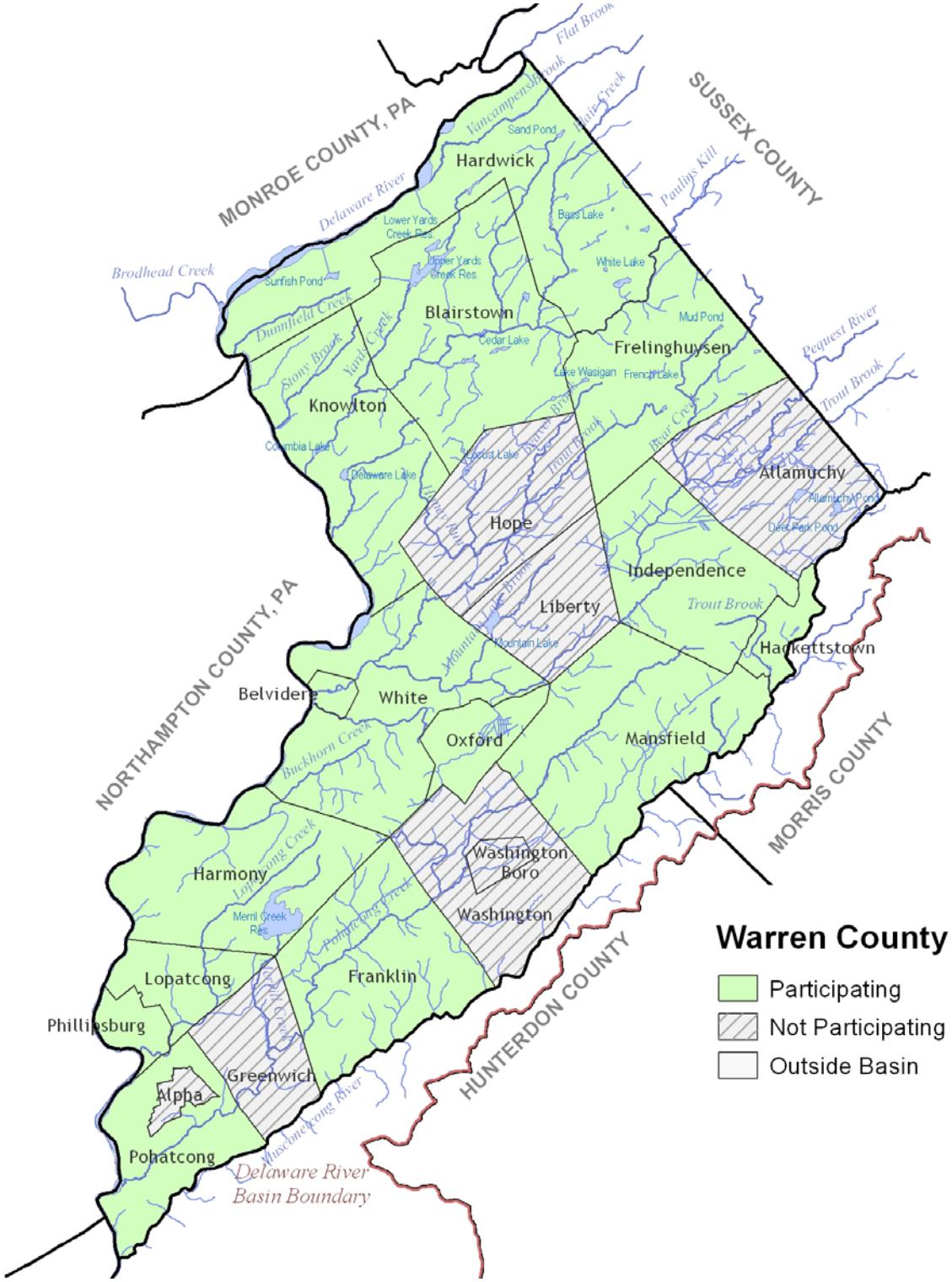
Warren County:

Participating municipalities in Warren County include Belvidere, Blairstown, Franklin, Frelinghuysen, Hackettstown, Hardwick, Harmony, Independence, Knowlton, Lopatcong, Mansfield, Oxford, Phillipsburg, Pohatcong and White.



Warren County was affected by the flood events in June 2006, April 2005, September 2004, and September 1999. Numerous county roads, bridges, and culverts sustain major damage during flooding events and limits emergency service access. Three county facilities are impacted by flooding: the Prosecutor's Office at Prospect and Water Street in Belvidere, which is impacted by the Pequest River; the Warren County Nutrition Program building in Blairstown Township, which is impacted by the Paulinskill River, and the ECHO residence in Stewartsville, which is impacted by the Pohatcong Creek. These buildings become uninhabitable during a flood event until the waters recede and the building cleaned. After flooding events, the county responds to a tremendous influx of solid waste that is disposed of at the county landfill. In addition, stream bank erosion, debris left in the river, and water pollution caused by household heating oil tanks are significant environmental impacts.

Warren County provides Reverse 911 service for its municipalities and has educated the public how to proceed and where to go if there is an anticipated flood. Before a predicted flood event, the county makes contact with NJSP/NJOEM and begins to **pre-stage assets.** The county also updates local coordinators with timely information and anticipated flooding levels. During a flood event, the county responds to and assists the municipalities with evacuations and opening shelters. The county contacts the Red Cross and the Salvation Army and continues to communicate with the state through phone and E-Team, an emergency response and incident management software. The county also assists the local coordinators with obtaining any equipment and assets to ensure safety and survival. After a flooding event, the county helps municipalities transition back into normal operation by closing shelters, assisting with the preliminary damage assessments, and if a disaster is declared, assist with the official walk through.

Warren County has open space acquisition/preservation and stormwater regulations in place to help mitigate flooding, but these policies do not entirely prevent the floodwaters. Warren County works closely with NJOEM during flood events, and reaches out to FEMA for financial assistance, NJSP/OEM for manpower assistance, and the ACE to conduct a study of the Delaware River. The county has previously received money from FEMA's Public Assistance Grant Program to rebuild county infrastructure after flooding events. **Uniquely, the Delaware River pushes the Pequest backwards so that even though the flood stage is 22 feet in Belvidere, "we" begin to flood at 16 feet.**

Warren County is interested in pursuing several mitigation actions. There are several high hazard dams in Warren County that need to be repaired including Bass Lake Dam in Hardwick Township and Blair Lake Dam in Blairstown Township. The county would also like to see the lower Pequest Dam north of the Delaware River decommissioned. Through the New Jersey Blue Acres program, the county hopes to assist municipalities in acquiring residences within the floodplain.

County Mitigation Statement:
Warren County pledges to support the mitigation goals and actions of their municipalities to the best of their ability.

County Mitigation Actions:

1. ACTION: Desnag the Pequest, Paulinskill, and Delaware River
Background:
Hazard: Flooding
Existing or new assets:
Existing mechanism through which action will be implemented:
Responsible Organization: NJDEP
Target Completion Date: 2012
Estimated Cost: Unknown
Potential Funding Sources: Grant
Priority: Medium

2. ACTION: Decommission the Lower Dam of the Pequest River
Description/Background:
Hazard: Flooding
Existing or new assets:
Existing mechanism through which action will be implemented:
Responsible Organization: NJDEP
Target Completion Date: 2015
Estimated Cost: Unknown
Potential Funding Sources: Unknown
Priority: High

3. ACTION: Dredge lower portion of the Pequest River
Description/Background:
Hazard: Flooding
Existing or new assets:
Existing mechanism through which action will be implemented:
Responsible Organization: NJDEP, ACE
Target Completion Date: 2015
Estimated Cost: Unknown
Potential Funding Sources: Unknown
Priority: Medium

Mitigation Action Plan of Participating Jurisdictions for Warren County

Jurisdiction	Page Number	Status
Warren County	193	3 actions submitted
Belvidere Township	200	6 actions submitted
Blairstown Township	204	6 actions submitted
Franklin Township	208	2 actions submitted
Frelinghuysen Township	209	4 actions submitted
Town of Hackettstown	212	2 actions submitted
Hardwick Township	214	2 actions submitted
Harmony Township	215	1 action submitted
Independence Township	218	2 actions submitted
Knowlton Township	220	2 actions submitted
Lopatcong Township	222	1 action submitted
Mansfield Township	225	1 action submitted
Oxford Township	227	2 actions submitted
Town of Phillipsburg	230	5 actions submitted
Pohatcong Township	234	8 actions submitted
White Township	238	3 actions submitted

Warren County: Municipal Mitigation Actions by Action Category

1. Prevention (Policy/Ordinances/Studies/Enforcement)

Municipality	Mitigation Action	Responsible Party	Estimated Cost	Priority
Belvidere Township	Decommission lower dam	TBD	To be determined	Medium
Blairstown Township	Change ordinance to request BFE of at least one foot above	Blairstown Township	$100	High
Frelinghuysen Township	Maintenance of stormwater facilities (non-functioning retention pond)	To be determined	To be determined	TBD
Warren County	Decommission the Lower Dam of the Pequest River	NJDEP/USACE	Unknown	High
Pohatcong Township	Adopt new flood damage prevention ordinance	Township Council	$5,000.00	High
Pohatcong Township	Review development ordinances including density of development and stormwater management requirements	Land Use Board and Township Council	$5,000.00	Medium

2. Property Protection (Acquisition, Elevation or Flood proofing)

Municipality	Mitigation Action	Responsible Party	Estimated Cost	Priority
Belvidere Township	Elevation	TBD	To be determined	High
Blairstown Township	Elevate utilities in homes in flood prone areas	Homeowners	5,000 to 10,000 per home	High
Frelinghuysen Township	Analyze the properties in a portion of town for structural elevation	TBD	To be determined	TBD
Frelinghuysen Township	Elevation of flood-prone structures	TBD	To be determined	TBD
Harmony Township	Acquire 10 properties on Goat Farm Road	Township Committee	$2,500,000	High
Knowlton Township	Mitigation of Severe Repetitive Loss Properties	Knowlton Township	To be determined	High
Knowlton Township	Elevate utilities and secure oil tanks	Property owners	To be determined	High
Independence Township	Assess elevations of critical facilities identified as being within the 100 year floodplain of the Pequest River	Township Committee	$10,000	Medium
Oxford Township	Assess elevations of critical equipment in the wastewater treatment plant and plan corrective action	PRMUA	$10,000 (assessment)	Medium
Pohatcong Township	Elevation of flood-prone residences	Property owners	$50,000 - $100,000 per structure	High

3. Public Information and Awareness

Municipality	Mitigation Action	Responsible Party	Estimated Cost	Priority
Hardwick Township	Education through seminars and discussions	TBD	To be determined	Medium

4. Emergency Services

Municipality	Mitigation Action	Responsible Party	Estimated Cost	Priority
Allamuchy Township	Create an emergency plan in case of dam failure or an uncontrolled release of stored water	TBD	To be determined	High
Hardwick Township	Continue Early Warning by use of Emergency Operation Plan	OEM	To be determined	High
White Township	Early Warning	Township	$15,000	High

