard Mitigation Plan

Table 6.4-1: Carbon County Mitigation Action Plan

Funding Source:	NA
COMMUNITY: Weatherly Borough	ACTION: Configure the internal wiring of the three wells that supply the Borough's water to accept a portable trailer type generator power in the event of an outage.
ACTION NO: 60	
Category:	Structural Projects
Hazard(s) Addressed:	Utility Interruption
Lead Agency/Department:	Weatherly Borough
Implementation Schedule:	In progress.
Funding Source:	Weatherly Borough
COMMUNITY: Kidder Township	ACTION: Install dry hydrants at water's edge encompassing Lake Harmony.
ACTION NO: 61	
Category:	Natural Resource Protection
Hazard(s) Addressed:	Wildfire
Lead Agency/Department:	Kidder Township
Implementation Schedule:	As funding becomes available
Funding Source:	FEMA/HMGP; PEMA
COMMUNITY: Carbon County	ACTION: Run newspaper ad pertaining to tree and brush clearing near road to prevent fire from crossing. Include area map.
ACTION NO: 62	
Category:	Natural Resource Protection; Public Education and Awareness
Hazard(s) Addressed:	Wildfire
Lead Agency/Department:	Carbon County Emergency Management Agency
Implementation Schedule:	2 years
Funding Source:	FEMA/HMGP

Table 6.4-1: Carbon County Mitigation Action Plan

COMMUNITY: Banks Township; Beaver Meadows Borough; Bowmanstown Borough; East Penn Township; East Side Borough; Franklin Township; Jim Thorpe Borough; Kidder Township; Lansford Borough; Lausanne Township; Lehigh Township; Lehighton Borough; Lower Towamensing Township; Mahoning Township; Nesquehoning Borough; Packer Township; Palmerton Borough; Parryville Borough; Penn Forest Township; Summit Hill Borough; Towamensing Township; Weatherly Borough; Weissport Borough	ACTION: Adopt Firewise program.
ACTION NO: 63	
Category:	Prevention
Hazard(s) Addressed:	Wildfire
Lead Agency/Department:	DCNR; County
Implementation Schedule:	5 year rotation for hazard fuel mitigation projects; Annually for public education projects and training; Three years for updates on Emergency Action Plans
Funding Source:	U.S. Forest Service; DCNR
COMMUNITY: Banks Township; Beaver Meadows Borough; Bowmanstown Borough; East Penn Township; East Side Borough; Franklin Township; Jim Thorpe Borough; Kidder Township; Lansford Borough; Lausanne Township; Lehigh Township; Lehighton Borough; Lower Towamensing Township; Mahoning Township; Nesquehoning Borough; Packer Township; Palmerton Borough; Parryville Borough; Penn Forest Township; Summit Hill Borough; Towamensing Township; Weatherly Borough; Weissport Borough	ACTION: Designate fire lane in identified critical areas.
ACTION NO: 64	
Category:	Prevention; Emergency Services
Hazard(s) Addressed:	Wildfire

Carbon County 2010 Hazard Mitigation Plan

Table 6.4-1: Carbon County Mitigation Action Plan

Lead Agency/Department:	Carbon County Office of Planning and Development; Municipal Planning Departments and Municipal Supervisors
Implementation Schedule:	1 year
Funding Source:	NA
COMMUNITY: Carbon County	ACTION: Hold meeting between county and DCNR to evaluate the feasibility of a Wildfire Response Plan.
ACTION NO: 65	
Category:	Prevention; Natural Resource Protection
Hazard(s) Addressed:	Wildfire
Lead Agency/Department:	DCNR-Bureau of Forestry; Carbon County EMA
Implementation Schedule:	1 year
Funding Source:	DCNR; FEMA/HMGP
COMMUNITY: Banks Township	ACTION: Utilize Fire House as storm shelter during winter storm.
ACTION NO: 66	
Category:	Emergency Services
Hazard(s) Addressed:	Winter Storm
Lead Agency/Department:	Banks Township
Implementation Schedule:	1 year
Funding Source:	NA
COMMUNITY: Mahoning Township	ACTION: Repair and widen Packerton Dam Drive to correct a hazardous narrow road that accumulates water and ice.
ACTION NO: 67	
Category:	Property Protection
Hazard(s) Addressed:	Winter Storm; Traffic Accident
Lead Agency/Department:	Mahoning Township
Implementation Schedule:	As funds become available.
Funding Source:	FEMA/HMGP; PEMA
COMMUNITY: Carbon County	ACTION: Identify means of managing stranded travelers during winter storms.
ACTION NO: 68	
Category:	Emergency Services
Hazard(s) Addressed:	Winter Storm
Lead Agency/Department:	Carbon County EMA
Implementation Schedule:	1 year

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Table 6.4-1: Carbon County Mitigation Action Plan

Funding Source:	NA
COMMUNITY: Carbon County, Banks Township; Beaver Meadows Borough; Bowmanstown Borough; East Penn Township; East Side Borough; Franklin Township; Jim Thorpe Borough; Kidder Township; Lansford Borough; Lausanne Township; Lehigh Township; Lehigh Township; Lower Towamensing Township; Mahoning Township; Nesquehoning Borough; Packer Township; Palmerton Borough; Parryville Borough; Penn Forest Township; Summit Hill Borough; Towamensing Township; Weatherly Borough; Weissport Borough	ACTION: Review wildfire section of ICC code and evaluate current level of enforcement.
ACTION NO: 69	
Category:	Prevention
Hazard(s) Addressed:	Wildfire
Lead Agency/Department:	DCNR-Bureau of Forestry; Carbon County EMA
Implementation Schedule:	1 year.
Funding Source:	DCNR; FEMA/HMGP
COMMUNITY: Lansford Borough	ACTION: Resurfacing of portions of various streets and intersections.
ACTION NO: 70	
Category:	Structural Projects
Hazard(s) Addressed:	Transportation Accidents
Lead Agency/Department:	Lansford Borough; PENNDOT
Implementation Schedule:	As funds become available.
Funding Source:	Lansford Borough
COMMUNITY: Lower Towamensing Township	ACTION: Remove large trees over power lines on Golf Road, south to the Palmerton Borough line.
ACTION NO: 71	
Category:	Property Protection
Hazard(s) Addressed:	Utility Interruption
Lead Agency/Department:	Lower Towamensing Township; PPL
Implementation Schedule:	As funds become available.

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Table 6.4-1: Carbon County Mitigation Action Plan

Funding Source:	NA
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Table 6.4-1 lists seventy-one 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 2010 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 evaluation and prioritization of mitigation actions. Evaluation 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 2010 HMP process 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, *favorable* and *less favorable* factors were

identified for each action. Table 6.4-2 summarizes the evaluation methodology and provides the results of this evaluation for all seventy-one 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.

Table 6.4-2: Summary of mitigation action prioritization using PASTEEL methodology.

MITIGATION ACTIONS		PA STEEL CRITERIA CONSIDERATIONS																								
		(+) Favorable						(-) Less favorable						(N) Not Applicable												
		P Political			A Administrative			S Social		T Technical			E Economic				E Environmental				L Legal			SUMMARY (EQUAL WEIGHTING)	SUMMARY (BENEFITS & COSTS PRIORITIZED)	
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 Lime Street in order to provide emergency access to Meadowcrest Subdivision	+	+	+	+	+	-	+	+	+	+	N	+	+	+	+	N	N	N	N	+	+	+	-	16 (+) 2 (-) 5(N)	20 (+) 2(-) 5(N)
2	Provide emergency generators at multiple facilities which can afford shelter during an emergency.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	N	N	N	+	+	+	+	+	18 (+) 0 (-) 4 (N)	22(+) 0 (-) 4 (N)
3	Build another bridge across Hazle Creek in the Borough in order to provide an emergency access route in the event the current bridge over Hazle Creek becomes damaged or unusable.	+	+	+	-	-	-	+	+	+	N	N	+	-	N	-	N	N	N	N	+	+	+	+	11 (+) 5 (-) 7(N)	13(+) 7 (-) 7 (N)
4	Complete and implement Western Carbon County Comprehensive Plan	+	+	N	-	-	N	+	+	+	N	+	+	+	+	+	-	+	N	+	+	+	+	N	15(+) 3(-) 5(N)	19(+) 3 (-) 5(N)
5	Conduct youth outreach campaign aimed at existing hazard and hazard mitigation education	N	+	N	+	+	N	+	+	+	N	N	+	+	N	+	N	N	N	N	+	+	+	N	12(+) 0(-) 11(N)	16(+) 0(-) 11(N)

Table 6.4-2: Summary of mitigation action prioritization using PASTEEL methodology.

MITIGATION ACTIONS		PA STEEL CRITERIA CONSIDERATIONS																								
		(+) Favorable (-) Less favorable (N) Not Applicable																								
		P Political			A Administrative			S Social		T Technical			E Economic			E Environmental				L Legal			SUMMARY (EQUAL WEIGHTING)	SUMMARY (BENEFITS & COSTS PRIORITIZED)		
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				
NO.	NAME																									
6	Work with County Planning and EMA to identify mitigation projects within the community.	+	+	+	+	+	N	+	+	+	N	N	+	+	N	N	+	N	N	N	+	N	N	10(+) 0(-) 14(N)	14(+) 0(-) 14 (N)	
7	Extend coverage of community warning system to entire township	+	+	+	+	+	+	+	+	+	N	+	+	+	N	-	+	N	N	N	+	+	+	N	17 (+) 1 (-) 5(N)	21 (+) 1(-) 5(N)
8	Hold public forum to educate public about types of hazard mitigation that can be done on an individual basis.	N	+	+	+	+	+	+	+	+	N	N	+	+	N	N	N	N	N	N	N	N	N	10 (+) 0 (-) 13(N)	14(+) 0 (-) 13 (N)	
9	Identify critical transportation arteries and evaluate means to open roads for emergency access.	+	+	N	-	-	-	+	+	-	+	N	+	-	N	-	N	N	N	N	N	N	N	6 (+) 6 (-) 11(N)	8(+) 8(-) 11(N)	
10	Evaluate and list alternatives to reconstruction of structures that damages from natural hazards are equal to or more than 50% of value. Make information available to public.	+	+	-	-	-	N	N	N	+	N	N	+	-	N	N	N	N	N	N	N	N	N	4(+) 4(-) 15 (N)	6(+) 6(-) 15(N)	

Table 6.4-2: Summary of mitigation action prioritization using PASTEEL methodology.

MITIGATION ACTIONS		PA STEEL CRITERIA CONSIDERATIONS																																										
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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																						
NO.	NAME																																											
11	Investigate the feasibility of collecting building points for the County.																			+	+	+	+	+	+	+	+	+	N	N	+	+	N	N	N	N	N	N	N	11(+) 0(-) 12(N)	15(+) 0(-) 12(N)			
12	Install flood gates at TippettsDam																			+	+	N	-	-	-	+	+	+	-	N	-	+	N	-	N	N	N	N	N	N	6(+) 6(-) 11(N)	8 (+) 8(-) 11(N)		
13	Foster increased cooperation and communication between Carbon County and the four significant out-of-county high-hazard dams that could impact Carbon through education, outreach, and dam failure scenarios or exercises, as appropriate.																			+	+	+	+	+	+	+	+	+	N	+	+	+	N	+	+	N	+	+	+	N	17 (+) 0 (-) 6(N)	21 (+) 0(-) 6(N)		
14	Increase awareness of and participation in FEMA's Community Rating System (CRS) Program.																			+	+	+	+	+	+	+	+	+	N	+	+	+	N	-	+	N	N	N	+	+	+	N	16 (+) 1 (-) 6(N)	20 (+) 1(-) 6(N)
15	Investigate ways to prevent homes on Bridge, State, and Washington Streets from flooding.																			N	+	+	-	-	N	+	+	+	N	N	+	+	+	-	+	N	N	+	+	+	+	N	13(+) 3(-) 7(N)	17(+) 3(-) 7(N)

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16	Replace pipes and re-grade Rhume Run from the mouth at Nesquehoning Creek to the headwaters.	+	+	N	-	-	-	N	+	+	N	N	+	-	N	-	N	N	N	N	N	N	N	N	5(+) 5(-) 13(N)	7 (+) 7(-) 13(N)
17	Extend pipe at Franklin and Fireline Road culvert to the stream at the back of the property located at 643-651 Fireline Road in order to prevent flooding.	N	+	N	-	-	-	N	+	+	N	N	+	-	N	-	+	N	N	N	N	N	N	N	5(+) 5(-) 13(N)	7 (+) 7(-) 13(N)
18	Increase the size of the culvert on SR 895 on west side of Smithlane Road.	+	+	N	-	-	-	N	+	+	N	N	+	-	N	-	+	N	N	N	N	N	N	N	6(+) 5(-) 12(N)	8 (+) 7(-) 12(N)
19	Increase the size of the culvert on SR 895 in front of Pleasant Trees Care Home (between Dinkey Road and Friendship Road).	+	+	N	-	-	-	N	+	+	N	N	+	-	N	-	+	N	N	N	N	N	N	N	6(+) 5(-) 12(N)	8 (+) 7(-) 12(N)
20	Raise SR 895 for short section between Church Hill Road and a little before Germans Road.	+	+	N	-	-	-	N	+	+	N	N	+	-	N	-	N	N	N	N	N	N	N	N	5(+) 5(-) 13(N)	7 (+) 7(-) 13(N)

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21	Increase the number of pipes or pipe size (or raise road) on Ben Salem Road (between Evergreen and Harris Roads	N	+	N	-	-	-	N	+	+	N	N	+	-	N	-	+	N	N	N	N	N	N	5(+) 5(-) 13(N)	7 (+) 7(-) 13(N)	
22	Install storm drains on Germans Road, west of Sand Quarry Road to Bake Oven Road to prevent flooding between Schleicher's Trailer Park and Bake Oven Road.	+	+	N	-	-	-	N	+	+	N	N	+	-	N	-	+	N	N	N	N	N	N	6(+) 5(-) 12(N)	8 (+) 7(-) 12(N)	
23	Install/replace/repair culverts Borough-wide.	+	+	N	-	-	-	N	+	+	N	N	+	-	N	-	N	N	N	N	N	N	N	5(+) 5(-) 13(N)	7 (+) 7(-) 13(N)	
24	Undertake stormwater management in the Borough.	+	+	+	-	-	+	+	+	+	N	N	+	-	N	-	+	N	N	N	+	+	+	N	12(+) 4 (-) 8(N)	14(+) 6 (-) 7 (N)
25	Install/replace/repair culverts in previously identified problem areas.	+	+	N	-	-	-	N	+	+	N	N	+	-	N	-	N	N	N	N	N	N	N	5(+) 5(-) 13(N)	7 (+) 7(-) 13(N)	
26	Develop and implement a comprehensive watershed study and plan for Mud Run Creek Watershed.	+	+	+	-	-	+	+	+	+	N	N	+	-	+	-	+	N	N	+	+	+	+	-	14(+) 5 (-) 4 (N)	16(+) 7 (-) 4 (N)

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27	Dredging of Panther Creek near Edgemont Road and Oak Streets and along Dock Street area.	-	+	-	-	-	-	-	N	+	N	N	-	-	N	-	+	N	N	N	+	+	+	N	6(+) 9 (-) 8(N)	6(+) 13(-) 8(N)
28	Install new storm water collection drains to stormwater system at W. Patterson and Cortright Streets and W. Bertsch Street extended near Boyer's parking lot entrance.	+	+	N	-	-	-	N	+	+	N	N	+	-	N	-	+	N	N	N	N	N	N	N	6(+) 5(-) 12(N)	8 (+) 7(-) 12(N)
29	Regrade and repair 23 additional stormwater inlet culverts.	N	+	N	-	-	-	N	+	+	N	+	+	-	N	-	N	N	N	N	N	N	N	N	5(+) 5(-) 13(N)	7 (+) 7(-) 13(N)
30	Perform flood control along South and North Stagecoach Road.	N	+	N	-	-	-	N	+	+	N	N	+	-	N	-	+	N	N	N	N	N	N	N	5(+) 5(-) 13(N)	7 (+) 7(-) 13(N)
31	Clean streets and protect piers and abutments of various bridges and culverts within the Borough to prevent flooding and/or structure failure.	+	+	+	+	+	+	+	+	+	N	N	+	+	N	N	+	N	N	+	N	N	+	N	14(+) 0 (-) 9(N)	19(+) 0 (-) 9(N)

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32	Construct adequate culvert in Gypsy Hill Road to stop flooding.	+	+	+	-	+	-	+	+	+	+	N	+	+	+	+	N	N	N	N	+	+	+	-	15 (+) 3 (-) 5(N)	19 (+) 3(-) 5(N)
33	Repair catch basins throughout the Borough to eliminate local flooding.	+	+	+	-	-	+	+	+	+	N	N	+	-	+	-	+	N	N	+	N	N	+	N	12(+) 4(-) 7(N)	14(+) 6 (-) 7(N)
34	Redirect water from Hunter's Creek to the Buckwha Creek in order to alleviate flooding problems.	-	+	-	-	-	-	-	N	+	N	N	-	-	N	-	+	N	N	N	+	+	+	N	6(+) 9 (-) 8(N)	6(+) 13(-) 8(N)
35	Dredge the 1,000 feet of the Aquashicola Creek that currently remain undredged from the 1998 Army Corps dredging project.	-	+	-	-	-	-	-	N	+	N	N	-	-	N	-	+	N	N	N	+	+	+	N	6(+) 9 (-) 8(N)	6(+) 13(-) 8(N)
36	Conduct an evaluation of Drift Road to determine how to resolve flooding and run-off problems.	N	+	+	-	-	+	+	+	+	N	N	+	-	+	-	+	N	N	+	N	N	+	N	11(+) 4(-) 8(N)	13(+) 6 (-) 8(N)
37	Widen obsolete narrow bridges on township and state roads which cross various small streams and restrict	+	+	+	-	-	-	+	+	+	+	+	+	-	+	-	+	N	N	+	+	+	+	N	15(+) 5 (-) 3(N)	17(+) 7 (-) 3 (N)

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	water passage during high water conditions.																									
38	Clean and repair catch basins and storm water control piping along and under roadways.	+	+	+	+	-	+	+	+	+	N	N	+	+	N	N	+	N	N	+	N	N	+	N	13(+) 1(-) 9(N)	17(+) 1 (-) 9(N)
39	Remove gravel bars, vegetation and silt deposits from Nesquehoning Creek from the Jim Thorpe- Nesquehoning Borough Line to Tippetts Dam.	+	+	+	+	-	-	+	+	+	N	N	+	-	N	N	+	N	N	+	N	N	+	N	11(+) 3 (-) 9 (N)	13(+) 5 (-) 9 (N)
40	Replace pipes and construct a stormwater collection system along SR 54 to prevent flooding on the north side of SR 54.	N	+	N	-	-	-	N	+	+	N	N	+	-	N	-	+	N	N	N	N	N	N	N	5(+) 5(-) 13(N)	7 (+) 7(-) 13(N)
41	Investigate ways to mitigate flooding of at identified problem locations.	+	+	+	+	-	+	+	+	+	+	+	+	+	N	N	+	N	N	+	+	+	+	N	17(+) 1(-) 5(N)	21(+) 1 (-) 5 (N)
42	Repair storm drains that collapse due to flooding or washing out of roads during	N	+	+	-	-	-	+	+	+	N	N	+	-	N	N	+	N	N	+	N	N	+	N	9(+) 4(-) 10 (N)	11(+) 6 (-) 10(N)

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NO.	NAME																								
	storms.																								
43	Increase the height of the banks of the Hazle Creek that runs through the Borough's downtown.	N	+	N	-	-	-	N	+	+	N	N	+	-	N	-	+	N	N	N	N	N	N	5(+) 5(-) 13(N)	7 (+) 7(-) 13(N)
44	Divert stormwater from SR 4006 that is currently flowing onto private property lands approximately 2,000 feet from the entrance to the Borough on Plane Street, to a storm sewer system to reach Hazle Creek.	+	+	+	-	-	+	+	+	+	N	N	+	-	N	N	+	N	N	+	N	N	+	11(+) 3(-) 9(N)	13(+) 5 (-) 9(N)
45	Install a storm sewer system to control stormwater from High Street, Jefferson Street, Franklin Street, and Dunningan Street.	+	+	+	-	-	-	+	+	+	N	N	+	-	N	N	+	N	N	+	N	N	+	10(+) 4 (-) 9 (N)	12(+) 6 (-) 9(N)
46	Elevate Blue Mountain Road (road to fire department)	+	+	+	-	-	-	+	+	+	N	N	+	-	N	N	+	N	N	+	N	N	+	10(+) 4 (-) 9 (N)	12(+) 6 (-) 9(N)

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47	Map location of pipes, culverts and channels and perform routine maintenance	+	+	+	-	-	-	+	+	+	N	N	+	-	N	N	+	N	N	+	N	N	+	N	10(+) 4 (-) 9 (N)	12(+) 6 (-) 9(N)
48	Identify mitigation projects within the community that would reduce flood vulnerability of critical facilities.	+	+	+	+	+	+	+	+	+	N	+	+	+	N	-	+	N	N	N	+	+	+	N	16 (+) 1 (-) 6(N)	20 (+) 1(-) 6(N)
49	Install retaining walls or overflow systems to divert stormwater flowing from the old water reserve dam located on the mountain north of the Borough, under the railroad tracks to the Hazle Creek. This will prevent flooding of the electric substation.	N	+	N	-	-	-	N	+	+	+	+	-	+	N	-	N	N	N	N	N	N	N	N	6(+) 5(-) 12(N)	8 (+) 7(-) 12(N)
50	Correction of water run-off problems on various Township roads to prevent washouts during heavy rains.	N	+	+	+	+	+	+	+	+	-	N	+	-	N	-	+	N	N	+	N	N	+	N	12(+) 3(-) 8 (N)	14(+) 5(-) 8 (N)

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51	Re-build road shoulder and install retaining walls at stream crossings where shoulders and guardrails have been routinely washed out.	+	+	N	-	-	+	+	+	+	-	N	-	+	N	-	+	N	N	N	N	N	+	N	9(+) 5(-) 9(N)	11 (+) 7(-) 9(N)
52	Correct water run-off problems within other areas of the Borough to prevent washouts of roads during storms.	+	+	N	-	-	+	+	+	+	-	N	-	+	N	-	+	N	N	N	N	N	+	N	9(+) 5(-) 9(N)	11 (+) 7(-) 9(N)
53	Regrading and repair of hillside, adjacent to pool pump house at rear of Lansford Pool.	N	+	+	-	+	+	+	+	+	N	N	+	-	N	-	+	N	N	N	N	N	+	N	10(+) 3(-) 10 (N)	12(+) 5 (-) 10 (N)
54	Install a ¼ mile section of guardrail along the west side of White Street (heading toward Palmerton) in order to provide driver and pedestrian safety.	+	+	N	-	-	+	+	+	+	-	N	-	+	N	-	+	N	N	N	N	N	+	N	9(+) 5(-) 9(N)	11 (+) 7(-) 9(N)
55	Install traffic lights and other necessary traffic control devices at high accident	+	+	+	-	+	+	+	+	+	+	+	+	+	N	-	+	N	N	N	N	N	+	N	14(+) 2 (-) 7 (N)	18(+) 2(-) 7(N)

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	intersections.																									
56	Trim trees along roads electrical distribution system to prevent power outages during storms.	+	+	+	+	+	+	+	+	+	+	+	+	N	-	+	N	N	N	N	N	N	+	N	15(+) 1 (-) 7 (N)	19(+) 1 (-) 7(N)
57	Clear large trees adjacent to PPL power lines on Summer Mountain Road.	N	+	+	-	+	+	+	+	+	+	+	+	+	+	+	N	N	N	N	N	N	+	N	15(+) 1 (-) 7(N)	19(+) 1 (-) 7 (N)
58	Improve access to electric transmission line along the Lehigh River.	N	+	N	-	N	+	+	N	+	N	N	+	-	+	-	N	N	N	N	N	N	+	N	7(+) 3 (-) 13 (N)	9(+) 5 (-) 13(N)
59	Purchase of an emergency generator to operate raw water pump station.	+	+	+	+	+	+	+	+	+	+	+	+	+	N	+	N	N	N	+	+	+	N	18(+) 0(-) 5 (N)	22(+) 0(-) 5(N)	
60	Configure the internal wiring of the three wells that supply the Borough's water to accept a portable trailer type generator power in the event of an outage.	N	+	N	-	-	-	+	+	+	N	N	+	-	N	-	+	N	N	N	N	+	N	7(+) 5 (-) 11 (N)	9(+) 7 (-) 11 (N)	

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61	Install dry hydrants at water's edge encompassing Lake Harmony.	N	N	-	-	-	+	+	+	+	N	N	+	-	N	-	+	N	N	N	+	+	+	N	9(+) 5 (-) 9(N)	11(+) 7 (-) 9(N)
62	Run newspaper ad pertaining to tree and brush clearing near road to prevent fire from crossing. Include area map.	+	+	+	+	+	+	+	+	+	N	N	+	+	N	N	+	N	N	N	+	+	+	N	15(+) 0 (-) 8 (N)	19(+) 0(-) 8 (N)
63	Adopt Firewise program	+	+	+	+	+	+	+	+	+	N	+	+	+	+	+	+	N	N	+	+	+	+	N	19(+) 0 (-) 4(N)	23(+) 0(-) 4(N)
64	Designate fire lane in identified critical areas	N	+	N	+	+	N	N	+	+	-	N	+	+	N	+	N	N	N	N	+	+	+	-	11(+) 2(-) 10(N)	15(+) 2 (-) 10(N)
65	Hold meeting between county and DCNR to evaluate the feasibility of a Wildfire Response Plan	+	+	+	N	N	N	+	+	+	N	N	+	+	N	N	+	N	N	N	+	+	+	N	12(+) 0 (-) 11 (N)	16 (+) 0 (-) 11 (N)
66	Utilize Fire House as storm shelter during winter storm	+	+	+	+	+	+	+	+	+	+	N	+	+	N	N	N	N	N	N	+	+	+	N	15(+) 0(-) 8 (N)	19(+) 0 (-) 8(N)
67	Repair and widen Packerton Dam Drive to correct a hazardous narrow road that	+	+	+	-	-	+	+	+	+	+	+	+	-	N	+	+	N	N	+	+	+	+	N	16(+) 3 (-) 4(N)	18(+) 5(-) 4(N)

Table 6.4-2: Summary of mitigation action prioritization using PASTEEL methodology.

MITIGATION ACTIONS		PA STEEL CRITERIA CONSIDERATIONS																							
		(+) Favorable (-) Less favorable (N) Not Applicable																							
		P Political			A Administrative			S Social		T Technical			E Economic				E Environmental				L Legal			SUMMARY (EQUAL WEIGHTING)	SUMMARY (BENEFITS & COSTS PRIORITIZED)
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			
NO.	NAME																								
	accumulates water and ice.																								
68	Identify means of managing stranded travelers during winter storms.	N	+	N	+	-	N	+	+	+	N	N	+	-	N	+	N	N	N	+	+	+	N	10(+) 2 (-) 11 (N)	12(+) 4 (-) 11 (N)
69	Review wildfire section of ICC code and evaluate current level of enforcement	+	+	N	+	+	N	+	+	+	N	N	+	+	N	N	+	N	N	+	+	+	+	14(+) 0 (-) 9 (N)	18(+) 0 (-) 9(N)
70	Resurfacing of portions of various streets and intersections.	+	+	+	-	+	+	+	+	+	-	N	+	+	N	+	N	N	N	+	+	+	+	15(+) 2 (-) 6 (N)	19(+) 2 (-) 6 (N)
71	Remove large trees over power lines on Golf Road, south to the Palmerton Borough line.	+	+	+	-	-	-	+	+	+	N	N	+	+	N	N	N	N	N	+	+	+	+	12(+) 3 (-) 8 (N)	16(+) 3 (-) 8 (N)

Using cost-benefit weighted prioritization, three actions received more unfavorable ratings than favorable rating. These include Actions 27, 34, 35. Actions 27 and 35 have to do with dredging of creeks. Action 34 has to do with redirecting water from one creek to another. The ratings do not mean that these actions should not be considered. Rather, barriers to implementation may increase their costs (i.e. political, financial, time, etc...) and therefore reduce overall benefits. Dredging and redirecting water from creeks can often be politically unfavorable and require permits, coordination with government entities, and expenses to complete the activities.

7. Plan Maintenance

7.1. Process Summary

Monitoring, evaluating and updating this plan, is critical to maintaining its value and success in Carbon 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.

7.2. Monitoring, Evaluating and Updating the Plan

The HMSC established for the 2010 HMP is designated to administer the plan maintenance processes of monitoring, evaluation and updating with support and representation from all 23 participating municipalities. Judy Borger, Director of the Carbon County Office of Planning and Development, in coordination with and cooperation of the Carbon County Emergency Management Agency Director, will lead the HMSC in all associated plan maintenance requirements including annual reviews. The HMSC will coordinate maintenance efforts, but the input needed for effective periodic evaluations will come from community representatives, local emergency management coordinators and planners, the general public and other important stakeholders. The HMSC will oversee the progress made on the implementation of action items identified in the 2010 HMP and modify actions, as needed, to reflect changing conditions. The HMSC will meet annually each January to discuss specific coordination efforts that may be needed with other stakeholders. Should a significant disaster occur within the County, the HMSC will reconvene within 30 days of the disaster to review and update the plan.

Each municipality will designate a community representative to monitor mitigation activities and hazard events within their respective communities. The local emergency management coordinator would be suitable for this role. This individual will be asked to work with the HMSC to provide updates on applicable mitigation actions and feedback on changing hazard vulnerabilities within their community.

