

Building Resiliency

Update on efforts in Broome County to become a more flood smart community

Prepared by
Broome County Department of Planning

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Introduction

Flooding is this country's the most costly natural disasters. In addition to inundating homes and businesses, floods can overwhelm sewage treatment plants and septic systems causing them to fail, contaminate drinking water supplies, move cars and trucks like they are toys, collapse building foundations, and devastate the local economy. Floods can also take lives. Since 1953, Broome County has been declared a disaster area nine times as a result of flooding.

In 1972, the northeast region experienced massive flooding from Hurricane Agnes, at the time the most costly natural disaster US history. Over the multi-state extent of the Agnes flooding, seventy-two people died and damages exceeded \$16.1 billion in today's dollars. In Broome County, Hurricane Agnes flood levels exceeded previous records by 3.5 feet in Vestal and over 4 feet in Conklin. The 1972 flood record stood until it was broken in 2006, and the 2006 record was broken just five years later by the 2011 floods associated with Tropical Storm Lee.

Between June 26 and 28, 2006 heavy rainfall resulted in historic flooding throughout Broome County. In some places rainfall accumulated over 7 inches, the Susquehanna River reached a record 33.65 feet (Vestal), and flood waters overtopped parts of the floodwall in Binghamton. There were 3,000 residents evacuated from the City of Binghamton alone, and another 300 Conklin residents were airlifted to safety. More than 3,000 structures were damaged and approximately \$175 million in property damages were reported.

On September 7, 2011 Tropical Storm Lee moved through Broome County. Rainfall amounted to 12 inches in some places. By the next day the Susquehanna River broke the 2006 record and reached a height of 35.25 feet (Vestal), which overtopped flood levees and damaged numerous flood protection structures. According to New York State Department of Housing and Urban Development (HUD), Broome County experienced the most significant damage, accounting for 36% of the severely damaged homes and 30% of the severely damaged businesses statewide. Broome County Department of Emergency Services reported that 24,000 people were evacuated, 2,500 people and 200 pets were sheltered. In addition, there was major damage to the water and sewer systems, over 350 private wells were contaminated, more than 7,000 structures were damaged, and an estimated \$502.8 million occurred in property damage county-wide.



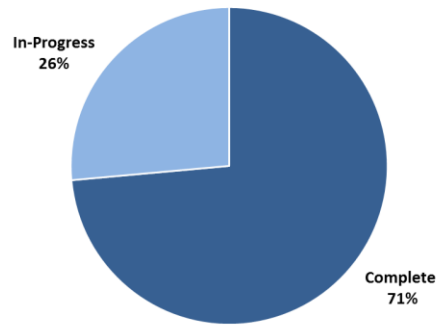
Conklin residents being airlifted (2006), Source: WBNG



Town of Union (2011)

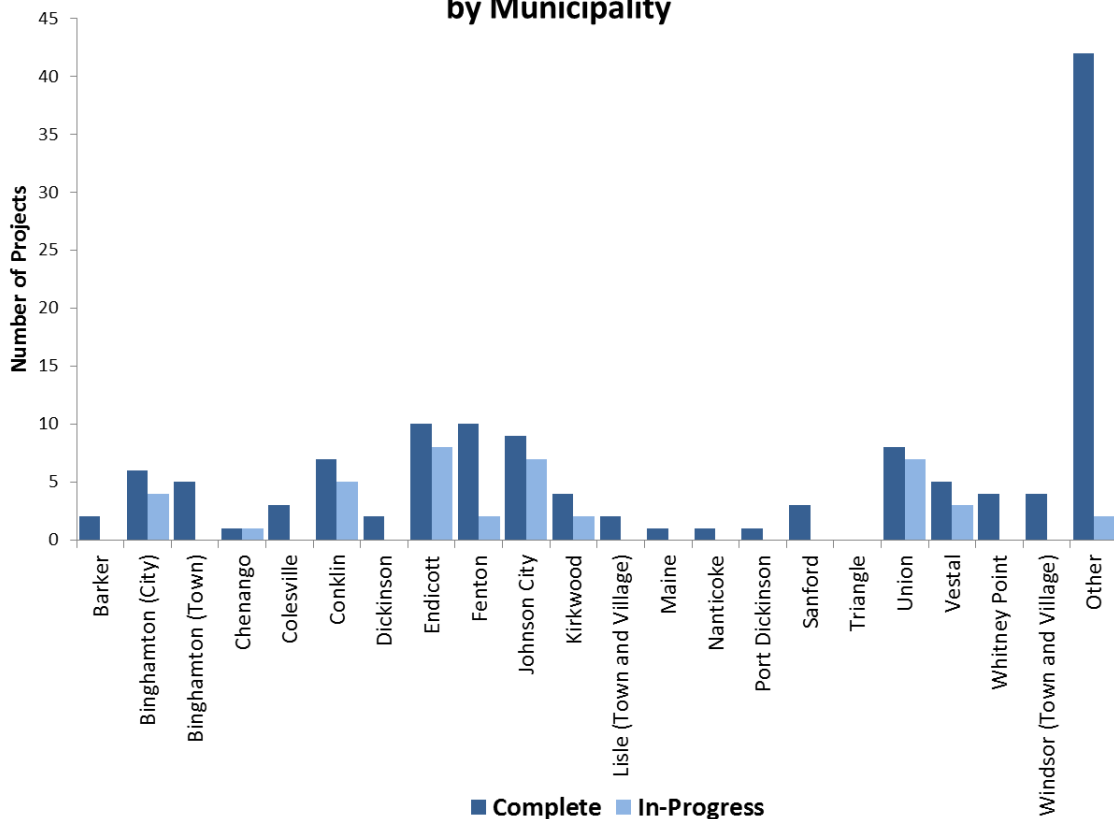
Broome County and its municipalities are dedicated to improving safety and creating a flood resilient community. Historically, the solution to flooding was the construction of floodwalls and levees. In response to the flood of 1936, the Army Corps of Engineers built a system of 17.5 miles of levees, 3 miles of floodwalls, 179 sectional gates, and the Whitney Point reservoir dam. Broome County constructed and continues to operate 21 flood-control structures or watersheds. This infrastructure has functioned to its design limits, but those limits were exceeded in places by the 2006 and 2011 floods. Since 2006, over 170 large and small-scale flood mitigation projects have been initiated or are underway to strengthen resiliency throughout Broome County.

Status of Flood Mitigation Projects Identified in Broome County



The charts summarize project status in the county reported by each municipality; the “Other” category represents Broome County’s and other non-municipal projects. A map showing the locations of the projects is located in Appendix D. In addition to the projects summarized in this report, municipalities indicated there were numerous on-going projects and other large-scale projects planned for the future, when more funding becomes available.

Status of Flood Mitigation Projects in Broome County by Municipality



Flood Mitigation Project Summary

This section highlights major projects that were identified by municipalities as underway or completed as of June 2016. The projects are classified into six categories; Property Protection, Structural, Prevention, Emergency Services, and Natural Resource Protection projects. The Public Awareness activities are summarized at the end of this section. These categories are based on FEMA guidelines; their descriptions were derived from the 2013 Broome County Hazard Mitigation Plan. A complete list of county, municipal, and non-municipal mitigation actions is included in Appendix C.

Property Protection

Property Protection actions involve (1) modification of existing buildings or structures to protect them from a hazard or (2) removal of the structures from the hazard area. Examples include acquisition, elevation, relocation, structural retrofits, storm shutters, and shatter-resistant glass.

Buyout/ Elevation/ Relocation: Home buyouts are one of the most effective property protection tools for long-term damage reduction. Buyouts permanently prevent the future loss of life and property, and create more space for flood waters to spread out. Since the 2006 flood, there were at least 377 home buyouts covering over 136 acres in Broome County.

Two buyout programs were used by local municipalities. FEMA oversees the Voluntary Home Buyout Grant Program for the acquisition (buyout) of flood-prone properties to reduce future flood damage to structures. FEMA provides 75% of the funds for the buyout and demolition. Once the transaction is complete, the municipality acquires the property, demolishes the structure, and agrees to maintain the land as open space. The Community Development Block Grant- Disaster Recovery (CDBG-DR) program can also assist with buyouts, but these properties are allowed to be resold, rehabilitated, or redeveloped. In addition to buyouts, this section also describes elevation and relocation projects happening in Broome County.

CITY OF BINGHAMTON: There were 20 property buyouts in the areas of Duke Street, Baltimore Avenue, Avon Road, Laurel Avenue, Charles Place, and New Street.

BINGHAMTON JOHNSON CITY JOINT SEWAGE TREATMENT PLANT: The pump station on Gates Road which handles wastewater from Vestal, Johnson City and part of the Town of Union, is in the process of being elevated; this project is expected to be completed by the end of 2016.

TOWN OF COLESVILLE: The Town purchased a flood-prone property on Riverview Place.

TOWN OF CONKLIN: The Town acquired 111 flood-prone properties in the areas of Conklin Road, JR Blvd, Stillwater Road, Alta Road, Shipman Road, Woodcrest Way, and Miller Street. Two of the buyouts were purchased by the County and turned over to the Town. Approximately 10 homes were elevated on Lilac Place, Conklin Road, JR Blvd, Stillwater Road and Shirley Avenue. Currently, the Town is in the early planning phases of relocating its community center out of the floodplain.

VILLAGE OF ENDICOTT: Two flood-prone properties located on South Loder Avenue were purchased in 2014 and 2015.

VILLAGE OF JOHNSON CITY: There were five properties purchased by the Village of Johnson City on River Terrace, Olive Street and North Hudson Street; three properties on North Harrison and North Baldwin Street are still in the buyout process. One property on Grand Avenue was elevated. Currently, the Village is finalizing the preliminary cost estimates of a project that proposes to build the Department of Public Works (DPW) office on the second floor at the existing site and construct a new maintenance building/ garage.

TOWN OF KIRKWOOD: There were 19 buyouts primarily in the areas of Kirkwood Gardens, Geiger Lane, River Run Lane, and Route 11. One of the buyouts was completed by the County and turned over to the Town. Approximately 5 flood-prone homes were elevated. The Town has purchased land and is planning to relocate the Town Highway Garage in the future to avoid flood risks.

TOWN OF UNION: There were a total of 149 buyouts through the FEMA and CDBG-DR programs, primarily in the areas of Argonne Avenue, South Endwell, Fairmont Park, Westover and West Corners. The Town has purchased land at 2900 Wayne Street to relocate the Highway and Refuse Facility, a design for the facility is being negotiated.

TOWN OF VESTAL: There were a total of 71 buyouts in the Castle Gardens and Twin Orchards neighborhoods. In addition, the Town is in the process of finding a new location to develop a civic center for the Town Court, Police Department and EMS squad.



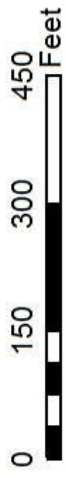
Elevated home in the Town of Conklin (2016)



2002 Aerial Image
Home Buyout Area
Argonne Avenue, Town of Union

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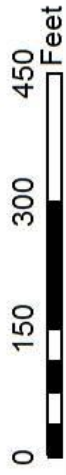
 2011 Flood





2014 Aerial Image
Home Buyout Area
Argonne Avenue, Town of Union

N 
 2011 Flood



Flood-Proofing: Numerous critical facilities throughout the County were inundated with water during the 2006 and 2011 floods, damaging essential equipment and preventing critical systems from functioning and serving the community. For these reasons, municipalities recognized flood-proofing as an important flood mitigation management tool. According to FEMA, flood-proofing includes anchoring buildings, sealing doors and windows to prevent water from passing through, protecting walls with new sealant, installing pumps and check valves to control water from entering interior of a building, and elevating utilities and equipment above flood levels.

VILLAGE OF ENDICOTT: Two backflow prevention devices were purchased for residential properties on North Jackson Avenue; these devices will prevent wastewater flow from entering a structure.

VILLAGE OF JOHNSON CITY: The Village is in the process of making improvements to the Water Treatment Plant. The improvements include elevating/ constructing a new building and replacing the generator; the generator was purchased in 2013 (shown below) and the rest of the project went out to bid in March.



Left: JC Water Treatment Plant during the 2011 flood

Right: JC Water Treatment Plant with new back-up generator elevated above flood levels (2013)

TOWN OF UNION: The Town used CDBG-DR funds to flood-proof the YMCA on Main Street in Johnson City. These activities included making repairs caused by flooding, installing a backflow prevention device, and a door jamb to prevent water from entering facilities. The Town also used CDBG-DR funds for flood damage repairs at the Boys and Girls Club in Endicott. In 2014, new submarine doors were installed and concrete walls were constructed to protect the facility from future flood damage; the aging electrical and boiler systems were also replaced. CDBG-DR also funded the new bathroom facilities at Glendale Park which had previously flooded; the new bathrooms were built to FEMA standards and carry a flood insurance policy. The CDBG-DR funds will also be used to help eight residents who submitted applications to the Town interested in available funds to rehabilitate their flood-damaged homes; an engineer is inspecting the foundational issues and will provide plans and estimated costs for repairs. The Town also organized a backflow preventer valve installation program. Devices are to be installed on individual properties; so far, devices have been installed on Seward Avenue.

TOWN OF VESTAL: In 2012, the Town completed flood-proofing Fire Station #3 in Ross Corners; this included the installation of a check valve to prevent water backup and a mobile flood gate was purchased.

Structural Projects

Structural projects involve the construction of structures to reduce the impact of a hazard. Such structures include dams, setback levees, floodwalls, retaining walls, and safe rooms. Other road/ flood infrastructure projects were categorized as structural projects for the purposes of this report.

Flood Control Structures: A floodwall is a permanent structure built to protect a structure(s) from flood waters and floating debris. Typically floodwalls are designed with a passive floodgate which will close during a flooding event. *Drainage Improvements:* Broome County and its municipalities realized the importance of improving the existing drainage systems to mitigate localized flooding. These improvements often involve replacing and upgrading culverts and stormwater/ wastewater systems.

BROOME COUNTY: The DPW Engineering Division was responsible for the repair and mitigation of 20 bridges and two large culverts following the 2011 flood. To minimize future flood damage, additional mitigation measures included: placement of heavy table-top rock along bridge bases, placement of heavy dump stone to protect inlets and outlets, bank / slope stabilization and armoring to repair structures' existing damage. The Engineering Division continuously reviews and addresses scour and/ or erosion conditions at county-owned bridges and culverts to make improvements to these structures, mitigating future flood damage. In addition, Emergency Services regularly meets with the NYSDEC to support floodwall closures.

BINGHAMTON-JOHNSON CITY JOINT SEWAGE TREATMENT PLANT: The sewage treatment plant is currently undergoing a \$200 million reconstruction to repair damages from the 2011 flood, with new flood protection measures; when it was possible, operational equipment was elevated. In addition, the newly reconstructed plant will be protected by a floodwall built to an elevation of 845 feet; this project is expected to be completed by the end of 2018.

CITY OF BINGHAMTON: The City completed its full street reconstruction of Riverside Drive from Front Street to the city line; this included separating stormwater and sanitary lines to reduce peak flows. Currently, the City is working on a similar project for the Front Street Gateway. Upgrades to the McDonald Ave sanitary pump station were completed in the First Ward.

TOWN OF BINGHAMTON: A new concrete bridge was built on Maxian Road to replace the timber bridge; this will prevent loss of service during a major storm event.

TOWN OF CONKLIN: The design for a new stormwater drainage system in the Stillwater Road neighborhood is complete, construction is expected to begin in 2017.

TOWN OF DICKINSON: After the 2011 flood, an engineering study examining methods to mitigate localized flooding in the areas of Boland Road and SUNY Broome was completed. This study resulted in the New York State DOT installing a flap gate underneath Interstate 81 to prevent river back-up.

TOWN OF FENTON: The Town completed a preliminary design for the replacement of the storm sewer system on Albany and Pine Streets in Port Crane.

VILLAGE OF JOHNSON CITY: The Village is working on a \$950,000 project to rehabilitate 3,500 feet of a drainage ditch which will eliminate erosion problems on 50 residential properties and increase the capacity of a detention pond near Anna Maria Drive; this project went out to bid earlier this year and construction is expected to commence in September. In 2016, the Village completed improvements to the Brown Street sanitary pump station which included upgrades to the power supply, operational equipment and physical structure; access to the structure was improved as well.

TOWN OF KIRKWOOD: The Town upgraded the twin culverts on Barlow Road, increasing the capacity of water flow during heavy rainfall. In addition, culverts were replaced, ditches were repaired and embankments were stabilized on Foley Road, Riverview Lane and in Veterans River Park.

LOURDES HOSPITAL: The 2006 flood closed Lourdes Hospital for 12 days and caused \$20 million in damages from 20 inches of water on the ground level. With assistance from New York State and FEMA, Lourdes constructed a floodwall to the 500-year flood elevation along the southern edge of the property. According to FEMA, the project also included closure structures, interior drainage, passive floodgates, pumping stations, utility relocations, and the development of an operation and maintenance plan. The floodwall is 11 feet at its highest point and includes 11 passive floodgates at each entry point, which allows unimpeded access by vehicles and pedestrians during dry times, but automatically deploys without reliance on power or personnel when flooding occurs (FEMA). During the 2011 flood, water came within 30 inches of breaching the wall, but the floodwall kept the hospital dry and fully-functioning.