5. Natural Resource Protection (Floodplain protection, Stream Corridor Restoration, Open space)

Municipality	Mitigation Action	Responsible Party	Estimated Cost	Priority
Belvidere Township	Reroute creek banks to channel water away from residential areas	TBD	To be determined	TBD
Belvidere Township	River and creek bank replacement	TBD	To be determined	TBD
Belvidere Township	Dredging	TBD	To be determined	TBD
Blairstown Township	Removing debris along Paulinskill River	DPW and DEP	$100,000.00	High
Franklin Township	Remove debris from the Musconetcong and other waterways	NJDEP	$100,000	Medium
Hackettstown	Remove downed trees and debris from Musconetcong and small streams.	Hackettstown OEM	To be determined	Low/ Medium
Independence Township	Remove debris from sections of the Pequest	NJDEP	$100,000	High
Mansfield Township	Remove or thin out debris on Musconetcong River	TBD	To be determined	TBD
Pohatcong Township	Landscape Block 97, Lots 53 & 54 which are in the riparian zone of the Delaware River	Rutgers Forest Restoration Program	$20,000	Low
Warren County	Dredge lower portion of the Pequest River	NJDEP/USACE	Unknown	Medium
Warren County	Desnag the Pequest, Paulinskill, and Delaware River	NJDEP	Unknown	Medium
White Township	Remove debris from tributaries	DEP, DPW	$100,000	High
White Township	Keep entrance from tributaries to the Delaware River clear to prevent backup	DEP, federal	$100,000	High

6. Structural Projects

Municipality	Mitigation Action	Responsible Party	Estimated Cost	Priority
Belvidere Township	One-way valve	To be determined	To be determined	TBD
Belvidere Township	Reroute creek banks	To be determined	To be determined	TBD
Blairstown Township	Install backflow suppressors	DPW	$20,000	Medium
Blairstown Township	Levy along Paulinskill River at Paulinskill Fields	Contractor and DEP	$30,000	Medium
Blairstown Township	Channeling or walls built along Blair Creek	Contractor and DEP	TBD	Medium
Franklin Township	Attenuate Stormwater with a section of the Morris Canal	Township Committee	$270,000	High
Frelinghuysen Township	Construction of barriers to protect flood-prone	To be determined	To be determined	TBD
Hackettstown	Install storm drain basins and larger storm pipes in area of East Prospect Street	Hackettstown Department of Public Work	$51,000	Medium
Lopatcong Township	Sewer Line Modification	Lopatcong/Phillipsburg	$625,000	High
Oxford Township	Use Furnace Lake and dam as a detention basin to attenuate stormwater	NJDEP	$30,000	High
Phillipsburg Town	Modifications to Lift Station on Riverside Way	Town of Phillipsburg	$500,000	High
Phillipsburg Town	Modifications to WWTP on S. Main Street	Town of Phillipsburg	$500,000	High
Phillipsburg Town	Modifications to Street and Retaining Wall on Riverside Way	Town of Phillipsburg	$400,000	High
Phillipsburg Town	Provide for an Engineering Feasibility Study of the Lopatcong Creek to determine Mitigation Actions to Prevent Backflow of Creek when the Delaware River is at Flood Stage	Town of Phillipsburg	$200,000	High
Phillipsburg Town	Install Backflow Prevention on Stormwater Discharges to the Delaware River and Lopatcong Creek	Town of Phillipsburg	$500,000 - $1,000,000	High
Pohatcong Township	Install a pipe with backflow prevention device under railroad from River Road to the Delaware River	Township Council	$150,000	Medium
Pohatcong Township	Install backflow prevention device on several existing pipes/culverts that discharge to the Delaware River	Township Council	$300,000	Medium
Pohatcong Township	Construct a stormwater detention basin along to Mountain Road to control runoff from the mountain	Dept. of Agriculture, Soil Conservation Service	$250,000 - $350,000	Medium
Pohatcong Township	Study the impact of the removal of the Musconetcong River dams on flooding	Musconetcong Watershed Assoc., USACE	$300,000	Medium

Belvidere Township, Warren County:

Location:

Belvidere Township is located along the Delaware River in west-central Warren County. Belvidere is home to 2,771 people living within 1.35 square miles. It is bordered by White Township to the north, south and east and the Delaware River to its west.

Geology:

The soils consist of glacial sands, gravels, and till deposits of the Wisconsin age. Granular limestone and dolomite are located in exposed areas of the flood plain.

Hydrology:

The *Delaware River* flows south along the western border of the township.

The *Pequest River* divides the township and comes in confluence with the Delaware River within Belvidere's borders.

The *Pophandusing Creek* is located in the southern portion of town and because of its smaller drainage area, is more reactive to shorter duration, high intensity events.

Recent Flood History:

When the Delaware River rises to 16 feet, its waters back into the Pequest River. The Pequest's waters then go up through Belvidere's storm drains and flood the township. During heavy rain and flooding events, the Pequest River later overtops its banks and causes additional flooding. The Pequest floods parts of Wall Street, Water Street, Front Street and DePue Street. On the southern side of the Pequest, water from the Delaware River also comes up a municipal boat ramp and further contributes to the flooding.

There are two existing run of river type dams within Belvidere on the Pequest River; the E.R. Collins and Son - Railroad Dam (NJDEP File No. 24-28), is located just downstream of the railroad (Conrail) bridge near the intersection with Water Street and the other, known as E.R. Collins & Son Dam – Market Street Dam (NJDEP File No. 24-29), is located just upstream of the Greenwich Street bridge. The E.R. Collins & Son Dam – Railroad Dam was recently purchased by the State of New Jersey with Green Acres funding and is currently operated by the NJDEP, Division of Fish & Wildlife. Local residents report siltation within the Pequest, notably behind and downstream of the lower Railroad Dam. Local residents also report a rise in the Delaware River bed at the confluence of the Pequest and Delaware River; where, since the first of the three floods, an island is forming on the south side of the Water Street bridge.

In the southern portion of Belvidere, the Pophandusing Brook backs up when the Delaware River floods. Just upstream from the confluence of the river and the brook, the Pophandusing flows in an "S" shaped meander that is constrained by a culvert thru a railroad embankment and by the end of DePue Street. The Pophandusing's banks are heavily eroded and the brook shows signs of impending realignment. Residents have placed boulders along the brook to prevent its

realignment from interfering with DePue Street. Portions of one driveway have already been lost due to bank erosion.

Belvidere was affected by the June 2006, April 2005, September 2004, and January 1996 flooding events. According to the township, there are six severe repetitive loss properties located at Water and Wall Streets, thirty-five repetitive loss properties near DePue Street, and eighteen repetitive loss properties located on Water Street between Wall and Market. Property values of the homes are approximately $250K-$350K. There are approximately 3 to 4 homeowners interested in being acquired or elevated, but there is no funding available.

During the past 3 flooding events, the Belvidere pump station was adversely affected. Residents were displaced, potable water was contaminated, and heating oil from residents' tanks was washed downstream. In addition, stream banks eroded and sand and silt was deposited in storm drains. In each flood, around 33 homes sustained basement damage and 22 sustained first floor damage.

Belvidere uses a community telephone notification system and goes door-to-door to encourage evacuations. Many people with only basement flooding refuse to evacuate and simply move their appliances to upper floors. The municipality has encouraged residents to elevate their utilities, evacuate when instructed, and seal basements from groundwater.

The municipality wants to explore dredging options in the Pequest River and is interested in redirecting flood waters to undeveloped areas. It is also interested in information about the effects of dam removal and channelization of the Pequest River. To mitigate stormwater drain backflow, Belvidere would like to install one-way flap gates.

Unique Flood Risk to Municipality:
The Delaware River runs along the western end of the entire town. The Pophandusing Creek runs along the southern end of the entire town. The Pequest River runs through the entire town including the business district. Flooding occurs on both the Pequest and the Pophandusing where it meets the Delaware River. Flooding along the Pequest causes a disruption to the business district.

Local Flood Mitigation Planning Committee:

Susan Reeder	EMC
Kelly Offerman	Resident
Paul Sterbenz	Engineer
Maryann Meyer Garcia	Governing Body
Charles Hoff	Zoning Officer
Charles O'Conner	Construction Official
Howard Thompson	Planning Board/Gov.
John Snyder	DPW

Ordinances/Plans Reviewed: Belvidere Municipal Code, Belvidere Tax Map, input from Army Corps of Engineers
Outreach: Army Corps of Engineers

First Public Meeting Date: 9/4/2007
Date and Method of Advertisement for FMP: Week of 8/27/2007 Riverbend Advertiser
Questionnaire Distribution Method: US Mail, 25 responses received
Public Response:

1. Concerns about water being released from the dams and reservoirs upstream
2. Suggest to work with NY and PA to control development
3. Clean and dredge Delaware and Pequest Rivers so that water can flow within their banks
4. Implement better stormwater management
5. Repair bank erosion along the banks of the Delaware River

Flood Mitigation Goals:

1. Install one-way flap valves in storm sewers along Water Street and Pequest and 4th St along the Pophanduysen Creek.
2. Elevation of Properties
3. Elevation of utilities for affected residences
4. Clean and Dredge areas of the Delaware, Pequest and Pophanduysen Creek
5. Replace riverbanks along the Delaware, Pequest and Pophanduysen that have been lost due to flooding.

Belvidere Mitigation Actions:

1. **ACTION: Decommission lower dam**
   Description/Background: Municipal representatives want to know whether removal of the downstream dam on the Pequest would help with the backwater problem they seem to experience from the Delaware River by helping the Pequest carry floodwater more efficiently, thereby reducing property damage

   A Pre-Authorization Planning Report and Plan of Work, titled "Lower Pequest River Watershed, Warren County, New Jersey", was completed by the United States Department of Agriculture, Soil Conservation Service (now known as the Natural Resource Conservation Service (NRCS)) in April 1985. This report was prepared in part to evaluate various methods to reduce flooding along the Lower Pequest River, specifically in the Town of Belvidere. Two of the alternatives pertain to the removal of one or more of the existing dams mentioned above and were both determined to be economically justified at that time.)
   Hazard: TBD
   Existing or new assets: Existing/New
   Existing mechanism through which action will be implemented: TBD
   Responsible Organization: TBD
   Target Completion Date: TBD
   Estimated Cost: TBD
   Potential Funding Sources: TBD
   Priority: TBD

2. **ACTION: Elevation of properties**
   Description/Background: Local officials would prefer not to have buyouts of flooded properties due to a loss of tax ratables.
   Hazard: Prevent first floor damage

Existing or new assets: Existing
Existing mechanism through which action will be implemented: TBD
Responsible Organization: TBD
Target Completion Date: TBD
Estimated Cost: TBD
Potential Funding Sources: TBD
Priority: TBD

3. **ACTION: Reroute creek banks to channel water away from residential areas**
Description/Background:
Hazard: TBD
Existing or new assets: TBD
Existing mechanism through which action will be implemented: TBD
Responsible Organization: TBD
Target Completion Date: TBD
Estimated Cost: TBD
Potential Funding Sources: TBD
Priority: TBD

4. **ACTION: Rebuild river banks**
Description/Background: Replace riverbanks along the Delaware, Pequest and Pophanduysen that have been lost due to flooding.
Hazard: TBD
Existing or new assets: TBD
Existing mechanism through which action will be implemented: TBD
Responsible Organization: TBD
Target Completion Date: TBD
Estimated Cost: TBD
Potential Funding Sources: TBD
Priority: TBD

5. **ACTION: Dredging**
Description/Background: Clean and dredge areas of the Delaware, Pequest and Pophanduysing Creek
Hazard: TBD
Existing or new assets: TBD
Existing mechanism through which action will be implemented: TBD
Responsible Organization: TBD
Target Completion Date: TBD
Estimated Cost: TBD
Potential Funding Sources: TBD
Priority: TBD

6. **ACTION: Install One-way valves**
Description/Background: Install one-way flap valves in storm sewers along Water Street and Pequest and 4th St along the Pophanduysen Creek.