Upon each HMP evaluation, the HMSC will consider whether applications should be submitted for existing mitigation grant programs. A decision to apply for funding will be based on appropriate eligibility and financial need requirements. The HMSC will also support local and County officials in applying for post-disaster mitigation funds when they are available. All state and federal mitigation funding provided to the County or local municipalities will be reported in subsequent plan updates. In addition, new plans and programs being developed within the County will be evaluated as to the ability and necessity to incorporate the 2010 HMP into them.

The 2010 HMP will be updated every five years, as required by the Disaster Mitigation Act of 2000, or following a disaster event. Future plan updates will account for any new hazard vulnerabilities, special circumstances, or new information that becomes available. During the five-year review process, the following questions will be considered as criteria for assessing the effectiveness the Carbon County HMP.

- Has the nature or magnitude of hazards affecting the County changed?
- Are there new hazards that have the potential to impact the County?
- Do the identified goals and actions address current and expected conditions?
- Have mitigation actions been implemented or completed?
- Has the implementation of identified mitigation actions resulted in expected outcomes?
- Are current resources adequate to implement the Plan?
- Should additional local resources be committed to address identified hazards?

Issues that arise during monitoring and evaluation which require changes to the risk assessment, mitigation strategy and other components of the plan will be incorporated during future updates.

7.3. *Incorporation into Other Planning Mechanisms*

Based on the comprehensive nature of this plan, the HMPT believes that this document will be highly useful when updating and developing other planning mechanisms in the County. Specific documents that the HMPT will actively incorporate information from the 2010 HMP into include:

- **Carbon County Comprehensive Plan:** Section 4.4.4, Future Development and Vulnerability, will provide information for the development of the next County Comprehensive Plan by making available specific risk and vulnerability information for the entire county but more specifically the potential areas of growth.
- **Carbon County Emergency Operations Plan:** The 2010 HMP 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.
- **Carbon County Hazard Vulnerability Analysis:** The County EMA's HVA and the County HMP 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 2010 HMP will be used to aid in goal and objective development, hazard identification, and risk assessment in the next County HVA.
- **Act 167 Stormwater Management Plans:** These plans are currently under development or in place for several watersheds. The results of the 2010 HMP vulnerability analysis, particularly for flooding, will be taken into consideration when finalizing these stormwater management plans and any new stormwater management plans.

7.4. *Continued Public Involvement*

As was done during the development of the 2010 HMP, the HMSC will involve the public during the evaluation and update of the HMP through various workshops and meetings. The public will have access to the current HMP through their local municipal office, the Carbon County Office of Planning and Development or the Carbon County Emergency Management Agency. Information on upcoming events related to the HMP or solicitation for comments will be announced via newsletters, newspapers, mailings, and on the County website (<http://www.carboncounty.com>). The HMSC will incorporate all relevant comments during the next update of the HMP.

8. Plan Adoption

The Plan was submitted to the Pennsylvania State Hazard Mitigation Officer on **xxxxx, 2010**. It was forwarded to FEMA for final review and approval-pending-adoption on **xxxxxx, 2010**. FEMA granted approval-pending-adoption on **<Month Day, Year>**. Full approval from FEMA was received on **<Month Day, Year>**.

This section of the plan includes copies of the local adoption resolutions passed by Carbon 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.

Carbon County 2010 Hazard Mitigation Plan
County Adoption Resolution

Resolution No. _____
Carbon County, Pennsylvania

WHEREAS, the municipalities of Carbon 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, Carbon 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 Carbon County 2010 Hazard Mitigation Plan has been developed by the Carbon County Office of Planning and Development and the Carbon County Emergency Management Agency in cooperation with other county departments, local municipal officials, and the citizens of Carbon County, and

WHEREAS, a public involvement process consistent with the requirements of DMA 2000 was conducted to develop the Carbon County 2010 Hazard Mitigation Plan, and

WHEREAS, the Carbon County 2010 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 Carbon that:

- The Carbon County 2010 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 Carbon County 2010 Hazard Mitigation Plan are hereby directed to implement the recommended activities assigned to them.

ADOPTED, this _____ day of _____, 2010

ATTEST:

CARBON COUNTY COMMISSIONERS

By _____

By _____

By _____

**Carbon County 2010 Hazard Mitigation Plan
Municipal Adoption Resolution**

Resolution No. _____

<Borough/Township of Municipality Name>, Carbon County, Pennsylvania

WHEREAS, the <Borough/Township of Municipality Name>, Carbon 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 Carbon County 2010 Hazard Mitigation Plan has been developed by the Carbon County Office of Planning and Development and the Carbon 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 Carbon County 2010 Hazard Mitigation Plan, and

WHEREAS, the Carbon County 2010 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 Carbon County 2010 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 Carbon County 2010 Hazard Mitigation Plan are hereby directed to implement the recommended activities assigned to them.

ADOPTED, this _____ day of _____, 2010

ATTEST:

<BOROUGH/TOWNSHIP OF MUNICIPALITY NAME>

By _____

By _____

By _____

9. Appendices

Appendix A – Bibliography

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Appendix B – Local Mitigation Plan Review Crosswalk

Local Mitigation Plan Review Crosswalk

INSTRUCTIONS FOR USING THE PLAN REVIEW CROSSWALK FOR REVIEW OF LOCAL MITIGATION PLANS

Attached is a Plan Review Crosswalk based on the **Local Multi-Hazard Mitigation Planning Guidance**, published by FEMA in July, 2008. This Plan Review Crosswalk is consistent with the *Robert T. Stafford Disaster Relief and Emergency Assistance Act* (Stafford Act), as amended by Section 322 of the *Disaster Mitigation Act of 2000* (P.L. 106-390), the *National Flood Insurance Act of 1968*, as amended by the *National Flood Insurance Reform Act of 2004* (P.L. 108-264) and *44 Code of Federal Regulations (CFR) Part 201 – Mitigation Planning*, inclusive of all amendments through October 31, 2007.

SCORING SYSTEM

N – Needs Improvement: The plan does not meet the minimum for the requirement. Reviewer's comments must be provided.

S – Satisfactory: The plan meets the minimum for the requirement. Reviewer's comments are encouraged, but not required.

Each requirement includes separate elements. All elements of a requirement must be rated "Satisfactory" in order for the requirement to be fulfilled and receive a summary score of "Satisfactory." A "Needs Improvement" score on elements shaded in gray (recommended but not required) will not preclude the plan from passing. When reviewing single jurisdiction plans, reviewers may want to put an N/A in the boxes for multi-jurisdictional plan requirements. When reviewing multi-jurisdictional plans, however, all elements apply. States that have additional requirements can add them in the appropriate sections of the *Local Multi-Hazard Mitigation Planning Guidance* or create a new section and modify this Plan Review Crosswalk to record the score for those requirements. Optional matrices for assisting in the review of sections on profiling hazards, assessing vulnerability, and identifying and analyzing mitigation actions are found at the end of the Plan Review Crosswalk.

The example below illustrates how to fill in the Plan Review Crosswalk:

Assessing Vulnerability: Overview				
Requirement §201.6(c)(2)(ii): [The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.				
Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan include an overall summary description of the jurisdiction's vulnerability to each hazard?	Section II, pp. 4-10	The plan describes the types of assets that are located within geographically defined hazard areas as well as those that would be affected by winter storms.		<input type="checkbox"/>
B. Does the new or updated plan address the impact of each hazard on the jurisdiction?	Section II, pp. 10-20	The plan does not address the impact of two of the five hazards addressed in the plan. Required Revisions: • Include a description of the impact of floods and earthquakes on the assets. Recommended Revisions: This information can be presented in terms of dollar value or percentages of damage.	<input type="checkbox"/>	
SUMMARY SCORE			<input type="checkbox"/>	

Appendix 13. Local Mitigation Plan Review Crosswalk Issued July 1, 2008

LOCAL MITIGATION PLAN REVIEW SUMMARY

The plan cannot be approved if the plan has not been formally adopted. Each requirement includes separate elements. All elements of the requirement must be rated "Satisfactory" in order for the requirement to be fulfilled and receive a score of "Satisfactory." Elements of each requirement are listed on the following pages of the Plan Review Crosswalk. A "Needs Improvement" score on elements shaded in gray (recommended but not required) will not preclude the plan from passing. Reviewer's comments must be provided for requirements receiving a "Needs Improvement" score.

Prerequisite(s) (Check Applicable Box)

1. Adoption by the Local Governing Body: §201.6(c)(5) OR

NOT MET	MET
<input type="checkbox"/>	<input type="checkbox"/>

2. Multi-Jurisdictional Plan Adoption: §201.6(c)(5)
AND

<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>

3. Multi-Jurisdictional Planning Participation: §201.6(a)(3)

<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------

Planning Process

4. Documentation of the Planning Process: §201.6(b) and §201.6(c)(1)

N	S
<input type="checkbox"/>	<input type="checkbox"/>

Risk Assessment

5. Identifying Hazards: §201.6(c)(2)(i)

N	S
<input type="checkbox"/>	<input type="checkbox"/>

6. Profiling Hazards: §201.6(c)(2)(i)

<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------

7. Assessing Vulnerability: Overview: §201.6(c)(2)(ii)

<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------

8. Assessing Vulnerability: Addressing Repetitive Loss Properties. §201.6(c)(2)(ii)

<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------

9. Assessing Vulnerability: Identifying Structures, Infrastructure, and Critical Facilities: §201.6(c)(2)(ii)(B)

<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------

10. Assessing Vulnerability: Estimating Potential Losses: §201.6(c)(2)(ii)(B)

<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------

11. Assessing Vulnerability: Analyzing Development Trends: §201.6(c)(2)(ii)(C)

<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------

12. Multi-Jurisdictional Risk Assessment: §201.6(c)(2)(iii)

<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------

*States that have additional requirements can add them in the appropriate sections of the *Local Multi-Hazard Mitigation Planning Guidance* or create a new section and modify this Plan Review Crosswalk to record the score for those requirements.

SCORING SYSTEM

Please check one of the following for each requirement.

N – Needs Improvement: The plan does not meet the minimum for the requirement. Reviewer's comments must be provided.

S – Satisfactory: The plan meets the minimum for the requirement. Reviewer's comments are encouraged, but not required.

Mitigation Strategy

13. Local Hazard Mitigation Goals: §201.6(c)(3)(i)

14. Identification and Analysis of Mitigation Actions: §201.6(c)(3)(ii)

15. Identification and Analysis of Mitigation Actions: **NFIP Compliance. §201.6(c)(3)(ii)**

16. Implementation of Mitigation Actions: §201.6(c)(3)(iii)

17. Multi-Jurisdictional Mitigation Actions: §201.6(c)(3)(iv)

N	S
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>

Plan Maintenance Process

18. Monitoring, Evaluating, and Updating the Plan: §201.6(c)(4)(ii)

19. Incorporation into Existing Planning Mechanisms: §201.6(c)(4)(ii)

20. Continued Public Involvement: §201.6(c)(4)(iii)

N	S
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>

Additional State Requirements*

Insert State Requirement

Insert State Requirement

Insert State Requirement

N	S
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>

LOCAL MITIGATION PLAN APPROVAL STATUS

PLAN NOT APPROVED

☐

See Reviewer's Comments

PLAN APPROVED

☐

Local Mitigation Plan Review and Approval Status

Jurisdiction:	Title of Plan:	Date of Plan:
Local Point of Contact:		Address:
Title:		
Agency:		
Phone Number:		E-Mail:

State Reviewer:	Title:	Date:
------------------------	---------------	--------------

FEMA Reviewer:	Title:	Date:
Date Received in FEMA Region [Insert #]		
Plan Not Approved		
Plan Approved		
Date Approved		

Jurisdiction:	DFIRM		NFIP Status*			
	In Plan	NOT in Plan	Y	N	N/A	CRS Class
1.						
2.						
3.						
4.						
5. [ATTACH PAGE(S) WITH ADDITIONAL JURISDICTIONS]						

*** Notes:** **Y = Participating** **N = Not Participating** **N/A = Not Mapped**

PREREQUISITE(S)

1. Adoption by the Local Governing Body

Requirement §201.6(c)(5): [The local hazard mitigation plan **shall** include] documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, County Commissioner, Tribal Council).

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			NOT MET	MET
A. Has the local governing body adopted new or updated plan?				
B. Is supporting documentation, such as a resolution, included?				
SUMMARY SCORE				

2. Multi-Jurisdictional Plan Adoption

Requirement §201.6(c)(5): For multi-jurisdictional plans, each jurisdiction requesting approval of the plan **must** document that it has been formally adopted.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			NOT MET	MET
A. Does the new or updated plan indicate the specific jurisdictions represented in the plan?				
B. For each jurisdiction, has the local governing body adopted the new or updated plan?				
C. Is supporting documentation, such as a resolution, included for each participating jurisdiction?				
SUMMARY SCORE				

3. Multi-Jurisdictional Planning Participation

Requirement §201.6(a)(3): Multi-jurisdictional plans (e.g., watershed plans) may be accepted, as appropriate, as long as each jurisdiction has participated in the process ... Statewide plans will not be accepted as multi-jurisdictional plans.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			NOT MET	MET
A. Does the new or updated plan describe how each jurisdiction participated in the plan's development?				
B. Does the updated plan identify all participating jurisdictions, including new, continuing, and the jurisdictions that no longer participate in the plan?				
SUMMARY SCORE				

PLANNING PROCESS: §201.6(b): *An open public involvement process is essential to the development of an effective plan.*

4. Documentation of the Planning Process

Requirement §201.6(b): *In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process **shall** include:*

- (1) *An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;*
- (2) *An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process; and*
- (3) *Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.*

Requirement §201.6(c)(1): *[The plan **shall** document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the plan provide a narrative description of the process followed to prepare the new or updated plan?				
B. Does the new or updated plan indicate who was involved in the current planning process? (For example, who led the development at the staff level and were there any external contributors such as contractors? Who participated on the plan committee, provided information, reviewed drafts, etc.?)				
C. Does the new or updated plan indicate how the public was involved? (Was the public provided an opportunity to comment on the plan during the drafting stage and prior to the plan approval?)				
D. Does the new or updated plan discuss the opportunity for neighboring communities, agencies, businesses, academia, nonprofits, and other interested parties to be involved in the planning process?				
E. Does the planning process describe the review and incorporation, if appropriate, of existing plans, studies, reports, and technical information?				
F. Does the updated plan document how the planning team reviewed and analyzed each section of the plan and whether each section was revised as part of the update process?				
SUMMARY SCORE				

Local Mitigation Plan Review Crosswalk Issued July 1, 2008

RISK ASSESSMENT: §201.6(c)(2): *The plan shall include a risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.*

5. Identifying Hazards

Requirement §201.6(c)(2)(i): *[The risk assessment **shall** include a] description of the type ... of all natural hazards that can affect the jurisdiction.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan include a description of the types of all natural hazards that affect the jurisdiction?				
SUMMARY SCORE				

6. Profiling Hazards

Requirement §201.6(c)(2)(i): *[The risk assessment **shall** include a] description of the ... location and extent of all natural hazards that can affect the jurisdiction. The plan **shall** include information on previous occurrences of hazard events and on the probability of future hazard events.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the risk assessment identify the location (<i>i.e.</i> , geographic area affected) of each natural hazard addressed in the new or updated plan?				
B. Does the risk assessment identify the extent (<i>i.e.</i> , magnitude or severity) of each hazard addressed in the new or updated plan?				
C. Does the plan provide information on previous occurrences of each hazard addressed in the new or updated plan?				
D. Does the plan include the probability of future events (<i>i.e.</i> , chance of occurrence) for each hazard addressed in the new or updated plan?				
SUMMARY SCORE				

7. Assessing Vulnerability: Overview

Requirement §201.6(c)(2)(ii): [The risk assessment **shall** include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description **shall** include an overall summary of each hazard and its impact on the community.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan include an overall summary description of the jurisdiction's vulnerability to each hazard?				
B. Does the new or updated plan address the impact of each hazard on the jurisdiction?				
SUMMARY SCORE				

8. Assessing Vulnerability: Addressing Repetitive Loss Properties

Requirement §201.6(c)(2)(ii): [The risk assessment] **must** also address National Flood Insurance Program (NFIP) insured structures that have been repetitively damaged floods.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan describe vulnerability in terms of the types and numbers of repetitive loss properties located in the identified hazard areas?		Note: This requirement becomes effective for all local plans approved after October 1, 2008.		
SUMMARY SCORE				

9. Assessing Vulnerability: Identifying Structures

Requirement §201.6(c)(2)(ii)(A): The plan **should** describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard area

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan describe vulnerability in terms of the types and numbers of existing buildings, infrastructure, and critical facilities located in the identified hazard areas?		Note: A "Needs Improvement" score on this requirement will not preclude the plan from passing.		
B. Does the new or updated plan describe vulnerability in terms of the types and numbers of future buildings, infrastructure, and critical facilities located in the identified hazard areas?		Note: A "Needs Improvement" score on this requirement will not preclude the plan from passing.		
SUMMARY SCORE				

10. Assessing Vulnerability: Estimating Potential Losses

Requirement §201.6(c)(2)(ii)(B): [The plan **should** describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan estimate potential dollar losses to vulnerable structures?		Note: A "Needs Improvement" score on this requirement will not preclude the plan from passing.		
B. Does the new or updated plan describe the methodology used to prepare the estimate?		Note: A "Needs Improvement" score on this requirement will not preclude the plan from passing.		
SUMMARY SCORE				

11. Assessing Vulnerability: Analyzing Development Trends

Requirement §201.6(c)(2)(ii)(C): [The plan **should** describe vulnerability in terms of] providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan describe land uses and development trends?		Note: A "Needs Improvement" score on this requirement will not preclude the plan from passing.		
SUMMARY SCORE				

12. Multi-Jurisdictional Risk Assessment

Requirement §201.6(c)(2)(iii): For multi-jurisdictional plans, the risk assessment **must** assess each jurisdiction's risks where they vary from the risks facing the entire planning area.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan include a risk assessment for each participating jurisdiction as needed to reflect unique or varied risks?				
SUMMARY SCORE				

Local Mitigation Plan Review Crosswalk Issued July 1, 2008

MITIGATION STRATEGY: §201.6(c)(3): *The plan shall include a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.*

13. Local Hazard Mitigation Goals

Requirement §201.6(c)(3)(i): *[The hazard mitigation strategy **shall** include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A Does the new or updated plan include a description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards?				
SUMMARY SCORE				

14. Identification and Analysis of Mitigation Actions

Requirement §201.6(c)(3)(ii): *[The mitigation strategy **shall** include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan identify and analyze a comprehensive range of specific mitigation actions and projects for each hazard?				
B Do the identified actions and projects address reducing the effects of hazards on new buildings and infrastructure?				
C. Do the identified actions and projects address reducing the effects of hazards on existing buildings and infrastructure?				
SUMMARY SCORE				

15. Identification and Analysis of Mitigation Actions: National Flood Insurance Program (NFIP) Compliance

Requirement: §201.6(c)(3)(ii): [The mitigation strategy] must also address the jurisdiction's participation in the National Flood Insurance Program (NFIP), and continued compliance with NFIP requirements, as appropriate.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan describe the jurisdiction (s) participation in the NFIP?		<i>Note: This requirement becomes effective for all local mitigation plans approved after October 1, 2008.</i>		
B. Does the mitigation strategy identify, analyze and prioritize actions related to continued compliance with the NFIP?		<i>Note: This requirement becomes effective for all local mitigation plans approved after October 1, 2008.</i>		
SUMMARY SCORE				

16. Implementation of Mitigation Actions

Requirement: §201.6(c)(3)(iii): [The mitigation strategy section **shall** include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization **shall** include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated mitigation strategy include how the actions are prioritized ? (For example, is there a discussion of the process and criteria used?)				
B. Does the new or updated mitigation strategy address how the actions will be implemented and administered, including the responsible department , existing and potential resources and the timeframe to complete each action?				
C. Does the new or updated prioritization process include an emphasis on the use of a cost-benefit review to maximize benefits?				
D. Does the updated plan identify the completed, deleted or deferred mitigation actions as a benchmark for progress, and if activities are unchanged (i.e., deferred), does the updated plan describe why no changes occurred?				
SUMMARY SCORE				

17. Multi-Jurisdictional Mitigation Actions

Requirement §201.6(c)(3)(iv): For multi-jurisdictional plans, there **must** be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan include identifiable action items for each jurisdiction requesting FEMA approval of the plan?				
B. Does the updated plan identify the completed, deleted or deferred mitigation actions as a benchmark for progress, and if activities are unchanged (<i>i.e.</i> , deferred), does the updated plan describe why no changes occurred?				
SUMMARY SCORE				

PLAN MAINTENANCE PROCESS

18. Monitoring, Evaluating, and Updating the Plan

Requirement §201.6(c)(4)(i): [The plan maintenance process **shall** include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan describe the method and schedule for monitoring the plan, including the responsible department?				
B. Does the new or updated plan describe the method and schedule for evaluating the plan, including how, when and by whom (<i>i.e.</i> the responsible department)?				
C. Does the new or updated plan describe the method and schedule for updating the plan within the five-year cycle?				
SUMMARY SCORE				

19. Incorporation into Existing Planning Mechanisms

Requirement §201.6(c)(4)(ii): *[The plan **shall** include a] process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan identify other local planning mechanisms available for incorporating the mitigation requirements of the mitigation plan?				
B. Does the new or updated plan include a process by which the local government will incorporate the mitigation strategy and other information contained in the plan (e.g., risk assessment) into other planning mechanisms, when appropriate?				
C. Does the updated plan explain how the local government incorporated the mitigation strategy and other information contained in the plan (e.g., risk assessment) into other planning mechanisms, when appropriate?				
SUMMARY SCORE				

Continued Public Involvement

Requirement §201.6(c)(4)(iii): *[The plan maintenance process **shall** include a] discussion on how the community will continue public participation in the plan maintenance process.*

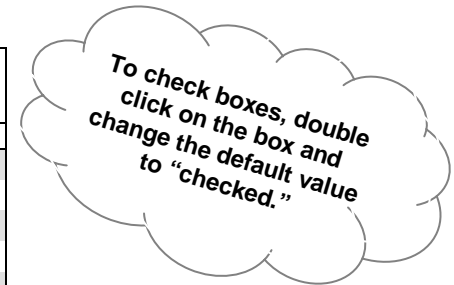
Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan explain how continued public participation will be obtained? (For example, will there be public notices, an on-going mitigation plan committee, or annual review meetings with stakeholders?)				
SUMMARY SCORE				

MATRIX A: PROFILING HAZARDS

This matrix can assist FEMA and the State in scoring each hazard. Local jurisdictions may find the matrix useful to ensure that their plan addresses each natural hazard that can affect the jurisdiction. **Completing the matrix is not required.**

Note: First, check which hazards are identified in requirement §201.6(c)(2)(i). Then, place a checkmark in either the N or S box for each applicable hazard. An “N” for any element of any identified hazard will result in a “Needs Improvement” score for this requirement. List the hazard and its related shortcoming in the comments section of the Plan Review Crosswalk.

Hazard Type	Hazards Identified Per Requirement §201.6(c)(2)(i)	A. Location		B. Extent		C. Previous Occurrences		D. Probability of Future Events	
	Yes	N	S	N	S	N	S	N	S
Avalanche	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Coastal Erosion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Coastal Storm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dam Failure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Drought	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Earthquake	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Expansive Soils	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Levee Failure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Flood	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hailstorm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hurricane	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Land Subsidence	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Landslide	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Severe Winter Storm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tornado	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tsunami	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Volcano	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wildfire	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Windstorm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Legend:

§201.6(c)(2)(i) Profiling Hazards

- A. Does the risk assessment identify the location (*i.e.*, geographic area affected) of each hazard addressed in the **new or updated** plan?
- B. Does the risk assessment identify the extent (*i.e.*, magnitude or severity) of each hazard addressed in the **new or updated** plan?
- C. Does the plan provide information on previous occurrences of each natural hazard addressed in the **new or updated** plan?
- D. Does the plan include the probability of future events (*i.e.*, chance of occurrence) for each hazard addressed in the plan?

MATRIX B: ASSESSING VULNERABILITY

This matrix can assist FEMA and the State in scoring each hazard. Local jurisdictions may find the matrix useful to ensure that the new or updated plan addresses each requirement. **Completing the matrix is not required.**

*Note: First, check which hazards are identified in requirement §201.6(c)(2)(i). Then, place a checkmark in either the N or S box for each **applicable** hazard. An “N” for any element of any identified hazard will result in a “Needs Improvement” score for this requirement. List the hazard and its related shortcoming in the comments section of the Plan Review Crosswalk. Note: Receiving an N in the shaded columns will not preclude the plan from passing.*

Hazard Type	Hazards Identified Per Requirement §201.6(c)(2)(i)		A. Overall Summary Description of Vulnerability		B. Hazard Impact			A. Types and Number of Existing Structures in Hazard Area (Estimate)		B. Types and Number of Future Structures in Hazard Area (Estimate)			A. Loss Estimate		B. Methodology	
	Yes		N	S	N	S		N	S	N	S		N	S	N	S
Avalanche	<input type="checkbox"/>	§201.6(c)(2)(ii) Assessing Vulnerability: Overview	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	§201.6(c)(2)(ii) Assessing Vulnerability: Identifying Structures	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	§201.6(c)(2)(ii) Assessing Vulnerability: Estimating Potential Losses	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Coastal Erosion	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Coastal Storm	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Dam Failure	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Drought	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Earthquake	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Expansive Soils	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Levee Failure	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Flood	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Hailstorm	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Hurricane	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Land Subsidence	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Landslide	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Severe Winter Storm	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Tornado	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Tsunami	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Volcano	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Wildfire	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Windstorm	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Other _____	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
Other _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			

To check boxes, double click on the box and change the default value to “checked.”

Legend:

§201.6(c)(2)(ii) Assessing Vulnerability: Overview

- Does the **new or updated** plan include an overall summary description of the jurisdiction's vulnerability to each hazard?
- Does the **new or updated** plan address the impact of each hazard on the jurisdiction?

- Does the **new or updated** plan describe vulnerability in terms of the types and numbers of future buildings, infrastructure, and critical facilities located in the identified hazard areas?

§201.6(c)(2)(ii)(A) Assessing Vulnerability: Identifying Structures

- Does the **new or updated** plan describe vulnerability in terms of the types and numbers of existing buildings, infrastructure, and critical facilities located in the identified hazard areas?

§201.6(c)(2)(ii)(B) Assessing Vulnerability: Estimating Potential Losses

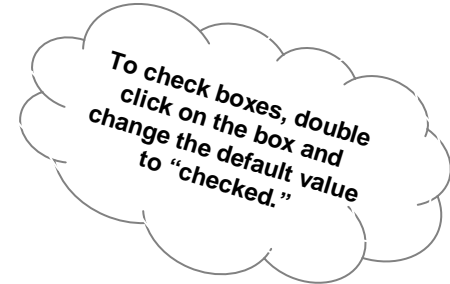
- Does the **new or updated** plan estimate potential dollar losses to vulnerable structures?
- Does the **new or updated** plan describe the methodology used to prepare the estimate?

MATRIX C: IDENTIFICATION AND ANALYSIS OF MITIGATION ACTIONS

This matrix can assist FEMA and the State in scoring each hazard. Local jurisdictions may find the matrix useful to ensure consideration of a range of actions for each hazard. **Completing the matrix is not required.**

*Note: First, check which hazards are identified in requirement §201.6(c)(2)(i). Then, place a checkmark in either the N or S box for each **applicable** hazard. An “N” for any identified hazard will result in a “Needs Improvement” score for this requirement. List the hazard and its related shortcoming in the comments section of the Plan Review Crosswalk.*

Hazard Type	Hazards Identified Per Requirement §201.6(c)(2)(i)	A. Comprehensive Range of Actions and Projects	
	Yes	N	S
Avalanche	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Coastal Erosion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Coastal Storm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dam Failure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Drought	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Earthquake	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Expansive Soils	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Levee Failure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Flood	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hailstorm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hurricane	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Land Subsidence	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Landslide	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Severe Winter Storm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tornado	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tsunami	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Volcano	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wildfire	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Windstorm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Legend:

§201.6(c)(3)(ii) Identification and Analysis of Mitigation Actions

A. Does the **new or updated** plan identify and analyze a comprehensive range of specific mitigation actions and projects for each hazard.