MACARTHUR ELEMENTARY: MacArthur Elementary School, located on Binghamton's Southside was affected by both flood events. After the 2011 flood, students and teachers were displaced for more than 4 years. As part of a \$79.5 million project in 2013, the school was demolished and a new building was constructed closer to the street. Three classroom pods were built on stilts, elevating the building 5 feet above the 500-year floodplain. In addition, the school was designed with an emphasis on sustainability; the building orientation allows for the classrooms to be lit by natural sunlight, and uses geothermal and solar energy technologies. MacArthur Elementary uses 25% of the energy for a building of its size and it is on track for being certified as a LEED Platinum building.

TOWN OF UNION: The Town is in the process of building a sectional gate and repairing the flood control structure at Watson Blvd. near Fairmont Park; the design is complete and will go out to bid later this year. The Town allocated CDBG-DR funds for the reconstruction of North Loder Avenue to increase the drainage capacity; a separate catch basin was installed, and the drainage lines were extended. This project also involved the replacement of the storm sewer pipe and repairing the by-pass mechanism, which diverts water flows during heavy rainfall. Repairs were made to the Johnson City-Endicott Interconnection pump station. The Town also replaced the Dittrich Street pump station and increased the capacity of the system.



Lourdes Hospital (2011)

The Town is making drainage improvements and rerouting stormwater flow to mitigate centralized flooding in the area of Pine Street and McKinley Ave in Endicott; the design is complete and will go out to bid later this year. A sediment trap will be installed on Brixius Creek to prevent debris from entering the drainage system; the Town is currently obtaining Army Corps permits for the project.

The Town is also working on the storm and sewer line separation “Interceptor B” project (area bounded by St. Charles Street, Grand Ave, Cherry Street and Floral Ave) in Johnson City. This project is in the preliminary design phase; this project will improve the capacity of the stormwater drainage system during heavy rainfall. There are also plans to create a drainage retention pond on the site of the new Binghamton University Pharmacy School on Corliss Avenue.

UNION-ENDICOTT HIGH SCHOOL: UE High School was also affected by the 2006 and 2011 floods. In 2006, floodwaters caused \$2.5 million in damages to the school. The United States Army Corps of Engineers worked with the Town and Village to construct a 14-foot floodwall which allows water to inundate the athletic facilities, but protects the buildings from flood damage. In 2011, the school was protected, but the athletic facilities were damaged. With FEMA Recovery Funds, the School District built a new scoreboard and reconstructed the Fran Angeline Fieldhouse. The newly elevated building was constructed with flood-proofing measures and it includes locker rooms, public restrooms, an observation deck, and a concession stand; it opened in Fall 2013.



Fran Angeline Fieldhouse (2016)

US ARMY CORPS OF ENGINEERS: The United States Army Corps of Engineers (USACE) Baltimore District is responsible for inspecting floodwalls and levees in Broome County. Since 2013, they repaired three Binghamton levee systems, the Vestal and the Endicott-Johnson City levee systems to their pre-storm condition.

TOWN OF VESTAL: Currently, the Town is working with the NYSDEC to construct an automatic stormwater pump station at the Pumphouse Road detention pond; the design is complete. In addition, the Town is in the design phase of converting a former sewer pump station into a stormwater pump station on Roberts Street. These pump stations will help remove stormwater from areas that cannot be drained by gravity. In 2015, the Town completed the construction of a 7-foot concrete floodwall around the eastern edge of the Town Hall building.



7-foot Floodwall built to protect the Town Hall from future flooding

Prevention

Prevention projects are government, administrative or regulatory actions or processes that influence the way land and buildings are developed and built. These actions also include public activities to reduce hazard losses. Examples include planning and zoning, floodplain local laws, capital improvement programs, open space preservation, and storm water management regulations.

BROOME COUNTY: Watersheds provide numerous benefits including flood control and recreational space. Typically they consist of a series of dams that temporarily store floodwater and slowly release it over a period of time. Spillways are important features of watershed dams because they allow excess water to flow around the dam in times of extreme weather, before it overtops the dam and causes significant damage. During the 2011 flood, 19 of the County's 21 watershed dams overflowed into their spillways for the first time in history. There is an Emergency Action Plan for each of the watersheds detailing different emergency levels and proper procedures; each emergency plan provides an evacuation map for residential areas that could be affected. The Department of Public Works Engineering team performed a series of engineering analyses on spillways to evaluate their stability and susceptibility to erosion; those spillways in need of repair were submitted as part of the County's Capital Improvement Program. In addition, TV/ video inspection of outfall piping at the County's high hazard dams were completed to examine the structural integrity and to identify needs for repairs/ upgrades.

During the 2011 flood when numerous evacuation centers were full, the County realized the need for a large evacuation center to accommodate thousands of people. With funds from the Governor's Office for Storm Recovery (GOSR) funds, the Planning and Emergency Services Departments are coordinating a \$500,000 study to evaluate the feasibility of renovating an existing county-owned facility into a regional evacuation center for future storm events. This facility could also serve as a training facility for emergency/ public safety squads when it is not being used for an emergency.

Broome County Planning also coordinates a group called the Flood Task Force. This group has representatives from local, state, and federal governments, including engineers, Soil and Water Conservation District staff, code officers and elected officials. The group serves to educate its members on topics related to flooding such as flood map amendments, flood insurance, and mitigation funding programs, as well as advocating for changes in federal and state regulations related to flood policy and hazard mitigation.

In 2016, the Planning Department released the Broome County Watershed Flood Hazard Mitigation Plan which provides an overview of the flood hazard risks throughout the County and acts as a tool for local municipal officials to make informed decisions on where to locate flood mitigation activities to achieve maximum benefit of their flood mitigation funds. This report established a database of flood hazards throughout the County and provides a systematic method to evaluate and rank flood risks. In addition, the report includes conceptual designs and a cost-benefit analysis for three high-risk mitigation projects. The final report can be accessed online at: www.gobroomecounty.com/planning/pubs.



Binghamton University Events Center (2011)

Source: Binghamton University

TOWN OF CONKLIN: In 2008, the Town completed a drainage study to mitigate the flash flooding issue from Carlin Creek in the Carol Court neighborhood. The implementation of this study included the installation of a new spillway and culvert, the cleaning of drainage ditches, and constructing a berm protection barrier in Schnurbusch Park. The Town also completed an engineering study to mitigate erosion and washout problems near Fallbrook and Stenson Road. To address this problem, new riprap was installed on the embankment, the drainage ditch was rerouted, and a new split-flow device was connected to divide the flow of water. Currently, the Town is working on implementing a plan to mitigate the standing water issue at Berota Court and Schnurbusch Park. The design for this project is complete, but the Town is waiting on an easement from a private property owner to begin the project.

TOWN OF UNION: In 2016, the Taft Heights/ Taft Avenue Sewer Collection Area Sanitary Study was completed; this study provided an analysis of the existing sewer lines/ drainage system for Taft Avenue (North) and two adjacent neighborhoods. In addition, the Town is performing a hydrologic analysis of Pine Street, North Loder Avenue and Robble Avenue in Endicott, which will make recommendations to address peak water flows.

The Town is currently working on a stormwater management study to determine alternatives for flood-proofing community facilities in the Village of Endicott on South Loder Avenue. After Phase 1 was completed, it was determined that the existing stormwater and sewer lines did not have enough capacity, so a section of these lines were recently replaced. Phase 2 of the project will consist of increasing the size of the stormwater pipe; this project is now out to bid and expected to be completed by the end of 2017. The Town completed a stormwater study for central Endicott (including the areas of Huron Campus, Skye Island Drive, Oak Hill Avenue, and the intersection of Robble Avenue and Clark Street) to examine the feasibility of constructing a new stormwater system to mitigate future flood risks. The next phase of this project involves examining the engineering/ design feasibility of an underground storage tank system.

US ARMY CORPS OF ENGINEERS: The USACE and the NYSDEC are working together on the Upper Susquehanna River Basin Flood Risk Management and Watershed Assessment Study to identify flood damage reduction measures for residents and businesses; the reconnaissance study was completed in 2010, prior to the 2011 flood. The USACE and the NYSDEC expect to execute the next phase of this study which would include the Upper Susquehanna River Basin Comprehensive Flood Damage Reduction Feasibility Study and provide mitigation projects for flood-prone areas.

Emergency Services

Emergency services actions protect people and property, during and immediately following, a disaster or hazard event. Services include warning systems, emergency response services, and the protection of essential facilities. Certain plans, organizations and critical facilities are also included in this section.

BROOME COUNTY: To assist its municipalities with disaster recovery, Broome County developed a Debris Management Plan. This document provides municipalities with an organizational structure, guidance, and standardized procedures for the removal and disposal of flood debris. This plan lays out the roles and responsibilities of offices and personnel involved with debris management, health and safety procedures to be followed, environmental regulations and permits to obtain for debris management, it details the County's approach for using reduction, reuse, and reclamation, and describes the protocol and lists priority areas for debris removal.

After 2006, Emergency Response Plans and associated action sequences were updated to correlate with BCGIS inundation models; these updates proved effective during the 2011 flood. To better assist residents during emergency situations, the Emergency Services Department developed agreements with the United Way and Broome County Organizations Active in Disaster (BCOAD) to utilize 211 (a program that updates residents with important information) more effectively. Emergency Services has made significant improvements into its backup communications infrastructure for 911 and public safety radio dispatching. Also, Emergency Services regularly publicizes the NY-Alert system, which is run by NYS and is used by municipalities to broadcast alert messages to its citizens for free. Broome County has completed a comprehensive Continuity of Operations/Continuity of Government Plan that can be implemented during any emergency, including a flood.

BROOME COUNTY COMMUNITY ORGANIZATIONS ACTIVE IN DISASTER (COAD): The Broome County COAD is an organization whose mission is to provide a collaborative structure to coordinate the work of community organizations and resources to mitigate, prepare for, respond to, and recover from disasters in Broome County, NY. Officially created in 2009, COAD is a membership program, comprised of independent agencies and organizations that may be active in all or any phases of disaster in Broome County. Since 2011, Broome County COAD has recruited over 1,000 volunteers, working over 50,000 hours to help the local community recover from disaster. They helped the 2011 flood recovery process by assisting individuals with their FEMA registration, and repaired/ rebuilt over 100 homes. In 2015, they hosted a FEMA Local Volunteer and Donations Management training to strengthen the capacity of local organizations to handle volunteers and donations during a disaster. Broome County COAD publishes a monthly newsletter that provides readers with safety and preparedness information.

TOWN OF CONKLIN: The Dormitory Authority of New York State (DASNY) is working with the Town on a feasibility study/ preliminary design of an evacuation route and flood protection measures for the Powers Road neighborhood where 300 residents were airlifted in 2006.

VILLAGE OF ENDICOTT: Plans to create a water supply interconnection (between the Village of Endicott and the Town of Vestal) are currently in the design phase; this project will create additional access to potable water for the Village in the event the existing water supply is unavailable.

VILLAGE OF JOHNSON CITY: In 2013, Supervisory Control and Data Acquisition (SCADA) equipment, used for monitoring and control purposes, was elevated above record-setting flood levels at the Combined Sewer Operations (CSO) facility.

VILLAGE OF WHITNEY POINT: The Village recently adopted a new Emergency Evacuation plan to bolster preparedness for the future.

Natural Resource Protection

Natural Resource Protection involves actions that minimize loss, and also preserves or restores the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.

Stream Bank Protection: Erosion is a common problem that occurs during and after a heavy rainfall or major flooding event. Maintaining bank stabilization projects can help protect streams and creeks from major erosion problems. Two common bank stabilization projects include structural (use of concrete blocks, large stones, riprap, retaining walls, etc.) and bioengineering (use of grasses, trees and other plant materials) to protect the bank. Small-scale stabilization projects may help reduce the need for an expensive, complex restoration project later on.

TOWN OF FENTON: Numerous bank stabilization projects in areas of Porter Hollow Creek, Canal Street, and the Port Crane Fire Station were completed.

VILLAGE OF JOHNSON CITY: In 2012, the Village lined a roadside ditch with riprap, installed a larger culvert and discharge pipe to increase flow capacity and minimize erosion on Deyo Hill Road.

TOWN OF UNION: The Town is in the process of restoring and stabilizing stream banks; Brixius Creek is currently in the environmental review phase, Patterson Creek is being designed, and West Creek will begin sometime in 2016.

TOWN OF VESTAL: The Town identified 7 major bank stabilization projects between completed since the 2006 flood. These projects focused on areas near Powderhouse Road, Chcoconut, Tracy, Raylene and Echo Creeks.

SOIL AND WATER CONSERVATION DISTRICT: The Broome County Soil and Water Conservation District assists citizens and local government in making sound decisions concerning the management of soil, water, and other natural resources. They received a state Stream Recovery Grant to stabilize and restore streams at high priority locations, and to prevent future flooding damages. With these funds the SWCD stabilized over 2,500 feet of stream banks in Binghamton, Windsor, Vestal, Sanford, Fenton, Kirkwood and the Town of Binghamton. In addition, they removed excess stream debris over 4,500 feet of streams in Windsor, Fenton, Vestal, Sanford, Maine and Chenango to help slow down stream flows and reduce erosion. Currently, they are working with the New York State Governor's Office of Storm Recovery to administer a \$3 million of New York Communities Rising Regional River Initiative which will go towards flood mitigation projects throughout the County.

Public Education and Awareness

Public awareness actions inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. Such actions include outreach projects, real estate disclosure, hazard information centers, and school-age and adult education programs.

Broome County and its municipalities have organized numerous public outreach efforts to keep residents informed about flood hazards and recovery. Broome County has flood-related information available online to promote public awareness and help municipalities plan for the future. Within the BC GIS Parcel Mapper, users can interactively choose Floodplain data layers including FEMA existing and preliminary floodplains, 2006 and 2011 flood inundations, SRBC flood stages, and 2011 aerial photos of the flood in the urban area. The Towns of Chenango and Union, and the Village of Johnson City created webpages which provides residents with information about flood insurance, property protection measures, safety tips, flood definitions, and includes information about flood recovery projects and updates. They can be accessed at: http://townofchenango.com/?page_id=253; <http://www.townofunion.com/emergency.htm>; <http://www.villageofjc.com/sewer.html#amp>.

In addition, many towns' local newsletters and webpages publicize information to residents about flood aftermath procedures and assistance programs.

In February, the NYS Citizens Preparedness Corps held a free training event at the Broome County Library to educate attendees how to properly prepare for any disaster, including developing a family emergency plan and stocking up on emergency supplies. In November 2015, the USACE and the NYSDEC provided flood-fight training to educate municipalities and residents about USACE assistance available to them, and to educate them about emergency preparedness. In addition, the USACE continually holds levee safety programs in Broome County; these programs include inspections to determine operations and maintenance issues, risk assessments associated with living behind a levee, and the anticipated performance of the levees during a high-water event and the consequences following potential water overtopping the structures. Public awareness efforts will continue to ensure residents are prepared in the event of another flood.

Community Rating System (CRS) is a voluntary program from the National Flood Insurance Program (NFIP) that recognizes community efforts that go beyond minimum NFIP requirements of floodplain management. There are a variety of actions communities can take to earn points towards a reduction (5% up to 45%) off property owners' insurance premiums. According to FEMA, CRS activities enhance public safety, reduce damages to property and public infrastructure, avoid economic disruption and losses, reduce human suffering, and protect the environment. Municipalities are required to provide annual update reports to NFIP. The Town of Union and the Village of Johnson City actively participate in this program. The Town of Chenango recently completed the CRS application and received confirmation from the NFIP. Other communities noted they explored the possibility of participating, but the program savings would not be cost-beneficial in the long run.

Summary

Broome County has a long, painful history of flooding. Many long-term residents thought that the flood of 1972 would be the greatest disaster ever faced by the region. But that record was broken in 2006 and again in 2011. These events devastated the local economy, disrupted many lives, and sapped government resources. The recovery from each flood has been long and slow. The perception by many in the community is that nothing has changed, nothing has been done.

But a great deal has been done. Critical facilities are now protected against future floods. This includes a carefully-designed, effective floodwall system at Lourdes Hospital and Union-Endicott High School. Similar protections are now being constructed for the Binghamton-Johnson City Joint Sewage Treatment. MacArthur School was rebuilt to be flood-proof and followed the highest environmental design standards. Multiple municipalities such as Conklin, Johnson City, Kirkwood, Union, and Vestal have begun the process of flood-proofing or relocating their municipal buildings out of the floodplain to protect against flood risks in the future.

The flood of 2006 taught us the value of having a well-coordinated volunteer and response effort. The result is COAD, a full-time organization which has put into place memorandums of understanding for managing donated supplies, securing staging areas, opening shelters, etc. to be utilized in time of disaster. COAD has also carried out large exercises to ensure that the volunteer network is ready to act quickly in the response phase of the next flood.