Hazard: Prevent stormwater back-up
Existing or new assets: TBD
Existing mechanism through which action will be implemented: TBD
Responsible Organization: TBD
Target Completion Date: TBD
Estimated Cost: TBD
Potential Funding Sources: TBD
Priority: TBD

Blairstown Township, Warren County:

Location:

Blairstown Township is located in the northern portion of Warren County and contains part of the Delaware Water Gap National Recreation Area. The township is home to 5,747 people within 31.77 square miles. It is bordered by Hardwick Township to the north, Frelinghuysen Township to the east, Hope Township to the southeast and Knowlton Township to the southwest.

Geology:

The topography of the area is hilly terrain, with the steepest slopes along the Kittatinny Mountains and the mildest terrain in the area surrounding the Paulins Kill. Elevations range from 320 feet near Paulins Kill to over 1,500 feet in the Kittatinny Mountains. There is a shaly soil over limestone bedrock which produces high runoff and low groundwater volatility.

Hydrology:

The *Paulinskill* is a tributary to the Delaware River located in the central part of the township. It enters Blairstown, where it is joined by *Blair Creek*, as well as *Jacksonburg Creek*, *Dilts Creek* and *Walnut Creek*. *Yard's Creek*, which rises at the Yard's Creek reservoir in Blairstown, enters the Paulins Kill near the hamlet of Hainesburg.

Recent Flood History:

The main source of flooding is the Paulinskill River which runs through the township.

As of 1991, there were 6 dams in the township, including 3 along the Paulinskill. These dams lessen flood severity downstream. Unfortunately, dam failure has historically plagued Blairstown. In 1892, the Slabtown Creek dam failed and structures on Main Street incurred flood damage. In 2004, Hurricane Ivan caused dam failure at Blair Creek and at the Hardwick Township YMCA camp dam.

The township was affected by the April 2005, September 2004, and January 1996 flooding events. Blairstown was also hit hard by the 1955 flood when the Paulinskill and Blair Creek overtopped their banks and flood waters inundated Main Street.

Of the recent flooding events, the September 2004 floods caused the most damage as flooding was exacerbated by dam failure. Fifty three houses sustained basement damage and 15 houses sustained first floor damage. Essential facilities, including schools and historic structures, were identified in Blairstown. Septic systems are also affected.

The community is in need of funding to help refurbish dams. In addition, it has been suggested that Blairstown expand the storm sewer system, install flood gates on pipes that outlet into the Paulinskill, construct dikes and floodwalls along the Paulinskill, insert a small floodwater retarding structure on Trout Brook, and widen and deepen Blair Creek in hopes to alleviate flooding. Land rights and lack of funding present problems for the municipality.

Unique Flood Risk to Municipality:
Dam failures in Blairstown and adjoining towns, Yards Creek breech or dam failure to one of their three reservoirs

Local Flood Mitigation Planning Committee:

Jeff Jablon	OEM Coordinator
Dawn Gallant	Adm. Ass. OEM
David Deihl	Floodplain Admin.
Robert DePuy	Deputy OEM Coord./Director Public Works
Dick Mach	Committee Member/Planning Board Member
Roger Gutzwiller	Environmental Committee Chairman

Ordinances/Plans Reviewed: NRCS Field Trip Report – July 2006, Watershed 1971 Work Improvement Report, Environmental Resource Inventory 2006
Outreach: Residents in floodplain areas
First Public Meeting Date: 2/20/2007
Date and Method of Advertisement for FMP: 1/29/2007 Express Times, 1/31/2007 The Press, 2/15/2007 posted at the Blairstown Municipal Building last week in January until the meeting, announced at Blairstown Township Committee meeting
Questionnaire Distribution Method: Mailed to residents in the floodplain, hand delivered by resident volunteers to the village area
Public Response:

1. Pennsylvania should be as proactive as the NJ towns are
2. Something needs to be done about the flooding problem in the downtown area
3. Get rid of the silt buildup in Blair Creek and the Paulinskill
4. Expedite permit process for mitigation actions
5. Improve and maintain storm drains, elevate roads, raise banks along the river, dredge Blair Creek and Paulinskill, clean debris from rivers, control building, keep dams in better shape, build retaining walls, plant trees and shrubs along banks, lower floor of river
6. 2 Pennsylvania residents were impressed with the local flood mitigation approach and were going to see if their towns in Pennsylvania would consider putting together an FMP

Flood Mitigation Goals:

1. Reduce flood waters in village area by installing backflow suppressors
2. Remove debris in Paulinskill River
3. Channel or build walls along Blair Creek
4. Reduce current along ball fields in flood area by installing a berm along one side of the Paulinskill River to channel current downstream further
5. Reduce likelihood of flooding of new or renovated construction by changing ordinance to request a BFE of at least one foot above

Blairstown Mitigation Actions:

1. **ACTION: Change ordinance to request BFE of at least one foot above**
   Description/Background: Base flood elevation – increase margin of safety with one foot additional freeboard.
   Hazard: Flooding of new construction
   Existing or new assets: New
   Existing mechanism through which action will be implemented: Township Committee and Floodplain administrator
   Responsible Organization: Blairstown Township
   Target Completion Date: 2008
   Estimated Cost: **$**100
   Potential Funding Sources: Blairstown Township
   Priority: High

2. **ACTION: Elevate utilities in homes in flood prone areas**
   Description/Background: Elevate utilities above BFE when replacing old or flood-damaged equipment (FEMA recommendation/requirement).
   Hazard: Flooding
   Existing or new assets: Existing
   Existing mechanism through which action will be implemented: Zoning and Construction Dept./Permits
   Responsible Organization: Homeowners
   Target Completion Date: TBD
   Estimated Cost: **$**5,000 to $10,000 per home
   Potential Funding Sources: Grants
   Priority: High

3. **ACTION: Removing debris along Paulinskill River**
   Description/Background: Debris, downed trees, limbs, trash, etc. causes a restriction or backup to the flow and increases flood potential during heavy rains.
   Hazard: Flooding in downtown area
   Existing or new assets: TBD
   Existing mechanism through which action will be implemented: Dept. of Public Works and Twp Committee
   Responsible Organization: DPW and DEP
   Target Completion Date: TBD
   Estimated Cost: **$**100,000

Potential Funding Sources: Grants
Priority: High

4. **ACTION: Channeling or walls built along Blair Creek**
Description/Background: This will help with elevated water in Blair Creek from the dam to the Paulinskill River
Hazard: Flooding to homes on both sides of Blair Creek
Existing or new assets: TBD
Existing mechanism through which action will be implemented: Township Engineer and Floodplain Administrator
Responsible Organization: Contractor and DEP
Target Completion Date: TBD
Estimated Cost: TBD
Potential Funding Sources: Grants
Priority: Medium

5. **ACTION: Install backflow suppressors**
Description/Background: This will help with elevated drainage into Blair Creek and the Paulinskill River
Hazard: Flooding in downtown area
Existing or new assets: New
Existing mechanism through which action will be implemented: Dept. of Public Works and Twp Committee
Responsible Organization: DPW
Target Completion Date: TBD
Estimated Cost: $20,000
Potential Funding Sources: Township budget or grants
Priority: Medium

6. **ACTION: Levy along Paulinskill River at Paulinskill Fields**
Description/Background: Currents during heavy rains are very strong and wash clay and debris from ball fields downstream. A levy would relocate the strong current downstream farther onto vacant land.
Hazard: Flooding
Existing or new assets: New
Existing mechanism through which action will be implemented: Dept. of Public Works and Twp Committee
Responsible Organization: Contractor and DEP
Target Completion Date: TBD
Estimated Cost: $30,000
Potential Funding Sources: Grants
Priority: Medium

Franklin Township, Warren County:

Location:

Franklin Township is located southeastern Warren County in the New Jersey highlands. The township houses 2,768 people within 23.99 square miles of land. Franklin was named after Benjamin Franklin and contains three historic villages. It is bordered by Washington Township on the northeast, Oxford Township to the north, Harmony Township to the northwest, Lopatcong Township to the west, Greenwich Township to the southwest, and the Borough of Bloomsbury and Bethlehem Township to the south and southeast.

Geology:

The township lies in the Highlands of New Jersey. The topographic relief of the township is moderate and characterized by parallel, irregular ridges and intervening valleys trending northeast. The ridges, which rise about 500 – 1000 feet above the valleys are composed of gneiss and other hard crystalline rocks. The valleys are mainly composed of carbonate rocks and shale.

Hydrology:

The *Musconetcong River* is the major waterway in Franklin Township. It originates at Lake Hopatcong; it then loops to the northwest after flowing through Lake Musconetcong. The river then flows southwest forming the border of Warren County until it gets to the Delaware River.

The *Pohatcong River* is a tributary to the Delaware River and flows from northeast to southwest. It flows through the central part of the township and drains the largest portion of the township.

Recent Flood History:

Major waterways in the township include the Musconetcong River to the southeast and the Pohatcong Creek. Flooding mainly occurs along the Pohatcong Creek. Franklin Township was affected by the April 2005, September 2004, and the September 1999 floods. During these events, 15 mobile homes in the Angel Valley Trailer park were flooded. Stewartsville Road and Mill Brook Road also sustained damages from the April 2005 flood.

Unique Flood Risk to Municipality: None

Local Flood Mitigation Planning Committee:

Sonny Read	Emergency Management Coordinator
Denise Cicerelle	Municipal Clerk
Joseph Nalio	Municipal Engineer Representative

Ordinances/Plans Reviewed: Stormwater Management Plan

Outreach: The Planning Committee will reach out as necessary once the extent of the flood risk is assessed and mitigation goals and implementation plans are being formulated.

First Public Meeting Date: 11/5/2007
Date and Method of Advertisement for FMP: 10/24/2007 Star Gazette
Questionnaire Distribution Method: US mail
Public Response: No responses from questionnaire.

Flood Mitigation Goals:

1. Reduce flood damages along all identified waterways within the township where the FIRM maps indicate a 100-year floodplain
2. Maintain emergency access to all township residents within the 100-year floodplain

Franklin Mitigation Actions

1. **ACTION: Attenuate Stormwater with a section of the Morris Canal**
   Description/Background: Use a section of the Morris Canal to attenuate stormwater flowing from Montana Mountain to Third Street
   Hazard: Flood
   Existing or new assets: Existing/New
   Existing mechanism through which action will be implemented: Township Committee
   Responsible Organization: Township Committee
   Target Completion Date: June 2008
   Estimated Cost: $270,000
   Potential Funding Sources: Grants
   Priority: High

2. **ACTION: Remove debris from the Musconetcong and other waterways**
   Description/Background: This will improve flow in the waterway and help alleviate flooding.
   Hazard: Flood
   Existing or new assets: Existing/New
   Existing mechanism through which action will be implemented: Township Committee
   Responsible Organization: NJDEP
   Target Completion Date: December 2008
   Estimated Cost: $100,000
   Potential Funding Sources: Grants
   Priority: Medium

Frelinghuysen Township, Warren County:

Location:

Frelinghuysen Township is located in the northeastern portion of Warren County. The township is home to 2,083 people in 23.55 square miles.