Appendix C – Meeting and Other Participation Documentation

THIS APPENDIX CONTAINS SENSITIVE INFORMATION AND HAS BEEN REMOVED















Appendix D - Community Flood Vulnerability Maps

Carbon County Hazard Mitigation Plan

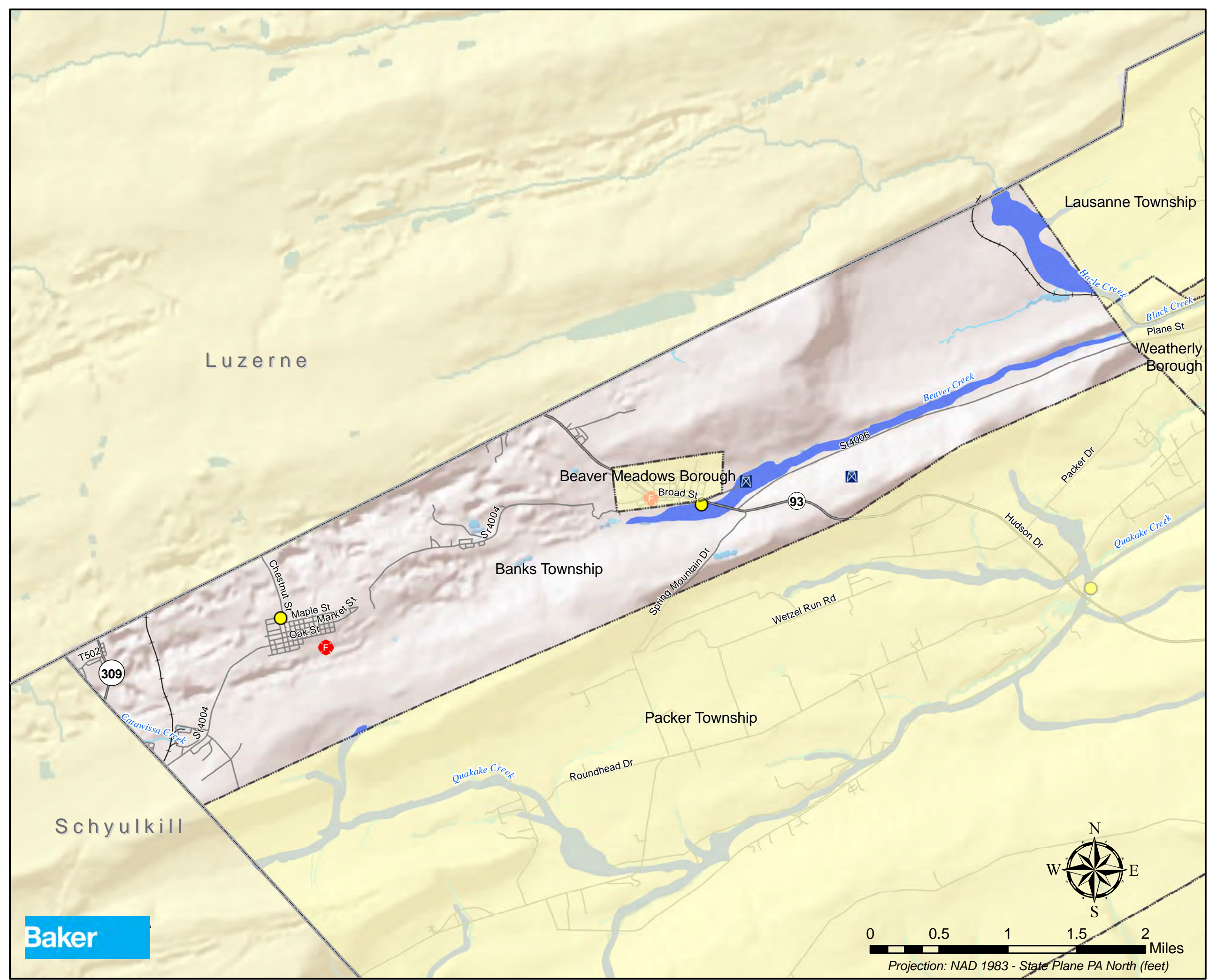
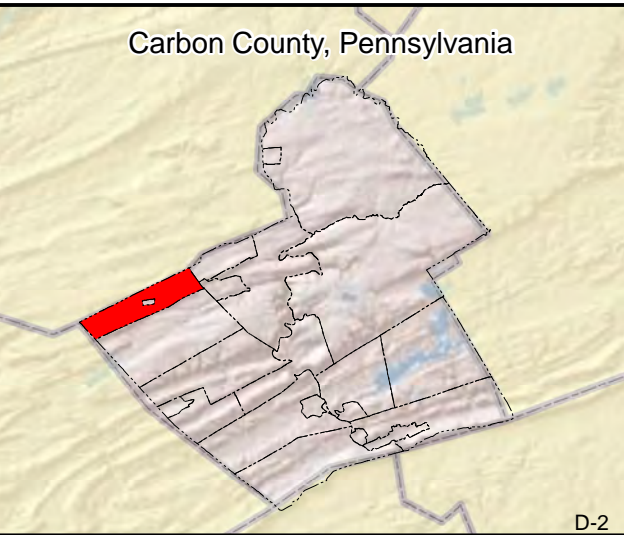


Banks Township Flood Vulnerability

LEGEND

- | | |
|--|---|
|  Fire Department |  Interstate |
|  Municipal Building |  US Highway |
|  Cell Tower |  Major Road |
|  Railroads |  Local Roads |
|  Rivers/Streams |  Counties |
|  Water Areas |  Municipalities |
| Special Flood Hazard Area | |
|  Approximate 1% Annual-Chance Flood | |
|  Detailed 1% Annual-Chance Flood | |

Source: PennDOT 2010, Carbon County GIS
Department 2010














Carbon County Hazard Mitigation Plan





Beaver Meadows Borough Flood Vulnerability

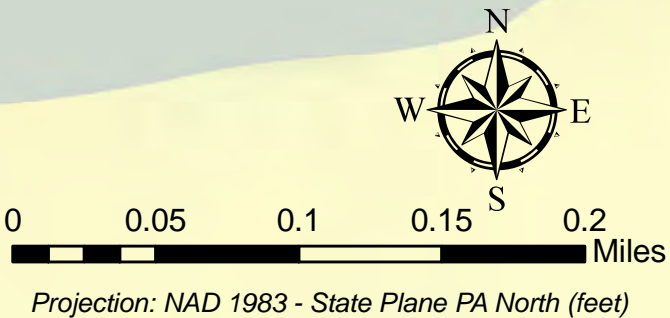
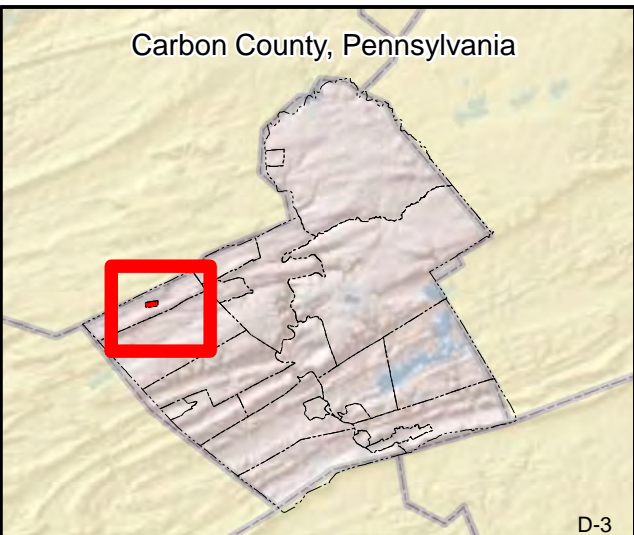
LEGEND

- | | |
|--|---|
|  Fire Department |  Interstate |
|  Police Department |  US Highway |
|  Municipal Building |  Major Road |
|  Rivers/Streams |  Railroads |
|  Water Areas |  Counties |
| |  Municipalities |

Special Flood Hazard Area

- | | |
|--|--|
|  Approximate 1% Annual-Chance Flood | |
|  Detailed 1% Annual-Chance Flood | |

Source: PennDOT 2010, Carbon County GIS Department 2010



Banks Township

Beaver Meadows Borough














Carbon County Hazard Mitigation Plan





Bowmanstown Borough Flood Vulnerability

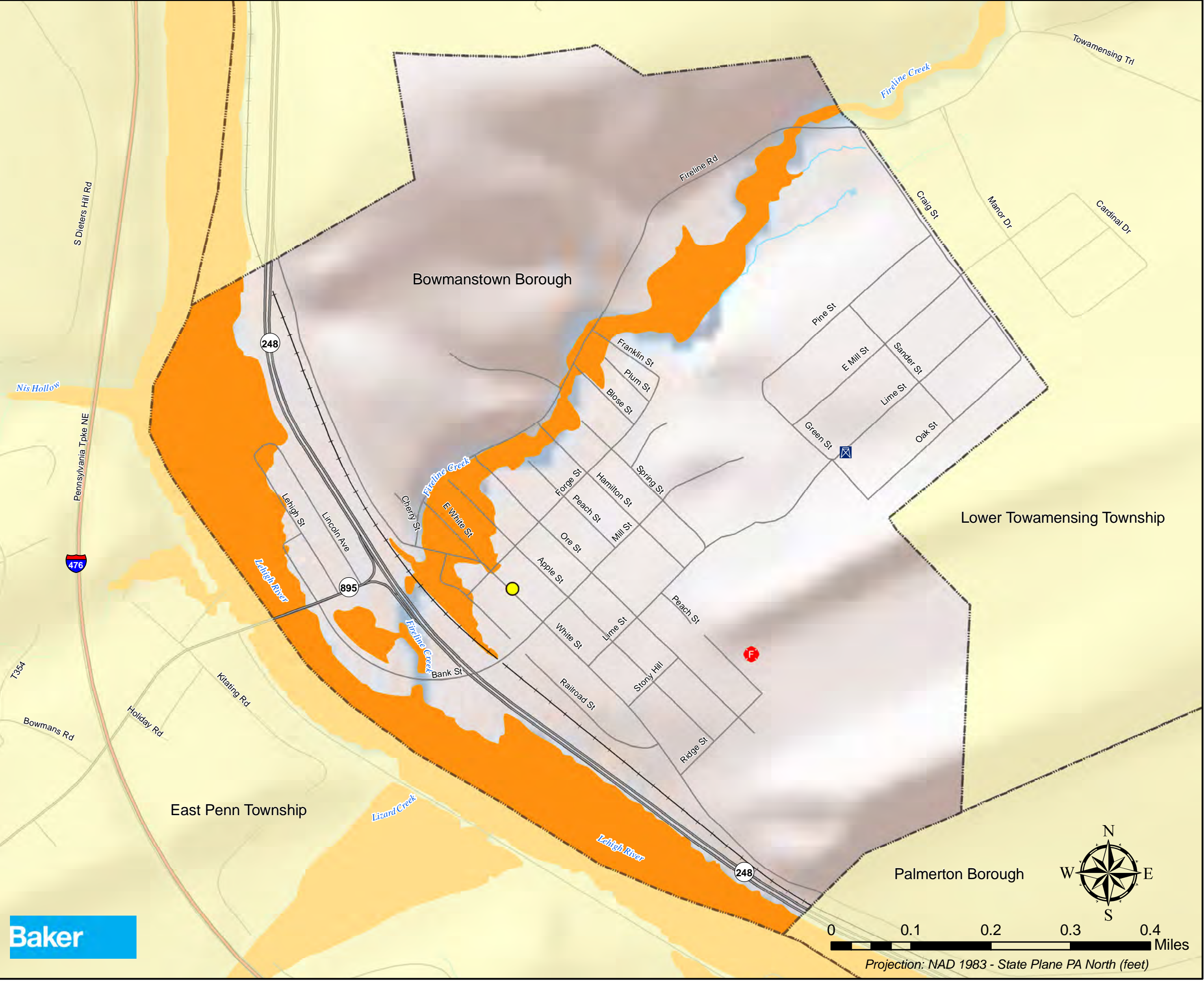
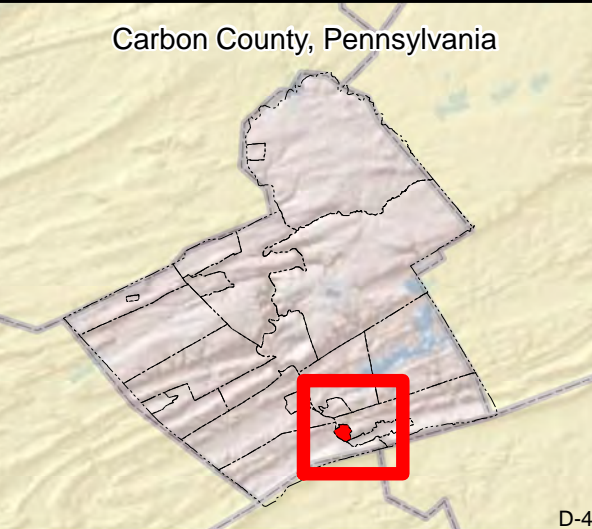
LEGEND

- | | |
|--|---|
|  Fire Department |  Interstate |
|  Municipal Building |  US Highway |
|  Cell Tower |  Major Road |
|  Rivers/Streams |  Railroads |
|  Water Areas |  Counties |
| |  Municipalities |

Special Flood Hazard Area

- | | |
|--|--|
|  Approximate 1% Annual-Chance Flood | |
|  Detailed 1% Annual-Chance Flood | |

Source: PennDOT 2010, Carbon County GIS
Department 2010



Carbon County Hazard Mitigation Plan

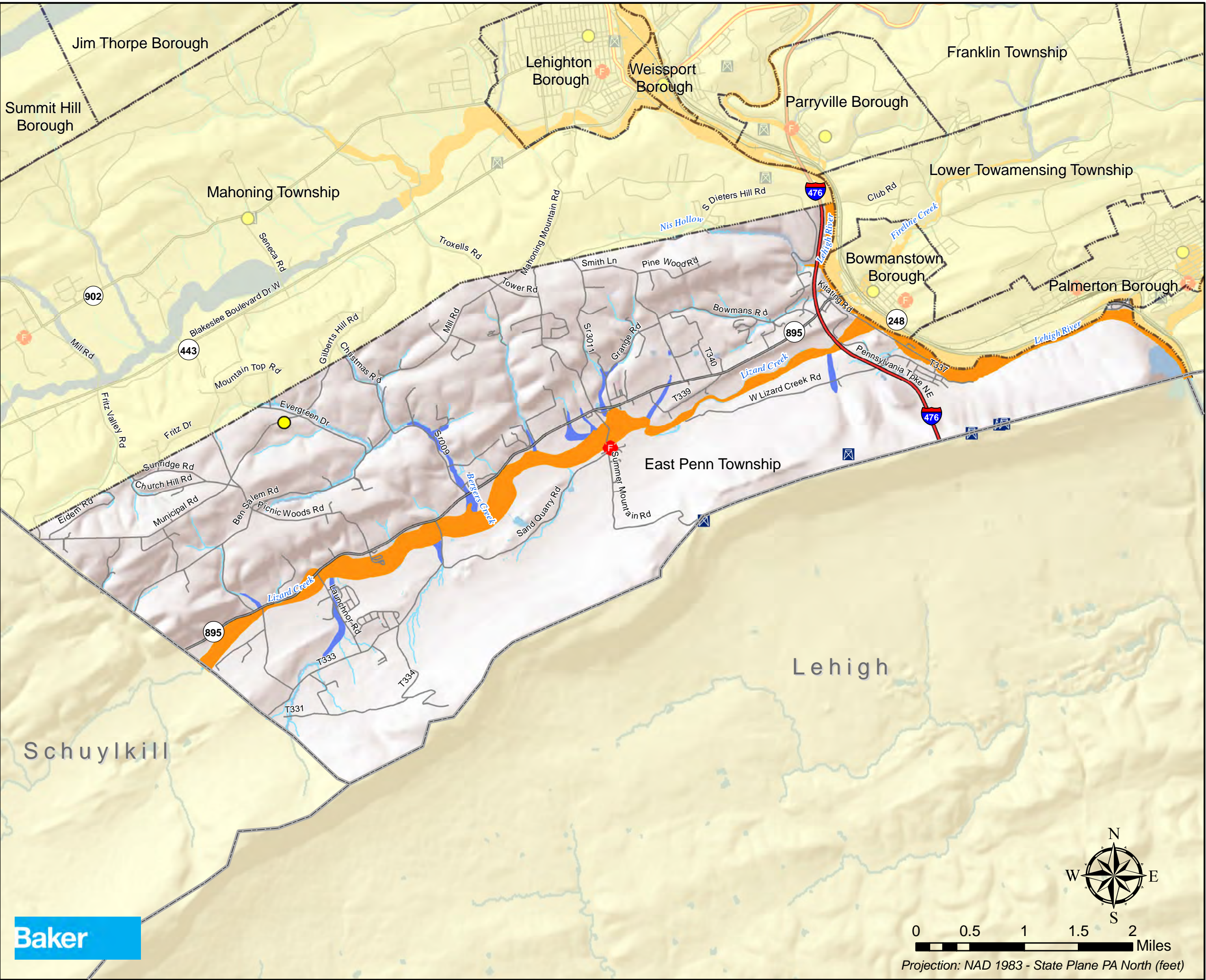
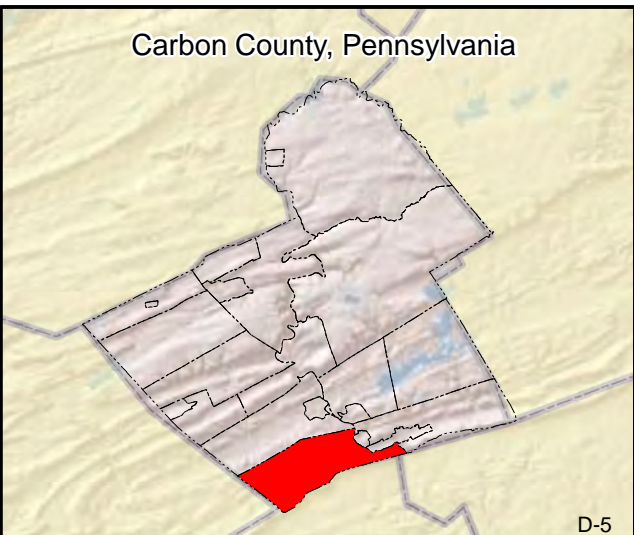


East Penn Township Flood Vulnerability

LEGEND

- | | | | |
|--|--------------------|--|----------------|
| | Fire Department | | Interstate |
| | Municipal Building | | US Highway |
| | Cell Tower | | Major Road |
| | Rivers/Streams | | Railroads |
| | Water Areas | | Counties |
| | | | Municipalities |
- Special Flood Hazard Area
- Approximate 1% Annual-Chance Flood
 - Detailed 1% Annual-Chance Flood

Source: PennDOT 2010, Carbon County GIS Department 2010



Carbon County Hazard Mitigation Plan

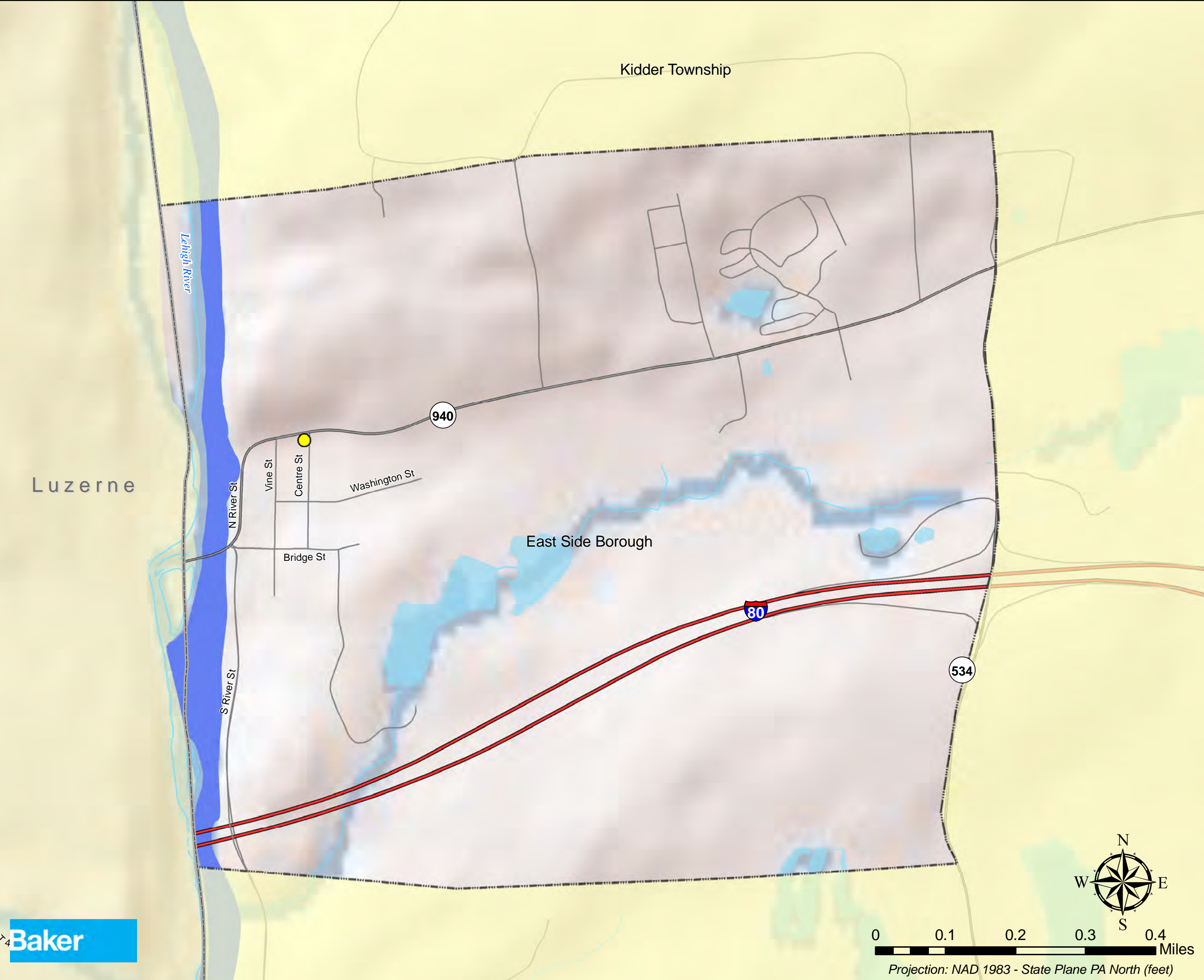
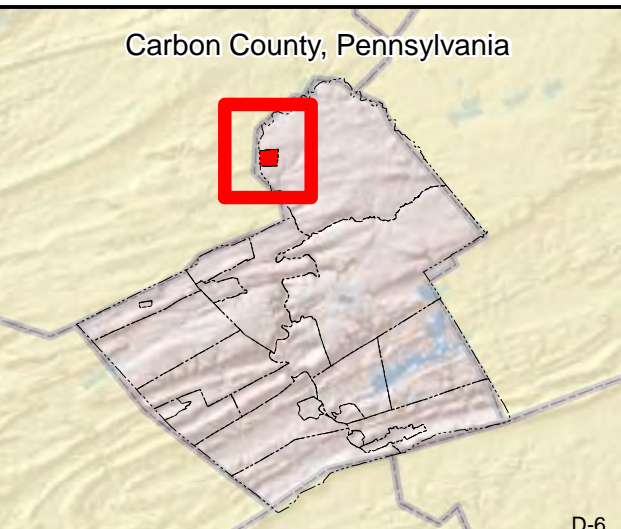


East Side Borough Flood Vulnerability

LEGEND

- Municipal Building
- Interstate
- US Highway
- Major Road
- Local Road
- Rivers/Streams
- Water Areas
- Railroads
- Counties
- Municipalities
- Special Flood Hazard Area**
 - Approximate 1% Annual-Chance Flood
 - Detailed 1% Annual-Chance Flood

Source: PennDOT 2010, Carbon County GIS Department 2010



Carbon County Hazard Mitigation Plan

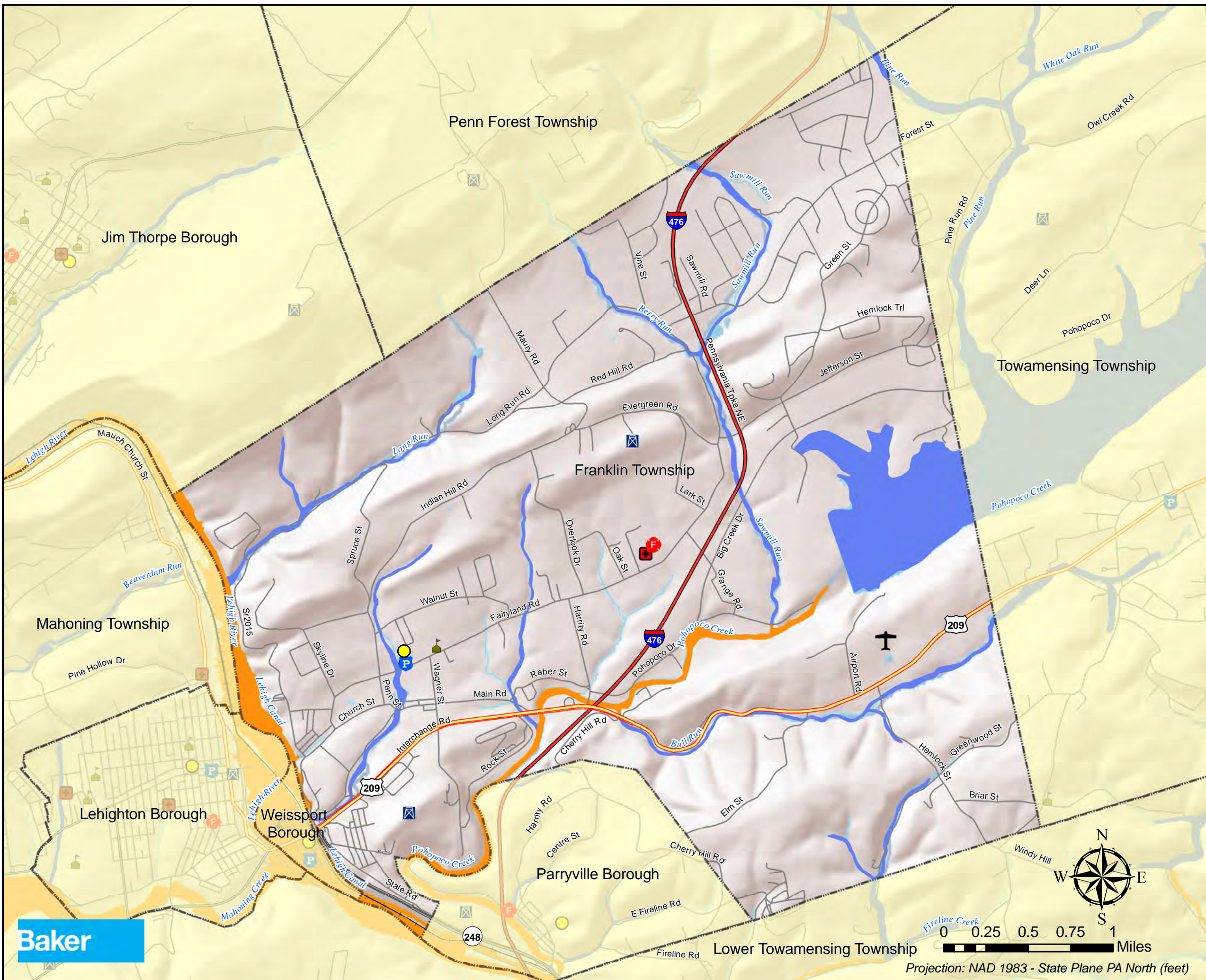
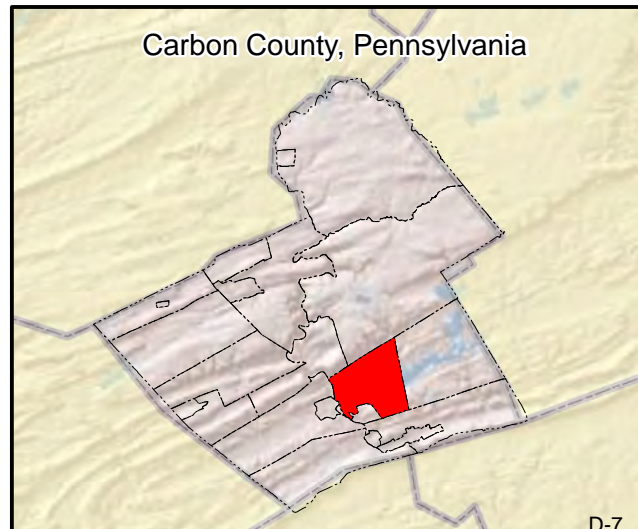


Franklin Township Flood Vulnerability

LEGEND

- | | | | |
|--|--------------------|--|----------------|
| | Airport | | Interstate |
| | Fire Department | | US Highway |
| | Police Department | | Major Road |
| | EMS | | Railroads |
| | Municipal Building | | Water Areas |
| | School | | Counties |
| | Cell Tower | | Municipalities |
| | Rivers/Streams | | |
- Special Flood Hazard Area
- Approximate 1% Annual-Chance Flood
 - Detailed 1% Annual-Chance Flood