Over 370 flood-impacted properties were purchased and demolished. This takes homeowners out of harm's way for the next flood. By creating over 100 acres in open space, buyouts also allow flood waters to spread out farther, thereby protecting other structures.

In preparing this report, it is clear that flood mitigation in Broome County is not one, monolithic, highly-visible project, but rather dozens of smaller less well-known efforts. With slender resources and many competing needs, local officials have worked hard to mitigate our flooding hazards. Over 170 projects have been completed and at least 45 more are underway. Local, state, and federal partners have spent nearly \$500 million to improve our flood resiliency. Flooding cannot be prevented. But local officials have taken many actions to ensure that future floods will not have the same disastrous impact on lives and property.

Appendix A

Federal and State Funding Programs

The following funding programs assisted Broome County communities with the planning, funding and implementation phases of municipal projects:

FEMA: Hazard Mitigation Assistance (HMA) Grants
Hazard Mitigation Grant Program (HMGP)
Flood Mitigation Assistance (FMA) Program
Pre-Disaster Mitigation (PDM) Program
Increased Costs of Compliance Coverage (ICC)
USDA Natural Resources Conservation Service (NRCS) – Emergency Watershed Protection (EWP)
Program
NYS Governor’s Office of Storm Recovery (GOSR): NY Rising Program
American Recovery and Reinvestment Act (ARRA)
Community Development Block Grant- Disaster Recovery (CDBG-DR)
Empire State Development’s Hurricane Irene–Tropical Storm Lee Flood Mitigation Grant Program
NYRC Regional River Initiative

Plans and Reports

Broome County reviewed the following plans and reports to create a list of flood mitigation projects to include in the project:

Broome County All-Hazards Mitigation Plan (2013)
NY Rising Community Reconstruction Plan (NYRCR Broome and Town of Chenango 2014)
City of Binghamton: “Mayor David: Focus on Flood Hazard Mitigation” (2015)
Town of Union Community Plan for Recovery and Resilience (2015)
City of Binghamton Blueprint Binghamton (2013)
Town of Union Action Plan for Disaster Recovery (2012)
Town of Union Community Development Block Grant (CDBG) Worksheet

Appendix B

Flood Mitigation Terms

100-Year Flood: A 100-year flood has a 1% chance of being equaled or exceeded in any given year.

500-Year Flood: A 500-year flood has a 0.2% chance of being equaled or exceeded in any given year.

Backflow Preventer Valve: A device used to temporarily block drainage pipes to protect buildings from sewage backup

Berm: A mound of earthen materials constructed along a waterway or road to protect against flooding

Catch Basin: A catch basin is a receptacle or reservoir that receives surface water runoff or drainage, typically made of concrete or bricks with a metal grate on top to allow water to enter.

Check Valve: A mechanism that allows for the flow of water or other fluids in one direction and not the opposite direction.

Culvert: A drain, pipe or channel which allows water to pass under a road or embankment.

Flood-Related Erosion: The collapse or sinking of land caused by an unusually high water level in a natural body of water, accompanied by a severe storm or by an unanticipated force of nature, such as a flash flood or an abnormal tidal surge, or by some similarly unusual and unforeseeable event which results in flooding.

Flood-Proofing: Flood-proofing involves any structural or non-structural changes, or adjustments to structures which reduce or eliminate flood damage.

Hydrologic Analysis: Performed to quantify the water flow rate of a drainage system

NFIP: National Flood Insurance Program; aims to reduce the impact of flooding on private and public structures. It does so by providing affordable insurance to property owners and by encouraging communities to adopt and enforce floodplain management regulations.

Outfall: An outfall pipe funnels treated or untreated stormwater and wastewater discharge to the ocean or other body of water.

Pump Stations: Pump stations are used to transfer fresh, storm and waste water across a distance.

Riprap: Rock placed on embankment slopes to prevent erosion.

Relief Well Systems: Used to reduce foundation seepage pressures to a tolerable level

Scour: The result of an erosive action of flowing water in waterways, excavating and carrying away material from the bed and banks.

Spillway: A structure that passes water in a manner that protects the structural integrity of dams or dikes.

Stormwater Management: The planned control of precipitation runoff

Sediment: Stone, gravel or cobbles that originate from the weathering of rocks and is transported by, suspended in, or deposited by water.

Well Station: Used to provide drinking water to public or private water supplies

Appendix C

Mitigation Project Tables

Broome County Flood Mitigation Progress Report: Completed & In-Progress Projects

Entity	Action	Description	Location	Classification	Status	Cost	Date
Broome County	FEMA Property Acquisition	Acquired flood-prone properties	Towns of Conklin and Kirkwood	Property Protection	COMPLETE: Two homes acquired in Conklin and one in Kirkwood; properties were turned over to the Towns		2010
Broome County Department of Public Works	Infrastructure Repairs/ Enhancements	Repaired 20 bridges and two culverts	Barker, Colesville, Conklin, Dickinson, Fenton, Kirkwood, Lisle, Sanford, Union, Vestal, Windsor	Structural Project	COMPLETE		2011-2013
Broome County Department of Public Works	Plans/ Studies	Performed a series of spillway engineering analyses to determine which structures were in most need of repair	County-wide	Prevention	COMPLETE		
Broome County Department of Public Works	Plans/ Studies	TV/ video inspection of outfall piping to identify needs for repair	Broome county's High-Hazard Dams	Prevention	COMPLETE		
Broome County Emergency Services	Infrastructure Repairs/ Enhancements	Meets with NYSDEC to support floodwall closures	County-wide	Structural Project	IN-PROGRESS		
Broome County Planning Department/ Emergency Services	Plans/ Studies	Feasibility study to create a regional evacuation shelter for emergencies	County-wide	Prevention	IN-PROGRESS	\$500,000	

Broome County Flood Mitigation Progress Report: Completed & In-Progress Projects

Entity	Action	Description	Location	Classification	Status	Cost	Date
Broome County Planning Department	Plans/ Studies	The Broome County Watershed Flood Hazard Mitigation Plan identifies and evaluates flood risk and acts as a tool for municipalities to make more informed decisions regarding mitigation funds	County-wide	Prevention	COMPLETE	\$50,000	2016
Broome County Planning Department	Plans/ Studies	The Debris Management Plan provides municipalities with information about debris removal protocol during and emergency	County-wide	Emergency Services	COMPLETE		2011
Broome County GIS	Public Outreach	The BCGIS updated its Parcel Mapper with a floodplain layer; users can view inundation levels from both floods and FIRM maps	County-wide	Public Awareness	COMPLETE		
Broome County Emergency Services	Plans/ Studies	The County's Emergency Response Plan actions were updated to correlate with BCGIS flood inundation models	County-wide	Emergency Services	COMPLETE		

Broome County Flood Mitigation Progress Report: Completed & In-Progress Projects

Entity	Action	Description	Location	Classification	Status	Cost	Date
Broome County Emergency Services	Plans/ Studies	The County completed a comprehensive Continuity of Operations/ Continuity of Government Plan	County-wide	Emergency Services	COMPLETE		
Broome County Emergency Services	Support Services	The County developed agreements with the United Way, COAD, and 211 to better assist residents and organize resources during an emergency	County-wide	Emergency Services	COMPLETE		
Broome County Emergency Services	Support Services	The County made improvements to its backup communications systems for 911 and public safety radio dispatching	County-wide	Emergency Services	COMPLETE		

City of Binghamton Flood Mitigation Progress Report: Completed & In-Progress Projects

Document	Action	Description	Location	Classification	Status	Cost	Date
Hazard Mitigation Plan (2013)	Drainage Improvements	Storm and sanitary sewer separation to assist with peak flows	James Street, Penston Road, Vestal Avenue	Structural Project	COMPLETE		
Hazard Mitigation Plan (2013)	Drainage Improvements	Cleaned / upgraded 60-inch sewer in First Ward	Trout Brook Storm Sewer	Structural Project	COMPLETE		2015
Hazard Mitigation Plan (2013)	Pump Stations	Upgraded pump station	First Ward, McDonald Avenue	Emergency Services	COMPLETE	\$1.9 million	2015
Hazard Mitigation Plan (2013)	Back-Up Power Supply	Installed back-up generator at City Hall	Downtown, City Hall	Emergency Services	COMPLETE		
Hazard Mitigation Plan (2013)	FEMA Property Acquisition	Acquired 20 flood-prone properties	Duke Street, Baltimore Avenue, Avon Rd, Laurel Avenue, New Street	Property Protection	COMPLETE: 20 buyouts		
NY Rising (2014)	Drainage Improvements	Stormwater and sewer line separation	Riverside Drive	Structural Project	COMPLETE		2016
Hazard Mitigation Plan (2013)	Infrastructure Repairs/ Enhancement	Work with United States Army Corps of Engineers (USACE) to analyze and upgrade infrastructure	First Ward	Structural Project	IN-PROGRESS: Design complete, funding secured, awaiting USACE permit approval		
NY Rising (2014)	Pump Stations	Upgrade sanitary sewer infrastructure and pumps at multiple sites	City-wide	Emergency Services	IN-PROGRESS		
NY Rising (2014)	Stream Channel Repairs	Repair Park Creek channel concrete and replace Chamberlain Creek culvert	Park Creek (Southside) Chamberlain Creek (Eastside)	Natural Resource Protection	IN-PROGRESS: Some repairs have been made to Park Creek	\$1.5 million	
NY Rising (2014) Mayor's Report (2015)	Drainage Improvements	Stormwater and sewer line separation	Front Street	Structural Project	IN-PROGRESS: Design complete; Project out to bid 2016	\$750,000	

Town of Conklin Flood Mitigation Progress Report Completed & In-Progress Projects

Document	Action	Description	Location	Classification	Status	Cost	Date
Hazard Mitigation Plan (2013)	FEMA Property Acquisition	Town acquired properties within floodplain	Flood-prone areas; Conklin Rd, JR Blvd, Stillwater Road, Alta Road, Shipman Road, Woodcrest Way, Miller Street areas	Property Protection	COMPLETE: 111 properties purchased by TOC		
Hazard Mitigation Plan (2013)	Property Elevation	Approximately 10 residents elevated homes	Lilac Place, Conklin Road, JR Blvd., Stillwater Road, Shirley Avenue	Property Protection	COMPLETE		
Hazard Mitigation Plan (2013)	Plans/ Studies	Performed engineering study to mitigate erosion and washout problems	Fallbrook and Stenson Roads; Little Snake Tributary	Prevention	COMPLETE: Rerouted ditches, new split flow, riprap control on embankment		
Hazard Mitigation Plan (2013)	Plans/ Studies	Drainage study to mitigate flash flooding issue	Carol Court neighborhood; Carlin Creek	Prevention	COMPLETE: Engineering Study completed in 2008; Outcomes: replaced spillway, cleaned ditch and installed larger culvert in Schnurbusch Park, created berm protection barrier		
Hazard Mitigation Plan (2013)	Critical Facilities	Identify and flood-proof critical facilities located in hazard areas	Town-wide	Property Protection	COMPLETE: Water well on Terrace Drive was elevated		

Town of Conklin Flood Mitigation Progress Report Completed & In-Progress Projects

Document	Action	Description	Location	Classification	Status	Cost	Date
Hazard Mitigation Plan (2013)	Critical Facilities	Identify and flood-proof critical facilities located in hazard areas	Town-wide	Emergency Services	COMPLETE: Three portable generators were purchased and will be located at critical facilities in the Town		
Hazard Mitigation Plan (2013)	Plans/ Studies	Incorporate Hazard Mitigation Plan into updated Town Comprehensive Plan	Town-wide	Prevention	COMPLETE: Natural Disaster Mitigation and Responsiveness recommendations		
Hazard Mitigation Plan (2013)	Plans/ Studies	Develop a plan to mitigate standing water issue	Berota Court, Schnurbusch Park	Prevention	IN-PROGRESS: Design complete, awaiting easement from property owner		
Hazard Mitigation Plan (2013)	Drainage Improvements	Continue to implement mitigation drainage activities from previous engineering study, planning to install new split flow device	Carol Court neighborhood	Structural Project	IN-PROGRESS: Short-term mitigation activities complete (listed above), working with NYSDEC to address environmental concerns for remainder of project		

Town of Conklin Flood Mitigation Progress Report Completed & In-Progress Projects

Document	Action	Description	Location	Classification	Status	Cost	Date
NY Rising (2014)	Drainage Improvements	Installation of stormwater drainage system including a one-end section with bar screen, corrugated pipe, four man holes, and a flap gate at pipe's discharge point into river	Stillwater Road	Structural Project	IN-PROGRESS: Design underway, construction expected to begin in 2017	\$600,000	
NY Rising (2014)	Plans and Studies	Feasibility study and preliminary engineering of an evacuation route and additional flood protection	Powers Road neighborhood	Emergency Services	IN-PROGRESS: Dormitory Authority (DASNY) executing study and design Implementation pending progress of feasibility study and design	\$130,000	
NY Rising (2014)	Critical Facilities	Construct new community center outside of the floodplain; provides space for emergency operations and shelter during storm events	Town-wide; out of floodplain	Property Protection	IN-PROGRESS: Planning phase	\$1.2 million	

Village of Endicott Mitigation Progress Report: Completed & In-Progress Projects

Document	Action	Description	Location	Classification	Status	Cost	Date
Hazard Mitigation Plan (2013)	Back-Up Power Supply	Obtain funding for new generator	South Street Water Station	Emergency Services	COMPLETE: Generator purchased	\$100,000	
Hazard Mitigation Plan (2013)	Back-Up Power Supply	Maintain existing portable and stationary back-up generators	DPW and other critical facilities	Emergency Services	COMPLETE: Two generators purchased for the water dept.		
Hazard Mitigation Plan (2013)	Critical Facilities	Elevate equipment above 2011 flood levels	Ranney Well Station	Emergency Services	COMPLETE		
Hazard Mitigation Plan (2013)	Drainage Improvements	Repaired culvert, installed new storm sewer pipe, installed two new catch basins, repaired existing catch basin and repaired	North Adams and Jenkins Street	Structural Project	COMPLETE		
Hazard Mitigation Plan (2013)	Infrastructure Repairs/ Enhancements	Installed fabric, repaired guard rail and road surface	Industrial Park Blvd.	Structural Project	COMPLETE		
Hazard Mitigation Plan (2013)	Infrastructure Repairs/ Enhancements	Repaired storm sewer man hole, water main, curb, sidewalk and road surface	Robble Avenue and West Clark Street	Structural Project	COMPLETE		
Hazard Mitigation Plan (2013)	Infrastructure Repairs/ Enhancements	Repaired sanitary sewer, main man hole	Riverview Drive	Structural Project	COMPLETE		

Village of Endicott Mitigation Progress Report: Completed & In-Progress Projects

Document	Action	Description	Location	Classification	Status	Cost	Date
Hazard Mitigation Plan (2013)	Infrastructure Repairs/ Enhancements	Replaced storm sewer pipe and repaired by-pass mechanism	Loder Avenue (200 Block), Loder Pump Station	Structural Project	COMPLETE: Funded by CDBG-DR funds from Town of Union		
Hazard Mitigation Plan (2013)	FEMA Property Acquisition	Two properties purchased for demolition	509 and 604 South Loder Avenue	Property Protection	COMPLETE		
Hazard Mitigation Plan (2013)	Critical Facilities	Continue on-going repairs, create a plan exploring alternatives for flood- proofing measures to be implemented when funding becomes available	Waste Water Treatment Plant	Property Protection	IN-PROGRESS: Phase 1 Planning Stage		
2014 NY Rising	Water Supply	Create additional access to potable water in the event the existing water supply is unavailable	Village of Endicott	Emergency Services	IN-PROGRESS: Design phase	\$549,000	
NY Rising (2014)	Critical Facilities	Provide flood mitigation for pump stations and install a generator	Endwell, Loder, and River Terrace Stations	Emergency Services	IN-PROGRESS: Phase 1 planning is near complete	\$710,000	
NY Rising (2014) CDBG Activity sheet	Drainage Improvements	Installation of backflow preventer valves on individual homes	Town-wide	Property Protection	IN-PROGRESS: Funded by CDBG-DR funds from Town of Union; Two (out of proposed 50) backflows purchased for 106 and 111 North Jackson Avenue	\$40,000	2015

Village of Johnson City Flood Mitigation Progress Report 2016: Completed & In-Progress Projects