Geology:

Most of the township is characterized by well drained soil overlying limestone or gneissic bedrock. The valleys are mainly composed of

carbonate rocks and shale.

Hydrology:

The *Paulinskill River* forms the northern border of this township.

Beaver Brook, a tributary to the Pequest, originates in the southwestern portion of Frelinghuysen. It does not reach its confluence with the Pequest until it enters the confines of White Township. *Trout Brook*, a tributary to the Beaver Brook, also has its headwaters in Frelinghuysen and has its confluence with the Beaver Brook in Hope Township.

Bear Creek, a tributary to the Pequest, originates in the eastern portion Frelinghuysen. It joins with the Pequest in Allamuchy Township. The *Bear Brook* is a tributary to Bear Creek and flows south to the east of Bear Creek.

Recent Flood History:

Frelinghuysen was affected by the September 2004 flood and a March 1997 winter storm. In September 2004, over 100 wooden structures sustained basement damage mainly due to cascading mountainside streams. In addition, springs overflowed and sinkhole basins flooded. All of the streams in the township were affected and homes that had never seen water damage incurred flooding.

In March of 1997, the Paulinskill River and the sinkhole basins flooded due to heavy rains on top of ice and snow. The most severe flooding occurred on South Street. Detention basins overflowed and streams became large lakes. Over 100 homes sustained basement damage and over 20 homes sustained first floor damage. Twelve families were evacuated. Since then, flooding in this area has continued and the township lowered property taxes for the affected families. Much effort has gone into engineering flood remediation for this South Street sinkhole basin including the construction of a detention pond/dam. Many people in the South Street sinkhole basin are interested in acquisition or elevation.

Unique Flood Risk to Municipality:

South Town Road is a known flood area that is unique because the floods come from underground springs during high water table years.

Local Flood Mitigation Planning Committee:

Nancy Predale	EMC
Allan DeCarlos	Planning Board Member
Debra Natyzak-Osadca	Township Committee
Billy Crone	Road Supervisor

Ordinances/Plans Reviewed:
Outreach:
First Public Meeting Date: 6/2/2007
Date and Method of Advertisement for FMP: May, 2007 Founders Day Event

Questionnaire Distribution Method: Mailed and handed out at events
Public Response:

1. There is little flood damage. Only 3 of the 4 people present incurred damages, which totaled under $7,000 in the last 5 years.
2. The problem area lies within a development that wasn't properly engineered or is defective.

Flood Mitigation Goals:

1. Alleviate flooding near South Town Road.

Frelinghuysen Mitigation Actions

1. **ACTION: Construction of barriers to protect flood-prone**
   Description/Background:
   Hazard: TBD
   Existing or new assets: TBD
   Existing mechanism through which action will be implemented: TBD
   Responsible Organization: TBD
   Target Completion Date: TBD
   Estimated Cost: TBD
   Potential Funding Sources: TBD
   Priority: TBD

2. **ACTION: Analyze the properties in a portion of town for structural elevation**
   Description/Background:
   Hazard: TBD
   Existing or new assets: TBD
   Existing mechanism through which action will be implemented: TBD
   Responsible Organization: TBD
   Target Completion Date: TBD
   Estimated Cost: TBD
   Potential Funding Sources: TBD
   Priority: TBD

3. **ACTION: Elevation of flood-prone structures**
   Description/Background:
   Hazard: TBD
   Existing or new assets: TBD
   Existing mechanism through which action will be implemented: TBD
   Responsible Organization: TBD
   Target Completion Date: TBD
   Estimated Cost: TBD
   Potential Funding Sources: TBD
   Priority: TBD

4. **ACTION: Maintenance of stormwater facilities (non functioning retention pond)**
   Description/Background:

Hazard: TBD
Existing or new assets: TBD
Existing mechanism through which action will be implemented: TBD
Responsible Organization: TBD
Target Completion Date: TBD
Estimated Cost: TBD
Potential Funding Sources: TBD
Priority: TBD

Hackettstown Township, Warren County:

Location:
The Town of Hackettstown is located in eastern Warren County in Northwestern New Jersey. It is home to 10,403 people in an area of 3.70 square miles. The township is bordered by Allamuchy Township to the north, Mount Olive Township to the northeast, the Township of Washington to the southeast, the Township of Mansfield to the southwest, and the Township of Independence to the northwest.

Geology:
The borough lies in the Highlands of New Jersey. The topographic relief of the borough is moderate and characterized by parallel, irregular ridges and intervening valleys trending northeast. The ridges, which rise about 500 – 1000 feet above the valleys are composed of gneiss and other hard crystalline rocks. The valleys are mainly composed of carbonate rocks and shale.

Hydrology:
The *Musconetcong River* is the main waterway in the borough. It originates at Lake Hopatcong, it then loops to the northwest after flowing through Lake Musconetcong. The river then flows southwest forming the border of Warren County until it gets to the Delaware River.

The *Hackettstown Brook* and *Hackery Brook* are tributaries to the Musconetcong River.

Recent Flood History:
Hackettstown was affected by the June 2006, April 2005, September 2004, September 1999, July 2000, August 2003, and November 2003 flooding events. Areas along the Musconetcong River, Water Street, Mountain Avenue, East Avenue and Rustic Knolls are repeatedly flooded. Hackettstown identifies 18 essential facilities, and during the September 2004 and September 1999 events, the House of Good Shepard Nursing Home was affected by flood waters. In July of 2000, localized heavy flooding and dam failures in Sussex County contributed to the flooding of 30 residential basements.

Unique Flood Risk to Municipality:
There are two partial dams on the Musconetcong River that tend to back up the flow of the

river. Both dams are under review by the Musconetcong River Authority for possible removal.

Local Flood Mitigation Planning Committee:

Charles Volkert	Emergency Management
Paul Sterbenz	Town Engineer
Michael Lavery	Mayor
Joseph Bristow	Council
Tom Kitchen	DPW Super.
Jerry McDonnell	Master Foods
Forrest Kinzli	Hackettstown Hospital
Bruce J Tynan	Fire Chief
Michele Vargo	Squad Chief
Lenny Kunz	Police Chief

Ordinances/Plans Reviewed:
Outreach:
First Public Meeting Date: 6/27/2007
Date and Method of Advertisement for FMP: Press release to all local newspapers, posters in town buildings, WRNJ radio
Questionnaire Distribution Method: OEM distributed, left for pick-up at town hall
Public Response:
1. Very little damage to structures, mostly water in basements

Flood Mitigation Goals:
1. Install storm drains and piping in area of East Prospect Street. This is in the area of one of our repetitive loss properties.
2. Clean downed trees and debris from streams and river.

Hackettstown Mitigation Actions

1. **ACTION: Install storm drain basins and larger storm pipes in area of East Prospect Street**
   Description/Background: East Prospect Street is the location of a repetitive loss property.
   Hazard: Flooding from heavy rain
   Existing or new assets: Both
   Existing mechanism through which action will be implemented:
   Responsible Organization: Hackettstown Department of Public Works
   Target Completion Date: 2008
   Estimated Cost: $51,000
   Potential Funding Sources: Grants
   Priority: Medium

2. **ACTION: Remove downed trees and debris from Musconetcong and small streams.**
   Description/Background: This will help prevent the Musconetcong from flooding.
   Hazard: Flooding, back-up water flow
   Existing or new assets: Existing

Existing mechanism through which action will be implemented:
Responsible Organization: Office of Emergency Management
Target Completion Date: Spring 2008
Estimated Cost:
Potential Funding Sources: Grant
Priority: Low/medium

Hardwick Township, Warren County:

Location:
Hardwick Township is located in the northernmost part of Warren County. Hardwick is now home to 1,464 people in 37.92 acres. Hardwick is the least-populated and most remote township in Warren County as large portions of the township are contained within the Delaware Water Gap National Recreation Area. The now-defunct township of Pahaquarry was absorbed into Hardwick in 1997.

Geology:
Most of the township is characterized by well drained soil overlying limestone or gneissic bedrock. The valleys are mainly composed of carbonate rocks and shale.

Hydrology:
The *Delaware River* forms the northwestern border of the township. *VanCampens Brook and Dunnfield Creek* are tributaries to the Delaware that join the Delaware within the borders of the township and the Delaware Water Gap National Recreation Area.

The Paulinskill River forms the southeastern portion of the township. Both *Blair Creek* and *Jacksonburg Creek* are tributaries to the Paulinskill and have their confluence in Blairstown.

Recent Flood History:
The September 1999 storm affected over 75% of the municipality. Jacksonburg Creek, Blair Creek, the Paulinskill River, and the Delaware River flooded an unknown number of residential basements and affected 3 bridges, 1 dam, and over 10 miles of road. There are no repetitive loss properties in Hardwick.

Unique Flood Risk to Municipality: Hardwick Township could be jeopardized if a dam breach were to occur (most likely from the Yards Creek Pumping Station in Blairstown).

Local Flood Mitigation Planning Committee:

Rob Krok	OEM Coordinator
Kevin Duffy	Mayor
Ted Rodman	Twp. Engineer
Tom Campbell	DPW Supervisor

Ordinances/Plans Reviewed: None
Outreach: Yards Creek Pumping Station
First Public Meeting Date: 8/1/2007
Date and Method of Advertisement for FMP: 8/2007 NJ Herald
Questionnaire Distribution Method: Posted in municipal building, delivered by Emergency Management Coordinator, distributed at Township Recognition Day
Public Response: None received

Flood Mitigation Goals:

1. Alleviate flood problems that arise from severe weather/storms
2. Early warning and education for residents

Hardwick Mitigation Actions

1. **ACTION: Education through seminars and discussions**
   Description/Background:
   Hazard: TBD
   Existing or new assets: TBD
   Existing mechanism through which action will be implemented: TBD
   Responsible Organization: TBD
   Target Completion Date: TBD
   Estimated Cost: TBD
   Potential Funding Sources: TBD
   Priority: Medium

2. **ACTION: Continue Early Warning by use of Emergency Operation Plan**
   Description/Background:
   Hazard: TBD
   Existing or new assets: TBD
   Existing mechanism through which action will be implemented: TBD
   Responsible Organization: OEM
   Target Completion Date: TBD
   Estimated Cost: TBD
   Potential Funding Sources: TBD
   Priority: High

Harmony Township, Warren County:

Location:

Harmony Township is located along the Delaware River in the southwestern portion of Warren County. The township is 24.14 square miles and contains 2,729 people in 1,076 housing units. It is bordered by the communities of Forks and Lower Mount Bethel (PA) on the west, the community of White to the north, Washington Township and Franklin to the east, and Greenwich and Lopatcong to the south.

Geology:

The township lies in the Highlands of New Jersey. The topographic relief of the township is moderate and characterized by parallel, irregular ridges and intervening valleys trending northeast. The ridges, which rise about 500 – 1000 feet above the valleys are composed of gneiss and other hard crystalline rocks. The valleys are mainly composed of limestone and shale. Elevations range from 155 feet at the Delaware River to 1,245 feet in the eastern part of the township.

Hydrology:

The *Buckhorn Creek*, a tributary to the Delaware, is in the northern portion of the township. It begins in the southwestern portion of White township and flows southwest to its mouth on the Delaware River. This creek drains most of southwestern White Township and north-central Harmony Township.

The *Delaware River* forms the western border of the township. It flows south and is the largest body of water flowing through the township.