Source: PennDOT 2010, Carbon County GIS Department 2010



Carbon County Hazard Mitigation Plan

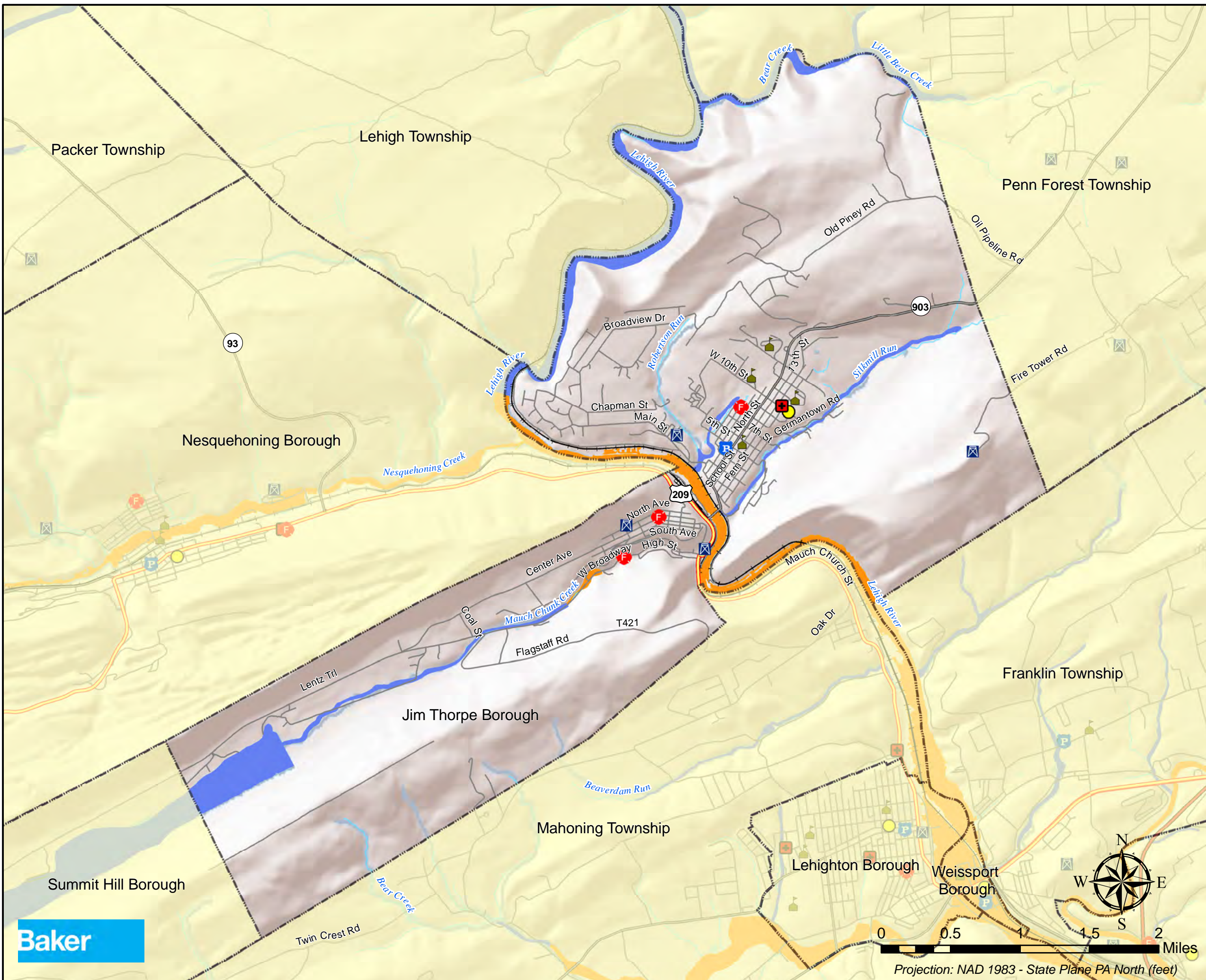
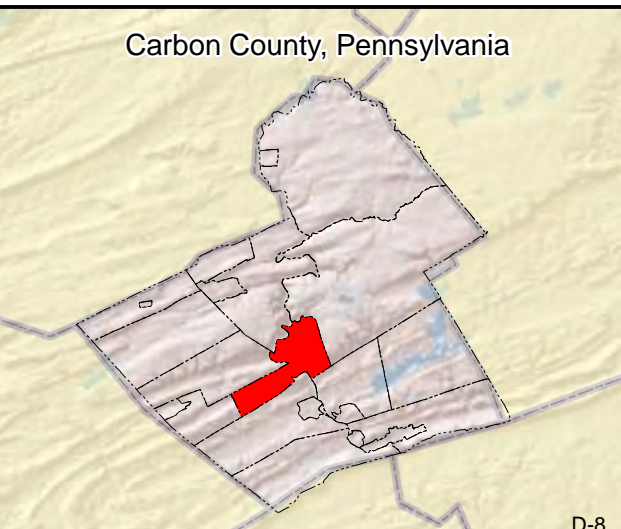


Jim Thorpe Borough Flood Vulnerability

LEGEND

- | | | | |
|--|--------------------|--|----------------|
| | Fire Department | | Interstate |
| | Police Department | | US Highway |
| | EMS | | Major Road |
| | Municipal Building | | Railroads |
| | School | | Water Areas |
| | Cell Tower | | Counties |
| | Rivers/Streams | | Municipalities |
- Special Flood Hazard Area
- Approximate 1% Annual-Chance Flood
 - Detailed 1% Annual-Chance Flood

Source: PennDOT 2010, Carbon County GIS Department 2010



Carbon County Hazard Mitigation Plan



Kidder Township Flood Vulnerability

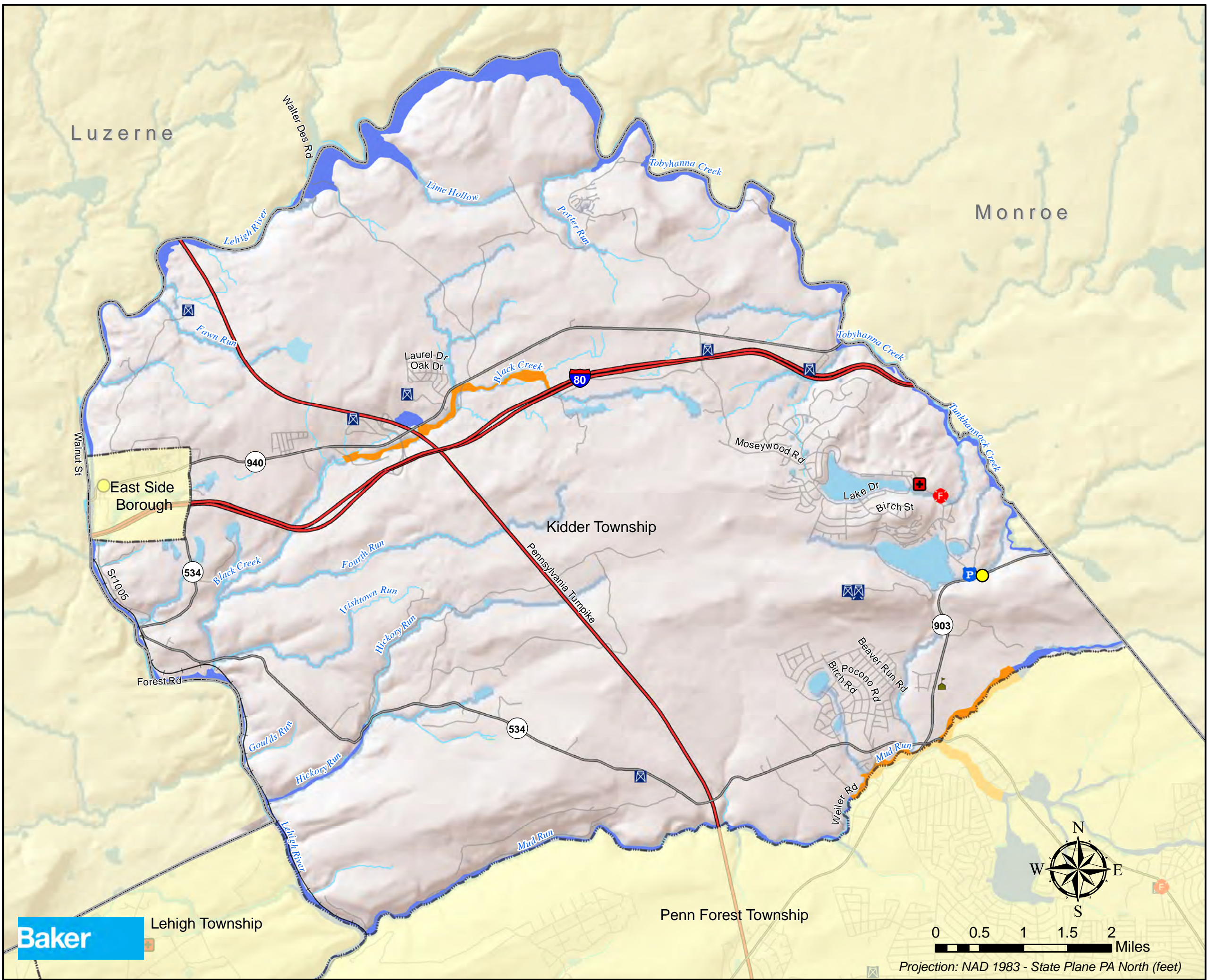
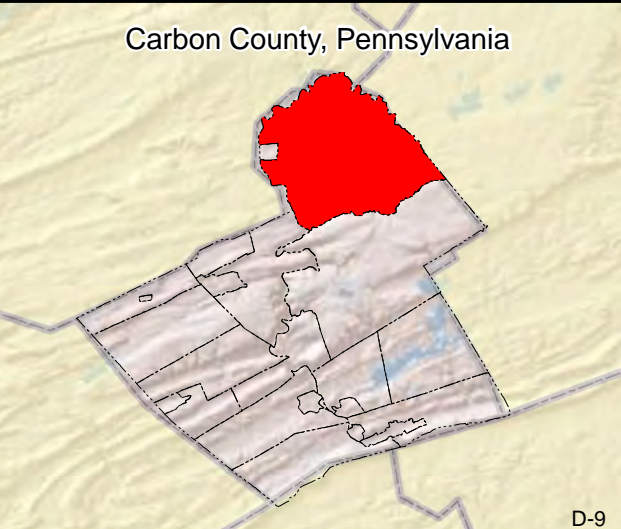
LEGEND

- | | | | |
|--|--------------------|--|----------------|
| | Municipal Building | | Interstate |
| | Fire Department | | US Highway |
| | Police Department | | Major Road |
| | EMS | | Railroads |
| | School | | Water Areas |
| | Cell Tower | | Counties |
| | Rivers/Streams | | Municipalities |

Special Flood Hazard Area

- | | |
|--|------------------------------------|
| | Approximate 1% Annual-Chance Flood |
| | Detailed 1% Annual-Chance Flood |

Source: PennDOT 2010, Carbon County GIS Department 2010



Carbon County Hazard Mitigation Plan

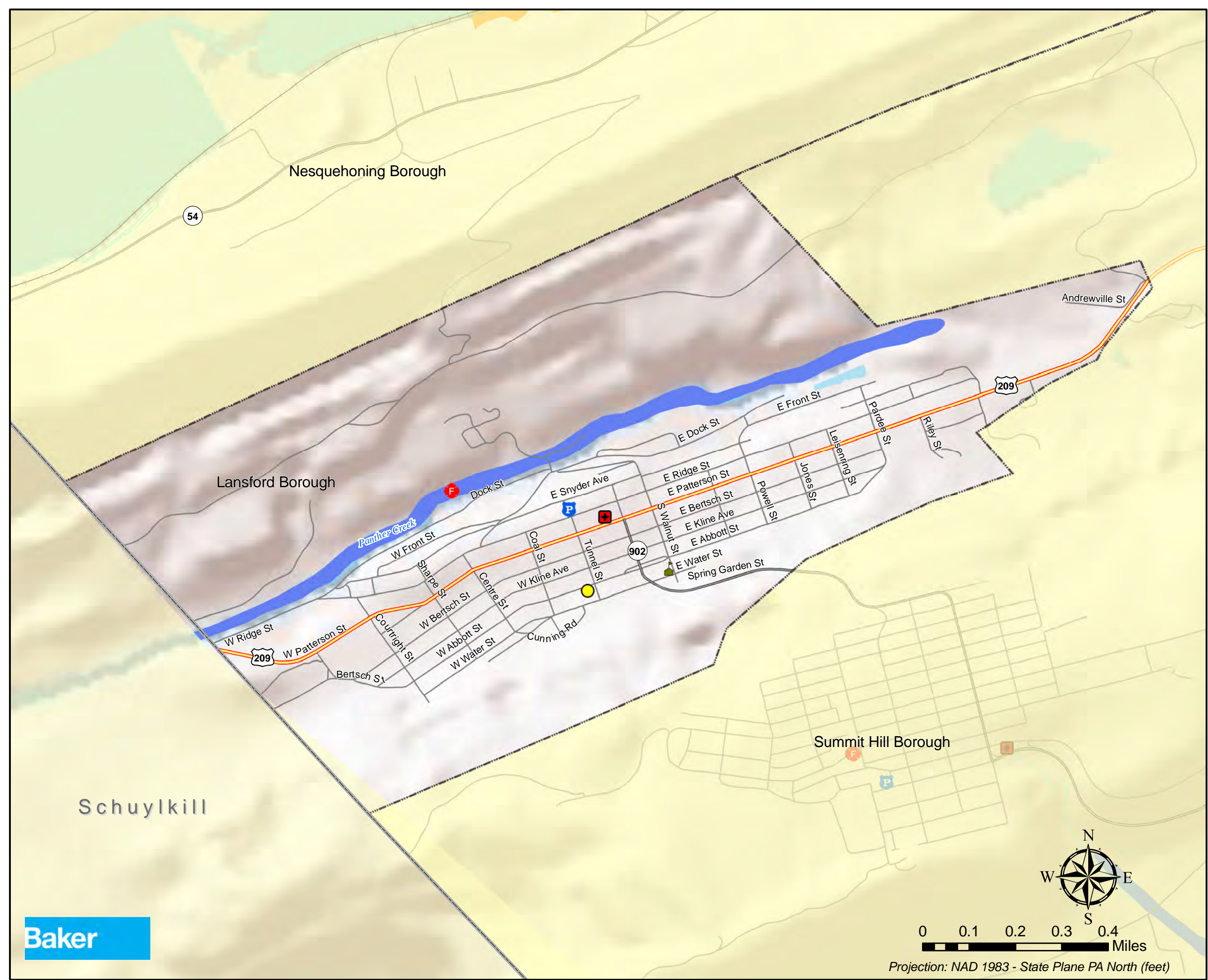
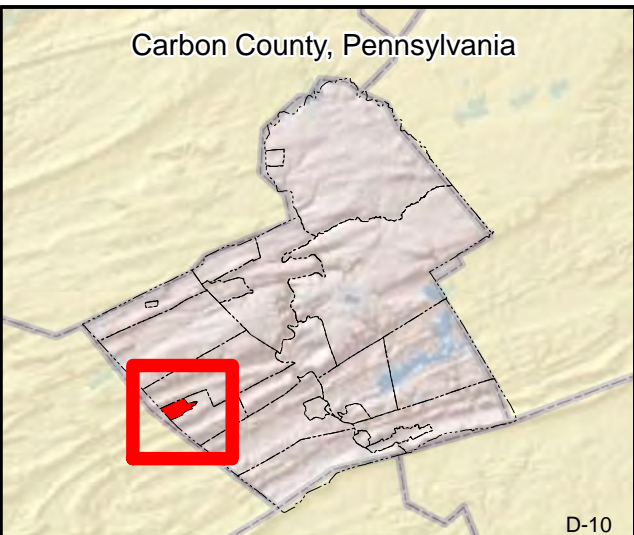


Lansford Borough Flood Vulnerability

LEGEND

- | | | | |
|--|--------------------|--|----------------|
| | Fire Department | | Interstate |
| | Police Department | | US Highway |
| | EMS | | Major Road |
| | Municipal Building | | Railroads |
| | School | | Water Areas |
| | Rivers/Streams | | Counties |
| | | | Municipalities |
- Special Flood Hazard Area
- Approximate 1% Annual-Chance Flood
 - Detailed 1% Annual-Chance Flood

Source: PennDOT 2010, Carbon County GIS Department 2010



Carbon County Hazard Mitigation Plan

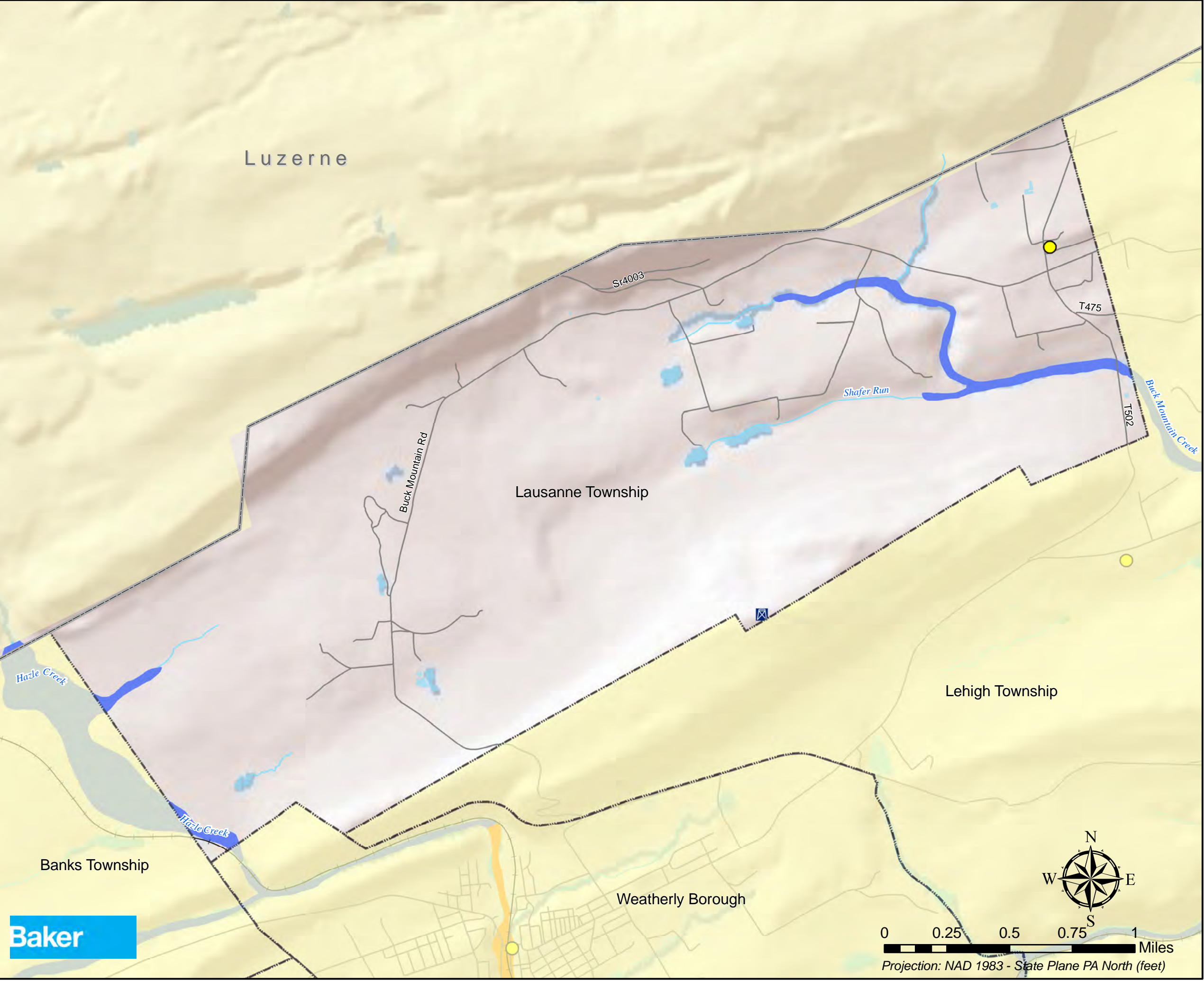
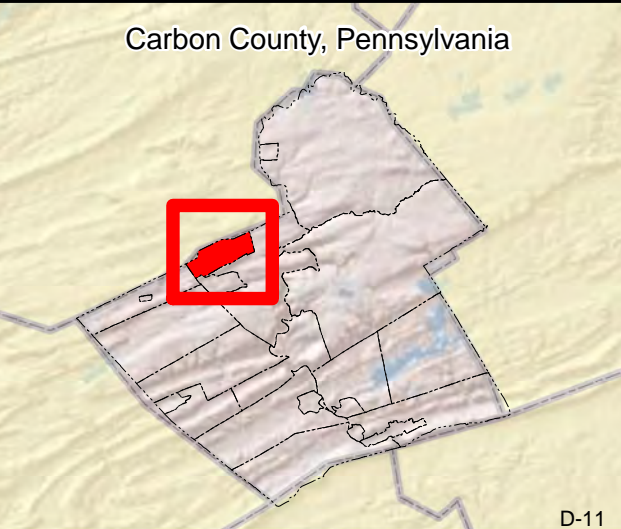


Lausanne Township Flood Vulnerability

LEGEND

- Municipal Building
- Cell Tower
- Railroads
- Rivers/Streams
- Water Areas
- Interstate
- US Highway
- Major Road
- Counties
- Municipalities
- Special Flood Hazard Area**
- Approximate 1% Annual-Chance Flood
- Detailed 1% Annual-Chance Flood

Source: PennDOT 2010, Carbon County GIS Department 2010



Carbon County Hazard Mitigation Plan

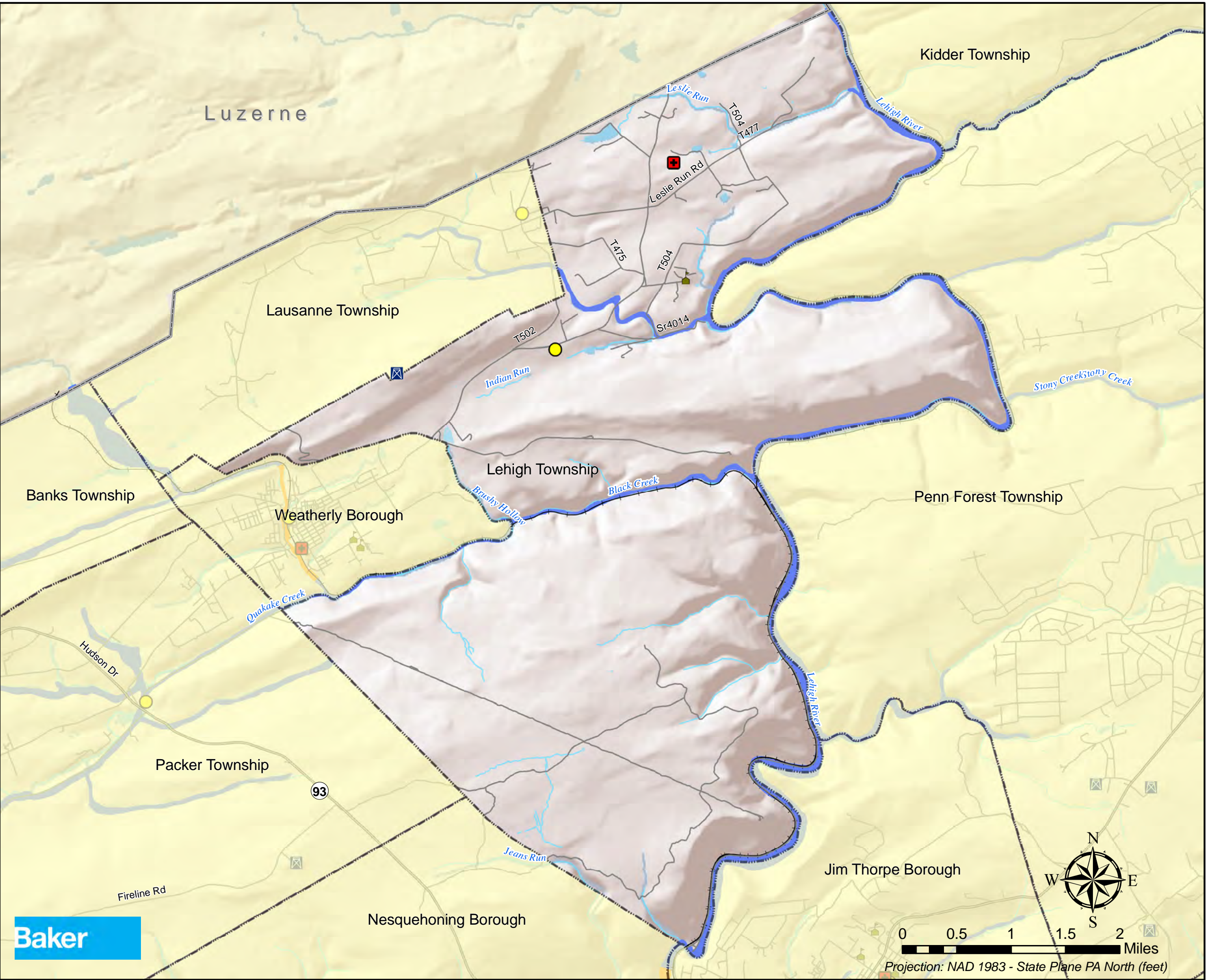
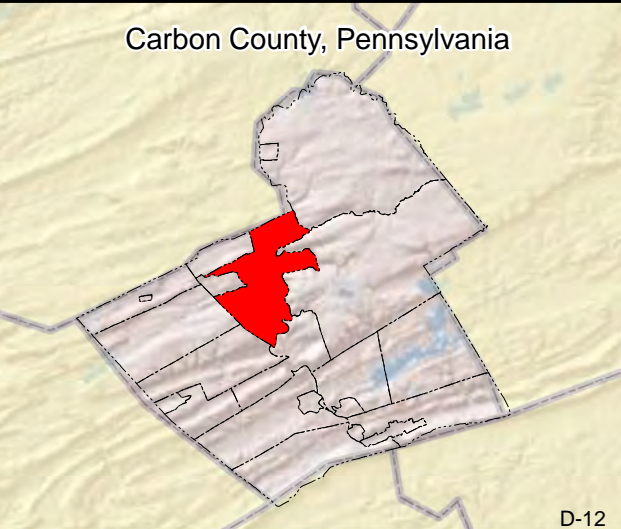


Lehigh Township Flood Vulnerability

LEGEND

- | | | | |
|--|--------------------|--|----------------|
| | EMS | | Interstate |
| | Municipal Building | | US Highway |
| | School | | Major Road |
| | Cell Tower | | Railroads |
| | Rivers/Streams | | Counties |
| | Water Areas | | Municipalities |
- Special Flood Hazard Area
- Approximate 1% Annual-Chance Flood
 - Detailed 1% Annual-Chance Flood

Source: PennDOT 2010, Carbon County GIS
Department 2010



Carbon County Hazard Mitigation Plan

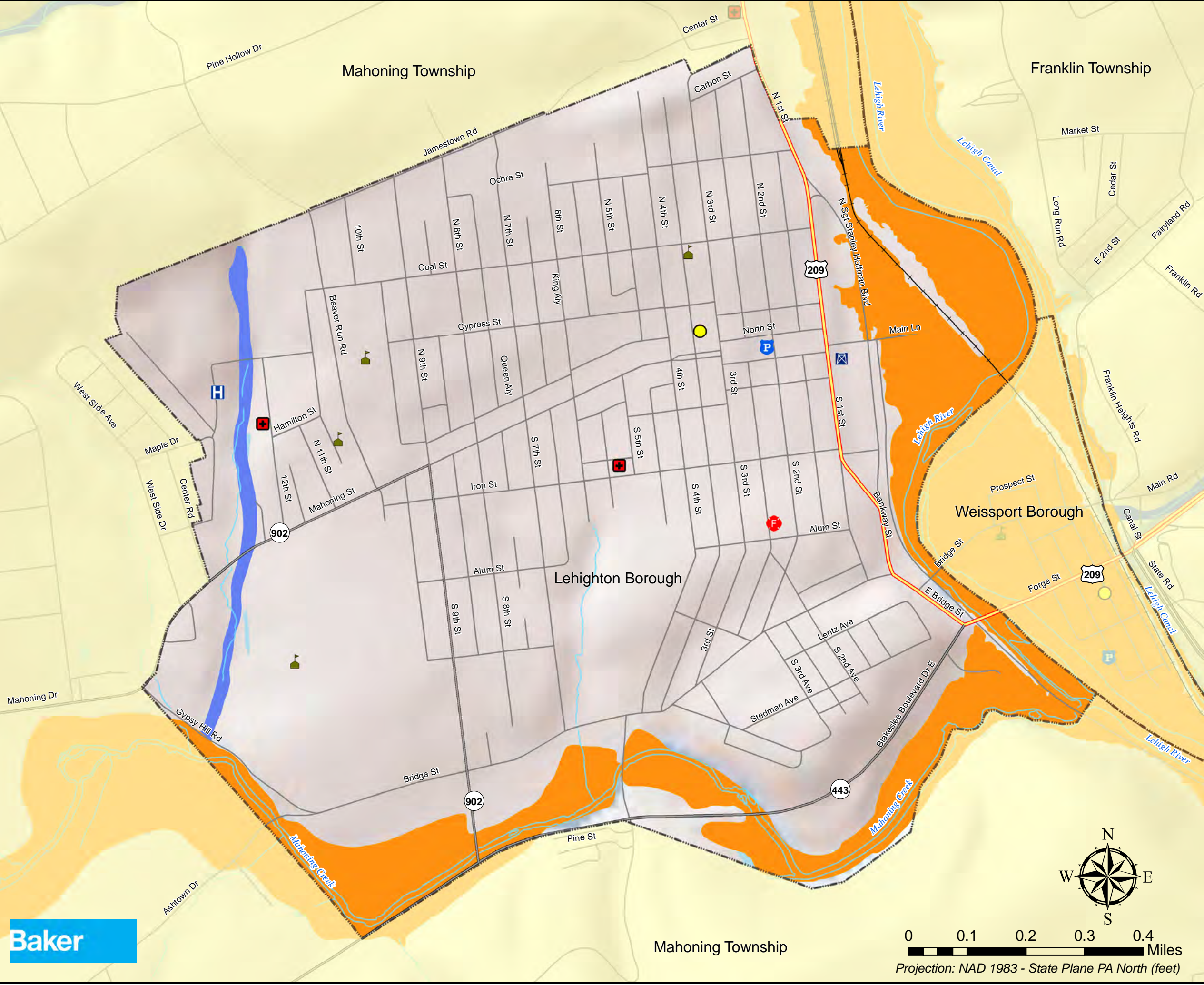
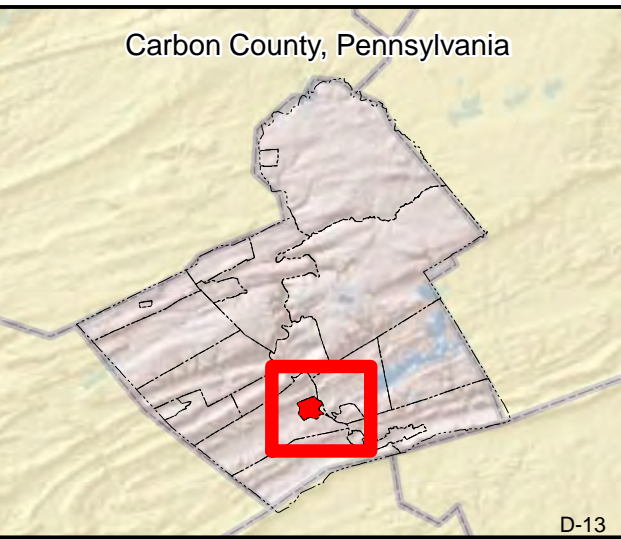