Document	Action	Description	Location	Classification	Status	Cost	Date
Hazard Mitigation Plan (2013)	FEMA Property Acquisition	FEMA Buyout Program; property purchased and maintained as green	37 River Terrace	Property Protection	COMPLETE		2007
		FEMA Buyout program— 4 properties purchased	33 River Terrace 83 Olive Street 91 Olive Street 72 N Hudson Street	Property Protection	COMPLETE	\$38,000	2015-2016
		FEMA Buyout Program— 3 properties pending	16 N Harrison Street 52 N Harrison Street 16 N Baldwin Street	Property Protection	IN-PROGRESS		
Hazard Mitigation Plan (2013)	Property Elevation	Elevated home to protect against future flood damage	525 Grand Avenue	Property Protection	COMPLETE		2007
Hazard Mitigation Plan (2013)	Infrastructure Repairs/ Enhancements	Improved drainage ditch with concrete headwall and vertical trash racks	Reynolds Road	Structural Project	COMPLETE	\$39,500	June 2012
Hazard Mitigation Plan (2013)	Infrastructure Repairs/ Enhancements	Installed new concrete steps for velocity dissipation, replacing damaged gabion steps	Robinson Hill Road	Natural Resource Protection	COMPLETE	\$29,000	June 2012
Hazard Mitigation Plan (2013)	Drainage Improvements	Lined roadside ditch with riprap, culvert size was increased and discharge pipe was installed	Deyo Hill Road	Natural Resource Protection	COMPLETE	\$47,000	May 2012
Hazard Mitigation Plan (2013)	Drainage Improvements	Reconstructed road with curb and closed drainage system	Arthur Avenue	Structural Project	COMPLETE	\$307,000	June 2012

Village of Johnson City Flood Mitigation Progress Report 2016: Completed & In-Progress Projects

Document	Action	Description	Location	Classification	Status	Cost	Date
Hazard Mitigation Plan (2013)	Back-Up Power Supply	Back-up generators installed at various locations	Wells #6/#7, Fairview Street/ Reynolds Road Booster Stations, North and Southside Fire	Emergency Services	COMPLETE: Fairview Street, Reynolds road, Well #7, Well #6 were flood-proofed	\$795,000	2009-2012
Hazard Mitigation Plan (2013)	Critical Facilities	Elevate SCADA equipment at least one foot above record setting flood levels	Combined Sewer Operations (CSO) facility	Property Protection	COMPLETE	\$307,500	2013
NY Rising (2014) Community Recovery Plan (2015)	Pump Stations	Upgraded pump station power supply, operational equipment, primary structure and accessibility	Brown Street	Structural Project	COMPLETE	\$208,000	2016
Hazard Mitigation Plan (2013) NY Rising (2014) Community Recovery Plan	Drainage Improvements	Rehabilitate drainage ditch and stormwater system to protect against future erosion and increase water storage capacity	Area between Anna Maria Drive and Reynolds Road	Structural Project	IN-PROGRESS: Out to bid April 2016	\$1,000,000	2016
NY Rising (2014) Community Recovery Plan (2015)	Critical Facilities	Planning and design to build DPW offices on second floor at existing site, maintain flood insurance; construct new maintenance building and garage	DPW Facility (Brown Street)	Property Protection	IN-PROGRESS: Finalizing preliminary cost estimates; pending GOSR funding and FEMA appeal	\$1.45 million	

Village of Johnson City Flood Mitigation Progress Report 2016: Completed & In-Progress Projects

Document	Action	Description	Location	Classification	Status	Cost	Date
Hazard Mitigation Plan NY Rising (2014)	Critical Facilities	Water Treatment Plant improvements; elevate/construct new building, replace generator	Water Department/ Treatment Plant (Camden Street)	Property Protection	IN-PROGRESS: Out to bid March 2016 Generator purchased (2013)	\$1 million	2016-2017
Community Recovery Plan (2015)							
CDBG Activity Worksheet	Drainage Improvements	Reconstruct road with curbing and infiltration system	Hudson Street, Grand Avenue and railroad tracks	Structural Project	IN-PROGRESS: Out to bid April 2016	\$165,000	2016

Town of Kirkwood Flood Mitigation Progress Report: Completed & In-Progress Projects

Document	Action	Description	Location	Classification	Status	Cost	Date
Hazard Mitigation Plan (2013)	FEMA Property Acquisition	Properties have been acquired through FEMA	Flood-prone areas including Kirkwood Gardens, Geiger Lane, River Run Lane, and Route 11 areas	Property Protection	COMPLETE: 19 Properties purchased by the Town		
Hazard Mitigation Plan (2013)	Flood Infrastructure	Upgraded twin culverts for peak storm flow	Barlow Road	Structural Project	COMPLETE: Increased size of culverts with ARRA Grant		2006
Additional Projects	Property Elevation	Five homes elevated through ICC Grant	Susquehanna Lane, Route 11	Property Protection	COMPLETE	\$30,000 per home	
Additional Projects	Flood Infrastructure	Replaced culverts, repaired ditches and bank stabilization	Foley Road, Riverview, Veterans River Park	Structural Project	COMPLETE: FEMA Assistance Project		
Hazard Mitigation Plan (2013)	Plans/ Studies	Feasibility study for removal of gravel/ sediment at mouths of six (6) major tributaries of the Susquehanna River	Town-wide; tributary confluence	Natural Resource Protection	COMPLETE: Woidt Engineering study looked at feasibility of removing sediment in Stratton Mill, Park and Acre Creeks and provided recommendations		
Hazard Mitigation Plan (2013)	Critical Facilities	Relocate Town Highway Garage	Town-wide; out of floodplain	Property Protection	IN-PROGRESS: Planning Phase: Purchased land on Frances Street, behind Town Hall		

Town of Union Flood Mitigation Progress Report: Completed & In-Progress Projects

Document	Action	Description	Location	Classification	Status	Cost	Date
Hazard Mitigation Plan (2013)	FEMA Property Acquisition	Purchased properties in flood-prone areas	Argonne Neighborhood, South Endwell, Fairmount Park, Westover, West Corners	Property Protection	COMPLETE: 149 Total Buyouts	\$2.1 million	
CDBG-DR Activity Sheet	Acquisition for Redevelopment	Acquired flood-damaged homes to be demolished and redeveloped	Westover Neighborhood Fairmount Park	Property Protection	COMPLETE: 149 Total Buyouts	\$951,000	
Hazard Mitigation Plan (2013)	Pump Stations	Replaced pump station and increased capacity	Dittrich Street	Structural Project	COMPLETE	\$15,000	
CDBG-DR Worksheet	Pump Station	Made repairs to Interconnection pump station	Johnson City-Endicott	Structural Project	COMPLETE	\$31,000	
Hazard Mitigation Plan (2013)	Flood Infrastructure	Installed box culverts to improve drainage and increase flows of Bradley and Patterson Creeks	Carriann Drive, Struble Road	Structural Project	COMPLETE		
Hazard Mitigation Plan (2013)	Flood-proofing	Installed door jamb and back flow device; made repairs caused by flooding	YMCA, Johnson City	Property Protection	COMPLETE	\$203,000	2016
CDBG Activity Sheet	Facility Repairs	Replaced bathroom facility, flood-proof design with flood insurance policy	Glendale Park, Endicott	Property Protection	COMPLETE: Bathroom facility built to FEMA standards and carries flood insurance	\$153,000	
Hazard Mitigation Plan (2013)	Back-Up Generators	TOU purchased generator for Endicott Water Treatment Facility	Village of Endicott	Emergency Services	COMPLETE	\$175,000	

Town of Union Flood Mitigation Progress Report: Completed & In-Progress Projects

Document	Action	Description	Location	Classification	Status	Cost	Date
CDBG Activity Sheet	Critical Facilities	Flood-proofing of lower levels; aging boiler and electrical systems replaced	Boys and Girls Club, Endicott	Property Protection	COMPLETE:	\$207,000	2015-2016
Hazard Mitigation Plan (2013)	Plans/ Studies	Taft Heights/ Taft Avenue Sewer Collection Area Sanitary Study Evaluation: Analysis of sewer lines/ drain system	Taft Avenue (North) and two adjacent neighborhoods	Prevention	COMPLETE: Final Draft submitted 2016	\$90,000	
Hazard Mitigation Plan (2013)	Rehabilitation Programs	Seek/ provide funding of rehabilitation programs for owner-occupied units	Within floodplain	Property Protection	IN-PROGRESS: A total of 8 applications received; engineer hired to inspect foundation issues, provide plans and costs for repairs	\$751,000	
CDBG-DR Worksheet							
Hazard Mitigation Plan (2013)	Flood Infrastructure	Build sectional gate on flood control structure to supplement existing flood protection system to the East	Fairmont Park, Watson Blvd. (east)	Structural Project	IN-PROGRESS: Design complete, expected to go out for bid in 2016	\$800,000	
Hazard Mitigation Plan (2013)	Drainage Improvements	Backflow preventer device installation program	Town-wide	Property Protection	IN-PROGRESS: Devices installed on Seward Avenue	\$135,000	
Hazard Mitigation Plan (2013)	Drainage Improvements	Street reconstruction to increase drainage, separate catch basin and extend line	North Loder Avenue	Structural Project	IN-PROGRESS	\$700,000	

Town of Union Flood Mitigation Progress Report: Completed & In-Progress Projects

Document	Action	Description	Location	Classification	Status	Cost	Date
CDBG-DR Worksheet	Plans/ Studies	Hydrologic analysis of major watersheds and recommendations for future drainage improvements	Three neighborhoods within Endicott: Pine St, North Loder Avenue, Robble Avenue	Prevention	IN-PROGRESS	\$75,000	
NY Rising (2014) Community Recovery Plan (2015)	Stream Bank Stabilization	Restore and stabilize stream banks	West Creek (north of Day Hollow Road) Patterson Creek	Natural Resource Protection	IN-PROGRESS: Brixius Creek undergoing environmental review, design 30% complete. Patterson Creek under design. West Creek will commence in 2016	\$300,000	
Hazard Mitigation (2013) NY Rising (2014)	Critical Facilities	Purchase land out of the floodplain to relocate the Highway and Refuse Facility	2900 Wayne Street	Property Protection	IN-PROGRESS: Land purchased, RFQ out for design of facility		
Hazard Mitigation Plan (2013) NY Rising (2014)	Critical Facilities	Prepare stormwater management study to explore alternatives to flood-proofing facilities	Endicott: Jennie F. Snapp School, Union Presbyterian Church Education Building, Central Methodist Church	Property Protection	IN-PROGRESS: Phase 1: Stormwater system study determined there was not enough capacity; SW/ sewer lines replaced 208 Loder to Hannah Street. Phase 2: Design to increase stormwater main out to bid	\$295,000	2016-2017
CDBG Activity Sheet	Infrastructure Repairs/ Enhancements	Installing sediment trap	Brixius Creek	Structural Project	IN-PROGRESS: Obtaining USACE permits		

Town of Union Flood Mitigation Progress Report: Completed & In-Progress Projects

Document	Action	Description	Location	Classification	Status	Cost	Date
Hazard Mitigation Plan (2013) 2014 NY Rising	Drainage Improvements	Analysis of stormwater system and construction of new system to mitigate future flood risks	Central Endicott/ Huron Campus; Skye Island Drive to Oak Hill Avenue, Intersection at Robble and Clark	Prevention	IN-PROGRESS: Stormwater study complete, engineering/ design feasibility of underground storage tanks underway	\$2.2 million	2017-2018
Hazard Mitigation Plan (2013)	Drainage Improvements	Drainage repair and improvement of storm sewer system; rerouting of drainage to mitigate centralized flooding events	Endicott: McKinley Avenue- Pine Street	Structural Project	IN-PROGRESS: Design complete, out to bid in 2016	\$2.2 million	2017-2018
NY Rising (2014) Community Recovery Plan (2015)	Drainage Improvements	Separate stormwater lines from sanitary sewer lines to eliminate flooding	Johnson City: Interceptor B; St. Charles to Cherry Street between Grand and Floral Avenue	Structural Project	IN-PROGRESS: Preliminary design phase	\$400,000	2016-2017

Town of Vestal Flood Mitigation Progress Report 2016: Completed & In-Progress Projects

Document	Action	Description	Location	Classification	Status	Cost	Date
Hazard Mitigation Plan (2013)	FEMA Property Acquisition	14 homes acquired & demolished (2008)	Castle Gardens area	Property Protection	COMPLETE: 14 buyouts (2008)	\$1,675,000	2008
		58 additional buyouts purchased (2013)	Twin Orchards & Castle Gardens area	Property Protection	57 buyouts (2014)	\$4,978,867	2015
Hazard Mitigation Plan (2013)	Flood-proofing	Flood-proof critical facilities	Fire Station #3, Ross Corners	Property Protection	COMPLETE: Installed check valve and purchased mobile flood gate	\$6,000	Aug. 2012
Hazard Mitigation Plan (2013)	Flood-proofing	Constructed floodwall	Town Hall	Structural Project	COMPLETE: 7ft floodwall built on east side of property	\$100,000	Sept. 2015
Hazard Mitigation Plan (2013)	Back-Up Power Supply	Purchased two back-up generators to existing storm water pump stations	Ethel Place and Valley Road	Emergency Services	COMPLETE: Portable generators and pump purchased	\$100,000	
Hazard Mitigation Plan (2013)	Stream Bank Stabilization	Improved stream bank protection at multiple creeks	Town-wide; State Line, Powderhouse Road, Choconut, Tracy, Raylene and Echo Creeks	Natural Resource Protection	COMPLETE: More information under Soil and Water Conservation section		
Hazard Mitigation Plan (2013)	Pump Stations	Flood control pumping station upgrades	Pumphouse Road	Structural Project	IN-PROGRESS: Design complete, project pending funding from DEC		
Hazard Mitigation Plan (2013) NY Rising (2014)	Pump Stations	Convert out of service sewer station to storm water pump station	Roberts Street/ Twin Orchards	Structural Project	IN-PROGRESS: Design Phase	\$850,000	2016
2013 Hazard Mitigation Plan NY Rising (2014)	Critical Facilities	Relocate Town Court, Police Dept. and Vestal EMS Squad out of floodplain	Town-wide	Property Protection	IN-PROGRESS	\$4.5 million	

All Other Municipalities Flood Mitigation Progress Report

Document	Action	Description	Location	Classification	Status	Cost	Date
Hazard Mitigation Plan (2013)	Flood Infrastructure	Increased the size of culverts	TOWN OF BARKER: Walters Road, King Street, Leetville Road, Bear Swamp Road, Bull Creek Road, Pease Hill Road, Davis Road, Cross Road, Barker Hill	Structural Project	COMPLETE		
Hazard Mitigation Plan (2013)	Flood Infrastructure	Purchased brush cutter and new equipment to maintain stormwater	TOWN OF BARKER	Structural Project	COMPLETE		
Hazard Mitigation Plan (2013)	Flood Infrastructure	New concrete bridge built with installation of heavy stone fill at the inlet and outlet of the bridge and stream channel	TOWN OF BINGHAMTON: Maxian Road (near Hawleyton)	Structural Project	COMPLETE		
Hazard Mitigation Plan (2013)	Flood Infrastructure	Analyzed culvert size increase; existing culvert overtops with heavy rain	TOWN OF BINGHAMTON: Maxian Road	Structural Project	COMPLETE		
Hazard Mitigation Plan (2013)	Flood Infrastructure	Rehabilitation of bridge; construction of new scour walls and installation of heavy stone to stabilize stream bed	TOWN OF BINGHAMTON: Hance Road	Structural Project	COMPLETE		

All Other Municipalities Flood Mitigation Progress Report

Document	Action	Description	Location	Classification	Status	Cost	Date
Hazard Mitigation Plan (2013)	Flood Infrastructure	New steel-pipe culvert installed with heavy stone fill at inlet and outlet of culvert and stream	TOWN OF BINGHAMTON: Hawthorne Road (Hazard Hill/ Moore Ave), Felters Road	Structural Project	COMPLETE		
Hazard Mitigation Plan (2013)	Flood Infrastructure	Rehabilitation of culvert; installation of new aluminum culvert with slip lining and new concrete headwalls/ wing walls at inlet and outlet; stabilized stream bank/ channel with heavy stone	TOWN OF BINGHAMTON: Cynthia Drive	Structural Project	COMPLETE		
Hazard Mitigation Plan (2013) NY Rising (2014)	Drainage Improvements	Install storm sewer system with catch basins to alleviate flooding from nearby creek	TOWN OF CHENANGO: Wallace Road - Smith Road	Structural Project	IN-PROGRESS: Design phase; construction to begin in 2017	\$1.2 million	2017
Hazard Mitigation Plan (2013)	Hazard Support Programs	Join Community Rating System (CRS) and continue participation	TOWN OF CHENANGO	Prevention	COMPLETE		2016
Hazard Mitigation Plan (2013)	Property Acquisition	Town purchased flood-prone property	TOWN OF COLESVILLE: 126 Riverview Place	Property Protection	COMPLETE		2008

All Other Municipalities Flood Mitigation Progress Report

Document	Action	Description	Location	Classification	Status	Cost	Date
Hazard Mitigation Plan (2013)	Flood Infrastructure	Replaced concrete retaining wall and culvert	TOWN OF COLESVILLE: Penny Hollow Road	Structural Project	COMPLETE		
Hazard Mitigation Plan (2013)	Flood Infrastructure	Implemented drainage improvements and built larger culverts	TOWN OF COLESVILLE	Structural Project	COMPLETE		
Hazard Mitigation Plan (2013)	Plans/ Studies	Stormwater infrastructure feasibility analysis to determine mitigation options for reoccurring flooding	TOWN OF DICKINSON: Boland Road (near SUNY Broome)	Prevention	COMPLETE		
Hazard Mitigation Plan (2013)	Flood Infrastructure	Implemented recommendation and installed a flap gate to prevent river backup	TOWN OF DICKINSON: Boland Road area	Structural Project	COMPLETE: Project funded by NYSDOT		2015
Hazard Mitigation Plan (2013)	Flood Infrastructure	Roadside ditches were lined with stone to prevent future erosion	TOWN OF FENTON	Structural Project	COMPLETE		
Hazard Mitigation Plan (2013)	Flood Infrastructure	Installed rock stream channel lining	TOWN OF FENTON: Near Port Crane Fire Station	Natural Resource Project	COMPLETE		