The *Lopatcong Creek* has its headwaters in northeastern Harmony and flows generally southwest through the townships of Lopatcong, Greenwich, Pohatong, and Phillipsburg where it empties into the Delaware River.

Merrill Creek, a tributary to the Pohatcong River is located in the eastern portion of the township. *Merrill Creek Reservoir* was built in 1988 following a severe drought by a consortium of power companies, collectively known as the Merrill Creek Owners' Group. The reservoir has a drainage area of only 3.13 square miles but is a pump-storage facility. During low water periods, the reservoir releases water to the Delaware River to supplement water used by electric generating facilities.

Recent Flood History:

Flooding in Harmony is severe. About 125 homes get flooded with 50% to 75% receiving 2-3 feet of water on the first floor. Floodwaters in the Hutchinson area have reached the eaves of 6 to 8 homes. When the Delaware River reaches 14 feet in Belvidere, the Hutchinson section of Harmony experiences flooded.

Harmony was affected by the June 2006, April 2005, September 2004, September 1999, and January 1996 flooding events. During flooding events, the Delaware River and Buckhorn Creek flood Hutchinson River Road, Harmony Station, the Brainards, Harmony Terrace, South River Terrace, and the Goat Farm areas. During the June 2006 event, 120 homes incurred basement flooding and 50 homes incurred first floor flooding. Flooding in Harmony causes significant erosion and road damage and normally requires 3 to 6 weeks of clean-up.

The township has already written a Flood Mitigation Plan to help address flooding issues. In 2006, six properties in the Hutchinson area were acquired and demolished. The land is now restricted for open space uses. Many more homes throughout the city have been elevated. In

2005, approximately ten homes were elevated. In July 2006, two ongoing property elevations had begun. Approximately 40 more people are interested in elevation or demolition, but need monetary assistance.

In addition to repetitive flooding of properties, Harmony Township is concerned about a abandoned quarry located in the Brainards section of the township. This site is in need of remediation, but the municipality does not have the means to adequately clean the site. The Delaware River has breached the quarry in two locations during the floods. The breach at the southern end of the quarry is about 70' long. There has been significant scouring of the river bank downstream of the southern breach, with loss of vegetation. This has caused a large depositional area in the river, accompanied by formation of an eddy.

Flood Mitigation:

A FEMA Repetitive Flood Claim application (100% FEMA funds to cover mitigation) was submitted in 2007 for 32 occupants. The application was also submitted to the FEMA Flood Mitigation Assistance Program (75% FEMA funds/25% non-Federal funds to cover mitigation). The grant application requested $11.5M for the 32 homes. The average value for the houses was estimated at $280,000-$300,000.

In 2006 six properties in the Hutchinson area were demolished and the use restricted to open space. These were the only six properties that met the FEMA Benefit Cost Ratio requirements. A pre-disaster appraisal of fair market value was used. 75% of the funds came from FEMA, 25% came from NJDEP's Green Acres Program. The homes were valued at $250,000 - $330,000.

Numerous homes on Riveredge Lane in the Hutchinson area have been elevated, some more than 30'.

Unique Flood Risk to Municipality:

The flood risk and damage to the Hutchinson, Brainards, Harmony Station, Harmony Terrace, South River Terrace, and Goat Farm areas are well documented. The township has been actively engaged with the state and FEMA in securing HMGP and FMA funding for acquisition and elevations.

Local Flood Mitigation Planning Committee:

Brian Tipton	Mayor
Kelley Smith	Property Owner/Municipal Clerk
Richard Collins	Local OEM and Floodplain Admin.
William Hunt	Warren County OEM
John Fritts	Zoning Officer
Molly Petty	School Business Administrator
Joseph Nalio	Finelli Consulting Engineers, Inc.

Ordinances/Plans Reviewed: Floodplain Management Plan, Stormwater Management Plan, Floodplain Ordinance

Outreach: FEMA, NJOEM
First Public Meeting Date: 8/7/2007
Date and Method of Advertisement for FMP: 7/12/2007 Star Gazette
Questionnaire Distribution Method: 7/2007 enclosed with the 2007 tax bills, posted at the local market and gas station
Public Response:

1. Upstream reservoir levels
2. Emergency response planning (evacuation routes, school evacuation, alarm sirens, evacuation shelters, and evacuation of farm animals) as opposed to mitigation actions

Flood Mitigation Goals:

1. Develop flood hazard mitigation policies that will reduce flood losses to residents and businesses and promote the health, safety, and welfare of river communities
2. Allow residents and businesses to reduce property losses through elevation or acquisition
3. Develop a dependable early flood surge warning system
4. Promote flood insurance awareness
5. Enhance and protect the natural beauty of the Delaware River

Harmony Mitigation Actions

1. **ACTION: Acquire 10 properties on Goat Farm Road**
   Description/Background:
   Hazard: Flood
   Existing or new assets: Existing
   Existing mechanism through which action will be implemented: Township Committee
   Responsible Organization: Township Committee
   Target Completion Date: December 2007
   Estimated Cost: $2,500,000
   Potential Funding Sources: FMA
   Priority: High

Independence Township, Warren County:

Location:

Independence Township is located in the east-central portion of Warren County. It is home to 5,603 people and encompasses 19.89 square miles.

Geology:

Hydrology:

The *Pequest River* flows through the eastern portion of the township.

The *Pohatcong Creek* has its headwaters in southern portion of Independence Township.

Hackery Brook, a tributary to the Musconetcong, has its headwaters in the eastern portion of

the township.

Recent Flood History:
Although the Pequest River floods, buildings are not affected by the flood waters. The Great Meadows area bordered by Hope-Greta Meadows Road, Shades of Death Road, and Alphano Road are susceptible to flooding.

Unique Flood Risk to Municipality: None

Local Flood Mitigation Planning Committee:

Cheryl Holowath	Emergency Management Coordinator
Gary Janiszewski	Township Committee
Joseph Nalio	Finelli Consulting Engineers, Inc.

Ordinances/Plans Reviewed: Stormwater Management
Outreach: The Planning Committee will reach out as necessary once the extent of the flood risk is assessed and mitigation goals and implementation plans are being formulated
First Public Meeting Date: 8/14/2007
Date and Method of Advertisement for FMP: 6/14/2007 Star Gazette
Questionnaire Distribution Method: Mailed to property owners in the floodplain 6/6/2007
Public Response:
1. Suggested dredging portions of the Pequest River removing debris thereby increasing its effective cross section

Flood Mitigation Goals:
1. Reduce flood damage along the Pequest River
2. Maintain emergency access to all township residents and essential facilities located within the 100 year floodplain of the Pequest River

Independence Mitigation Actions

1. **ACTION: Remove debris from sections of the Pequest**
   Description/Background: By removing debris, the effective cross section of the river will improve. Where specifically?
   Hazard: Flood
   Existing or new assets: Existing/New
   Existing mechanism through which action will be implemented: Township Committee
   Responsible Organization: NJDEP
   Target Completion Date: December 2008
   Estimated Cost: $100,000
   Potential Funding Sources: Grant
   Priority: High

2. **ACTION: Assess elevations of essential facilities identified as being within the 100-year floodplain of the Pequest River**

Description/Background:
Hazard: Flood
Existing or new assets: Existing
Existing mechanism through which action will be implemented: Township Committee
Responsible Organization: Township Committee
Target Completion Date: June 2008
Estimated Cost: $10,000
Potential Funding Sources:
Priority: Medium

Knowlton Township, Warren County:

Location:
Knowlton Township is located in the northwestern portion of Warren County. It contains 2,977 people within 25.31 square miles. It is bordered by Blairstown Township to the east, the Townships of White and Hope to the south, the Delaware River to the west, and Hardwick Township to the north.

Geology:
The topography of the area is hilly terrain, with the steepest slopes along the Kittatinny Mountains and the mildest terrain in the area surrounding the Paulins Kill. Elevations range from 280 feet near Paulins Kill to over 1,400 feet in the Kittatinny Mountains. There is a shaly soil over limestone bedrock which produces high runoff and low groundwater volatility.

Hydrology:
The *Delaware River* along the western boundary of Knowlton Township.

From north to south, the *Stony Brook, Paulinskill*, and *Delawanna* are tributaries to the Delaware River that flow across the township from northeast to southwest.

Recent Flood History:
The township has experienced flooding along the Delaware River, which runs the western length of the township and the Delwanna Creek.

Knowlton was affected by the June 2006, April 2005, September 2004, 1996, and 1955 flooding events. During flood events, residences, businesses, and roadways along the Delaware River are impacted. Approximately 35 homes are affected by the flooding, with 13 having water in the 1st floor 3'-5' high. The homes are appraised at approximately $150K-$200K.

Flooding affects Route 46, which prevents access to the elementary school and fire and rescue buildings. The road becomes impassible in 4 to 5 locations. Flooding results in displaced storm drains, road erosion, washed out shoulders, and damage to the Paulinskill Bridge over

Route 46. Flooding also causes oil spillage and individual well contamination.

The township provides storage services during flooding events and has encouraged homeowners to raise their utilities. When a major event is forecast, Knowlton OEM and fire officials visit expected flood victims and help remove and store possessions in tractor trailers.

There are several people in Knowlton who are interested in elevation. Although 12 applications have been sent for FEMA's RFC program, many homes do not meet FEMA's budget cost analysis criteria. Knowlton Township needs elevation surveys for the homes that flood. The township has compiled addresses, water levels, and costs for the repairs. The township is also interested in a community telephone notification system, but has determined that it is not monetarily feasible at the current time.

Flood Mitigation:
One house on Willow Lane is being elevated at a total cost of $110,000. It is costing $45K to raise it, with $30K being reimbursed through FEMA's Increased Cost of Compliance Program. There was a $65K cost associated with doing flood repair and building an addition, with $56K being reimbursed through flood insurance

In 2006, one structure was acquired for $450,000.

Unique Flood Risk to Municipality: The FEMA flood risk maps are not currently accurate and need to be updated.

Local Flood Mitigation Planning Committee:

Lisa Patton	Municipal Clerk
Frank Makowski	EMC
Brian Peck	DEMO
George James	Twp. Committee
Eleanor Clarkson	Asst. Clerk
Jo Commack	Resident
Frank VanHorn	Mayor
Ralph Price	Construction Official
Ted Rodman	Floodplain Admin.
Ramon Cowell	SPW Supervisor
Craig Muser	Resident
Bill Housel	Resident

Ordinances/Plans Reviewed: Flood Damage Prevention Ordinance
Outreach: DRBC, Warren County OEM, NJDOT
First Public Meeting Date: 5/9/2007
Date and Method of Advertisement for FMP: 4/26/2007 Star Gazette, 4/30/2007 Star Ledger
Questionnaire Distribution Method: Mailing
Public Response:

1. The majority of repetitively flooded residents are pursuing mitigation through FEMA grants.
2. Local response is good. The township could possibly stock supplies for emergency measures.
3. Maintenance of storm drains along Route 46 should be better.