Lehighton Borough Flood Vulnerability

LEGEND

- | | |
|------------------------------------|----------------|
| Hospital | Interstate |
| Fire Department | US Highway |
| Police Department | Major Road |
| EMS | Railroads |
| Municipal Building | Water Areas |
| School | Counties |
| Cell Tower | Municipalities |
| Rivers/Streams | |
| Special Flood Hazard Area | |
| Approximate 1% Annual-Chance Flood | |
| Detailed 1% Annual-Chance Flood | |

Source: PennDOT 2010, Carbon County GIS Department 2010



Penn Forest Township

Carbon County Hazard Mitigation Plan

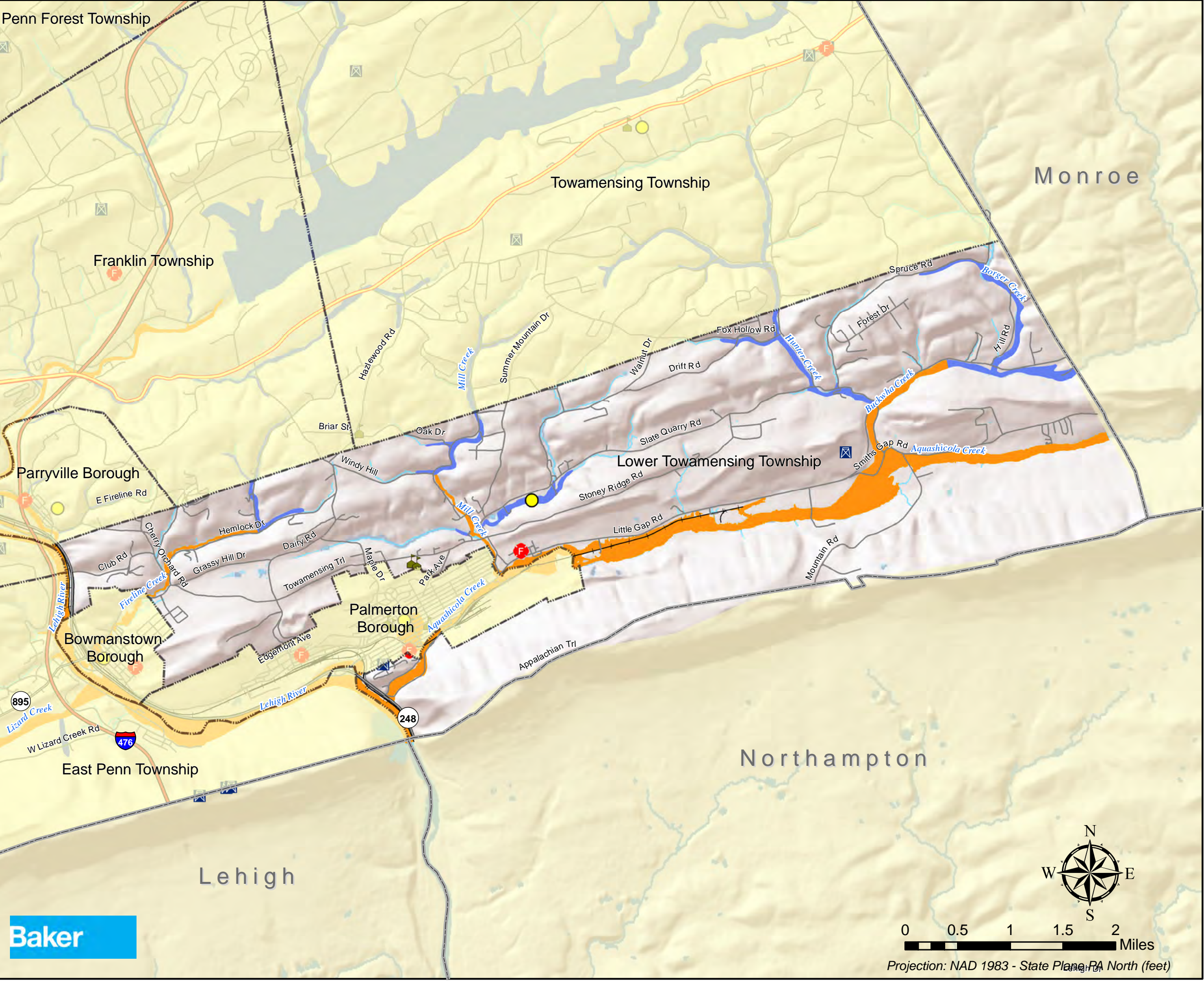
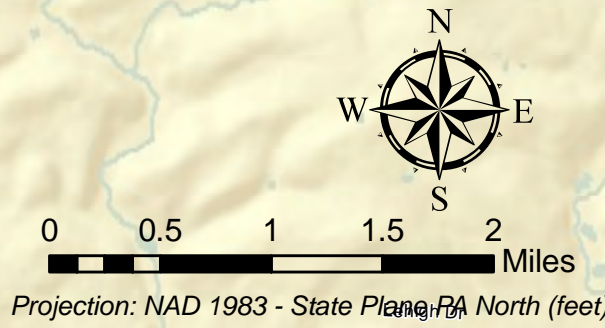
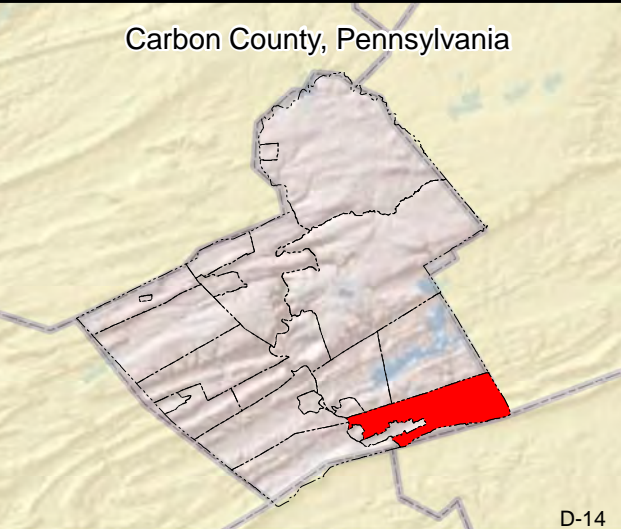


Lower Towamensing Township Flood Vulnerability

LEGEND

- | | | | |
|--|--------------------|--|----------------|
| | Fire Department | | Interstate |
| | Municipal Building | | US Highway |
| | School | | Major Road |
| | Cell Tower | | Railroads |
| | Rivers/Streams | | Counties |
| | Water Areas | | Municipalities |
- Special Flood Hazard Area
- Approximate 1% Annual-Chance Flood
 - Detailed 1% Annual-Chance Flood

Source: PennDOT 2010, Carbon County GIS Department 2010



Carbon County Hazard Mitigation Plan

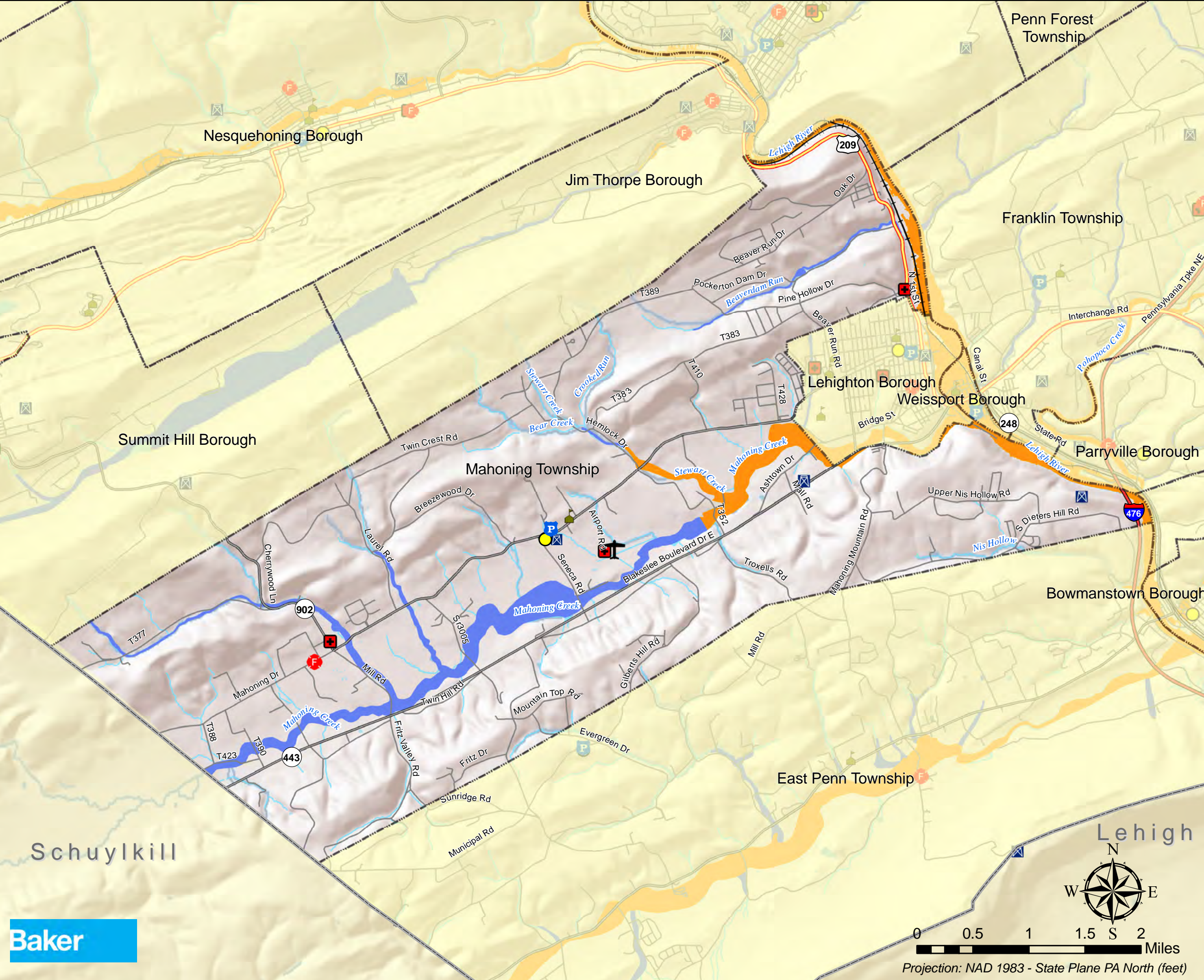
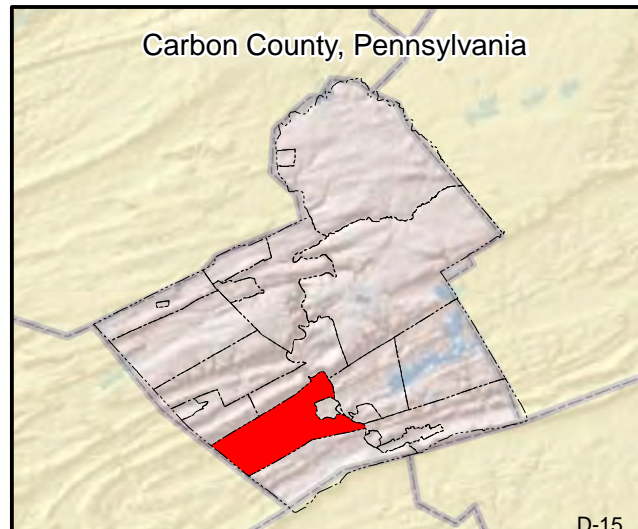


Mahoning Township Flood Vulnerability

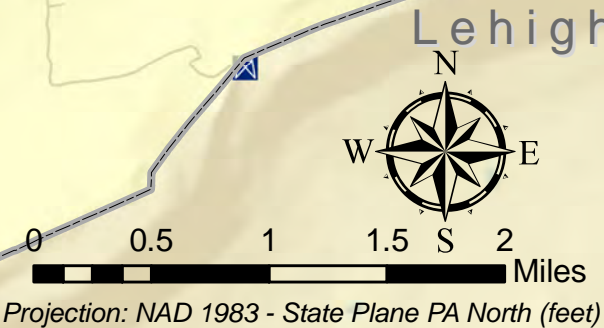
LEGEND

- | | | | |
|--|--------------------|--|----------------|
| | Airport | | Interstate |
| | Fire Department | | US Highway |
| | Police Department | | Major Road |
| | EMS | | Railroads |
| | Municipal Building | | Water Areas |
| | School | | Counties |
| | Cell Tower | | Municipalities |
| | Rivers/Streams | | |
- Special Flood Hazard Area
- Approximate 1% Annual-Chance Flood
 - Detailed 1% Annual-Chance Flood

Source: PennDOT 2010, Carbon County GIS
Department 2010



Baker



Carbon County Hazard Mitigation Plan

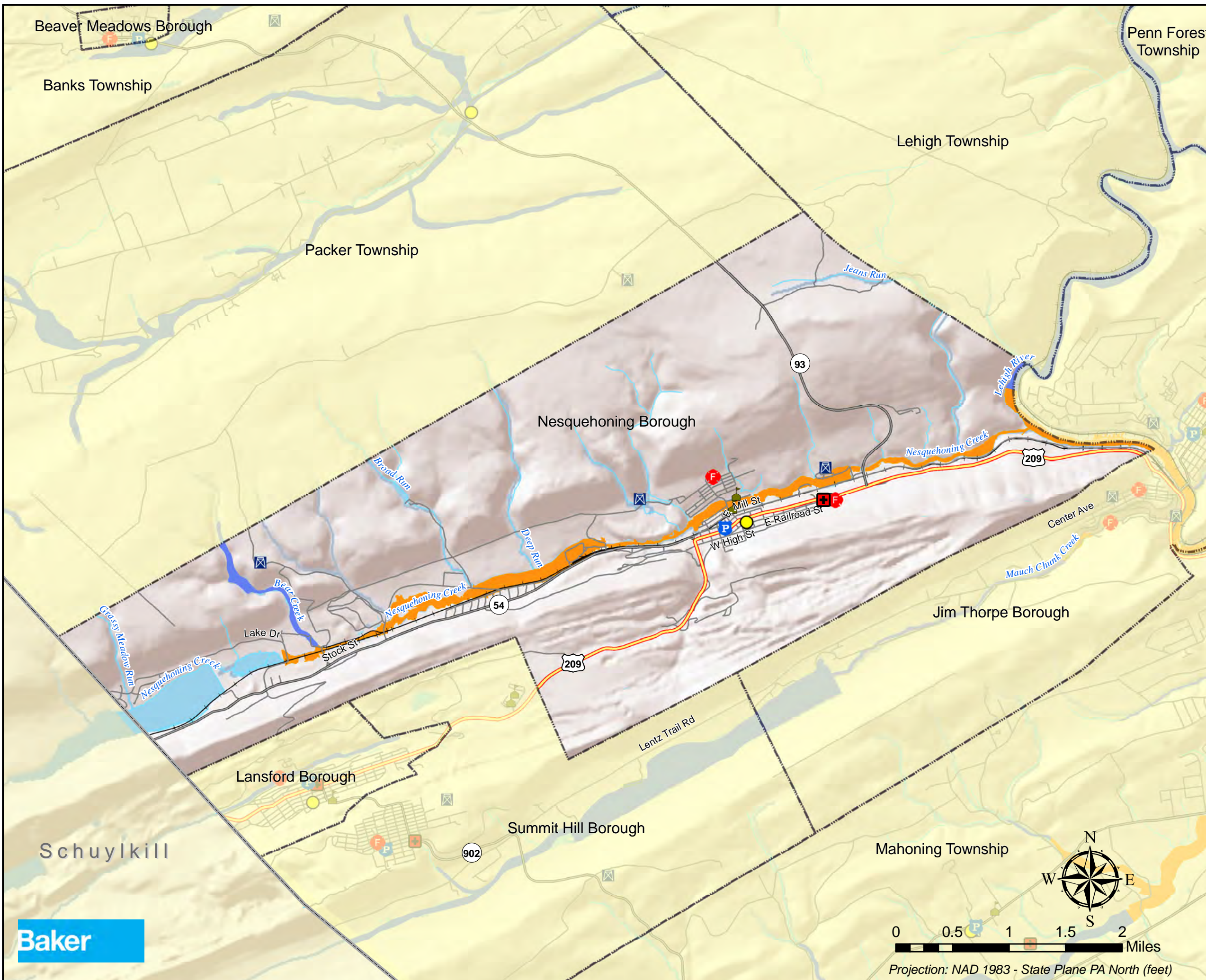
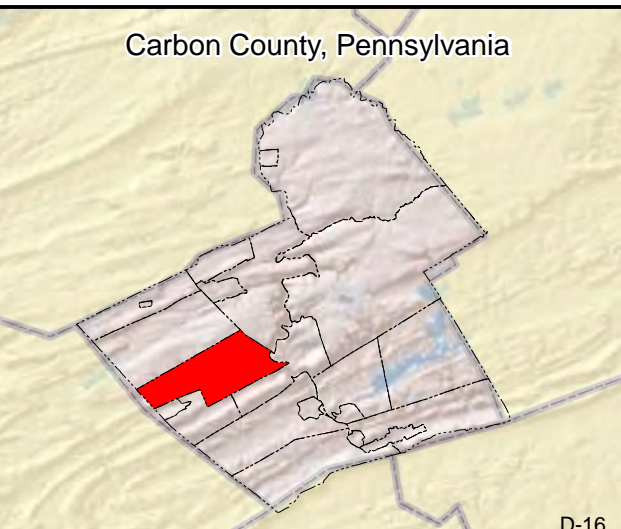


Nesquehoning Borough Flood Vulnerability

LEGEND

- | | |
|--------------------|----------------|
| Fire Department | Interstate |
| Police Department | US Highway |
| EMS | Major Road |
| Municipal Building | Railroads |
| School | Water Areas |
| Cell Tower | Counties |
| Rivers/Streams | Municipalities |
- Special Flood Hazard Area
- Approximate 1% Annual-Chance Flood
 - Detailed 1% Annual-Chance Flood

Source: PennDOT 2010, Carbon County GIS Department 2010



Carbon County Hazard Mitigation Plan

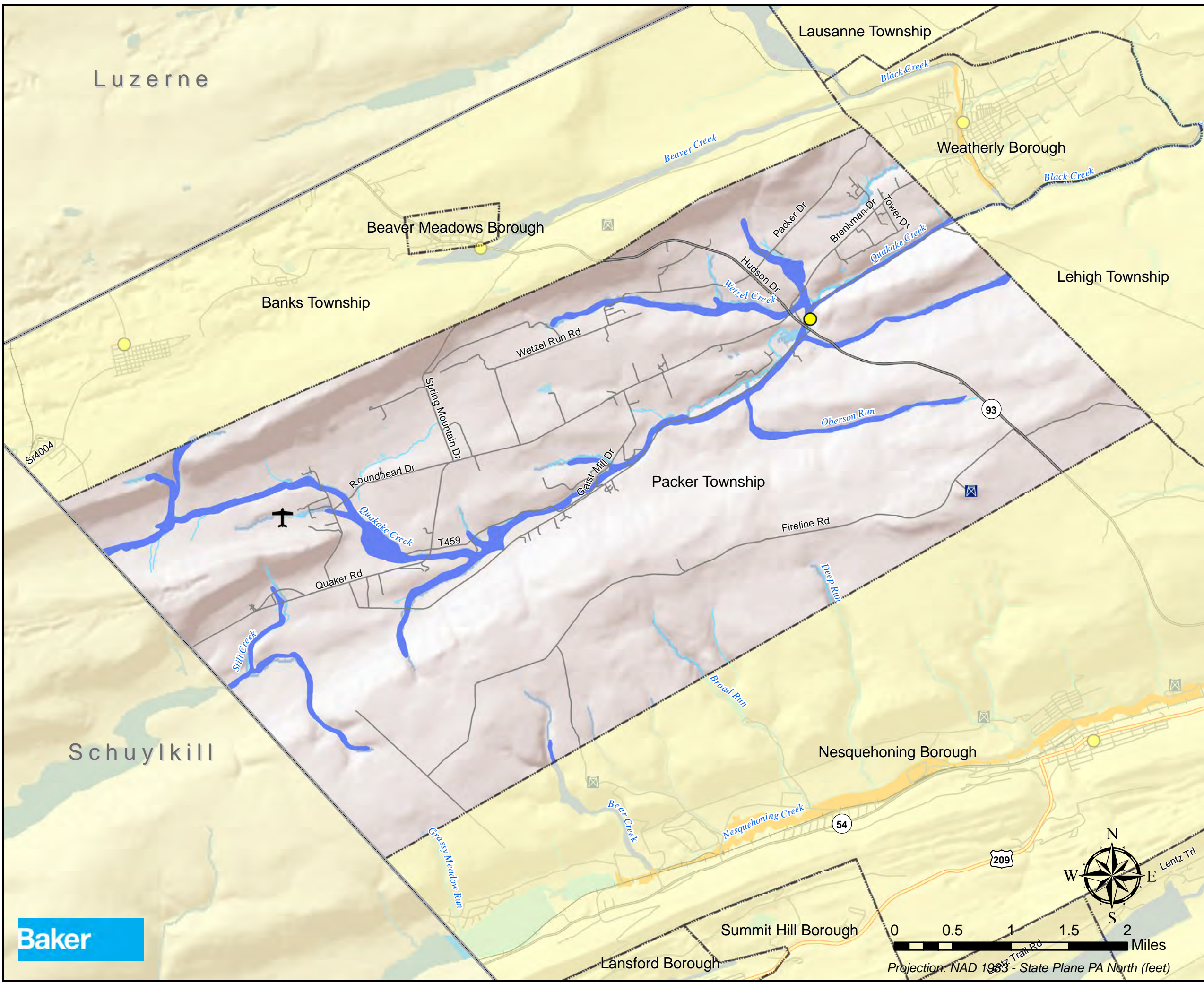
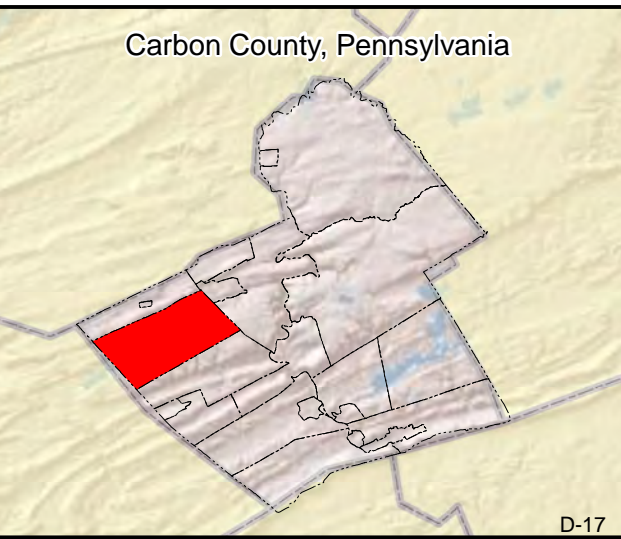


Packer Township Flood Vulnerability

LEGEND

- | | | | |
|--|--------------------|--|----------------|
| | Airport | | Interstate |
| | Municipal Building | | US Highway |
| | Cell Tower | | Major Road |
| | Rivers/Streams | | Railroads |
| | Water Areas | | Counties |
| | | | Municipalities |
- Special Flood Hazard Area
- Approximate 1% Annual-Chance Flood
 - Detailed 1% Annual-Chance Flood

Source: PennDOT 2010, Carbon County GIS
Department 2010



Carbon County Hazard Mitigation Plan

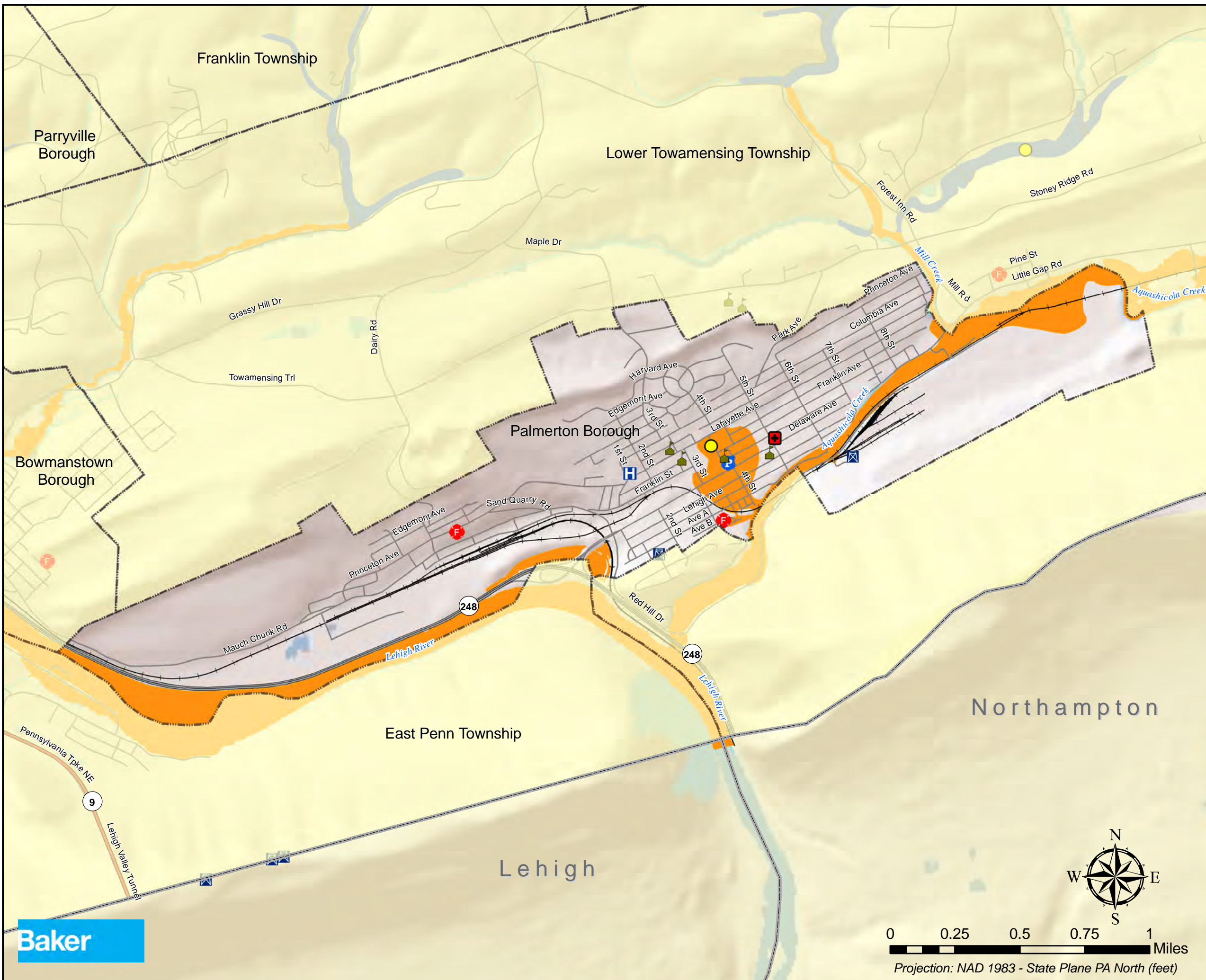
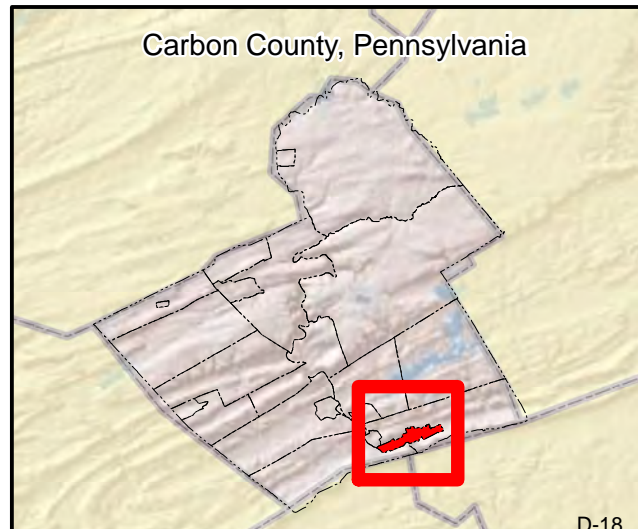


Palmerton Borough Flood Vulnerability

LEGEND

- | | |
|------------------------------------|----------------|
| Hospital | Interstate |
| Fire Department | US Highway |
| Police Department | Major Road |
| EMS | Railroads |
| Municipal Building | Water Areas |
| School | Counties |
| Cell Tower | Municipalities |
| Rivers/Streams | |
| Special Flood Hazard Area | |
| Approximate 1% Annual-Chance Flood | |
| Detailed 1% Annual-Chance Flood | |