All Other Municipalities Flood Mitigation Progress Report

Document	Action	Description	Location	Classification	Status	Cost	Date
Hazard Mitigation Plan (2013)	Flood Infrastructure	Increase flow capacity and size of culverts when they are replaced	TOWN OF FENTON: Canal Street (near Post Office), Albany Street culvert	Structural Project	COMPLETE		
Hazard Mitigation Plan (2013)	Flood Infrastructure	Continue/ expand program to install riprap as necessary to protect municipal facilities	TOWN OF FENTON: Areas near Town facilities	Natural Resource Protection	COMPLETE: 250 feet of riprap channel lining protecting Port Crane Fire Station and the US Post office		
Hazard Mitigation Plan (2013)	Flood Infrastructure	Continue and expand newly created project to install riprap in road ditches to prevent future washouts	TOWN OF FENTON	Natural Resource Protection	COMPLETE: Completed Riprap installation including sediment trap near junction of NY 7B & NY369; installed Sediment Trap on Depot Hill Creek at 7B		
Hazard Mitigation Plan (2013)	Flood Infrastructure	Removed undersized pipes and installed new culvert, install additional pipe under highway; permanent easement required	TOWN OF FENTON: Porter Hollow Creek	Structural Project	COMPLETE: Obtained easement, removed undersized pipe, and lined 500' of stream channel		

All Other Municipalities Flood Mitigation Progress Report

Document	Action	Description	Location	Classification	Status	Cost	Date
Hazard Mitigation Plan (2013)	Flood Infrastructure	Channel lining, sedimentation pools, install heavy rock lining with stilling basins for silt and rock trap; replace existing private	TOWN OF FENTON: Channel between Route 7B and Canal Street	Structural Project	COMPLETE		
Hazard Mitigation Plan (2013)	Town Facilities	Added security lighting and fencing and cameras	TOWN OF FENTON: Well Fields and Storage Tanks	Prevention	COMPLETE: Security lighting & 12 cameras installed		
Hazard Mitigation Plan (2013)	Stream Protection	Stream bank protection	TOWN OF FENTON: Page Brook, Walnut Street	Natural Resource Protection	COMPLETE		
Hazard Mitigation Plan (2013)	Administrative	Modify mobile home ordinance to require that all new mobile homes be placed on permanent foundation	TOWN OF FENTON	Prevention	COMPLETE: New manufactured homes are permitted only in Mobile Home Parks. Frost protected foundations are		
Hazard Mitigation Plan (2013)	Flood Infrastructure	Storm sewer replacement	TOWN OF FENTON: Albany Street, Pine Street (Port Crane)	Structural Project	IN-PROGRESS: Preliminary design completed		
Hazard Mitigation Plan (2013)	Plans/ Studies	Analyze storm sewer GIS data for potential upgrades to infrastructure	TOWN OF FENTON: Depot Hill stream, NY Route 7B, Canal Street	Structural Project	IN-PROGRESS: Drainage inventory underway		
Hazard Mitigation Plan (2013)	Flood Infrastructure	Installation of bigger pipes	TOWN OF LISLE	Structural Project	COMPLETE		

All Other Municipalities Flood Mitigation Progress Report

Document	Action	Description	Location	Classification	Status	Cost	Date
Hazard Mitigation Plan (2013)	Critical Facilities	Designated evacuation system to Fire Station	VILLAGE OF LISLE	Emergency Services	COMPLETE		
Hazard Mitigation Plan (2013)	Flood Infrastructure	Reconstructed road bank/ rock cut to prevent future road and driveway washouts	TOWN OF MAINE: Pollard Hill Road	Structural Project	COMPLETE: Cross pipes were upsized, rock cut drainage improved	\$286,193	
Hazard Mitigation Plan (2013)	Flood Infrastructure	Assessment for upgrades to stormwater infrastructure	TOWN OF NANTICOKE: Kenyon Road	Structural Project	COMPLETE		
Hazard Mitigation Plan (2013)	Flood Infrastructure	Increased pumping capacity behind flood walls; pumping will continue during power outages	VILLAGE OF PORT DICKINSON: Near Watson Avenue	Structural Project	COMPLETE: Pumping capacity increased by over 50%, installed concrete pond facility; monitoring equipment and remote cameras will also be installed		2016
Hazard Mitigation Plan (2013)	Flood Infrastructure	Replaced pipes with larger diameter pipes, placing heavy rocks in streams at erosion points	TOWN OF SANFORD	Structural Project	COMPLETE		
Hazard Mitigation Plan (2013)	Flood Infrastructure	Riprap installed to stabilize bank; electrical components were upgraded and elevated	TOWN OF SANFORD: Oquaga Lake Sewer Plant	Structural Project	COMPLETE		

All Other Municipalities Flood Mitigation Progress Report

Document	Action	Description	Location	Classification	Status	Cost	Date
Hazard Mitigation Plan (2013)	Town Facilities	Acquired flood insurance for critical facilities	TOWN OF SANFORD: Highway Garage	Prevention	COMPLETE		
Hazard Mitigation Plan (2013)	Town Facilities	Acquired flood insurance for critical facilities	VILLAGE OF WHITNEY POINT: Sewer Plant	Prevention	COMPLETE		
Hazard Mitigation Plan (2013)	Plans/ Studies	Working with regulatory agencies to address chronic flooding	VILLAGE OF WHITNEY POINT: Prospect Street, Collins Road	Prevention	COMPLETE		
Hazard Mitigation Plan (2013)	Town Facilities	Purchased generator and portable generators for critical facilities	VILLAGE OF WHITNEY POINT: Sewer plant and pump stations	Emergency Services	COMPLETE		
Additional Project	Plans and Studies	Village adopted new Emergency Evacuation Plan to bolster preparedness	VILLAGE OF WHITNEY POINT	Prevention	COMPLETE		2016
Hazard Mitigation Plan (2013)	Flood Infrastructure	Improved river crossing and enlarged culverts for better drainage	VILLAGE OF WINDSOR	Structural Project	COMPLETE		
Hazard Mitigation Plan (2013)	Flood Infrastructure	Installation of riprap to enhance stream flow	VILLAGE OF WINDSOR: Occanum Creek	Structural Project	COMPLETE		
Hazard Mitigation Plan (2013)	Town Facilities	Elevated electrical controls above 100 year flood levels	VILLAGE OF WINDSOR: Well water pump house	Emergency Services	COMPLETE		
Hazard Mitigation Plan (2013)	Town Facilities	Completion and design of river crossing for public water supply	VILLAGE OF WINDSOR	Structural Project	COMPLETE		

Non-Municipal Flood Mitigation Progress Report: Completed & In-Progress Projects

Entity	Action	Description	Location	Classification	Status	Cost	Date
Binghamton City School District	Critical Facilities	Reconstructed school 5 feet above 500-year floodplain. Incorporated sustainable practices such as solar and geo-thermal energy technologies	MacArthur School, Binghamton	Structural Project	COMPLETE	\$79.5 million	2015
Binghamton-Johnson City Sewage Treatment Plant	Critical Facilities	Reconstruction and upgrades to of sewage treatment plant, construction of a floodwall to protect the new facility	Binghamton-Johnson City Sewage Treatment Plant, Vestal	Structural Project	IN-PROGRESS	\$200 million	2018
Binghamton-Johnson City Sewage Treatment Plant	Pump Stations	Elevating pump station and equipment	Gates Road, Vestal	Property Protection	IN-PROGRESS		2016
Binghamton University Pharmacy School	Stormwater Management	Plans to create on-site drainage retention pond	46 Corliss Avenue, Johnson City	Structural Project	IN-PROGRESS		2018
Lourdes Hospital	Critical Facilities	Constructed 11-foot floodwall with additional mitigation measures	Lourdes Hospital, Binghamton	Structural Project	COMPLETE	\$7 million	2011
New York State Citizens Preparedness Corps.	Public Outreach	Hosted training program for residents to prepare for disaster	Broome County Library, Binghamton	Public Awareness	COMPLETE		2016

Non-Municipal Flood Mitigation Progress Report: Completed & In-Progress Projects

Entity	Action	Description	Location	Classification	Status	Cost	Date
Union-Endicott Central Schools	Critical Facilities	Constructed 14-foot floodwall to the 500-year floodplain elevation	Union-Endicott High School, Endicott	Structural Project	COMPLETE	\$10 million	2009
United States Army Corps. of Engineers	Infrastructure Repairs/ Enhancements	Repaired levees to pre-flood conditions	City of Binghamton, Vestal, Endicott, Johnson City	Structural Project	COMPLETE	\$3.1 million	2013-2016
United States Army Corps. of Engineers and NYSDEC	Plans/ Studies	Upper Susquehanna Risk Management and Watershed Assessment to determine vulnerable areas and projects to increase protection	County-wide	Prevention	COMPLETE: Reconnaissance study completed in 2010, feasibility study expected to commence in the future		2010
United States Army Corps. of Engineers and NYSDEC	Public Outreach	Hosted public Flood-Fight training to educate residents about emergency preparedness	County-wide	Public Awareness	COMPLETE		2015
United States Army Corps. of Engineers	Public Outreach	Levee safety programs: inspections to determine maintenance and operational issues, educational information for residents	Binghamton, Endicott, Johnson City, Lisle, Vestal, Whitney Point	Public Awareness	COMPLETE		

Non-Municipal Flood Mitigation Progress Report: Completed & In-Progress Projects

Entity	Action	Description	Location	Classification	Status	Cost	Date
Soil and Water Conservation District (SWCD)	Stream bank stabilization	Stream restoration project: Installed slope rock, rip rap to stabilize bank and prevent damage from future flooding	Park Terrace, Binghamton; Route 38B, Maine; Old Route 17, Windsor	Natural Resource Protection	COMPLETE	\$113,000	
SWCD	Stream bank stabilization	Same as above 800' of rock rip-rap	Langdon Rd, Choconut Creek; Vestal	Natural Resource Protection	COMPLETE	\$155,000	
SWCD	Stream bank stabilization	Same as above 1000' of rock rip-rap	Ross Corners, Tracy Creek; Vestal	Natural Resource Protection	COMPLETE	\$200,000	
SWCD	Stream bank stabilization	Same as above 300' rock rip-rap	North Sanford, Oquaga Creek; Sanford	Natural Resource Protection	COMPLETE	\$40,000	
SWCD	Stream bank stabilization	Same as above 100' of rock rip-rap	Walnut Street, Page Brook; Fenton	Natural Resource Protection	COMPLETE	\$10,000	
SWCD	Stream bank stabilization	Same as above 130' of rock rip-rap	Zimmer Rd, Kirkwood	Natural Resource Protection	COMPLETE	\$19,000	
SWCD	Stream bank stabilization	Same as above 260' of rock rip-rap	Corner of Juneberry Road and NYS Rt. 26	Natural Resource Protection	COMPLETE	\$23,745	
SWCD	Stream bank stabilization	Same as above 100' feet of rock rip-rap	Hawleyton Rd; Binghamton	Natural Resource Protection	COMPLETE	\$9,800	

Non-Municipal Flood Mitigation Progress Report: Completed & In-Progress Projects

Entity	Action	Description	Location	Classification	Status	Cost	Date
Soil and Water Conservation District (SWCD)	Stream debris removal	Removed 800' of excess stream debris to protect agricultural land	Three sites in Windsor	Natural Resource Protection	COMPLETE	\$12,000	
SWCD	Stream and field debris removal	600' of stream corridor work	Castle Creek, Chenango	Natural Resource Protection	COMPLETE	\$8,000	
SWCD	Stream debris removal	1200' of stream debris removal	Tuscarora Creek, Windsor	Natural Resource Protection	COMPLETE	\$4,000	
SWCD	Stream debris removal	900' of stream debris removal	Occanum Creek, Windsor	Natural Resource Protection	COMPLETE	\$12,000	
SWCD	Stream debris removal	300' of stream debris removal	Tracy Creek, Vestal	Natural Resource Protection	COMPLETE	\$4,000	
SWCD	Stream debris removal	700' of stream debris removal	Fenton	Natural Resource Protection	COMPLETE	\$4,400	
SWCD	Stream debris removal	Stream and agricultural land debris removal	Oquaga Creek, Sanford	Natural Resource Protection	COMPLETE	\$2,200	
SWCD	Stream debris removal and stream bank stabilization	125' of rock rip-rap, agricultural land and stream debris removal	West Branch Nanticoke Creek, Maine	Natural Resource Protection	COMPLETE	\$16,000	
SWCD	Field debris removal	Debris removal from 4-acre crop field	Page Brook, Fenton	Natural Resource Protection	COMPLETE	\$10,200	

Non-Municipal Flood Mitigation Progress Report: Completed & In-Progress Projects

Entity	Action	Description	Location	Classification	Status	Cost	Date
New York State Department of Environmental Conservation (NYSDEC) Region 7	Flood Infrastructure	Comprehensive maintenance of levees and floodwalls	County-wide	Prevention	IN-PROGRESS		
NYSDEC Region 7	Flood Infrastructure	Structural condition assessment of floodwalls	County-wide	Prevention	COMPLETE		2014
NYSDEC Region 7	Flood Equipment	Purchased additional flood fighting equipment (pumps, excavators, lighting, etc.)	County-wide	Emergency Services	COMPLETE		2007
NYSDEC Region 7	Flood Infrastructure Protection	Removal of trees and other woody vegetation near levees	County-wide	Prevention	COMPLETE		2008
NYSDEC Region 7	Flood Infrastructure Protection	Replaced sluice gate hatch covers	County-wide	Prevention	COMPLETE		2009
NYSDEC Region 7	Stream Debris Removal	Shoal removal	County-wide	Natural Resource Protection	COMPLETE		2012
NYSDEC Region 7	Plans/ Studies	Video inspections of conduits through levees and floodwalls	County-wide	Prevention	COMPLETE		2013
NYSDEC Region 7	Flood Infrastructure	Replacement of defective conduits through levees	County-wide	Structural Project	COMPLETE: Phase 1 included 5 conduits		2014
NYSDEC Region 7	Plans/ Studies	Comprehensive survey and monumentation of flood control lands	County-wide	Prevention	IN-PROGRESS		