Flood Mitigation Goals:

1. Mitigate of residences along Route 46 with severe repetitive losses
2. Elevation of electric boxes, oil tanks, etc. to second stories

Knowlton Mitigation Actions

1. **ACTION: Mitigation of Severe Repetitive Loss Properties**
   Description/Background: Homes that have lost over 50% of their value due to flood events along Route 46 will be elevated
   Hazard: Flood
   Existing or new assets: Existing
   Existing mechanism through which action will be implemented: New Jersey Office of Emergency Management/ FEMA grants
   Responsible Organization: Knowlton Township
   Target Completion Date: ASAP
   Estimated Cost:
   Potential Funding Sources: NJOEM grants, FEMA grants
   Priority: High

2. **ACTION: Elevate utilities and secure oil tanks**
   Description/Background: During past flooding events, oil tanks have been washed away and electrical equipment damaged. Elevating utilities and securing oil tanks in the flood-prone areas along Route 46 will lower risks.
   Hazard: Flooding
   Existing or new assets: Existing
   Existing mechanism through which action will be implemented:
   Responsible Organization: Property owners
   Target Completion Date: 12/31/2007
   Estimated Cost:
   Potential Funding Sources: TBD
   Priority: High

Lopatcong Township, Warren County:

Location:

Lopatcong Township is located along the Delaware River in the southwestern portion of Warren County. The township is home to 5,765 people within 7.14 square miles. It is bordered by the communities of Forks and Easton on the west, the Town of Philipsburg to the southwest, the Townships of Pohatcong and Greenwich to the south and southeast,

Harmony Township to the north, and Franklin Township to the east.

Geology:

The township lies in the Highlands of New Jersey. The topographic relief of the township is moderate and characterized by parallel, irregular ridges and intervening valleys trending northeast. The ridges, which rise about 500 to 750 feet above the valleys are composed of gneiss and other hard crystalline rocks. The valleys are mainly composed of limestone and shale. Elevations range from 152 feet at the Delaware River to 970 feet in the eastern part of the township.

Hydrology:

The *Delaware River* forms the western border of the township. It flows south and is the largest body of water flowing through the township.

The *Lopatcong Creek* has its headwaters in northeastern Harmony and flows generally southwest through the townships of Harmony, Lopatcong, Greenwich, Pohatong, and Phillipsburg where it empties into the Delaware River. The creek drains most of the township except for areas very close to the Delaware River.

Recent Flood History:

In addition to Delaware River flooding, the Lopatcong Creek floods during heavy rainfall events and when debris impedes the floodway.

Lopatcong Township was affected by the April 2005, September 2004, and September 1999 flooding events. When the Delaware River flooded in April of 2005, two residential basements flooded. In September 2004, the Lopatcong Creek flooded Belview Road and partially washed out Lower Stryker's Road. Three residential basements flooded and 1 house incurred first floor damage. During the September 2004 event, the Baltimore Street pump station was impacted by flood waters. Raw sewerage was pumped above ground and the facility cost $5,200.00 to repair. In September 1999, 24 homes incurred basement flooding. In addition, the sewer wastewater collection system was also affected. Lopatcong residents are not interested in elevations or acquisitions at this time.

Unique Flood Risk to Municipality:

A majority of the central and easterly portions of the township drain to the Lopatcong Creek. Lopatcong Creek is a major tributary to the Delaware River and drains in a southerly direction through the central portion of the township. Lopatcong Creek is crossed by a number of major collector roadways including Belview Road, County Route 519, State Highway Route 57, and Strykers Road. Although roadways vital to the movement of traffic and pedestrians in the township cross Lopatcong Creek, the culverts that carry stormwater are all undersized on each of these roadways. The roadways frequently get flooded when more intense rainfall events occur, requiring closure. Strykers Road sustained significant damage due to floodwaters following Hurricane Ivan in 2004.

A portion of the township abuts the Delaware River. While the area of Lopatcong Township that abuts the river is not populated, there are a number of businesses as well as an active rail line

that could be impacted by floodwater in the future. The township would like to protect those areas from flooding.

Local Flood Mitigation Planning Committee:

Gary Woolf	Local EMC
Paul Sterbenz	Engineer/Floodplain Admin/Stormwater Mgmt Coord.
George Ritter	Planner
Wayne Degan	Zoning Official
Victor Camporine	Council Pres./Pub. Safety Dir.

Ordinances/Plans Reviewed: Floodplain Prevention Ordinance, Zoning and Land Use Ordinance, Lopatcong Master Plan, Stormwater Management Regulations
Outreach:
First Public Meeting Date: 5/2/2007
Date and Method of Advertisement for FMP: 4/12/2007 Express-Times, Lopatcong Township web site
Questionnaire Distribution Method: Township web site, mailed to residents in floodplain
Public Response: none

Flood Mitigation Goals:

1. Protect human life and health
2. Minimize expenditure of public money for costly flooding, which is generally undertaken at the expense of the general public
3. Minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public
4. Minimize prolonged business interruptions
5. Minimize damage to public facilities and utilities
6. Reduce flood loss to promote and maintain a stable tax base
7. Ensure training for local officials and enforcement of existing ordinances, codes, and regulations
8. Educate citizens regarding flood risk, sustainable development, disaster preparedness, and hazard mitigation opportunities
9. Maintain emergency access to all the township

Lopatcong Mitigation Actions

1. **ACTION: Sewer Line Modification**
   Description/Background: Modifications to Sewer Lines along Baltimore Street/U.S. Highway Rt. 22 by reinforcing and/or replacing the sewer lines upstream in order to lessen the impact of rainwater to eliminate system backups which currently cause overflows on Baltimore and U.S. Highway Rt. 22.
   Hazard: Env. Health
   Existing or new assets: Existing
   Existing mechanism through which action will be implemented: Capital Improvement Plan
   Responsible Organization: Lopatcong/Phillipsburg

Target Completion Date: TBD
Estimated Cost: $625,000
Potential Funding Sources: State Infrastructure Grant Programs
Priority: High

Mansfield Township, Warren County:

Location:
Mansfield Township is located on the eastern border of Warren County and is centrally located north to south. The township is home to 6,653 people in 29.94 square miles. It is bordered by the Townships of Independence and Liberty to the north, White Township to the west, Washington Township to the southwest, the Townships of Washington and Lebanon to the east, and the Town of Hackettstown to the northeast.

Geology:
The township lies in the Highlands of New Jersey. The topographic relief of the township is moderate and characterized by parallel, irregular ridges and intervening valleys trending northeast. The ridges, which rise about 500 – 1000 feet above the valleys are composed of gneiss and other hard crystalline rocks. The valleys are mainly composed of carbonate rocks and shale.

Hydrology:
The *Pohatcong River* is a tributary to the Delaware River and flows from northeast to southwest. It flows through the central part of the township and drains the largest portion of the township.

The *Musconetcong River* forms the southern border of Mansfield Township. The river then flows southwest forming the border of Warren County until it gets to the Delaware River. *Hances Brook* is a tributary to the Musconetcong.

Recent Flood History:
Mansfield was affected by the April 2005 and September 2004 flooding events and the January 1999 after-blizzard floods. In April 2005, the Musconetcong flooded State Highway 57, Kings Highway, Stephensburg Road, and Butler Park Road. The floods did not affect any buildings.

In September 2004, the Pohatcong River, coupled with stormwater run-off in poor drainage areas, partially washed out town roads and caused road closures. Road wash-outs included Carrie Road, Beatty Road, Hieser Road, Airport Road, Janes Chapel Road, Townsbury Road, Michael Road, and Mitchel Road.

In January 2006, three residences sustained basement damage near the Musconetcong River.

FEMA reports 2 repetitive loss properties in Mansfield Township. The most concerning flooding areas are along the Musconetcong on State Highway 57, which includes both residential and commercial structures.

Unique Flood Risk to Municipality:

There are low-lying residential areas including Butler Park on Route 57 along the Musconetcong River. This is a serious flooding risk. Areas along the Hopatcong Creek have incurred minor flooding due to stormwater runoff.

Local Flood Mitigation Planning Committee:

Robert Griffith	EMC
Scott Hammel	DEMC
George Baldwin	Mayor
Doug Mace	Township Engineer
C. McGuinness	Zoning Board
P. Wydner	Flooded Property Owner
B. Slyker	DPW Super.

Ordinances/Plans Reviewed:

Outreach: Musconetcong Watershed Association, NJDEP, New Jersey Land Use Regulation, NJ Dam Safety

First Public Meeting Date: 5/9/2007

Date and Method of Advertisement for FMP: Mid-April, Easton, The Express Times, The Warren Reporter, delivered meeting fliers during the April 2007 flood

Questionnaire Distribution Method: Local Boy Scout Troop and OEM Coordinator distributed, also distributed during April flood

Public Response:

1. There was concern about the slowing of the Musconetcong River waters due to large trees and branches that have collected at the bend in the river near the Butler Park area. The collected debris backs up water into the Butler Park residential area. A township fire house is also located in this area. Although the firehouse itself does not flood, access to the station is sometimes compromised. This situation has gotten worse over the past few years. There could be serious flooding in that area in the future.
2. One man commented that the Musconetcong River reaches the rear of his home, and on some occasions has damaged his floor. He is not interested in pursuing any actions to correct this. He also mentioned a small drainage ditch in the same area. When heavy rains fall, the ditch floods his yard in the area of his swimming pool. The township has looked at it, but with the level of his yard in relationship to the river, it appears that the township could not solve the flooding problem.

Flood Mitigation Goals:

1. Remove debris from the Musconetcong
2. Mitigate flooding in the Butler Park area

Mansfield Mitigation Actions

1. **ACTION: Remove or thin out debris on Musconetcong River**

Description/Background: The Deputy Emergency Management Coordinator (DEMC) has been in contact with the Musconetcong Watershed Association and NJDEP Land Use Permit Office. As per the land use office, the township will be able to move forward after November 5, 2007 when the land use office will have new updated permits for stream debris removal. NJDEP suggested collaborating with the Musconetcong Watershed Association. The Mansfield DEMC has been attempting to obtain vital information regarding the Mansfield Township section of the river. The township is proactively pushing forward to finalize an actual physical plan to eliminate the debris in the river that causes back up of the water flow. The plan must be very specific since the river is a highly protected trout fed river with a vast amount of wildlife.

The following questions will be asked to the Musconetcong Watershed Association regarding the river:

1. Where can the township get a list of companies for estimates regarding this type of debris removal?
2. What does the Musconetcong Watershed Association have planned for this section of the river? (This includes the Penwell Dam)
3. Who has the ultimate authority over the Mansfield Township section of the river?

A committee headed by the DEMC will meet again when more information is obtained from the Musconetcong Watershed Association. At that time, funding for this project will be discussed.

Hazard: Flooding in the Butler Park Area
Existing or new assets: TBD
Existing mechanism through which action will be implemented: TBD
Responsible Organization: TBD
Target Completion Date: TBD
Estimated Cost: TBD
Potential Funding Sources: TBD
Priority: TBD

Oxford Township, Warren County:

Location:

Oxford Township is located in central Warren County. As of 2000, the township population was 2,307. Oxford is bordered by White Township to the north and west, Liberty to the north, Mansfield to the east and Washington Township to the south.

Geology:

The topographic relief of the township is moderate and characterized by parallel, irregular ridges and intervening valleys trending northeast. Most of the township is characterized by well drained soil overlying limestone or gneissic bedrock.

Hydrology:

Furnace Brook is a tributary to the Pequest.

Headwaters of the *Pophandusing Brook* form in the western portion of the township.

Recent Flood History:

The township was affected by flooding of Furnace Brook during the April 2005 and September 2004 events. In both events, 10 commercial and 50 residential structures incurred basement flooding and 10 commercial and 10 residential structures incurred first floor flooding. Areas near Kent Street, Cinder Street, Belvidere Avenue, Main Street, and Washington Street were affected. Historic buildings were flooded, embankments were eroded, and the city incurred minor road washouts. The condition of the Furnace Brook Stream dam upstream of downtown is of particular concern to the municipality.