Source: PennDOT 2010, Carbon County GIS Department 2010



Carbon County Hazard Mitigation Plan

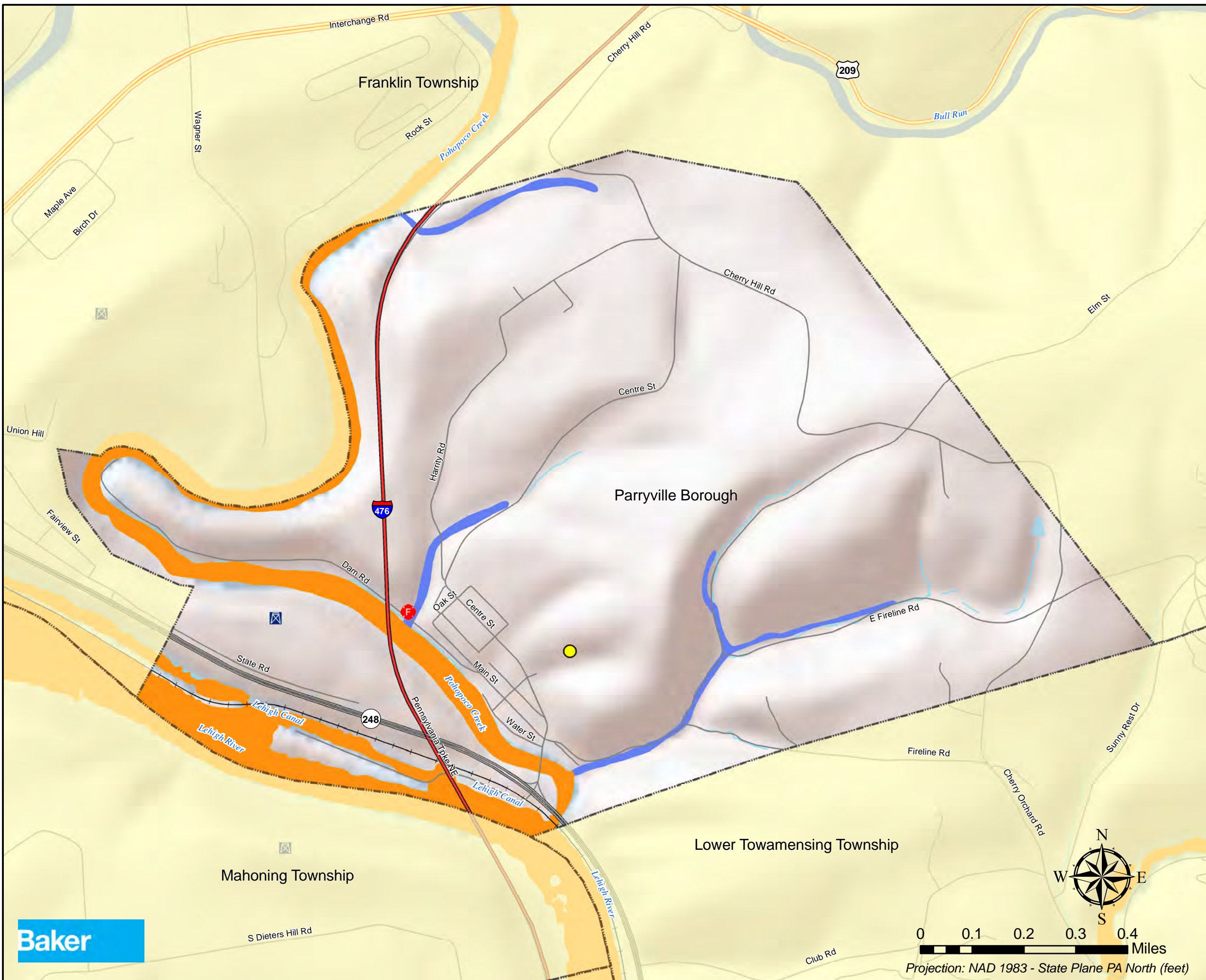
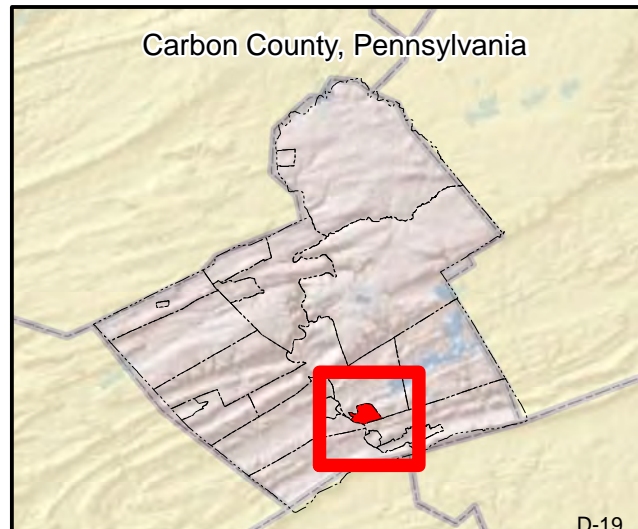


Parryville Borough Flood Vulnerability

LEGEND

- | | |
|--------------------|----------------|
| Fire Department | Interstate |
| Municipal Building | US Highway |
| School | Major Road |
| Cell Tower | Railroads |
| Rivers/Streams | Counties |
| Water Areas | Municipalities |
- Special Flood Hazard Area
- Approximate 1% Annual-Chance Flood
 - Detailed 1% Annual-Chance Flood

Source: PennDOT 2010, Carbon County GIS Department 2010



Carbon County Hazard Mitigation Plan

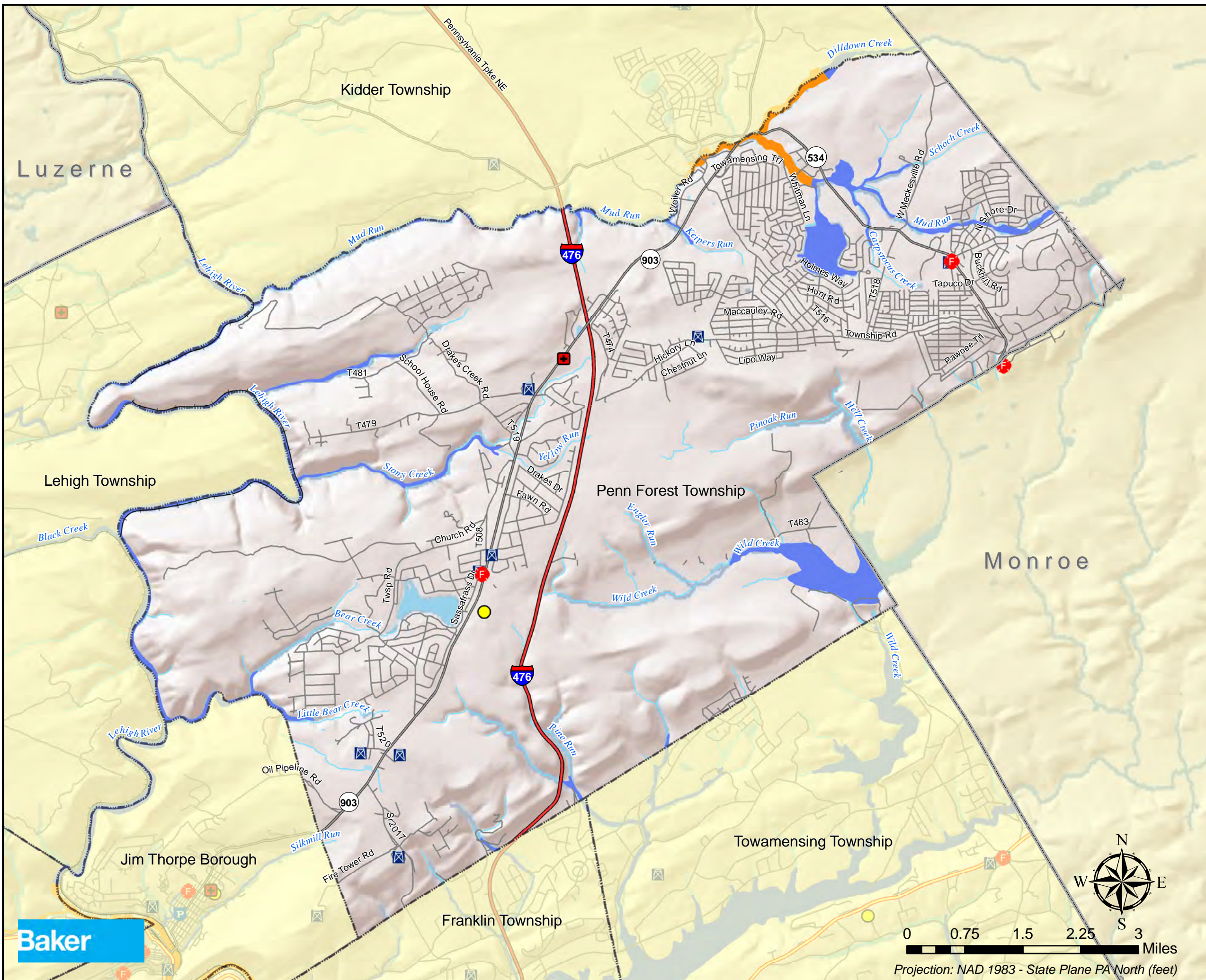
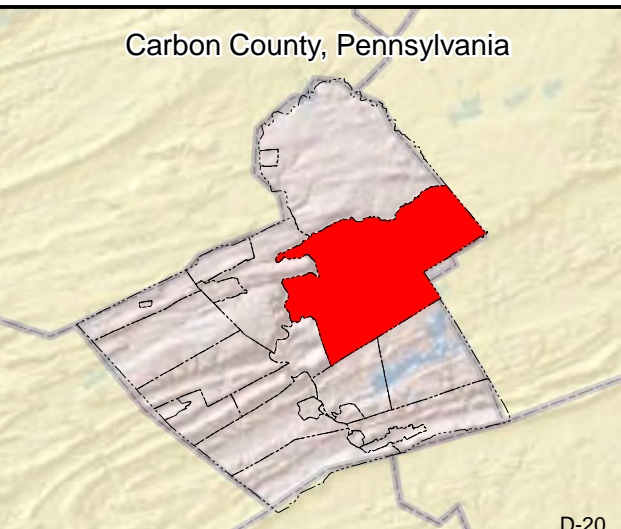


Penn Forest Township Flood Vulnerability

LEGEND

- | | | | |
|--|--------------------|--|----------------|
| | Fire Department | | Interstate |
| | Police Department | | US Highway |
| | EMS | | Major Road |
| | Municipal Building | | Railroads |
| | Cell Tower | | Water Areas |
| | Rivers/Streams | | Counties |
| | | | Municipalities |
- Special Flood Hazard Area
- Approximate 1% Annual-Chance Flood
 - Detailed 1% Annual-Chance Flood

Source: PennDOT 2010, Carbon County GIS Department 2010



Carbon County Hazard Mitigation Plan

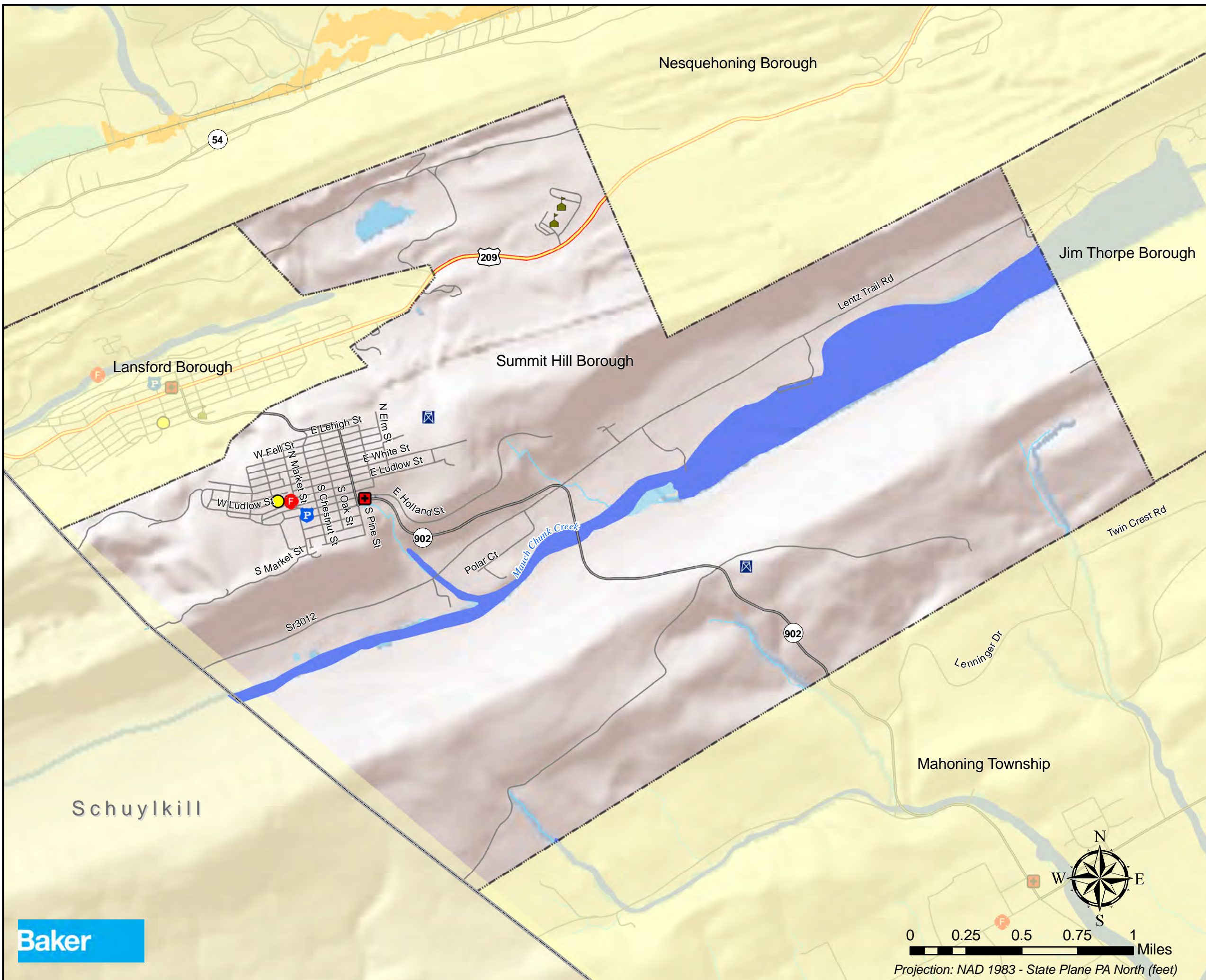
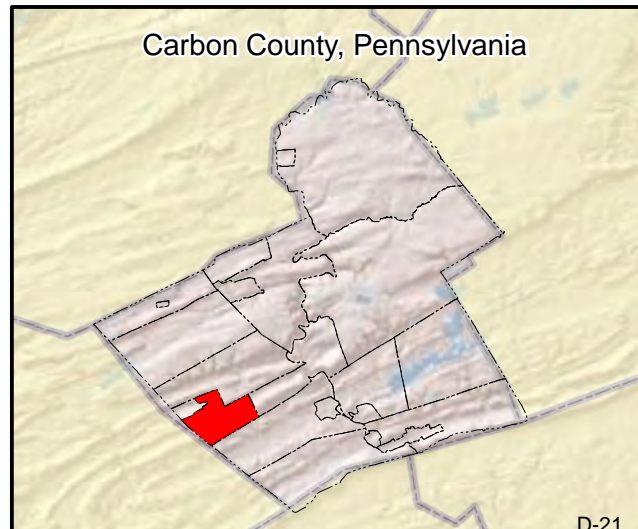


Summit Hill Borough Flood Vulnerability

LEGEND

- | | | | |
|--|--------------------|--|----------------|
| | Fire Department | | Interstate |
| | Police Department | | US Highway |
| | EMS | | Major Road |
| | Municipal Building | | Railroads |
| | School | | Water Areas |
| | Cell Tower | | Counties |
| | Rivers/Streams | | Municipalities |
- Special Flood Hazard Area
- Approximate 1% Annual-Chance Flood
 - Detailed 1% Annual-Chance Flood

Source: PennDOT 2010, Carbon County GIS Department 2010



Carbon County Hazard Mitigation Plan

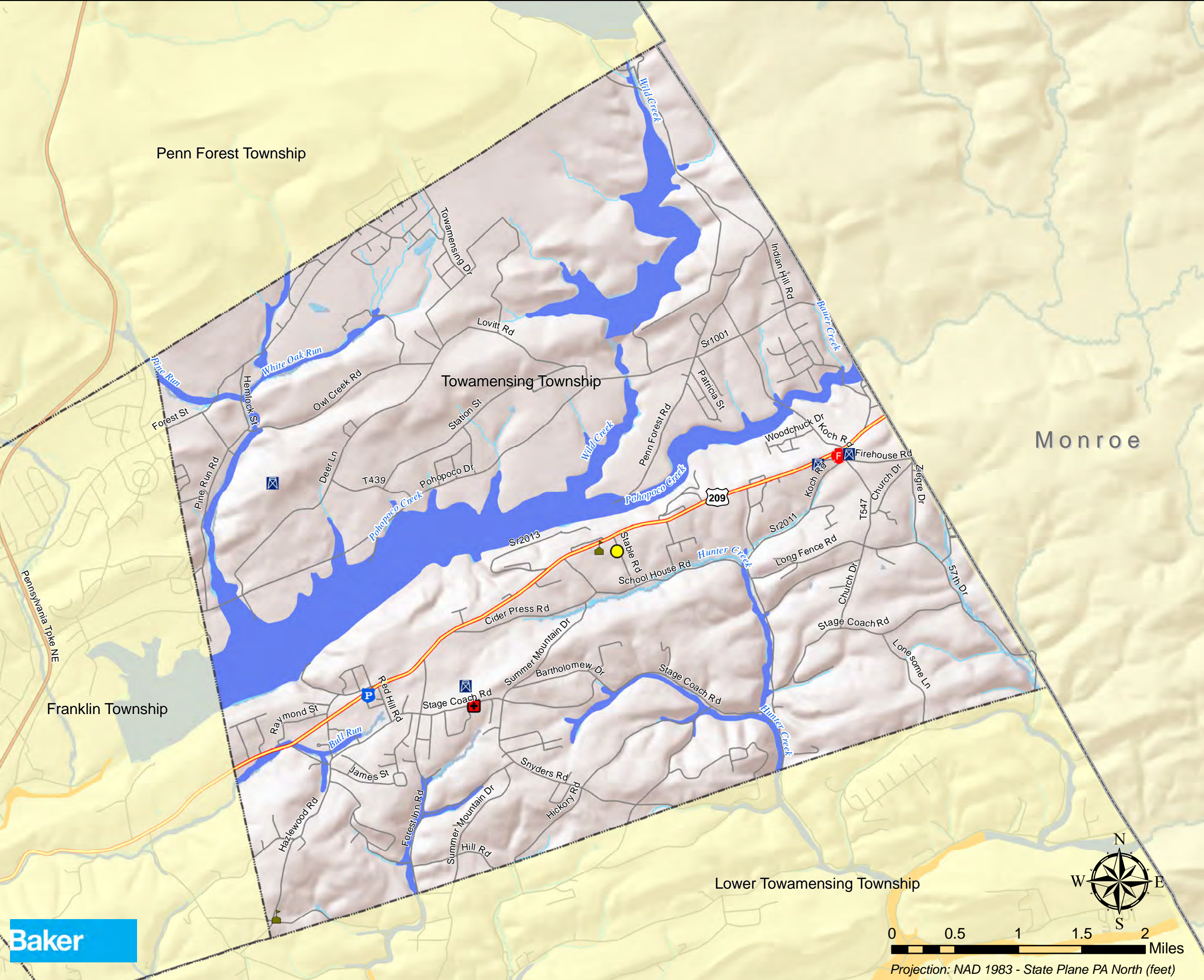
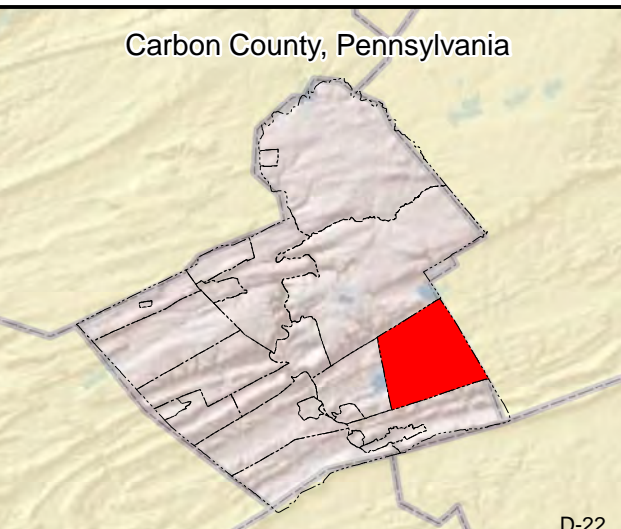


Towamensing Township Flood Vulnerability

LEGEND

- | | | | |
|--|--------------------|--|----------------|
| | Fire Department | | Interstate |
| | Police Department | | US Highway |
| | EMS | | Major Road |
| | Municipal Building | | Railroads |
| | School | | Water Areas |
| | Cell Tower | | Counties |
| | Rivers/Streams | | Municipalities |
- Special Flood Hazard Area
- Approximate 1% Annual-Chance Flood
 - Detailed 1% Annual-Chance Flood

Source: PennDOT 2010, Carbon County GIS
Department 2010



Carbon County Hazard Mitigation Plan

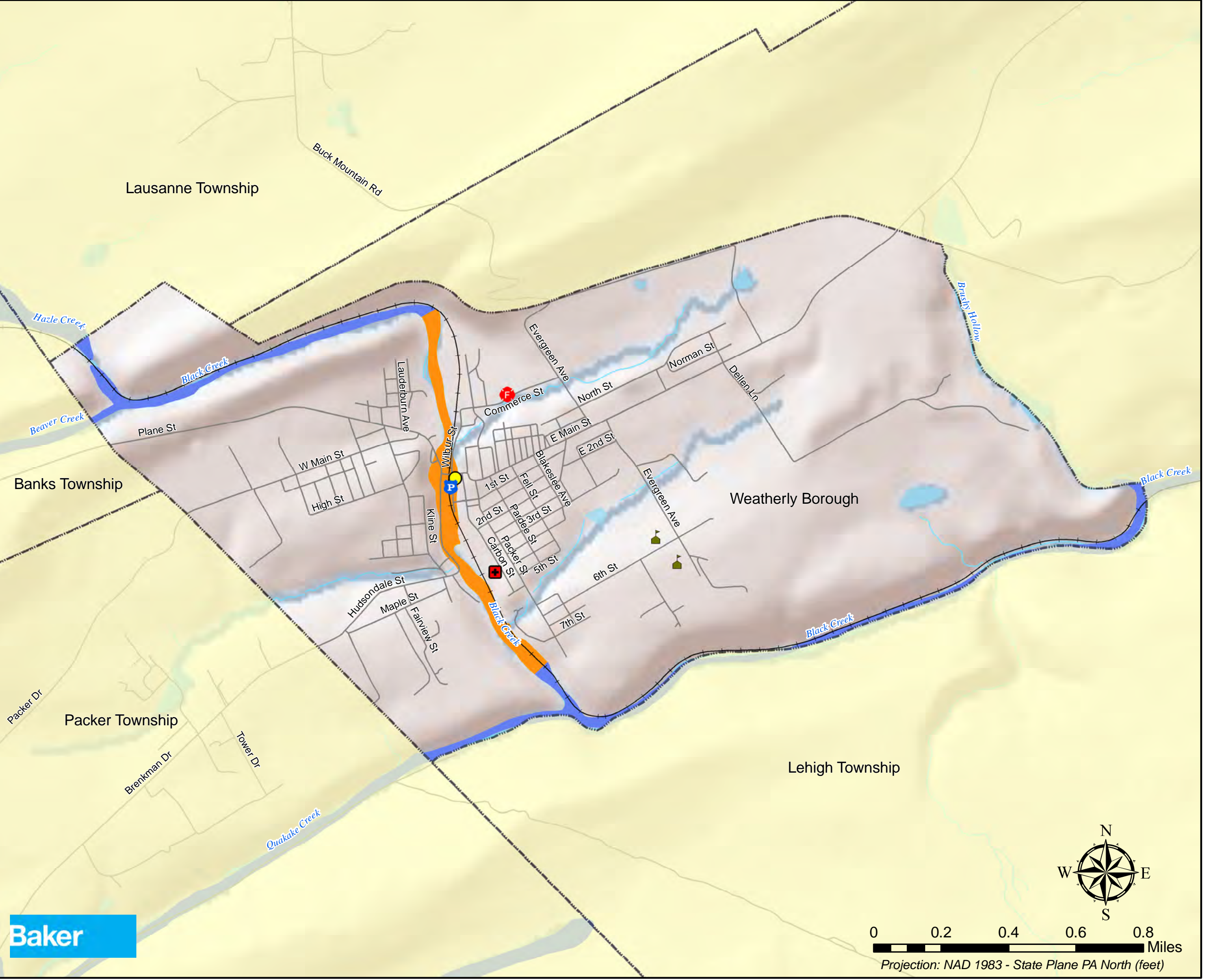
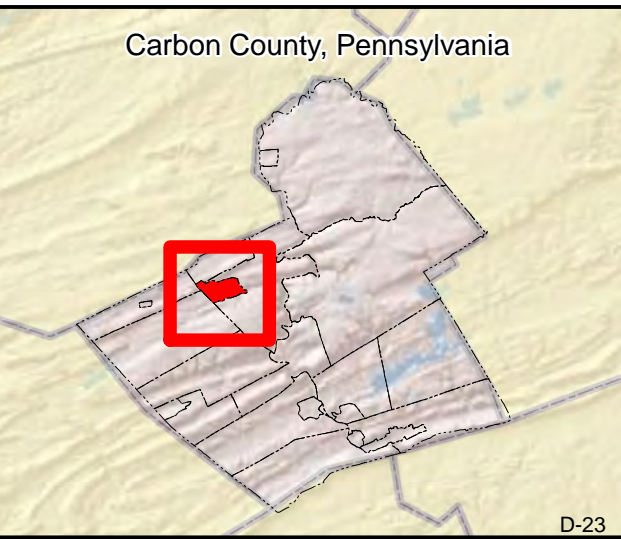


Weatherly Borough Flood Vulnerability

LEGEND

- | | | | |
|--|--------------------|--|----------------|
| | Fire Department | | Interstate |
| | Police Department | | US Highway |
| | EMS | | Major Road |
| | Municipal Building | | Railroads |
| | School | | Counties |
| | Rivers/Streams | | Municipalities |
| | Water Areas | | |
- Special Flood Hazard Area
- Approximate 1% Annual-Chance Flood
 - Detailed 1% Annual-Chance Flood

Source: PennDOT 2010, Carbon County GIS Department 2010



Carbon County Hazard Mitigation Plan

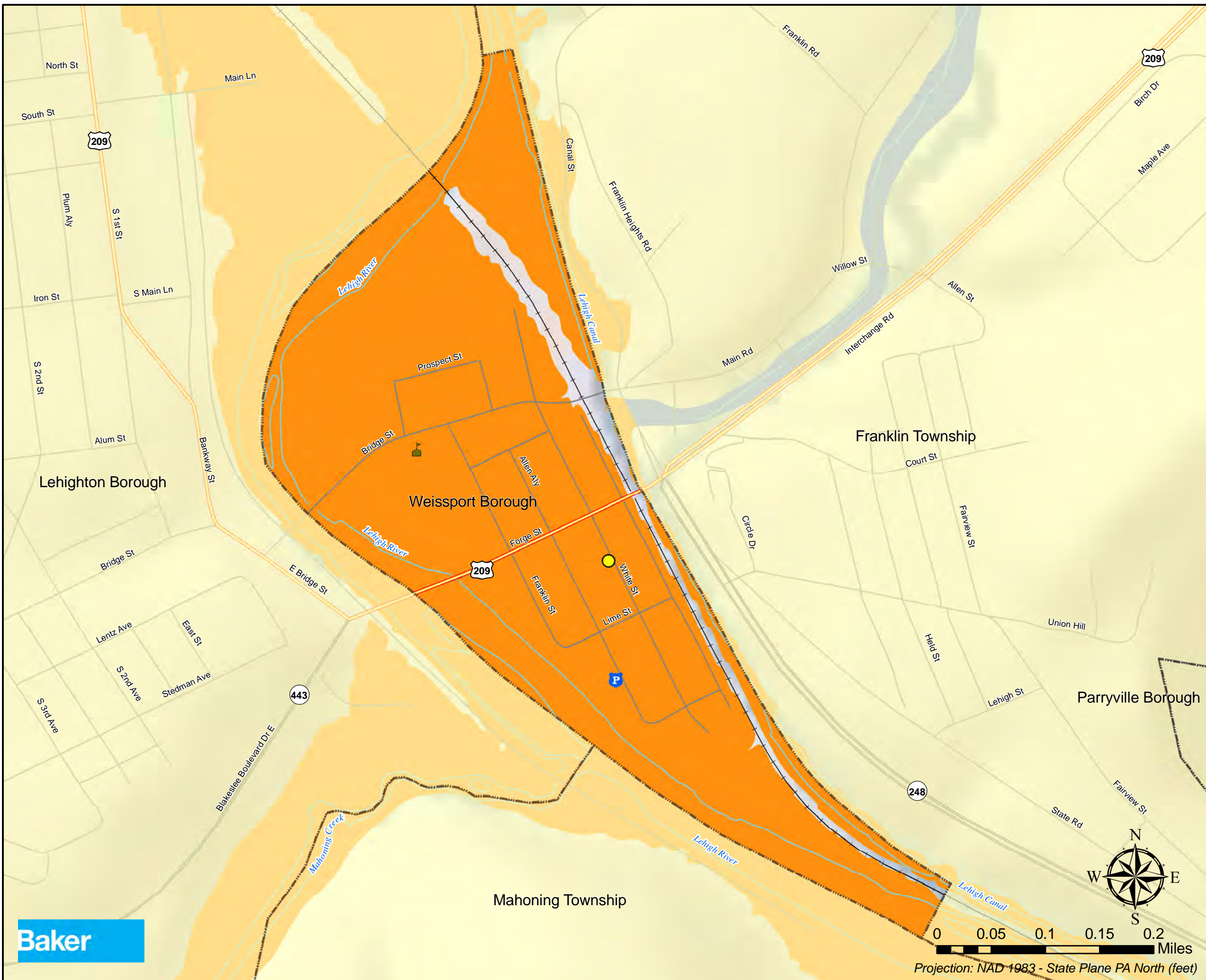


Weissport Borough Flood Vulnerability

LEGEND

- | | | | |
|--|--------------------|--|----------------|
| | Police Department | | Interstate |
| | Municipal Building | | US Highway |
| | School | | Major Road |
| | Rivers/Streams | | Railroads |
| | Water Areas | | Counties |
| | | | Municipalities |