Appendix D

Maps

Flood Mitigation Projects

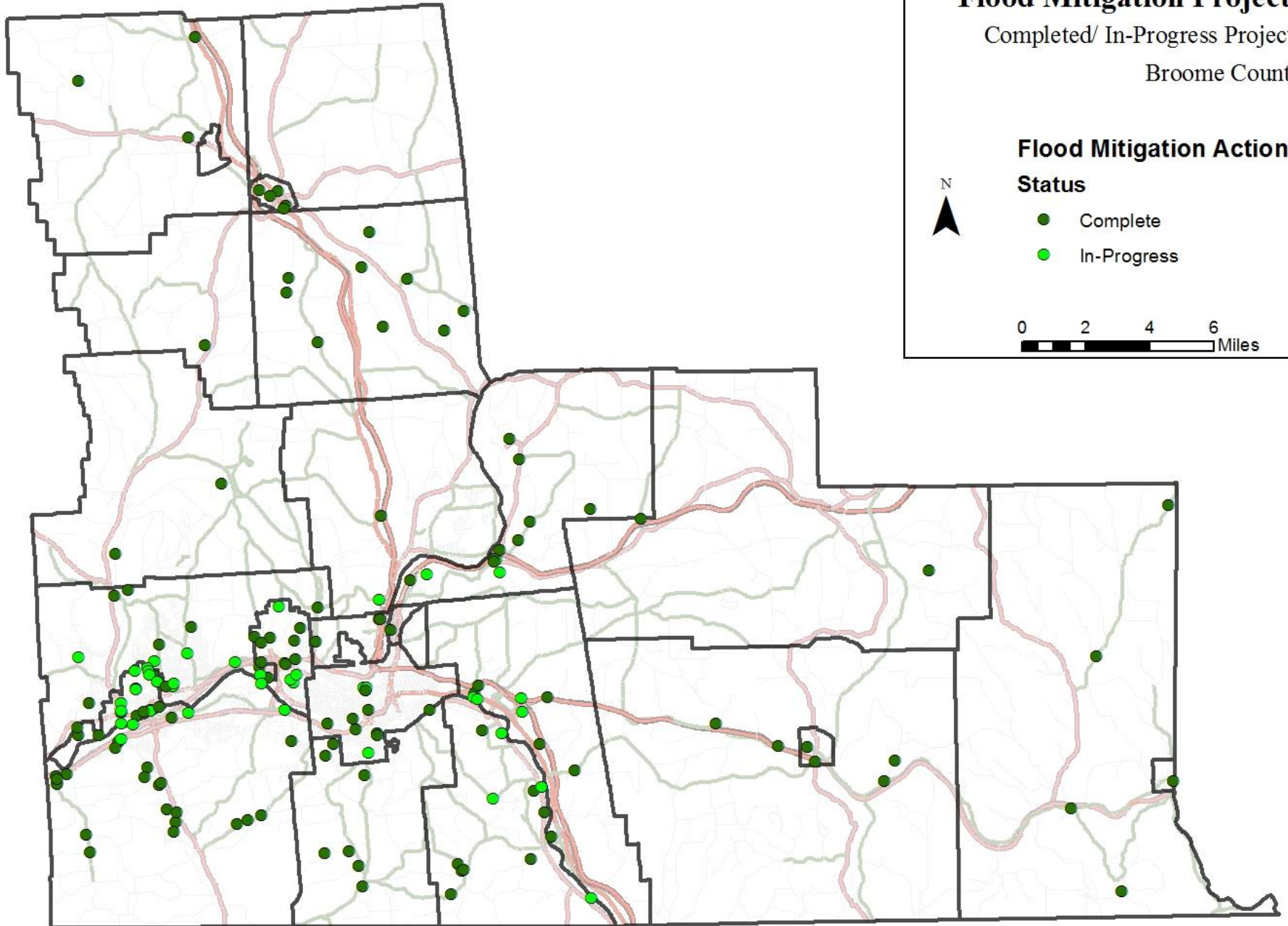
Completed/ In-Progress Projects

Broome County

Flood Mitigation Actions

Status

- Complete
- In-Progress



Flood Mitigation Projects

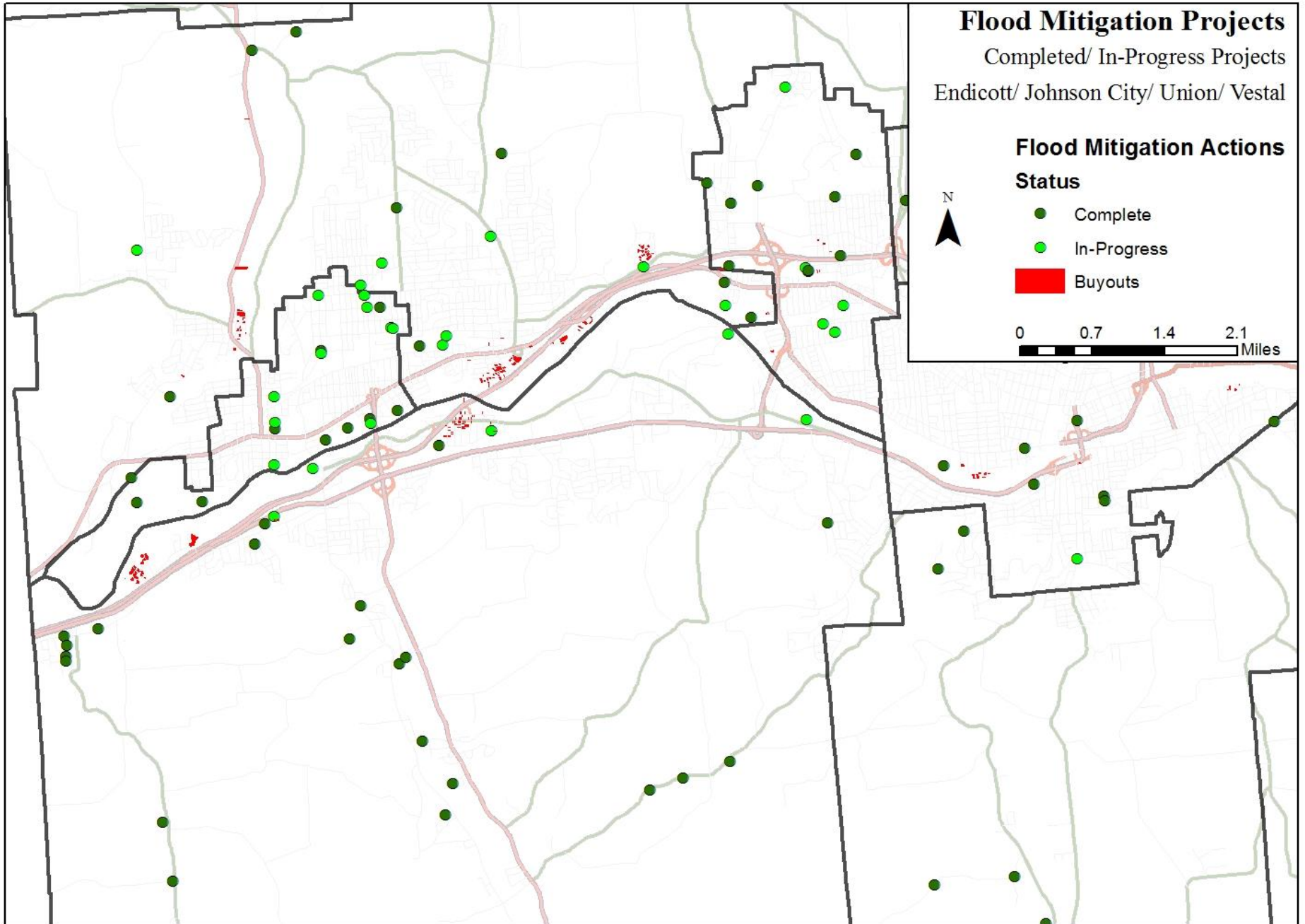
Completed/ In-Progress Projects
Endicott/ Johnson City/ Union/ Vestal