Unique Flood Risk to Municipality: The Furnace Lake and associated dam provide a detention basin for stormwater attenuation and could potentially be used to manage flood conditions.

Local Flood Mitigation Planning Committee:

Rick Clabrese	EMC
Alex Lazorisak	Mayor
Louis Accetturo	DPW Supervisor
Joseph Nalio	Finelli Consulting Engineers, Inc.

Ordinances/Plans Reviewed: Stormwater Management Ordinance
Outreach: The Planning Committee will reach out as necessary once the extent of the flood risk is assessed and mitigation goals and implementation plans are formulated.
First Public Meeting Date: 7/18/2007
Date and Method of Advertisement for FMP: 7/13/2007, Easton Times
Questionnaire Distribution Method: US Mail 6/8/2007
Public Response:

1. Dredging Furnace Brook culvert at Route 31
2. Possibility of lowering the water level in Furnace Lake prior to storm events

Flood Mitigation Goals:

1. Reduce flood damage along the Furnace Brook
2. Maintain emergency access to all township residents and essential facilities located within the 100-year floodplain on Furnace Brook

Oxford Mitigation Actions

1. **ACTION**: **Use Furnace Lake and dam as a detention basin to attenuate stormwater**
   Description/Background:
   Hazard: Flood
   Existing or new assets: Existing
   Existing mechanism through which action will be implemented: Township Committee

Responsible Organization: NJDEP
Target Completion Date: December 2008
Estimated Cost: $30,000
Potential Funding Sources: Grant
Priority: High

2. **ACTION: Assess elevations of critical equipment in the wastewater treatment plant and plan corrective action**
Description/Background:
Hazard: Flood
Existing or new assets: Existing
Existing mechanism through which action will be implemented: Township Committee, Pequest River Municipal Utility Authority (PRMUA)
Responsible Organization: PRMUA
Target Completion Date: December 2008
Estimated Cost: $10,000 (assessment)
Potential Funding Sources: Grant
Priority: Medium

Town of Phillipsburg, Warren County:

Location:

The Town of Phillipsburg is located on the Delaware River in southwestern Warren County. The town is home to 15,166 people within 3.34 square miles. It is bordered by the City of Easton to the west, Lopatcong Township to the north and east, and Pohatcong Township to the south.

Geology:

The township lies in the Highlands of New Jersey. The area is characterized by gently rolling to steep uplands underlain by gneiss, quartzite and limestone. Elevations range from 133 feet at the Delaware River to 405 feet in the north-central part of town.

Hydrology:

The *Delaware River* forms the western border of the town. It flows south and is the largest body of water flowing through the township.

The *Lopatcong Creek* has its headwaters in northeastern Harmony and flows generally southwest through the townships of Lopatcong, Greenwich, Pohatong to Phillipsburg where it empties into the Delaware River. The creek drains most of the town except for areas very close to the Delaware River.

Recent Flood History:

The town was flooded by storms in June 2006, April 2005, September 2004, September 1999, 1996, 1955, and 1903. Flooding is most common along the Lopatcong Creek and in the Union Square area. Although the Lopatcong can flood from localized rainfall, the Delaware River can also back into the Lopatcong and cause flooding. When the Delaware River reaches 30 feet, its waters flood the storm sewers. There are 10 outfalls into the Delaware River and four into the Lopatcong Creek. There is a primary problem was with outfalls #1 to #6 into the River. The four outfalls into the creek were a problem in the 2004 storm.

During the storm events of 2004, 2005 and 2006, approximately 22 residential and 3 commercial structures incur basement damage and 2 industrial, 22 residential, and 3 commercial structures incur first floor damage. Many of the buildings are rental properties whose residents do not carry flood contents insurance. Homes range in value from $200K - $310K.

More properties were affected in 2004 because of a rainfall directly on this tributary to the Delaware (10.5 inches of rain reported locally). A few properties near the confluence with the Delaware River were also flooded in 2005 and 2006 when the Delaware River backed up the Lopatcong.

The pumping station between the Northhampton Street bridge and the toll bridge has been inundated in all three floods, resulting in raw sewage entering the Delaware River. The wastewater treatment plant, built in 1952 with a $10 million upgrade in the 1990's, near

Lopatcong Creek, was also inundated and damaged in all three floods. The lift station had to be replaced.

Flooding also affects roads, bridges, and a railroad line used to transport coal. Roads most often affected include Union Square, Riverside Way, North Main Street, South Main Street, Saw Mill Street, Morris Canal Way, and Lock Street. The railroad track along the Delaware River was flooded subsequently fixed by Norfolk Southern Railroad. This line transports coal to the Martin Creel power plant and has a bridge crossing over to Easton. The road and retaining wall north of the Northhampton Street bridge failed due to one of the floods.

Flood Mitigation:
A private dam was removed on Lopatcong Creek in 2005, which alleviated some of the flooding problem.

Unique Flood Risk to Municipality: None

Local Flood Mitigation Planning Committee:

Richard Hay	EMC
Mabel Cook	DEMC
Kevin Duddy	Const./Zoning Officer
Dennis Viscomi	Public Works Supervisor
Harry Wyant	Mayor
Michele Broubalow	Adm./Clerk
Municipal Engineer	Firm under contract

Ordinances/Plans Reviewed: Floodplain and zoning mapping, incident reports and photographs from 1955, 2004, 2005, and 2006 flood events
Outreach: Army Corps of Engineers, NJDEP, DRBC, Delaware River Joint Toll Bridge Commission
First Public Meeting Date: 10/16/2007
Date and Method of Advertisement for FMP: 10/3/2007, Express-Times newspaper
Questionnaire Distribution Method: mail
Public Response:

1. Do not allow New York City to empty their reservoir overload during flood events
2. Backflow prevention for storm lines that empty into the Delaware River and Lopatcong Creek
3. Stop future development
4. Build barriers to protect water front property
5. Require new development to capture run-off
6. Construct dam on Lopatcong Creek
7. Flood barriers for streets
8. Dredge the Delaware River
9. Prevent the Delaware River from backing up the Lopatcong Creek into low lying areas of South Main Street during high water

Flood Mitigation Goals:

1. Reduce infrastructure and environmental damage as well as health risk, health hazards

Phillipsburg Mitigation Actions

1. **ACTION: Modifications to Lift Station on Riverside Way**
   Description/Background: Modifications to the lift station will make it more flood resistant and allow for its continued operation during flood events. The existing facility is rendered non-operational as soon as it is impacted by flood waters. The town needs to upgrade, elevate, and waterproof all electrical panels and systems, install waterproof submersible pumps, and provide for a prolonged backup energy source as well as any structural modifications that may be needed.
   Hazard: Environmental Health
   Existing or new assets: Existing
   Existing mechanism through which action will be implemented: Town of Phillipsburg and the Phillipsburg Sewer Utility
   Responsible Organization: Town of Phillipsburg
   Target Completion Date: ASAP
   Estimated Cost: $500,000
   Potential Funding Sources: Grants
   Priority: High

2. **ACTION: Modifications to Waste Water Treatment Plant on South Main Street**
   Description/Background: Modifications to the waste water treatment plant on South Main Street will make it more flood resistant and allow for its continued operation during flood events. The existing facility's operations are compromised during flood events. The town needs to upgrade, elevate, and waterproof all electrical panels and systems, install waterproof submersible pumps, and provide improvements to the backup energy source.
   Hazard: Environmental Health
   Existing or new assets: Existing
   Existing mechanism through which action will be implemented: Town of Phillipsburg and the Phillipsburg Sewer Utility
   Responsible Organization: Town of Phillipsburg
   Target Completion Date: ASAP
   Estimated Cost: $500,000
   Potential Funding Sources: Grants
   Priority: High

3. **ACTION: Modifications to Street and Retaining Wall on Riverside Way**
   Description/Background: Modifications to street and retaining wall on Riverside Way to make it more flood resistant and to prevent street undermining and collapse and river bank erosion and collapse during flood events
   Hazard: Infrastructure protection
   Existing or new assets: Existing
   Existing mechanism through which action will be implemented: Town of Phillipsburg
   Responsible Organization: Town of Phillipsburg
   Target Completion Date: ASAP

Estimated Cost: $400,000
Potential Funding Sources: Grants
Priority: High

4. **ACTION: Install Backflow Prevention on Stormwater Discharges to the Delaware River and Lopatcong Creek**
Description/Background: Installing backflow prevention on 8 of the 14 stormwater discharges to the Delaware River and Lopatcong Creek will prevent flood waters from backing up into the storm water system and flooding low lying sections of the North End, Union Square, and the lower South Main Street, Sawmill Street area.
Hazard: Protection of existing property and infrastructure
Existing or new assets: Existing/New
Existing mechanism through which action will be implemented: Town of Phillipsburg
Responsible Organization: Town of Phillipsburg
Target Completion Date: ASAP
Estimated Cost: $500,000 to $1,000,000.
Potential Funding Sources: Grants
Priority: High

5. **ACTION: Provide for an Engineering Feasibility Study of the Lopatcong Creek to determine Mitigation Actions to Prevent Backflow of Creek when the Delaware River is at Flood Stage**
Description/Background: There is a need to determine methods to prevent flooding of the lower South Main Street, Sawmill Street area due to backflow of the Lopatcong Creek when the Delaware River is at flood stage. The area study will include the entire length of the Lopatcong Creek within the corporate limits of the Town of Phillipsburg including the confluence of the Lopatcong Creek and the Delaware River.
Hazard: Protection of existing property and infrastructure
Existing or new assets: Existing/New
Existing mechanism through which action will be implemented: Town of Phillipsburg, New Jersey Department of Enviornmental Protection
Responsible Organization: Town of Phillipsburg
Target Completion Date: ASAP
Estimated Cost: $200,000
Potential Funding Sources: Grants
Priority: High

Pohatcong Township, Warren County:

Location:

Pohatcong Township is located in the southernmost tip of Warren County. It is home to 3,416 people within 13.61 square miles. It is bordered by Riegelsville to the west, the communities of Phillipsburg and Lopatcong to the north, Greenwich to the north and east, Bloomsbury to the east, and Holland and Bethlehem to the south. The township also surrounds the Borough of Alpha.

Geology:

The township lies in the Highlands of New Jersey. The topographic relief of the township is moderate and characterized by rolling steep uplands. The hills, which rise about 500 feet above the valleys are composed of gneiss and other hard crystalline rocks. The valleys are mainly composed of carbonate rocks and shale. Elevations range from 116 feet at the Delaware River to 725 feet in the southeastern corner of the township.

Hydrology:

The *Delaware River* flows along the western boundary of the township and is the largest waterway in the township.

The *Lopatcong Creek* loops into the township for a distance of only 2,400 feet. The creek drains a small area in the northern part of the township.

The *Pohatcong River* is a tributary to the Delaware River and flows from northeast to southwest. It flows through the central part of the township and drains most of the central and northern portion of the township.

The *Musconetcong River* is the major waterway in Pohatcong Township. It originates at Lake Hopatcong; it then loops to the northwest after flowing through Lake Musconetcong. The river then flows southwest forming the border of Warren County until it gets to the Delaware River.