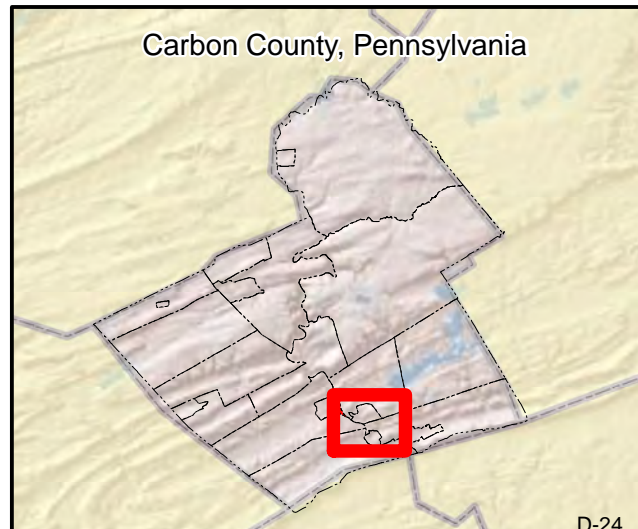
- Special Flood Hazard Area
- Approximate 1% Annual-Chance Flood
 - Detailed 1% Annual-Chance Flood



Baker

Projection: NAD 1983 - State Plane PA North (feet)

Source: PennDOT 2010, Carbon County GIS
Department 2010



Appendix E - Critical Facilities

FACILITY NAME	ADDRESS	MUNICIPALITY	WITHIN THE 1% ANNUAL- CHANCE FLOOD ZONE	WITHIN COMBO- HIGH LANDSLIDE ZONE	WITHIN HIGH WILDFIRE ZONE
AIRPORTS					
Beltzville Airport	14N 3778 Interchange Road, Lehigh, PA 18235	Franklin Township		✓	✓
Jake Arner Memorial Airport	2321 Mahoning Drive, East Lehigh PA 18235	Mahoning Township		✓	
Sency Airport	not available	Packer Township			✓
CELL TOWERS					
Cell Tower	1255 Deer Lane	Towamensing Township		✓	✓
Cell Tower	Firehouse Road	Towamensing Township		✓	✓
Cell Tower	E. Hazard Street	Summit Hill Borough		✓	
Cell Tower	Wargo Sub-Div Off T520	Penn Forest Township			✓
Cell Tower	Maury Road- Penns Peak	Penn Forest Township			✓
Cell Tower	Off Rt903- PennForest Streams	Penn Forest Township			✓
Cell Tower	Off Stoney Mtn. Road	Penn Forest Township			✓
Cell Tower	PennForest Fire Co.	Penn Forest Township			✓
Cell Tower	SR0903 and Transfer Rd.	Penn Forest Township			✓
Cell Tower	Rte.#248- Hoffman Salvage	Parryville Borough		✓	
Cell Tower	State Game Lands-Broad Mtn.	Nesquehoning Borough			✓
Cell Tower	Dennison Road	Nesquehoning Borough			✓
Cell Tower	Kovatch Ent.	Nesquehoning Borough			✓
Cell Tower	101 Adventure Lane	Nesquehoning Borough			✓
Cell Tower	394 Dieters Hill Road	Mahoning Township		✓	
Cell Tower	Roof of Lehigh Eld. Housing	Lehigh Borough		✓	
Cell Tower	Off Buck Mtn. Rd.	Lausanne Township		✓	✓
Cell Tower	Big Boulder Mtn.	Kidder Township			✓
Cell Tower	Big Boulder Mtn.	Kidder Township			✓
Cell Tower	Big Boulder Mtn.	Kidder Township			✓
Cell Tower	Spring Hill Road	Kidder Township			✓

Carbon County 2010 Hazard Mitigation Plan

FACILITY NAME	ADDRESS	MUNICIPALITY	WITHIN THE 1% ANNUAL- CHANCE FLOOD ZONE	WITHIN COMBO- HIGH LANDSLIDE ZONE	WITHIN HIGH WILDFIRE ZONE
Cell Tower	Beechcrest	Kidder Township			✓
Cell Tower	Jeras Corp.- Off Rte#534	Kidder Township			✓
Cell Tower	Mt. Laurel Resort	Kidder Township			✓
Cell Tower	Moseywood Road	Kidder Township			✓
Cell Tower	Big Boulder Mtn.	Kidder Township			✓
Cell Tower	Pocono Inn and Resort	Kidder Township			✓
Cell Tower	Bear Mtn. Lookout Tower	Jim Thorpe Borough		✓	✓
Cell Tower	Annex Roof	Jim Thorpe Borough		✓	✓
Cell Tower	1 Adventure Lane	Jim Thorpe Borough			✓
Cell Tower	North Ave.	Jim Thorpe Borough		✓	✓
Cell Tower	295 Evergreen Road	Franklin Township		✓	✓
Cell Tower	Rock Street	Franklin Township		✓	✓
Cell Tower	Off Rte. #93	Beaver Meadows Borough	✓	✓	
Cell Tower	1020 Blakeslee Blvd. East	Mahoning Township		✓	
Cell Tower	Off FireHouse Rd.	Towamensing Township		✓	✓
Cell Tower	Off Strohs Valley Road	Towamensing Township		✓	✓
Cell Tower	On water tower	Palmerton Borough		✓	
Cell Tower	Off Rt93 on PPL ROW	Banks Township		✓	✓
Cell Tower	2685 Mahoning Drive East	Mahoning Township		✓	
Cell Tower	East Mountain Top Road	Summit Hill Borough		✓	
Cell Tower	Off SR0534 and Navajo Trail	Penn Forest Township			✓
EMERGENCY MEDICAL SERVICES					
Lehighton Ambulance- Summit Hill Station	230 E Amidon St, Summit Hill 18250	Summit Hill Borough			
Lansford Volunteer Ambulance Assoc.	31 E Patterson St, Lansford 18232	Lansford Borough		✓	
Mahoning Valley Ambulance	902 Mill Rd, Lehighton 18235	Mahoning Township		✓	
Lehighton Ambulance- Penn Forest Station	SR903, Jim Thorpe 18229	Penn Forest Township		✓	✓

Carbon County 2010 Hazard Mitigation Plan

FACILITY NAME	ADDRESS	MUNICIPALITY	WITHIN THE 1% ANNUAL- CHANCE FLOOD ZONE	WITHIN COMBO- HIGH LANDSLIDE ZONE	WITHIN HIGH WILDFIRE ZONE
Lake Harmony Rescue and Ambulance Corps.	105 Lake Dr, PO Box 631, Lake Harmony 18624	Kidder Township			✓
Nesquehoning Ambulance	67 W High St, Nesquehoning 18240	Nesquehoning Borough			✓
Palmerton Community Ambulance Assoc.	501 Delaware Ave., PO Box 2, Palmerton 18071	Palmerton Borough		✓	
Greater Weatherly Ambulance Assoc.	400 Carbon St, Weatherly 18255	Weatherly Borough		✓	
Lehighon Ambulance Assoc.	516 Iron St, PO Box 82, Lehighon 18235	Lehighon Borough		✓	
Lehighon Ambulance- Jim Thorpe Station	100 E 10th St, Jim Thorpe 18229	Jim Thorpe Borough			✓
East Coast Medical Services	708 N First St, Lehighon 18235	Mahoning Township		✓	
Franklin Twp. QRS	2440 Fairyland Rd, Lehighon 18235	Franklin Township		✓	✓
Towamensing Twp. QRS	1640 Stagecoach Rd W, Palmerton 18071	Towamensing Township		✓	✓
Marian Field Heliport	190 Decker Lane, Weatherly 18255	Lehigh Township			✓
Gnaden Huetten Hospital Heliport	211 N 12th St, Lehighon 18235	Lehighon Borough		✓	
Carbon County Base-PennSTAR Carbon County Airport	2321 Mahoning Drive East, Lehighon 18235	Mahoning Township		✓	
FIRE DEPARTMENTS					
American Fire Company	26 East Patterson Street, Lansford 18232	Lansford Borough	✓	✓	
Aquashicola-Lower Towamensing VFC	270 Little Gap Road, PO Box 41, Aquashicola 18012	Lower Towamensing Township		✓	✓
Beaver Meadows VFD	50 Church Street, PO Box 404, Beaver Meadows 18216	Beaver Meadows Borough		✓	
Bowmanstown VFC	259 Lime Street, Bowmanstown 18030	Bowmanstown Borough		✓	
Citizens FC	107 Spring Street, Weatherly 18255	Weatherly Borough		✓	

Carbon County 2010 Hazard Mitigation Plan

FACILITY NAME	ADDRESS	MUNICIPALITY	WITHIN THE 1% ANNUAL- CHANCE FLOOD ZONE	WITHIN COMBO- HIGH LANDSLIDE ZONE	WITHIN HIGH WILDFIRE ZONE
Diligence FC	114 W Ludlow Street, Summit Hill 18250	Summit Hill Borough		✓	
Diligent Fire Company	330 Center Avenue, Jim Thorpe 18229	Jim Thorpe Borough		✓	✓
East Penn Township VFC	403 Blue Mountain Road, PO Box 33, Ashfield 18212	East Penn Township		✓	✓
Fairview Hose Company	9th & School Streets, Jim Thorpe 18229	Jim Thorpe Borough			✓
Franklin Township VFC	2440 Fairyland Road, Lehighton 18235	Franklin Township		✓	✓
Lake Harmony VFC	122 North Lake Drive, PO Box 554, Lake Harmony 18624	Kidder Township			✓
Lehighon Fire Dept	140 S. 3rd Street, Lehighton 18235	Lehighon Borough		✓	
Mahoning Valley VFC	2358 Mahoning Drive W, Lehighton 18235	Mahoning Township		✓	
Nesquehoning Hose Company	7953 East Catawissa Street, PO Box 31, Nesquehoning 18240	Nesquehoning Borough			✓
New Columbus FC	7 East Diaz Avenue, Nesquehoning 18240	Nesquehoning Borough			✓
Palmerton Fire Company	414 3rd Street, Palmerton 18071	Palmerton Borough		✓	
Parryville VFC	359 Main Street, PO Box 40, Parryville 18244	Parryville Borough		✓	
Penn Forest Township VFC	1387 SR 903, Jim Thorpe 18229	Penn Forest Township			✓
Penn Forest Township VFC2	1507 SR 534, Albrightsville 18210	Penn Forest Township			✓
Phoenix Hose Company	173 West Broadway, Jim Thorpe 18229	Jim Thorpe Borough		✓	✓
Towamensing Township VFC	105 Firehouse Road, Palmerton 18071	Towamensing Township		✓	✓
Tresckow FC	26 East Oak Street, PO Box 10, Tresckow 18254	Banks Township		✓	✓
West End Fire Company	855 Princeton Avenue, Palmerton 18071	Palmerton Borough		✓	

Carbon County 2010 Hazard Mitigation Plan

FACILITY NAME	ADDRESS	MUNICIPALITY	WITHIN THE 1% ANNUAL- CHANCE FLOOD ZONE	WITHIN COMBO- HIGH LANDSLIDE ZONE	WITHIN HIGH WILDFIRE ZONE
HOSPITALS					
Palmerton Hospital	135 Lafayette Avenue, Palmerton 18071	Palmerton Borough		✓	
Gnaden Huetten Memorial Hospital	211 N. 12th Street, Leighton 18235	Leighton Borough		✓	
MUNICIPAL BUILDINGS					
Banks Municipal Building	not available	Banks Township		✓	✓
Beaver Meadows Municipal Building	100 East Broad Street, Beaver Meadows, PA 18216	Beaver Meadows Borough		✓	
Bowmanstown Municipal Building	Ore and Mill Street, Bowmanstown, PA 18030	Bowmanstown Borough		✓	
East Penn Municipal Building	167 Municipal Road, Leighton, PA 18235	East Penn Township		✓	✓
East Side Municipal Building	170 Centre Street	East Side Borough			
Franklin Municipal Building	900 Fairyland Road, Leighton, PA 18235	Franklin Township		✓	✓
Jim Thorpe Municipal Building	101 East 10th Street	Jim Thorpe Borough			✓
Kidder Municipal Building	not available	Kidder Township			✓
Lansford Municipal Building	26 East Patterson Street, Lansford, PA 18232	Lansford Borough		✓	
Lausanne Municipal Building	143 North Stagecoach Road, Weatherly, PA 18255	Lausanne Township		✓	✓
Lehigh Municipal Building	1741 South Lehigh Gorge Drive, Weatherly, PA 18235	Lehigh Township		✓	✓
Leighton Municipal Building	140 S. 3rd Street	Leighton Borough		✓	
Lower Towamensing Municipal Building	595 Hahns Drive, Palmerton, PA 18071	Lower Towamensing Township	✓	✓	✓
Mahoning Municipal Building	2685 Mahoning Drive East, Leighton, PA 18235	Mahoning Township		✓	

Carbon County 2010 Hazard Mitigation Plan

FACILITY NAME	ADDRESS	MUNICIPALITY	WITHIN THE 1% ANNUAL- CHANCE FLOOD ZONE	WITHIN COMBO- HIGH LANDSLIDE ZONE	WITHIN HIGH WILDFIRE ZONE
Nesquehoning Municipal Building	114 West Catawissa Street, Nesquehoning, PA 18240	Nesquehoning Borough			✓
Packer Municipal Building	RD 1 P.O. Box 41	Packer Township			✓
Palmerton Municipal Building	443 Delaware Avenue, Palmerton, PA 18071	Palmerton Borough	✓	✓	
Parryville Municipal Building	not available	Parryville Borough		✓	
Penn Forest Municipal Building	not available	Penn Forest Township			✓
Summit Hill Municipal Building	116 West Ludlow Street	Summit Hill Borough		✓	
Towamensing Municipal Building	120 Stable Road, Lehigh, PA 18235	Towamensing Township		✓	✓
Weatherly Municipal Building	10 Wilbur Street, Weatherly, PA 18255	Weatherly Borough	✓	✓	
Weissport Municipal Building	not available	Weissport Borough	✓	✓	
POLICE DEPARTMENTS					
Beaver Meadows Borough	100 E Broad St, Beaver Meadows, 18216	Beaver Meadows Borough		✓	
East Penn Twp.	167 Municipal Rd, Lehigh, 18235	East Penn Township		✓	✓
Franklin Twp.	900 Fairyland Rd, Lehigh, 18235	Franklin Township		✓	✓
Jim Thorpe Borough	421 North St, Jim Thorpe, 18229	Jim Thorpe Borough			✓
Kidder Twp.	PO Box 576, Lake Harmony, 18624	Kidder Township			✓
Lansford Borough	1 W Ridge St, Lansford, 18232	Lansford Borough		✓	
Lehigh Borough	PO Box 29, Lehigh, 18235	Lehigh Borough		✓	
Mahoning Twp.	2685 Mahoning Dr E, Lehigh, 18235	Mahoning Township		✓	
Nesquehoning Borough	114 W Catawissa St, Nesquehoning, 18240	Nesquehoning Borough			✓
Palmerton Borough	401 Delaware Ave, Palmerton, 18071	Palmerton Borough	✓	✓	
Summit Hill Borough	40 W Amidon St, Summit Hill, 18250	Summit Hill Borough		✓	

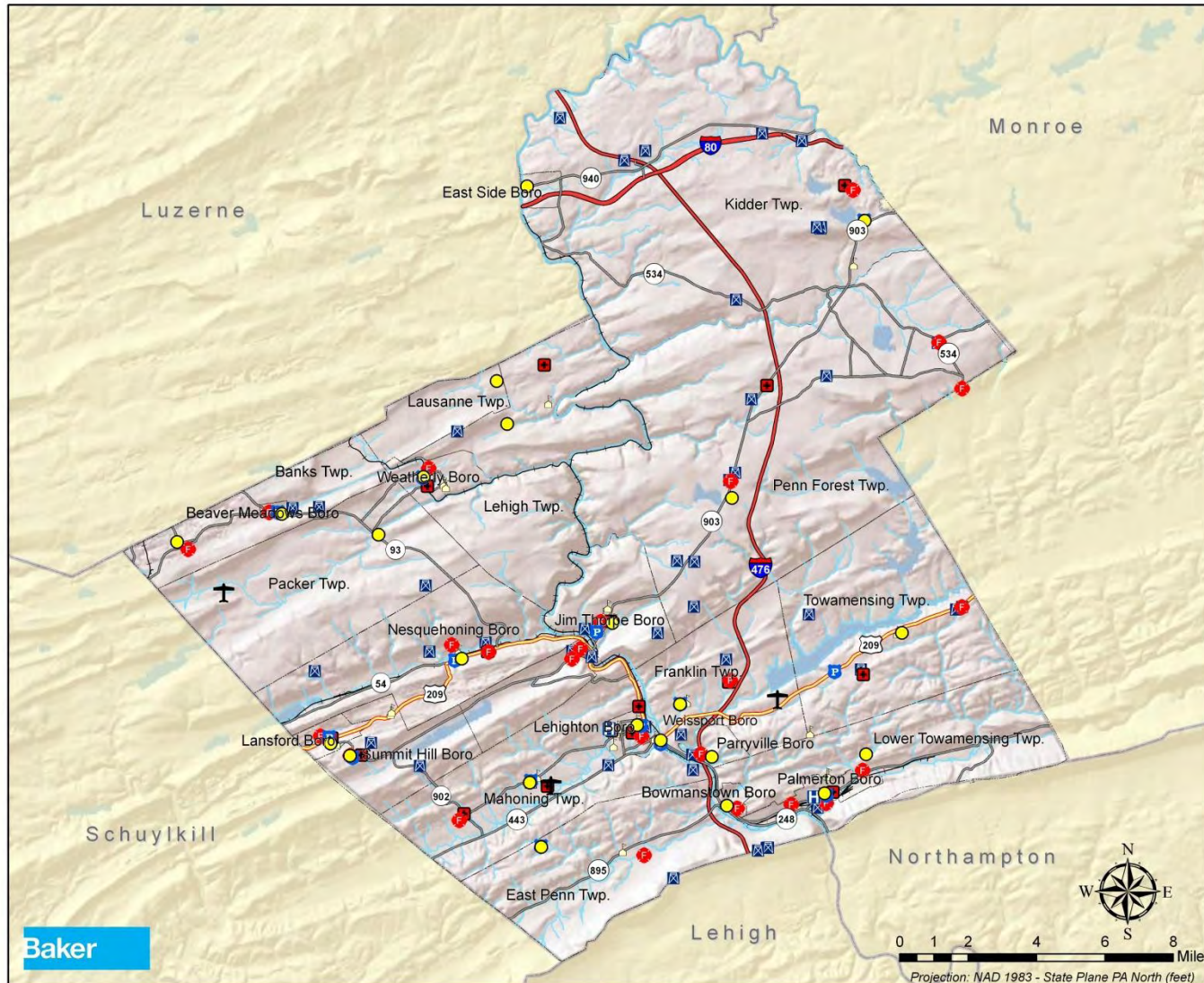
Carbon County 2010 Hazard Mitigation Plan

FACILITY NAME	ADDRESS	MUNICIPALITY	WITHIN THE 1% ANNUAL- CHANCE FLOOD ZONE	WITHIN COMBO- HIGH LANDSLIDE ZONE	WITHIN HIGH WILDFIRE ZONE
Towamensing Twp.	5730 Interchange Rd, Lehighton, 18235	Towamensing Township		✓	✓
Weatherly Borough	10 Wilbur St, Weatherly, 18255	Weatherly Borough	✓	✓	
Weissport Borough	440 Allen Alley, Weissport, 18235	Weissport Borough	✓	✓	
SCHOOLS					
Panther Valley High School	SR 209, Lansford- Nesquehoning Highway	Summit Hill Borough		✓	
Panther Valley Middle School	SR 209, Lansford- Nesquehoning Highway	Summit Hill Borough		✓	
Panther Valley Elementary School	1 N Mermon Ave	Nesquehoning Borough	✓		✓
L.B. Morris Elementary School	1 W 10th St	Jim Thorpe Borough			✓
Jim Thorpe Area High School	1 Olympian Way	Jim Thorpe Borough			✓
Penn Kidder Campus	1 Penn Kidder Ln	Kidder Township			✓
Carbon Career and Technical Institute	150 W 13th St	Jim Thorpe Borough			✓
Lehighton Area High School	1 Indian Ln	Lehighton Borough		✓	
Lehighton Area Middle School	301 Beaver Run Rd	Lehighton Borough		✓	
Shull-David Elementary School	200 Beaver Run Rd	Lehighton Borough		✓	
Mahoning Elementary School	2466 Mahoning Drive East	Mahoning Township		✓	
East Penn Elementary School	496 West Lizard Creek Rd	East Penn Township		✓	✓
Franklin Elementary School	1122 Fairyland Rd	Franklin Township		✓	✓
Palmerton Area High School	3525 Fireline Rd	Lower Towamensing Township		✓	✓

Carbon County 2010 Hazard Mitigation Plan

FACILITY NAME	ADDRESS	MUNICIPALITY	WITHIN THE 1% ANNUAL- CHANCE FLOOD ZONE	WITHIN COMBO- HIGH LANDSLIDE ZONE	WITHIN HIGH WILDFIRE ZONE
Palmerton Area Middle School	3529 Fireline Rd	Lower Towamensing Township		✓	✓
Towamensing Elementary School	7920 Interchange Rd	Towamensing Township		✓	✓
Palmer Elementary School	298 Lafayette Ave	Palmerton Borough		✓	
Carbon Learning and Adjustment School	480 Delaware Ave	Palmerton Borough		✓	
St. John Neumann School	259 Lafayette Ave	Palmerton Borough		✓	
Carbon County Christian School	25 Oak St	Towamensing Township		✓	✓
Weatherly Area High School	601 6th St	Weatherly Borough		✓	
Weatherly Area Elememtry/Middle School	602 6th St	Weatherly Borough		✓	
Our Lady of the Angels Academy	30 E Bertsch St	Lansford Borough		✓	
Lehigh Carbon Community College	24 E Locust St	Nesquehoning Borough			✓
Parkside Education Center	680 Fourth St	Palmerton Borough	✓	✓	
Educare- Clinical Innovations	413 Bridge St	Weissport Borough	✓	✓	
All Saints Eastern Orthodox School	378 Laurytown Dr	Lehigh Township			✓
SS Peter and Paul School	307 Coal St	Lehighon Borough		✓	
St. Joseph Regional Academy	25 W 6th St	Jim Thorpe Borough			✓

Carbon County Critical Facility Locations.



Carbon County Hazard Mitigation Plan



Critical Facility Locations

LEGEND

- Airport
- Municipal Building
- Hospital
- Police Department
- Fire Department
- EMS
- School
- Cell Tower
- Interstate
- US Highway
- Major Road
- Railroads
- Major Streams
- Municipalities
- Counties

Source: ESRI 2010, Carbon County GIS Department 2010



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Appendix F HAZUS Results Reports

HAZUS-MH: Flood Event Report

Region Name: Carbon County HMP

Flood Scenario: Carbon_AllStreams

Print Date: Wednesday, July 21, 2010

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using HAZUS loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social

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General Description of the Region

HAZUS is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of HAZUS is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Pennsylvania

Note:

Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 381 square miles and contains 2,428 census blocks. The region contains over 24 thousand households and has a total population of 58,802 people (2000 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 28,627 buildings in the region with a total building replacement value (excluding contents) of 4,342 million dollars (2006 dollars). Approximately 93.39% of the buildings (and 78.23% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

HAZUS estimates that there are 28,627 buildings in the region which have an aggregate total replacement value of 4,342 million (2006 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure (\$1000)	Percent of Total
Residential	3,396,727	78.2%
Commercial	609,149	14.0%
Industrial	139,798	3.2%
Agricultural	12,239	0.3%
Religion	82,369	1.9%
Government	53,773	1.2%
Education	48,117	1.1%
Total	4,342,172	100.00%

Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure (\$1000)	Percent of Total
Residential	730,830	69.6%
Commercial	211,742	20.2%
Industrial	65,037	6.2%
Agricultural	1,856	0.2%
Religion	17,773	1.7%
Government	8,116	0.8%
Education	14,628	1.4%
Total	1,049,982	100.00%

Essential Facility Inventory

For essential facilities, there are 1 hospitals in the region with a total bed capacity of 70 beds. There are 26 schools, 19 fire stations, 9 police stations and no emergency operation centers.

Flood Scenario Parameters

HAZUS used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	Carbon County HMP
Scenario Name:	Carbon_AllStreams
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

General Building Stock Damage

HAZUS estimates that about 247 buildings will be at least moderately damaged. This is over 8% of the total number of buildings in the scenario. There are an estimated 101 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the HAZUS Flood technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Table 3: Expected Building Damage by Occupancy

Occupancy	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	5	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	0	0.00	1	100.00	0	0.00
Religion	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	0	0.00	13	5.39	19	7.88	44	18.26	64	26.56	101	41.91
Total	0		18		19		44		65		101	

Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
ManufHousing	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	18	100.00
Masonry	0	0.00	4	6.15	4	6.15	11	16.92	21	32.31	25	38.46
Steel	0	0.00	2	66.67	0	0.00	0	0.00	1	33.33	0	0.00
Wood	0	0.00	11	6.88	15	9.38	33	20.63	43	26.88	58	36.25

Essential Facility Damage

Before the flood analyzed in this scenario, the region had hospital beds available for use. On the day of the scenario flood event, the model estimates that hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	19	1	0	1
Hospitals	1	0	0	0
Police Stations	9	0	0	0
Schools	26	1	0	1

If this report displays all zeros or is blank, two possibilities can explain this.

- (1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.
- (2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

HAZUS estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

Analysis has not been performed for this Scenario.

Social Impact

Shelter Requirements

HAZUS estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. HAZUS also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 869 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 1,980 people (out of a total population of 58,802) will seek temporary shelter in public shelters.

Economic Loss

The total economic loss estimated for the flood is 126.08 million dollars, which represents 12.01 % of the total replacement value of the scenario buildings.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 124.92 million dollars. 1% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 40.47% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
<u>Building Loss</u>						
	Building	33.05	10.92	5.73	0.92	50.61
	Content	17.89	32.65	14.20	5.41	70.15
	Inventory	0.00	1.41	2.74	0.02	4.16
	Subtotal	50.94	44.97	22.66	6.35	124.92
<u>Business Interruption</u>						
	Income	0.00	0.14	0.00	0.01	0.16
	Relocation	0.07	0.05	0.00	0.00	0.12
	Rental Income	0.02	0.03	0.00	0.00	0.05
	Wage	0.01	0.21	0.00	0.61	0.83
	Subtotal	0.10	0.43	0.01	0.63	1.16
ALL	Total	51.03	45.40	22.67	6.98	126.08

Appendix A: County Listing for the Region

Pennsylvania

- Carbon

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
<div><div>Pennsylvania</div></div>				
Carbon	58,802	3,396,727	945,445	4,342,172
Total	58,802	3,396,727	945,445	4,342,172
Total Study Region	58,802	3,396,727	945,445	4,342,172

HAZUS-MH: Hurricane Event Report

Region Name: Carbon Hurricane

Hurricane Scenario: Probabilistic 100-year Return Period

Print Date: Tuesday, August 03, 2010

Disclaimer:

Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using HAZUS loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Hurricane. These results can be improved by using enhanced inventory data.

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General Description of the Region

HAZUS is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences. The primary purpose of HAZUS is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The hurricane loss estimates provided in this report are based on a region that includes 1 county(ies) from the following state(s):

- Pennsylvania

Note:

Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 386.73 square miles and contains 10 census tracts. There are over 23 thousand households in the region and has a total population of 58,802 people (2000 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 28 thousand buildings in the region with a total building replacement value (excluding contents) of 4,342 million dollars (2002 dollars). Approximately 93% of the buildings (and 78% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

HAZUS estimates that there are 28,627 buildings in the region which have an aggregate total replacement value of 4,342 million (2002 dollars). Table 1 presents the relative distribution of the value with respect to the general occupancies. Appendix B provides a general distribution of the building value by State and County.

Table 1: Building Exposure by Occupancy Type

Occupancy	Exposure (\$1000)	Percent of Tot
Residential	3,396,727	78.2%
Commercial	609,149	14.0%
Industrial	139,798	3.2%
Agricultural	12,239	0.3%
Religious	82,369	1.9%
Government	53,773	1.2%
Education	48,117	1.1%
Total	4,342,172	100.0%

Essential Facility Inventory

For essential facilities, there are 1 hospitals in the region with a total bed capacity of 70 beds. There are 26 schools, 19 fire stations, 9 police stations and no emergency operation facilities.

Hurricane Scenario

HAZUS used the following set of information to define the hurricane parameters for the hurricane loss estimate provided in this report.