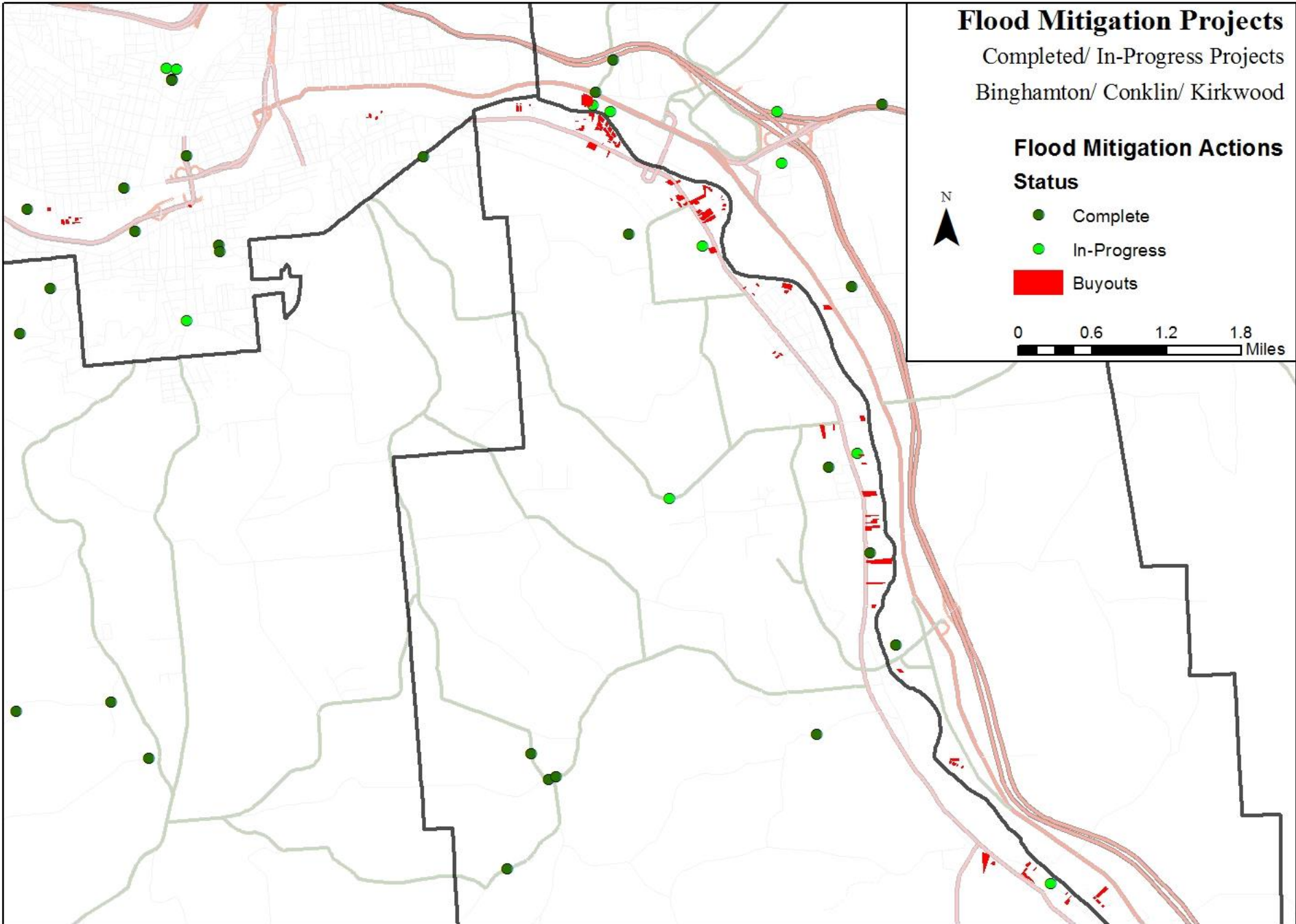
Flood Mitigation Actions Status

- Complete
- In-Progress
- Buyouts



0 0.7 1.4 2.1 Miles





Flood Infrastructure

Dams and Levees
Broome County

▲ Dams

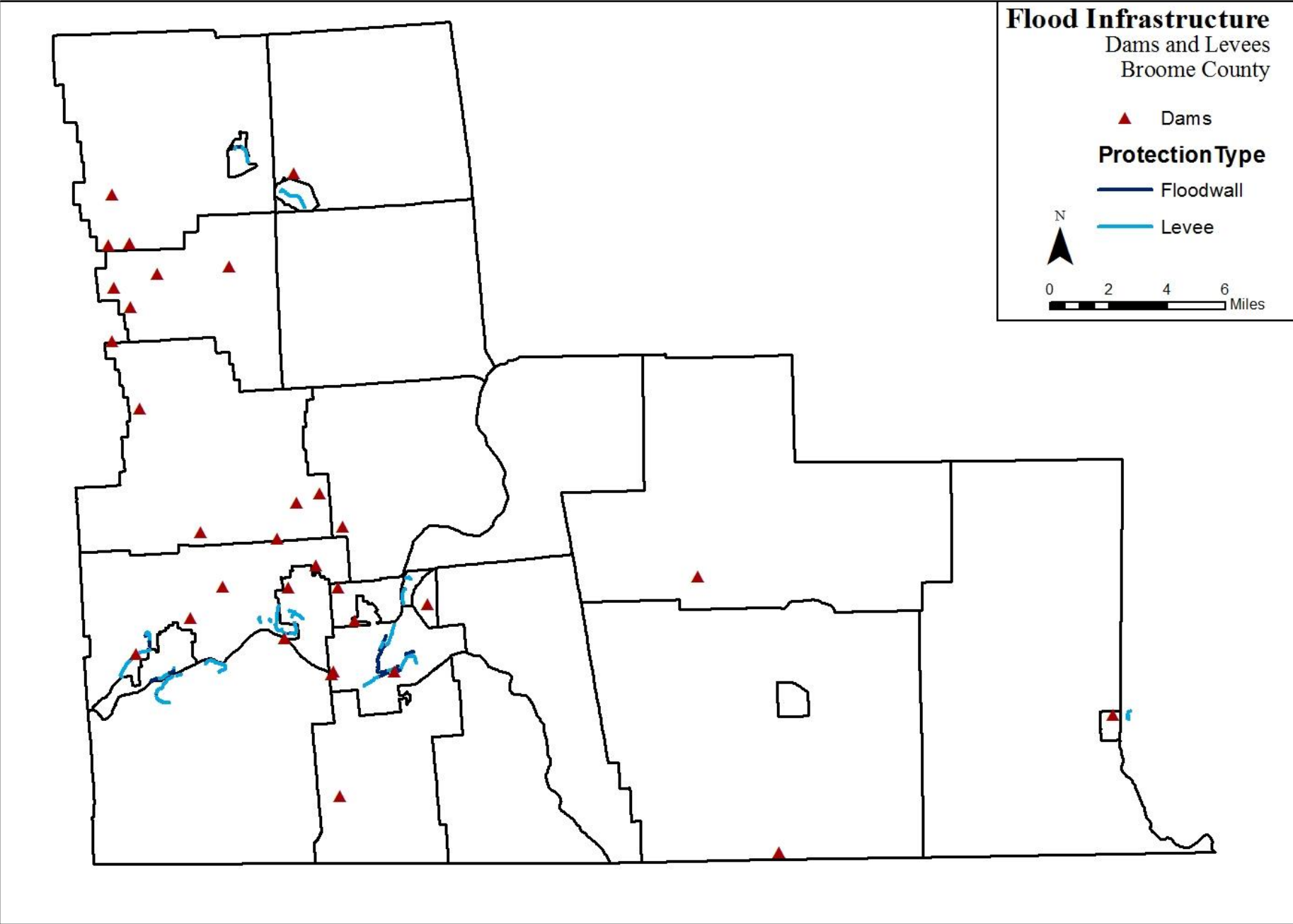
Protection Type

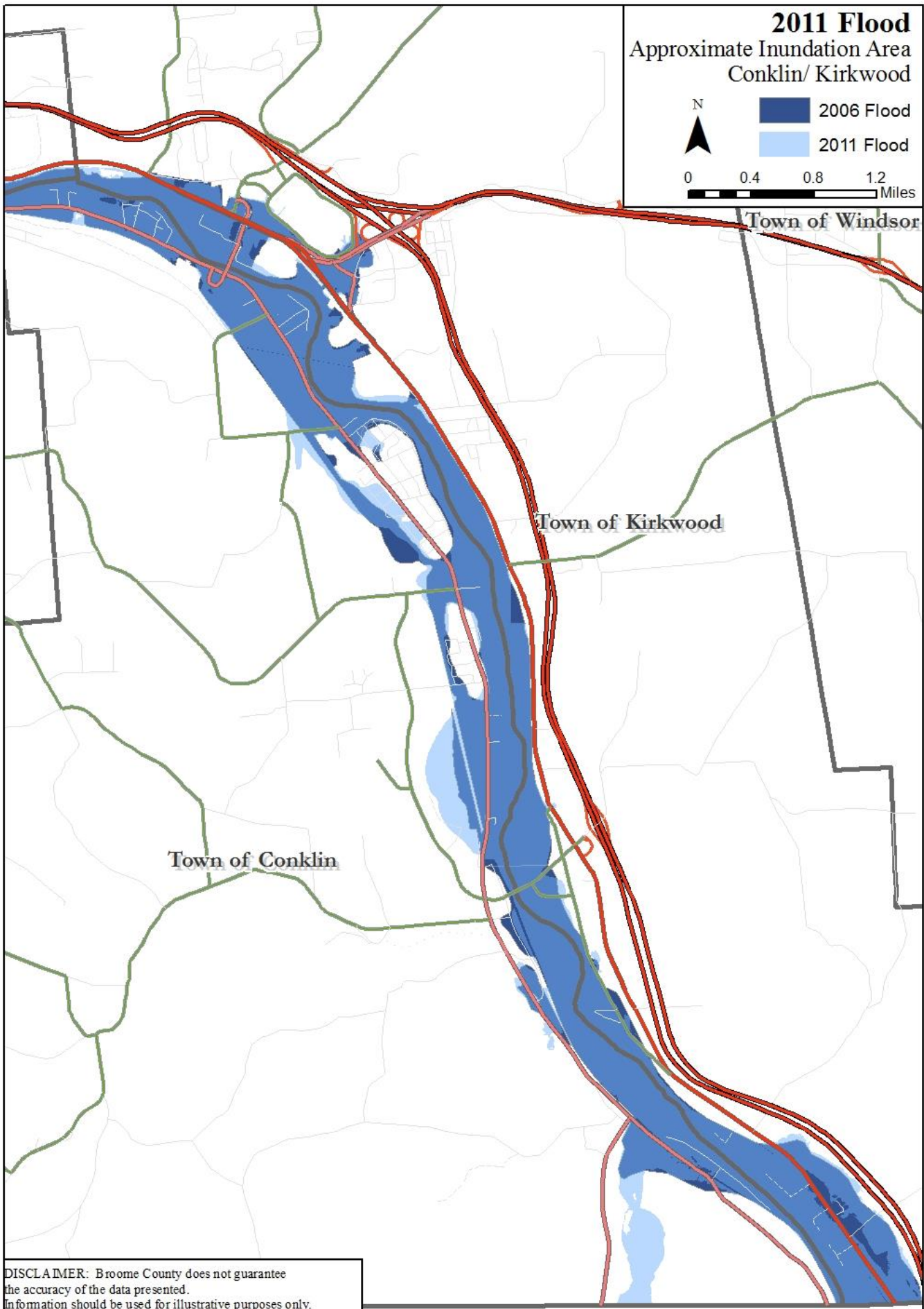
— Floodwall

— Levee

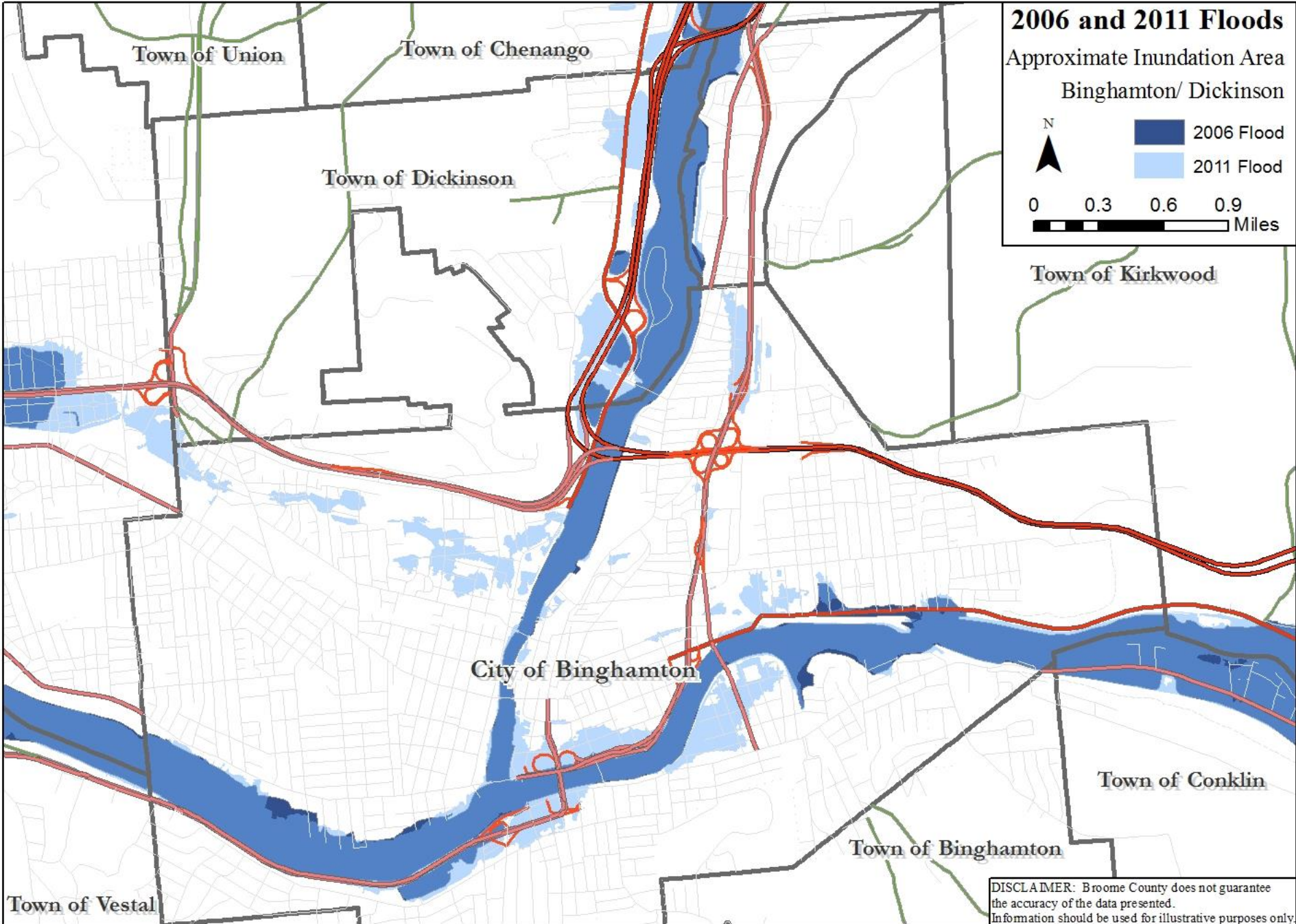


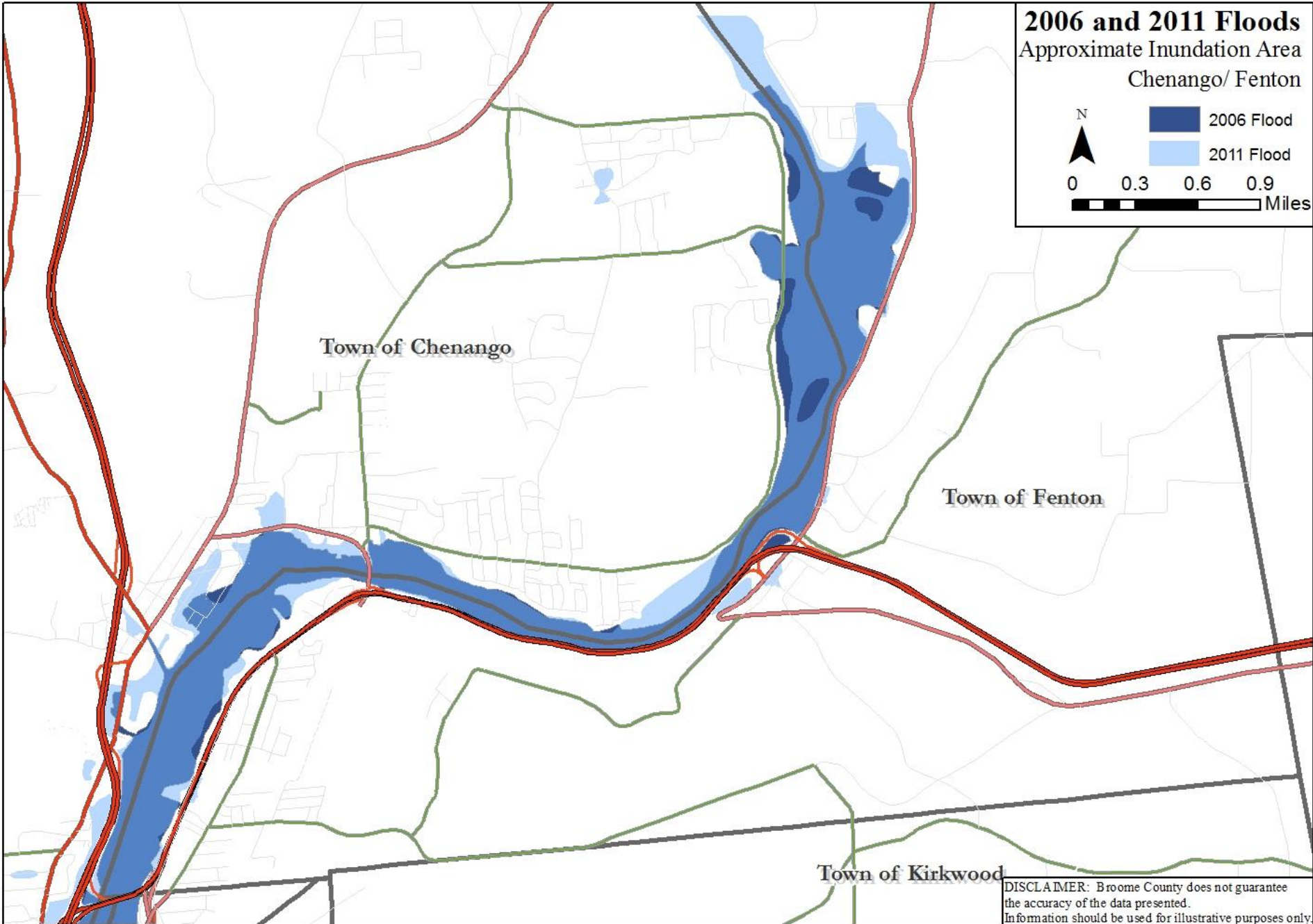
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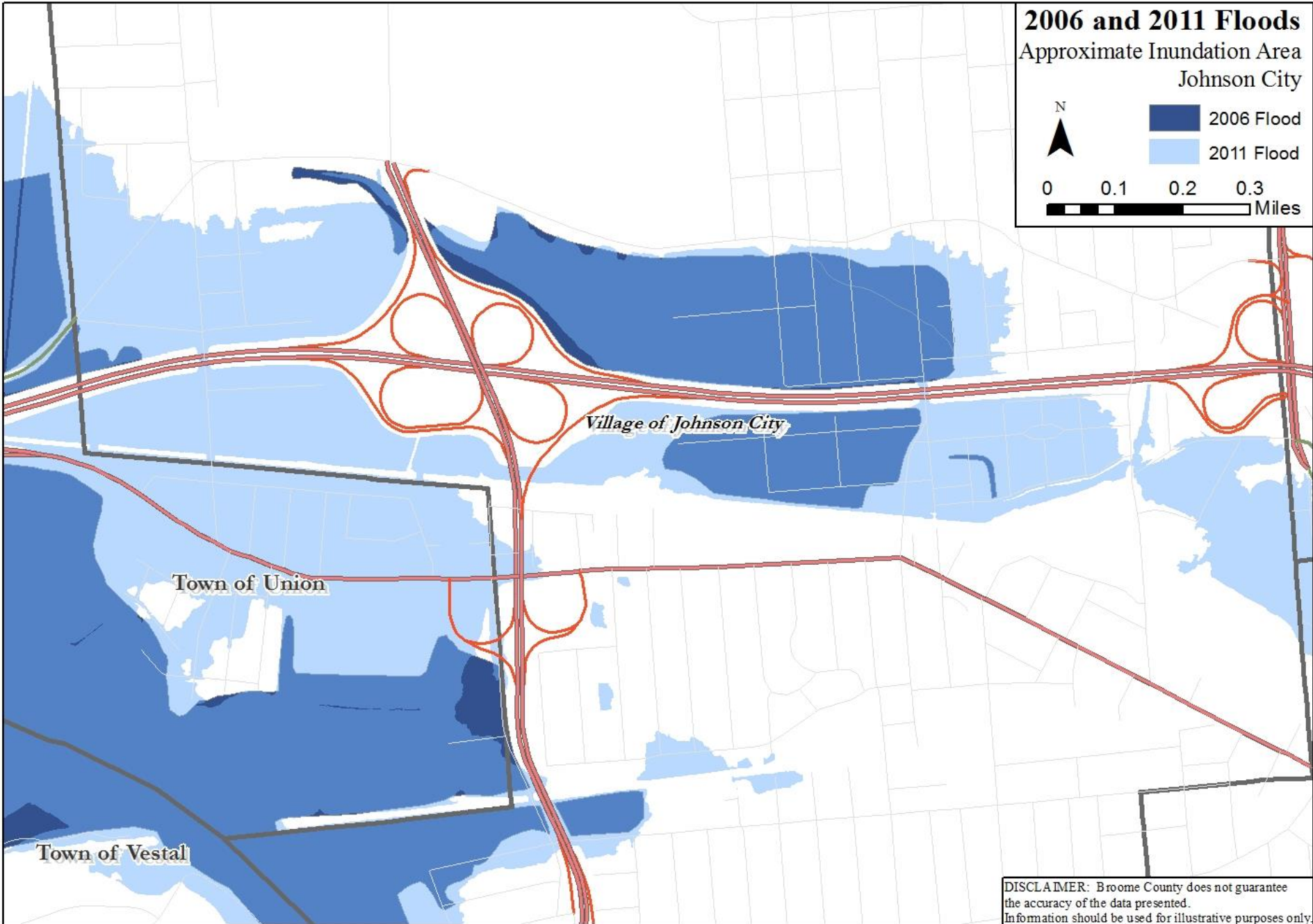


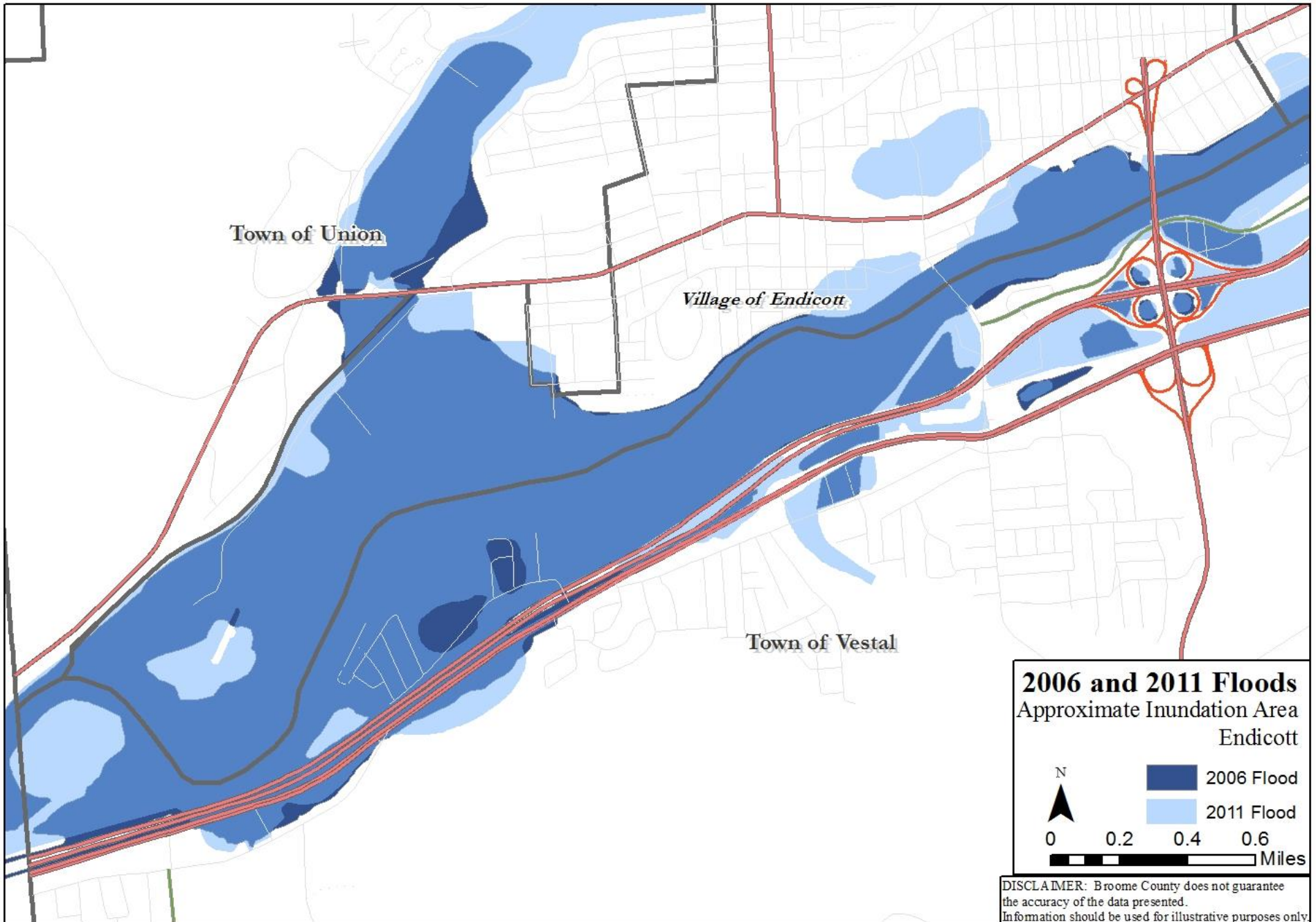


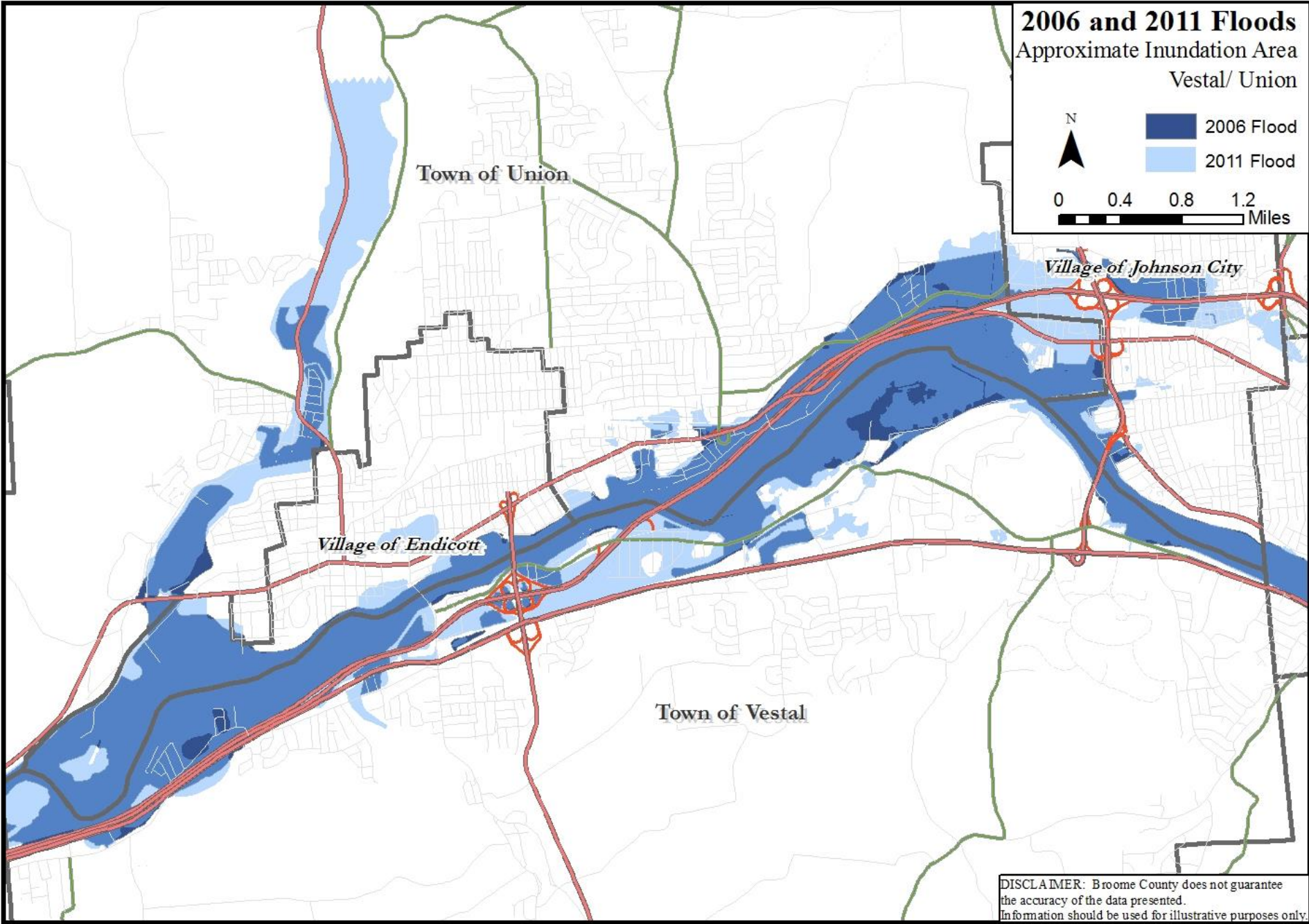
DISCLAIMER: Broome County does not guarantee the accuracy of the data presented. Information should be used for illustrative purposes only.