Recent Flood History:

The township was affected by the June 2006, April 2005, September 2004, and September 1999 flooding events. During June of 2006, the Musconetcong, Pohatcong, and the Delaware River flooded River Road, Snyders Road, Manor Road, Route 627, Mt. Joy Road, Musconetcong Street, and the residential villages of Carpentersville, Riegelsville, and Finesville. Seventy-six (76) residential structures sustained basement damage and thirty (30) residential structures sustained first floor damage. Waters contaminated individual wells and septic systems.

During April 2005, all 4 major waterways flooded. Eighty (80) homes incurred basement damage and forty-four (44) incurred first floor damage. The September 2004 event affected Ninety-five (95) basements and forty (40) first floors. In addition, the Pohatcong Emergency Operations Center at Huntington Volunteer Fire Company 1 was flooded. Roadways were washed away and Pohatcong's drainage system was destroyed. Damage from the 2004 storm

can still be seen in parts of the township. FEMA estimated repair for public damage at $600,000 to $750,000. Repair for private damage was estimated at over $1,000,000. The 4 waterways also flooded roads and homes in 1999.

Flood Mitigation:

There have been 4 properties elevated with NFIP and 2 that have been acquired with help by FEMA and New Jersey Green Acres. Approximately a dozen more homeowners are interested in elevation but lack funding.

Unique Flood Risk to Municipality: None

Local Flood Mitigation Planning Committee:

Donald Grube	EMC
Richard McIntyre, P.E.	Municipal Engineer, Floodplain administrator
Gwen Steckel, P.E.	Stormwater Management Coordinator
Samuel Souders	Council/Land Use Board
Wanda Kutzman	Township Clerk
Alan Pyatt	Property Owner
Charity Pyatt	Property Owner
Manny Couto	Property Owner
Walter Banfield, Jr.	Property Owner
Ron Stueber	Property Owner
Louis Hajdu	Property Owner
Judith Forbes	Property Owner
Richard Forbes	Property Owner

Ordinances/Plans Reviewed: Flood Damage Prevention Ordinance, Zoning Ordinance
Outreach: DRBC, FEMA, NJDEP, NJOEM
First Public Meeting Date: 10/23/2007
Date and Method of Advertisement for FMP: 10/6/2007 The Express-Times
Questionnaire Distribution Method: Hand delivered with instructions by deputy management coordinators and available at the municipal building
Public Response:

1. Mandate controlled releases from the New York reservoirs and require them to remain at or below 80% capacity
2. Don't allow a particular subdivision development to be built

Flood Mitigation Goals:

1. Protect human life and health
2. Minimize expenditures of public money for costly flood-control projects
3. Minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public
4. Minimize prolonged business interruptions
5. Minimize damage to public facilities and utilities such as water and gas mains, electric,

telephone, and sewer lines, streets and bridges that are located in the floodplain
6. Help maintain a stable tax base by providing for the use and development of floodplains so as to minimize future flood blight areas
7. Insure that potential buyers are notified that property is in a floodplain
8. Ensure that those who occupy floodplains assume responsibility for their actions
9. Establish standards for development in floodplains

Pohatcong Mitigation Actions

1. **ACTION: Elevation of flood-prone residences**
   Description/Background:
   Hazard: Flood
   Existing or new assets: Existing
   Existing mechanism through which action will be implemented: Flood damage prevention ordinance / NFIP participation
   Responsible Organization: Property owners
   Target Completion Date: As soon as funds become available
   Estimated Cost: $50,000 to $100,000 per structure
   Potential Funding Sources: NFIP; Various FEMA grant programs
   Priority: High

2. **ACTION: Adopt new flood damage prevention ordinance**
   Description/Background:
   Hazard: Flood
   Existing or new assets: New and existing
   Existing mechanism through which action will be implemented: Flood damage prevention ordinance
   Responsible Organization: Township Council
   Target Completion Date: 2008
   Estimated Cost: $5,000
   Potential Funding Sources: Municipal funds
   Priority: High

3. **ACTION: Install a pipe with backflow prevention device under railroad from River Road to the Delaware River**
   Description/Background: When the river floods, water seeps under the railroad embankment and onto River Road. There are no storm drains or culverts under the railroad to allow the water to drain quickly back into the river once the flood waters recede. During flood events, this portion of River Road remains impassible for several days.
   Hazard: Flood
   Existing or new assets: Existing
   Existing mechanism through which action will be implemented: N/A
   Responsible Organization: Township Council
   Target Completion Date: 2009
   Estimated Cost: $150,000
   Potential Funding Sources: FEMA's Hazard Mitigation Grant Program

Priority: Medium

4. **ACTION: Install backflow prevention device on several existing pipes/culverts that discharge to the Delaware River**
   Description/Background: Backflow prevention devices are needed on several existing storm drains and culverts to prevent flood water from backing up into them causing flooding of residential areas and roads that would otherwise not be flooded.
   Hazard: Flood
   Existing or new assets: Existing
   Existing mechanism through which action will be implemented: N/A
   Responsible Organization: Township Council
   Target Completion Date: 2009
   Estimated Cost: $300,000
   Potential Funding Sources: FEMA's Hazard Mitigation Grant Program
   Priority: Medium

5. **ACTION: Construct a stormwater detention basin along Mountain Road to control runoff from the mountain**
   Description/Background: In the past, Mountain Road required total reconstruction due to damage from erosion. Additionally, the eroded material completely filled in and blocked an existing drainage system. Controlling the rate of the runoff should alleviate this during future storms.
   Hazard: Flood
   Existing or new assets: Existing
   Existing mechanism through which action will be implemented: N/A
   Responsible Organization: Dept. of Agriculture; Soil Conservation Service
   Target Completion Date: 2010
   Estimated Cost: $250,000 to $350,000
   Potential Funding Sources: Hazard Mitigation Grant Program
   Priority: Medium

6. **ACTION: Review development ordinances including density of development and stormwater management requirements**
   Description/Background:
   Hazard: Flood
   Existing or new assets: New
   Existing mechanism through which action will be implemented: Land development ordinances
   Responsible Organization: Land Use Board and Township Council
   Target Completion Date: 2008
   Estimated Cost: $5,000
   Potential Funding Sources: Municipal funds
   Priority: Medium

7. **ACTION: Study the impact of the removal of the Musconetcong River dams on flooding**

Description/Background: There will be no removal of the dams until study proves that their removal will not worsen flooding.
Hazard: Flood
Existing or new assets: Existing
Existing mechanism through which action will be implemented: N/A
Responsible Organization: Musconetcong Watershed Assoc.; Army Corps of Engineers
Target Completion Date: 2010
Estimated Cost: $300,000
Potential Funding Sources: NJDEP, Army Corps of Engineers, FEMA
Priority: Medium

8. **ACTION: Landscape Block 97, Lots 53 & 54 which are in the riparian zone of the Delaware River**
Description/Background:
Hazard: Flood
Existing or new assets: Existing
Existing mechanism through which action will be implemented: N/A
Responsible Organization: Rutgers Forest Restoration Program
Target Completion Date: 2009
Estimated Cost: $20,000
Potential Funding Sources: Rutgers Univ. & EPA
Priority: Low

White Township, Warren County:

Location:
White Township is located in the west-central portion of Warren County along the Delaware River. It is home to 4,245 people within 27.75 square miles.

It is bordered by the Townships of Knowlton and White to the north, the Townships of Liberty and Oxford to the east, the Township's of Harmony and Washington to the south, and the Delaware River to the west.

Geology:
White Township has mostly hilly terrain with some flatter areas near the Delaware River. It is more hilly and mountainous in the eastern and northern part of the township with elevations exceeding 1,200 feet. Most of the township is characterized by well drained soil overlying limestone or gneissic bedrock.

Hydrology:
The *Pequest River* drains into the Delaware River in White Township and flows from northeast to southwest. *Mountain Lake Brook* and the *Beaver Brook*, both tributaries to the Pequest, flow south and joins the Pequest River in White Township.

The *Delaware River* flows south along the western border of the township alongside a

residential area. White Township surrounds Belvidere Township and exists to both the north and south of Belvidere along the Delaware.

The *Pophandusing Brook*, a tributary to the Delaware, flows west through the center of White Township and forms the southern border of Belvidere Township.

The *Buckhorn Creek* originates in the southern portion of the township and joins the Delaware within the boundary of Harmony Township.

Recent Flood History:

Although Buckhorn Creek, Beaver Brook, and the Pequest River flow through the township, White is primarily affected by Delaware River flooding due to development patterns.

White Township was affected by the June 2006, April 2005, September 2004, and September 1999 flooding events. During the events, approximately 60 residential and commercial structures sustained basement damage and 35 sustained first floor damage. There were major road closures and damage as well as septic tank damage. Route 46 along the Delaware River, River View, and Foul Rift Road are repeatedly flooded.

Unique Flood Risk to Municipality:

White is affected by several tributaries and the Delaware River. When the Delaware River rises to flood stages, it blocks off the tributaries with debris. The Pequest River and its tributaries back up. Water flowing from the north is blocked by the Delaware, the build up is quick, and White Township gets inundated. White is at least a foot below the flood stages in Belvidere. This needs to be investigated because of timing factors.

Local Flood Mitigation Planning Committee:

Bryan Vande Verde	Mayor
Frank Panetta	EMC/OEM
Mick Ennis	Deputy EMC
Sam Race	Committeeman
Jim Ashe	Committeeman
Mike Grossman	Resident
Elaine O'Neil	Flood Property Resident
Bob Mackey	Resident
Jeff Herb	Resident
Ron Beck	Public
Sue McEvoy	Public
Linda Heilman	School CSA
Brian Vander Verde	Mayor
Kathleen Reinalda	CFO
Jim Hothouse	DPW

Ordinances/Plans Reviewed: Zoning and land use ordinances, slope ordinances, Master Plan, Wetlands, Land Preservation
Outreach: Belvidere, Harmony, Oxford, Washington Township, Liberty Township, Knowlton Township, Pequest Watershed
First Public Meeting Date: 8/1/2007
Date and Method of Advertisement for FMP: Local newspapers two weeks in advance
Questionnaire Distribution Method: Phone calls, word of mouth, advertisement
Public Response:

1. How much advance warning will be given in the event of another flooding incident?
2. How would residents be notified?
3. Where would shelters be set up?

Flood Mitigation Goals:

1. Keep residents safe at all times
2. Ample public notification during events by going door-to-door, radio notification, or Reverse 911

White Mitigation Actions

1. **ACTION: Early Warning**
   Description/Background:
   Hazard: Flood
   Existing or new assets: Existing
   Existing mechanism through which action will be implemented: EOP
   Responsible Organization: Township
   Target Completion Date: 2008
   Estimated Cost: $15,000
   Potential Funding Sources: Township
   Priority: High

2. **ACTION: Remove debris from tributaries**
   Description/Background:
   Hazard: Repetitive loss
   Existing or new assets: Existing
   Existing mechanism through which action will be implemented:
   Responsible Organization: DEP, DPW
   Target Completion Date: 2010
   Estimated Cost: $100,000
   Potential Funding Sources: DEP/FEMA
   Priority: High

3. **ACTION: Keep entrance from tributaries to the Delaware River clear to prevent backup**
   Description/Background:
   Hazard: Repetitive loss
   Existing or new assets: Existing
   Existing mechanism through which action will be implemented:

Responsible Organization: DEP, Federal
Target Completion Date: 2010
Estimated Cost: $100,000
Potential Funding Sources: DEP/FEMA
Priority: High

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