Scenario Name: Probabilistic

Type: Probabilistic

Building Damage

General Building Stock Damage

HAZUS estimates that about 0 buildings will be at least moderately damaged. This is over 0% of the total number of buildings in the region. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 6 of the HAZUS Hurricane technical manual. Table 2 below summarizes the expected damage by general occupancy for the buildings in the region. Table 3 summarizes the expected damage by general building type.

Table 2: Expected Building Damage by Occupancy : 100 - year Event

Occupancy	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	73	99.83	0	0.17	0	0.00	0	0.00	0	0.00
Commercial	1,233	99.76	3	0.24	0	0.00	0	0.00	0	0.00
Education	39	99.74	0	0.26	0	0.00	0	0.00	0	0.00
Government	65	99.74	0	0.26	0	0.00	0	0.00	0	0.00
Industrial	364	99.73	1	0.27	0	0.00	0	0.00	0	0.00
Religion	115	99.81	0	0.19	0	0.00	0	0.00	0	0.00
Residential	26,726	99.97	8	0.03	0	0.00	0	0.00	0	0.00
Total	28,615		12		0		0		0	

Table 3: Expected Building Damage by Building Type : 100 - year Event

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	374	99.65	1	0.35	0	0.00	0	0.00	0	0.00
Masonry	8,974	99.90	9	0.10	0	0.00	0	0.00	0	0.00
MH	1,462	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Steel	985	99.72	3	0.28	0	0.00	0	0.00	0	0.00
Wood	16,820	100.00	1	0.00	0	0.00	0	0.00	0	0.00

Essential Facility Damage

Before the hurricane, the region had 70 hospital beds available for use. On the day of the hurricane, the model estimates that 70 hospital beds (only 100.00%) are available for use. After one week, 100.00% of the beds will be in service. By 30 days, 100.00% will be operational.

Table 4: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		Probability of at Least Moderate Damage > 50%	Probability of Complete Damage > 50%	Expected Loss of Use < 1 day
Fire Stations	19	0	0	19
Hospitals	1	0	0	1
Police Stations	9	0	0	9
Schools	26	0	0	26

Induced Hurricane Damage

Debris Generation

HAZUS estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into three general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, and c) Trees. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 630 tons of debris will be generated. Of the total amount, Brick/Wood comprises 1% of the total, Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 0 truckloads (@25 tons/truck) to remove the debris generated by the hurricane.

Social Impact

Shelter Requirement

HAZUS estimates the number of households that are expected to be displaced from their homes due to the hurricane and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 0 households to be displaced due to the hurricane. Of these, 0 people (out of a total population of 58,802) will seek temporary shelter in public shelters.

Economic Loss

The total economic loss estimated for the hurricane is 0.4 million dollars, which represents 0.01 % of the total replacement value of the region's buildings.

Building-Related Losses

The building related losses are broken into two categories: direct property damage losses and business interruption losses. The direct property damage losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the hurricane. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the hurricane.

The total property damage losses were 0 million dollars. 0% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 100% of the total loss. Table 4 below provides a summary of the losses associated with the building damage.

Table 5: Building-Related Economic Loss Estimates
(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
<u>Property Damage</u>						
	Building	376.80	0.00	0.00	0.00	376.80
	Content	0.00	0.00	0.00	0.00	0.00
	Inventory	0.00	0.00	0.00	0.00	0.00
	Subtotal	376.80	0.00	0.00	0.00	376.80
<u>Business Interruption Loss</u>						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	0.22	0.00	0.00	0.00	0.22
	Rental	0.00	0.00	0.00	0.00	0.00
	Wage	0.00	0.00	0.00	0.00	0.00
	Subtotal	0.22	0.00	0.00	0.00	0.22
<u>Total</u>						
	Total	377.02	0.00	0.00	0.00	377.02

Appendix A: County Listing for the Region

Pennsylvania

- Carbon

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Pennsylvania				
Carbon	58,802	3,396,727	945,445	4,342,172
Total	58,802	3,396,727	945,445	4,342,172
Study Region Total	58,802	3,396,727	945,445	4,342,172

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Appendix G – Winter Storm Past Occurrence Table

Previous winter storm events impacting Carbon County since 1994 (NCDC, 2010). Events with the location “Multiple Counties” include Carbon County.		
LOCATION	DATE	TYPE
Multiple Counties	11/27/1994	Freezing Rain And Sleet
Multiple Counties	12/14/1994	Freezing Drizzle
Multiple Counties	12/31/1994	Freezing Rain
Multiple Counties	1/6/1995	Winter Storm
Multiple Counties	1/11/1995	Freezing Rain
Multiple Counties	1/31/1995	Freezing Rain
Multiple Counties	2/3/1995	Heavy Snow
Multiple Counties	2/15/1995	Freezing Rain
Multiple Counties	2/26/1995	Freezing Rain Sleet And Light
Multiple Counties	2/27/1995	Freezing Rain
Multiple Counties	3/8/1995	Snow
Multiple Counties	6/1/1995	Snow Drought
Carbon and Monroe Counties	11/14/1995	Heavy Snow
Multiple Counties	11/29/1995	Snow
Carbon and Monroe Counties	12/9/1995	Heavy Snow
Multiple Counties	12/14/1995	Wintry Mix
Multiple Counties	12/16/1995	Snow
Carbon and Monroe Counties	12/19/1995	Heavy Snow
Multiple Counties	1/2/1996	Winter Storm
Multiple Counties	1/12/1996	Heavy Snow
Multiple Counties	3/7/1996	Winter Storm
Multiple Counties	3/28/1996	Ice Storm
Multiple Counties	12/5/1996	Heavy Snow
Carbon and Monroe Counties	12/7/1996	Heavy Snow
Carbon and Monroe Counties	12/13/1996	Heavy Snow
Carbon and Monroe Counties	1/9/1997	Snow
Multiple Counties	1/16/1997	Winter Storm
Multiple Counties	1/24/1997	Wintry Mix
Multiple Counties	1/27/1997	Snow
Carbon and Monroe Counties	2/4/1997	Wintry Mix
Multiple Counties	2/14/1997	Winter Storm
Multiple Counties	3/3/1997	Snow
Multiple Counties	3/14/1997	Wintry Mix
Multiple Counties	3/31/1997	Heavy Snow
Multiple Counties	4/1/1997	Heavy Snow

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Previous winter storm events impacting Carbon County since 1994 (NCDC, 2010). Events with the location "Multiple Counties" include Carbon County.		
LOCATION	DATE	TYPE
Carbon and Monroe Counties	11/13/1997	Winter Storm
Carbon and Monroe Counties	12/10/1997	Heavy Snow
Multiple Counties	12/22/1997	Winter Storm
Carbon and Monroe Counties	12/24/1997	Freezing Rain
Carbon and Monroe Counties	12/29/1997	Winter Storm
Multiple Counties	1/15/1998	Ice Storm
Carbon and Monroe Counties	1/23/1998	Winter Storm
Multiple Counties	1/24/1998	Snow
Multiple Counties	2/4/1998	Wintry Mix
Carbon and Monroe Counties	2/17/1998	Freezing Rain
Carbon and Monroe Counties	2/23/1998	Wintry Mix
Carbon and Monroe Counties	3/18/1998	Wintry Mix
Carbon and Monroe Counties	3/21/1998	Winter Storm
Carbon and Monroe Counties	4/9/1998	Snow
Carbon and Monroe Counties	12/29/1998	Wintry Mix
Multiple Counties	12/30/1998	Black Ice
Carbon and Monroe Counties	1/2/1999	Winter Storm
Carbon and Monroe Counties	1/8/1999	Winter Storm
Multiple Counties	1/13/1999	Winter Storm
Multiple Counties	2/1/1999	Freezing Rain
Carbon and Monroe Counties	2/7/1999	Snow
Carbon and Monroe Counties	3/6/1999	Snow
Multiple Counties	3/14/1999	Heavy Snow
Carbon and Monroe Counties	3/22/1999	Snow
Carbon and Monroe Counties	12/14/1999	Wintry Mix
Multiple Counties	12/20/1999	Freezing Rain
Carbon and Monroe Counties	1/13/2000	Snow
Multiple Counties	1/20/2000	Snow
Multiple Counties	1/25/2000	Heavy Snow
Carbon and Monroe Counties	1/30/2000	Heavy Snow
Multiple Counties	2/3/2000	Snow
Carbon and Monroe Counties	2/13/2000	Ice Storm
Multiple Counties	2/18/2000	Winter Storm
Multiple Counties	4/9/2000	Snow
Carbon and Monroe Counties	11/25/2000	Freezing Rain
Multiple Counties	12/13/2000	Winter Storm
Carbon and Monroe Counties	12/16/2000	Freezing Rain
Carbon and Monroe Counties	12/19/2000	Heavy Snow

Carbon County 2010 Hazard Mitigation Plan

Previous winter storm events impacting Carbon County since 1994 (NCDC, 2010). Events with the location "Multiple Counties" include Carbon County.		
LOCATION	DATE	TYPE
Multiple Counties	1/5/2001	Snow
Multiple Counties	1/8/2001	Snow
Carbon and Monroe Counties	1/15/2001	Freezing Rain
Carbon and Monroe Counties	1/19/2001	Wintry Mix
Carbon and Monroe Counties	1/20/2001	Winter Storm
Multiple Counties	1/20/2001	Snow
Multiple Counties	1/30/2001	Freezing Rain
Multiple Counties	2/5/2001	Heavy Snow
Carbon and Monroe Counties	2/16/2001	Freezing Rain
Multiple Counties	2/22/2001	Heavy Snow
Multiple Counties	2/25/2001	Winter Storm
Multiple Counties	3/4/2001	Winter Storm
Multiple Counties	3/9/2001	Snow
Carbon and Monroe Counties	3/12/2001	Ice Storm
Carbon and Monroe Counties	12/8/2001	Wintry Mix
Carbon and Lehigh Counties	12/28/2001	Snow Showers
Carbon and Monroe Counties	1/6/2002	Heavy Snow
Multiple Counties	1/7/2002	Snow
Multiple Counties	1/9/2002	Wintry Mix
Multiple Counties	1/19/2002	Snow
Carbon and Monroe Counties	1/31/2002	Freezing Rain
Carbon and Monroe Counties	2/1/2002	Freezing Rain
Multiple Counties	2/4/2002	Snow Showers
Multiple Counties	3/17/2002	Wintry Mix
Carbon and Monroe Counties	3/20/2002	Snow
Carbon and Monroe Counties	3/21/2002	Snow Squalls
Carbon and Monroe Counties	3/26/2002	Ice Storm
Multiple Counties	11/26/2002	Snow
Carbon and Lehigh Counties	12/1/2002	Winter Weather/mix
Multiple Counties	12/5/2002	Heavy Snow
Multiple Counties	12/11/2002	Winter Storm
Multiple Counties	12/24/2002	Winter Storm
Multiple Counties	1/2/2003	Winter Storm
Carbon and Monroe Counties	2/1/2003	Winter Weather/mix
Multiple Counties	2/6/2003	Heavy Snow
Multiple Counties	2/10/2003	Winter Weather/mix
Multiple Counties	2/16/2003	Heavy Snow
Carbon and Monroe Counties	2/20/2003	Winter Weather/mix

Carbon County 2010 Hazard Mitigation Plan

Previous winter storm events impacting Carbon County since 1994 (NCDC, 2010). Events with the location "Multiple Counties" include Carbon County.		
LOCATION	DATE	TYPE
Multiple Counties	2/23/2003	Winter Weather/mix
Carbon and Monroe Counties	3/1/2003	Winter Weather/mix
Multiple Counties	3/5/2003	Winter Weather/mix
Multiple Counties	3/6/2003	Winter Storm
Multiple Counties	3/13/2003	Winter Weather/mix
Carbon and Monroe Counties	3/19/2003	Winter Weather/mix
Carbon and Monroe Counties	4/4/2003	Winter Weather/mix
Multiple Counties	4/7/2003	Winter Weather/mix
Carbon and Monroe Counties	4/9/2003	Winter Weather/mix
Multiple Counties	12/2/2003	Winter Weather/mix
Multiple Counties	12/5/2003	Winter Storm
Multiple Counties	12/14/2003	Winter Storm
Carbon and Monroe Counties	1/2/2004	Winter Weather/mix
Carbon and Monroe Counties	1/4/2004	Ice Storm
Multiple Counties	1/14/2004	Winter Weather/mix
Multiple Counties	1/17/2004	Winter Weather/mix
Multiple Counties	1/27/2004	Winter Storm
Carbon and Monroe Counties	2/3/2004	Winter Storm
Multiple Counties	2/5/2004	Winter Storm
Carbon and Monroe Counties	2/20/2004	Winter Weather/mix
Multiple Counties	2/24/2004	Winter Weather/mix
Carbon and Monroe Counties	3/8/2004	Winter Weather/mix
Carbon and Monroe Counties	3/9/2004	Winter Weather/mix
Multiple Counties	3/16/2004	Winter Storm
Multiple Counties	3/18/2004	Heavy Snow
Carbon County	4/4/2004	Winter Weather/mix
Carbon and Monroe Counties	11/12/2004	Winter Weather/mix
Carbon and Monroe Counties	12/6/2004	Winter Weather/mix
Multiple Counties	12/19/2004	Winter Weather/mix
Multiple Counties	12/19/2004	Winter Weather/mix
Multiple Counties	12/26/2004	Winter Weather/mix
Multiple Counties	1/5/2005	Winter Storm
Multiple Counties	1/7/2005	Ice Storm
Multiple Counties	1/11/2005	Winter Weather/mix
Multiple Counties	1/19/2005	Winter Weather/mix
Multiple Counties	1/22/2005	Heavy Snow
Multiple Counties	1/24/2005	Winter Weather/mix
Carbon and Monroe Counties	2/14/2005	Winter Weather/mix

Carbon County 2010 Hazard Mitigation Plan

Previous winter storm events impacting Carbon County since 1994 (NCDC, 2010). Events with the location "Multiple Counties" include Carbon County.		
LOCATION	DATE	TYPE
Carbon and Monroe Counties	2/17/2005	Winter Weather/mix
Carbon and Monroe Counties	2/20/2005	Winter Storm
Multiple Counties	2/24/2005	Winter Weather/mix
Multiple Counties	2/28/2005	Heavy Snow
Multiple Counties	3/1/2005	Heavy Snow
Multiple Counties	3/8/2005	Winter Weather/mix
Carbon and Monroe Counties	3/11/2005	Winter Weather/mix
Carbon and Monroe Counties	3/20/2005	Winter Weather/mix
Carbon and Monroe Counties	3/23/2005	Winter Storm
Carbon and Monroe Counties	3/27/2005	Winter Weather/mix
Multiple Counties	12/4/2005	Winter Weather/mix
Multiple Counties	12/9/2005	Heavy Snow
Multiple Counties	12/15/2005	Winter Storm
Carbon and Monroe Counties	12/23/2005	Winter Weather/mix
Carbon and Monroe Counties	12/26/2005	Winter Weather/mix
Multiple Counties	12/31/2005	Winter Weather
Carbon and Monroe Counties	1/3/2006	Winter Storm
Carbon and Monroe Counties	1/4/2006	Winter Weather
Carbon and Monroe Counties	1/17/2006	Winter Weather
Multiple Counties	1/23/2006	Winter Storm
Carbon and Monroe Counties	1/24/2006	Winter Weather
Multiple Counties	2/11/2006	Winter Weather
Multiple Counties	3/2/2006	Winter Storm
Multiple Counties	4/5/2006	Winter Weather
Multiple Counties	4/8/2006	Winter Weather
Carbon and Monroe Counties	11/23/2006	Winter Weather
Carbon and Monroe Counties	12/7/2006	Winter Weather
Carbon and Monroe Counties	12/8/2006	Winter Weather
Carbon and Monroe Counties	12/22/2006	Winter Weather
Multiple Counties	1/10/2007	Winter Weather
Carbon and Monroe Counties	1/15/2007	Winter Weather
Multiple Counties	1/19/2007	Winter Weather
Carbon and Monroe Counties	1/25/2007	Winter Weather
Multiple Counties	2/2/2007	Winter Weather
Multiple Counties	2/13/2007	Winter Storm
Multiple Counties	2/25/2007	Winter Weather
Carbon and Monroe Counties	3/1/2007	Winter Weather
Multiple Counties	3/7/2007	Winter Weather

Carbon County 2010 Hazard Mitigation Plan

Previous winter storm events impacting Carbon County since 1994 (NCDC, 2010). Events with the location "Multiple Counties" include Carbon County.		
LOCATION	DATE	TYPE
Multiple Counties	3/16/2007	Heavy Snow
Carbon and Monroe Counties	4/11/2007	Winter Weather
Carbon and Monroe Counties	4/15/2007	Winter Weather
Carbon and Monroe Counties	11/9/2007	Winter Weather
Multiple Counties	11/18/2007	Heavy Snow
Carbon and Monroe Counties	11/20/2007	Winter Weather
Carbon and Monroe Counties	12/1/2007	Winter Weather
Multiple Counties	12/2/2007	Winter Storm
Multiple Counties	12/2/2007	Winter Weather
Carbon and Monroe Counties	12/4/2007	Winter Weather
Carbon and Monroe Counties	12/7/2007	Winter Weather
Multiple Counties	12/9/2007	Winter Weather
Multiple Counties	12/13/2007	Ice Storm, Winter Weather, Winter Storm
Multiple Counties	12/15/2007	Winter Storm
Multiple Counties	12/26/2007	Winter Weather
Multiple Counties	12/30/2007	Winter Weather
Carbon and Monroe Counties	1/1/2008	Winter Weather
Carbon and Monroe Counties	1/11/2008	Winter Weather
Multiple Counties	1/13/2008	Winter Weather
Multiple Counties	1/17/2008	Winter Weather
Multiple Counties	1/29/2008	Winter Weather
Carbon and Monroe Counties	1/29/2008	Winter Weather
Multiple Counties	2/1/2008	Winter Storm
Carbon and Monroe Counties	2/4/2008	Winter Weather
Carbon and Monroe Counties	2/9/2008	Winter Weather
Carbon and Monroe Counties	2/10/2008	Winter Weather
Multiple Counties	2/12/2008	Winter Storm
Carbon County	2/17/2008	Winter Weather
Carbon and Monroe Counties	2/21/2008	Winter Storm/Winter Weather
Multiple Counties	2/26/2008	Winter Weather
Multiple Counties	2/29/2008	Winter Weather
Multiple Counties	3/1/2008	Winter Weather
Carbon and Monroe Counties	3/18/2008	Winter Weather
Carbon and Monroe Counties	3/31/2008	Winter Weather
Carbon and Monroe Counties	4/3/2008	Winter Weather
Multiple Counties	10/27/2008	Heavy Snow
Carbon and Monroe Counties	11/24/2008	Winter Weather

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Previous winter storm events impacting Carbon County since 1994 (NCDC, 2010). Events with the location "Multiple Counties" include Carbon County.		
LOCATION	DATE	TYPE
Carbon and Monroe Counties	11/30/2008	Winter Weather
Carbon and Monroe Counties	12/1/2008	Winter Weather
Multiple Counties	12/6/2008	Winter Weather
Carbon and Monroe Counties	12/10/2008	Winter Storm
Multiple Counties	12/16/2008	Winter Weather
Multiple Counties	12/19/2008	Winter Storm
Multiple Counties	12/21/2008	Winter Weather
Multiple Counties	12/24/2008	Winter Weather
Carbon and Monroe Counties	12/26/2008	Winter Weather
Carbon and Monroe Counties	12/31/2008	Winter Weather
Multiple Counties	1/6/2009	Winter Storm
Multiple Counties	1/10/2009	Winter Storm
Multiple Counties	1/17/2009	Winter Weather
Multiple Counties	1/27/2009	Winter Storm
Multiple Counties	2/3/2009	Winter Weather
Multiple Counties	2/18/2009	Winter Weather
Multiple Counties	3/2/2009	Winter Weather
Carbon and Monroe Counties	10/15/2009	Winter Weather
Multiple Counties	12/5/2009	Winter Weather
Multiple Counties	12/8/2009	Winter Storm
Multiple Counties	12/13/2009	Winter Weather
Multiple Counties	12/19/2009	Winter Weather
Carbon and Monroe Counties	12/25/2009	Winter Weather
Multiple Counties	12/31/2009	Winter Weather
Multiple Counties	1/1/2010	Winter Weather
Carbon and Monroe Counties	1/17/2010	Ice Storm, Winter Weather
Carbon and Monroe Counties	1/24/2010	Winter Weather
Multiple Counties	1/28/2010	Winter Weather
Multiple Counties	2/2/2010	Winter Weather
Multiple Counties	2/5/2010	Winter Storm
Multiple Counties	2/9/2010	Winter Storm
Multiple Counties	2/22/2010	Winter Storm
Multiple Counties	2/25/2010	Winter Storm
Multiple Counties	3/30/2010	Winter Weather

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Appendix H – Dam Failure Profile (Section 4.3.5)

THIS APPENDIX CONTAINS SENSITIVE INFORMATION AND HAS BEEN REMOVED

Appendix I – Pennsylvania Standard List of Hazards

Hazard	Hazard Description
Avalanche/ Glacier	An avalanche is a mass of snow sliding down a mountainside. It occurs when the stress (from gravity) trying to pull the snow downhill exceeds the strength of bonds that form between snow grains within the snow cover. Temperature, precipitation, wind, depth of snow cover, slope, and vegetation density all influences the frequency and intensity of avalanches. Conditions do not exist for avalanches to occur within Pennsylvania. (FEMA, 1997). A glacier is a very large mass of ice which may or may not be moving slowly over a land mass, formed from compacted snow in an area where snow accumulation exceeds melting and sublimation. Glaciers exist where, over a period of years, snow remains after summer's end. They are present in North America, but have not existed in Pennsylvania for approximately 17,000 years (DCNR, 1999).
Coastal Erosion	Coastal erosion is a natural coastal process in which sediment outflow exceeds sediment inflow at a particular location. These sediments are typically transported from one location to another by wind, waves, currents, tides, wind-driven water, waterborne ice, runoff of surface waters, or groundwater seepage. Depending on the location and processes in place, coastal erosion can take place very slowly, whereby the shoreline shifts only inches to a foot per year; or more rapidly, whereby changes can exceed ten feet per year. Intense storms and human interference can result in avulsive events where large portions of a beach or dune are washed away by strong currents and large waves. With the exception of portions of Erie County, coastal erosion is not a hazard for communities in Pennsylvania. (FEMA, 1997).
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).
Dust, Sand Storm	A dust or sand storm is a severe windstorm that sweeps clouds of dust across an arid region. Drought and wind contribute to the emergence of dust storms, as do poor farming and grazing practices by exposing dust and sand to the wind. Dust and sand storm events can be hazardous to transportation, navigation, and human health. Severe or prolonged dust and sand storms can result in disaster causing extensive economic damage over a wide area and personal injury or death in some cases. Dust and sand storm events occur in the dry regions of the United States (e.g. Texas, New Mexico, and Arizona) and historically have not been considered a significant hazard in Pennsylvania. (NOAA, 2009).
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).

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<i>Expansive Soils</i>	Clay soils have the potential to shrink and swell when they become wetted or dried. Expansive soils do not change size quickly, but over time can result in significant movement that can damage supply lines (e.g. roads, power lines, railways, bridges, etc...) and structures that lack proper design. (Olive et al, 1989).
<i>Extreme Temperature</i>	Extreme cold temperatures drop well below what is considered normal for an area during the winter months and often accompany winter storm events. Combined with increases in wind speed, such temperatures in Pennsylvania can be life threatening to those exposed for extended periods of time. Extreme heat can be described as temperatures that hover 10°F or more above the average high temperature for a region during the summer months. Extreme heat is responsible for more deaths in Pennsylvania than all other natural disasters combined (Lawrence County, PA HMP, 2004).
<i>Flood, Flash Flood, Ice Jam</i>	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. (NOAA, 2009). 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).
<i>Hailstorm</i>	In addition to flooding and severe winds, hail is another potential damaging product of severe thunderstorms. Hailstorms occur when ice crystals form within a low pressure front due to the rapid rise of warm air into the upper atmosphere and the subsequent cooling of the air mass. Frozen droplets gradually accumulate on the ice crystals until, having developed sufficient weight, they fall as precipitation in the form of balls or irregularly shaped masses of ice greater than 0.75 inches in diameter (FEMA, 1997). The size of hailstones is a direct function of the size and severity of the storm. High velocity updraft winds are required to keep hail in suspension in thunderclouds. The strength of the updraft is a function of the intensity of heating at the Earth's surface. Damage to crops and vehicles are typically the most significant impacts of hailstorms. Areas in eastern and central Pennsylvania typically experience less than 2 hailstorms per year while areas in western Pennsylvania experience 2-3 annually. (FEMA, 1997).
<i>Hurricane, Tropical Storm, Nor'easter</i>	Hurricanes, tropical storms, and nor'easters are classified as cyclones and are any closed circulation developing around a low-pressure center in which the winds rotate 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 (June through November). (FEMA, 1997).

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<i>Invasive Species</i>	An invasive species is a species that is not indigenous to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health. These species can be any type of organism: plant, fish, invertebrate, mammal, bird, disease, or pathogen. Infestations may not necessarily impact human health, but can create a nuisance or agricultural hardships by destroying crops, defoliating populations of native plant and tree species, or interfering with ecological systems (Governor's Invasive Species Council of Pennsylvania, 2009).
<i>Landslide</i>	A landslide is the downward and outward movement of slope-forming soil, rock, and vegetation reacting to the force of gravity. Landslides may be triggered by both natural and human-caused changes in the environment, including heavy rain, rapid snow melt, steepening of slopes due to construction or erosion, earthquakes, and changes in groundwater levels. Mudflows, mudslides, rockfalls, rockslides, and rock topples are all forms of a landslide. Areas that are generally prone to landslide hazards include previous landslide areas, the bases of steep slopes, the bases of drainage channels, developed hillsides, and areas recently burned by forest and brush fires. (Delano & Wilshusen, 2001).
<i>Lightning Strike</i>	Lightning is a discharge of electrical energy resulting from the build-up of positive and negative charges within a thunderstorm. The flash or "bolt" of light usually occurs within clouds or between clouds and the ground. A bolt of lightning can reach temperatures approaching 50,000°F. On average, 89 people are killed each year by lightning strikes in the United States. Within Pennsylvania, the annual average number of thunder and lightning events a given area can expect ranges between 40-70 events per year (FEMA, 1997).
<i>Pandemic</i>	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).
<i>Radon Exposure</i>	Radon is a cancer-causing natural radioactive gas that you can't see, smell, or taste. It is a large component of the natural radiation that humans are exposed to and can pose a serious threat to public health when it accumulates in poorly ventilated residential and occupation settings. According to the USEPA, radon is estimated to cause about 21,000 lung cancer deaths per year, second only to smoking as the leading cause of lung cancer (EPA 402-R-03-003: EPA Assessment..., 2003). An estimated 40% of the homes in Pennsylvania are believed to have elevated radon levels (Pennsylvania Department of Environmental Protection, 2009).
<i>Subsidence, Sinkhole</i>	Subsidence is a natural geologic process that commonly occurs in areas with underlying limestone bedrock and other rock types that are soluble in water. Water passing through naturally occurring fractures dissolves these materials leaving underground voids. Eventually, overburden on top of the voids causes a collapse which can damage structures with low strain tolerances. This collapse can take place slowly over time or quickly in a single event, but in either case. Karst topography describes a landscape that contains characteristic structures such as sinkholes, linear depressions, and caves. In addition to natural processes, human activity such as water, natural gas, and oil extraction can cause subsidence and sinkhole formations. (FEMA, 1997).
<i>Tornado, Wind Storm</i>	A wind storm can occur during severe thunderstorms, winter storms, coastal storms, or tornadoes. Straight-line winds such as a downburst have the potential to cause wind gusts that exceed 100 miles per hour. Based on 40 years of tornado history and over 100 years of hurricane history, FEMA identifies western and central Pennsylvania as being more susceptible to higher winds than eastern Pennsylvania. (FEMA, 1997). A tornado is a violent windstorm characterized by a twisting, funnel-shaped cloud extending to the ground. Tornadoes are most

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	<p>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 minor to catastrophic 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. Each year, an average of over 800 tornadoes is reported nationwide, resulting in an average of 80 deaths and 1,500 injuries (NOAA, 2002). Based on NOAA Storm Prediction Center Statistics, the number of recorded F3, F4, & F5 tornadoes between 1950-1998 ranges from <1 to 15 per 3,700 square mile area across Pennsylvania (FEMA, 2009). A water spout is a tornado over a body of water (American Meteorological Society, 2009).</p>
<i>Tsunami</i>	<p>A tsunami is a series of ocean waves generated by sudden displacements in the sea floor, landslides, or volcanic activity. In the deep ocean, the tsunami wave may only be a few inches high. The tsunami wave may come gently ashore or may increase in height to become a fast moving wall of turbulent water several meters high. Worldwide, unusual wave heights have been known to be over 100 feet high and depending on a number of factors, some low-lying areas could experience severe inland inundation of water and debris of more than 1,000 feet. No known tsunami events have been documented in Pennsylvania over the past 200 years (Dunbar & Weaver, 2007).</p>
<i>Wildfire</i>	<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 (PA DCNR, 1999).</p>
<i>Winter Storm</i>	<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. (NOAA, 2009).</p>
<i>Volcano</i>	<p>A volcano is a vent in the earth's crust through which magma, rock fragments, gases, and ash are ejected from the earth's interior. Over time, accumulation of these erupted materials on the earth's surface creates a volcanic mountain. Hazards associated with the eruption of volcanoes endanger people, buildings, and infrastructure. Volcanoes can lie dormant for centuries between eruptions and the risk posed by volcanic activity is not always apparent. There are no active or dormant volcanoes in Pennsylvania. (FEMA, 1997).</p>