2011 Flood DRU Assessments Conklin & Kirkwood

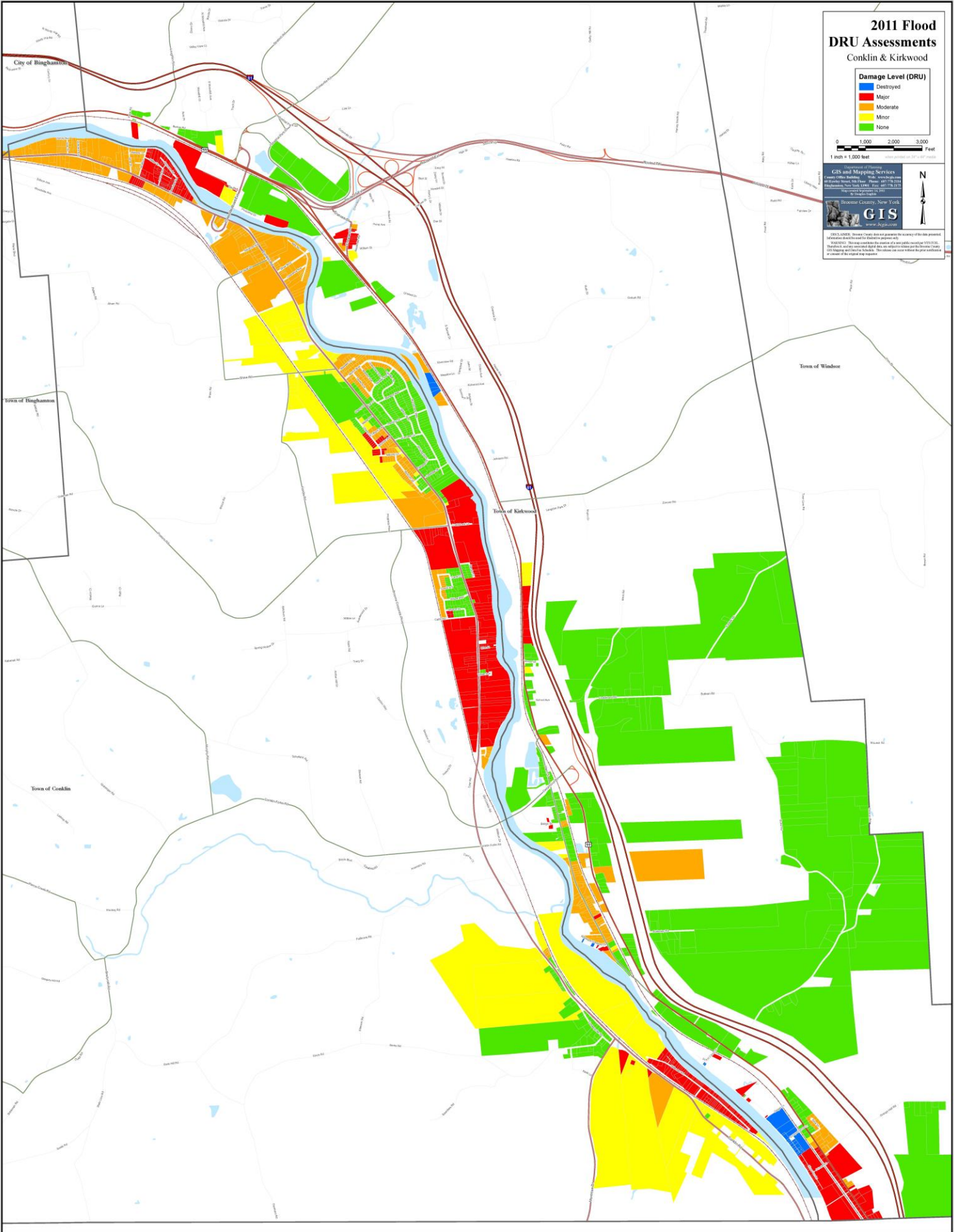
Damage Level (DRU)	
Blue	Destroyed
Red	Major
Orange	Moderate
Yellow	Minor
Green	None



Department of Planning
GIS and Mapping Services
County Office Building 10th Floor
100 Franklin Street, 12th Floor
Binghamton, New York 13902
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www.binghamton.gov

GIS
Geographic Information Systems

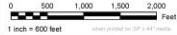
THIS MAPS: Shows County data as provided to the accuracy of the data provided. Information is not to be used for disaster preparedness or emergency response. This map was prepared by the use of a computer program (GIS) and is not a substitute for a professional survey. The user is responsible for the proper use and interpretation of the map data.



**2011 Flood
DRU Assessments**
City of Binghamton

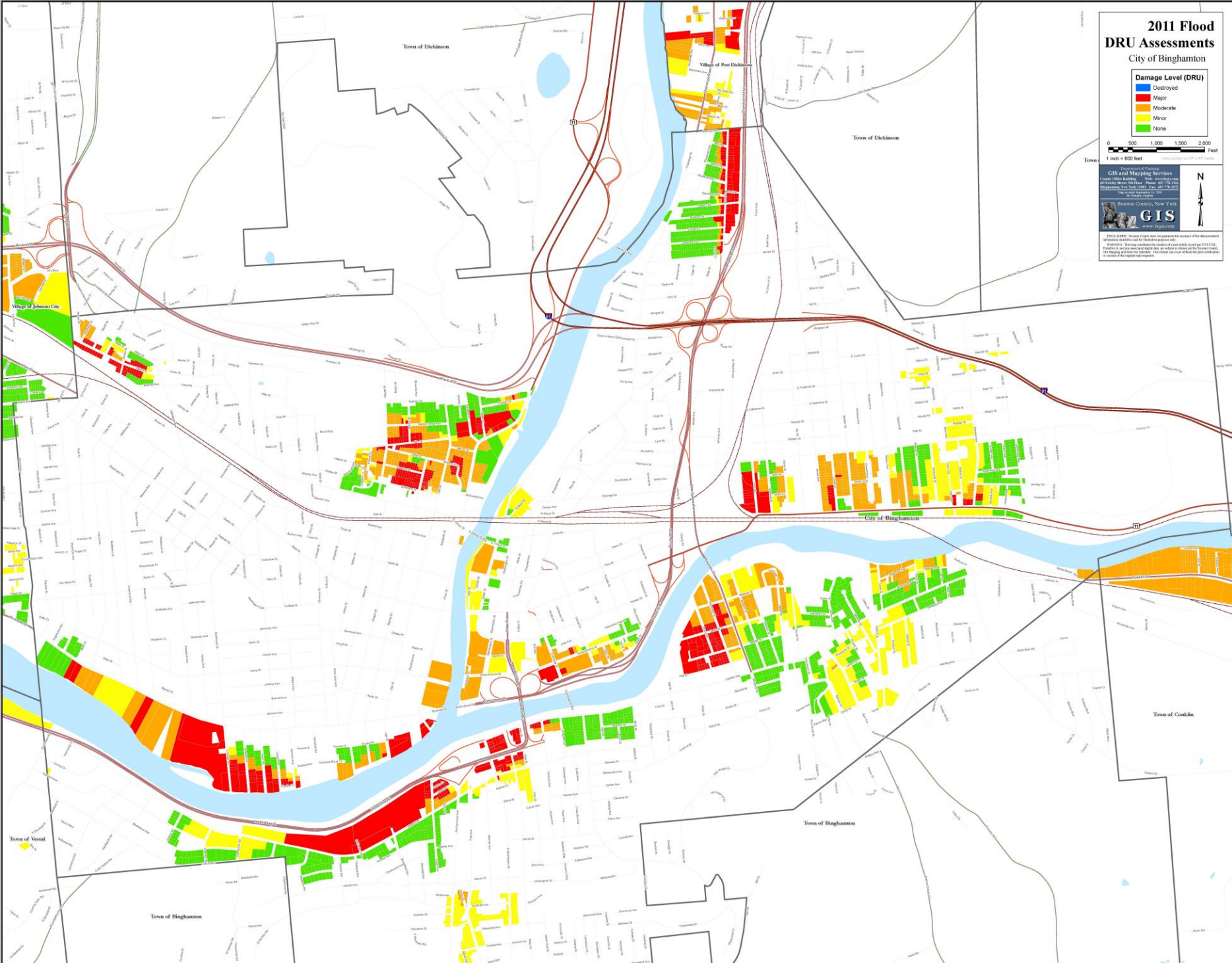
Damage Level (DRU)

Blue	Destroyed
Red	Major
Orange	Moderate
Yellow	Minor
Green	None



City of Binghamton
GIS and Mapping Services
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60 Franklin Street, Binghamton, NY 13902
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Binghamton, NY 13902 Fax: 607-733-2113
www.binghamton.gov

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2011 Flood DRU Assessments Union & Vestal

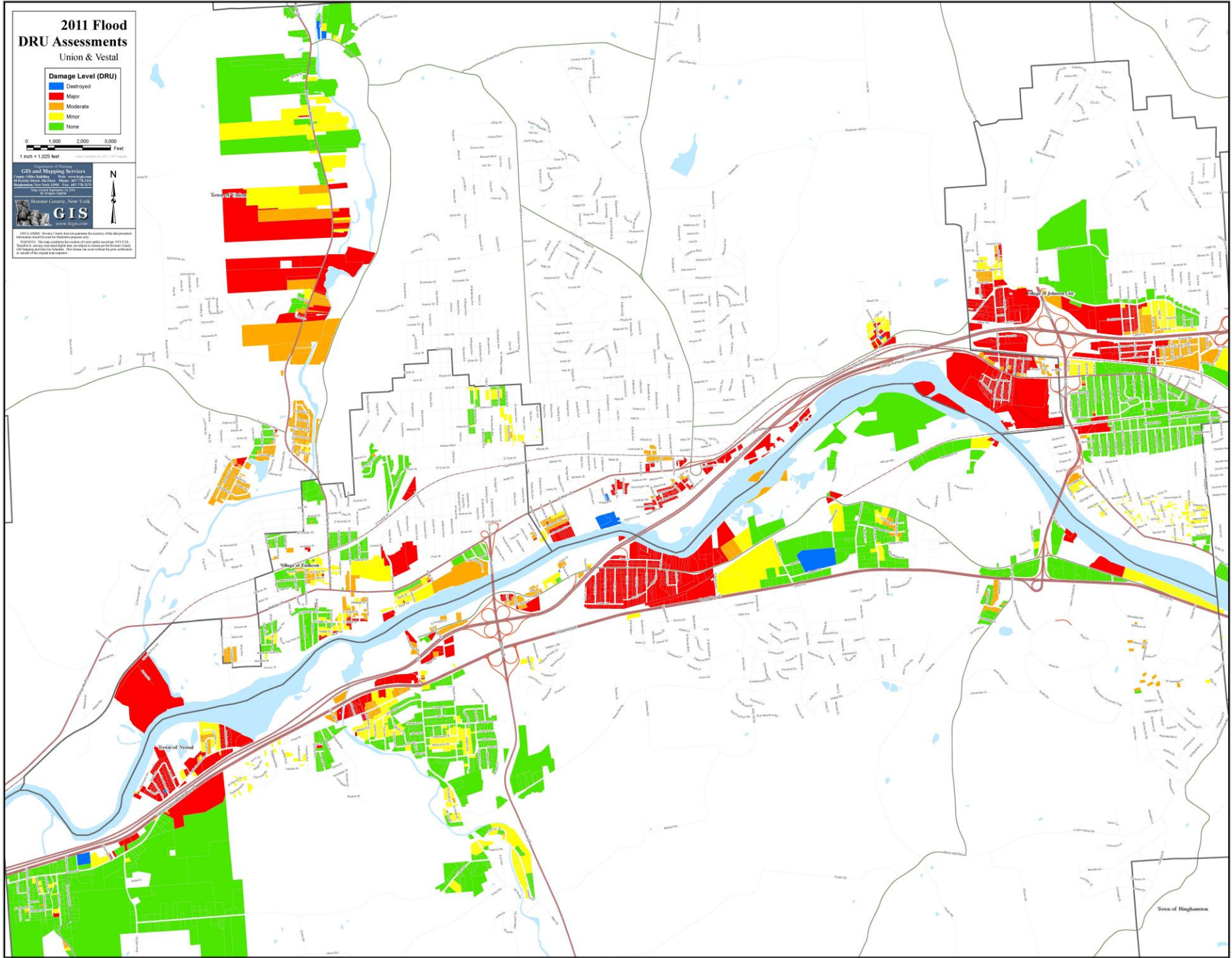
Damage Level (DRU)	
Blue	Destroyed
Red	Major
Orange	Moderate
Yellow	Minor
Green	None



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100 West Main Street, Vestal, NY 13850
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Broome County, New York
GIS and Mapping Services
DRU Assessments are the result of the Department of Environmental Conservation's Flood Hazard Mapping Program. This map was prepared as a result of a contract awarded to GIS and Mapping Services, Inc. by Broome County, New York. The information shown on this map was derived from the best available data at the time of the assessment.



Town of Hinghamton

Appendix E

On-Going Flood Mitigation Activities

- Incorporate actions into planning and land use mechanisms
- Develop resilient land management practices by reviewing current plans and ensuring information and practices are effective and sustainable
- Develop model ordinance for sediment and erosion control, stormwater management and stream buffer implementation
- Encourage site plan review by fire companies
- Support and promote underground utilities
- Maintain back-up generators and other utilities
- Consider changes to zoning to promote future development to areas outside of the floodplain
- Review current site plans to ensure developments served by private wells have adequate well recharge areas
- Support and promote interaction with emergency service providers
- Emergency Service providers should create/ enhance/ maintain Mutual Aid agreements with neighboring municipalities
- Support and participate in emergency services/ prevention activities and interaction with emergency providers
- Obtain and archive elevation certificates
- Continue/ enhance programs to prevent trees from threatening lives, property, and public infrastructure
- Support on-going updates of Comprehensive Emergency Planning
- Develop relationships with agencies such as FEMA, SOEM and Broome County that can provide assistance with post- disaster paperwork and activities
- Work with agencies to develop damage assessment capabilities and hazard-related datasets
- Develop detailed inventory of critical facilities based on FEMA's Comprehensive Data Management System
- Assist in update of FIRM maps at the jurisdiction level & attend meetings help by related agencies
- Utilize SWCD for stream stabilization projects and opportunities for funding
- Evaluate participation in the CRS
- Continue participation in NFIP
- Ensure staff is up-to-date on information and policies regarding hazard & related topics
- Maintain compliance with NFIP/ CRS standards; adoption/ enforcement of floodplain management, mapping, public outreach
- Commence or continue training and participation in local and regional hazard programs (NCIS/ NIMS, CRS, NFIP)
- StormReady Communities: Enhance community resiliency through advanced planning, education and awareness
- Provide educational flood information to residents

- Provide links to HMP website, distribute informational letters, use email newsletters to educate public on flood mitigation, potential funding sources and natural hazard risk reduction measures
- Provide up-to-date information and educational activities to general public about natural hazards, emergency preparedness, management, flood-proofing, etc. (NOAA, CERT, NY-Alert)
- Facilitate outreach events for residents and businesses to promote hazard risk reduction

