



Town of Union Floodplain Management Plan



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Updated 11/2006

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FLOODPLAIN MANAGEMENT PLAN TOWN OF UNION, BROOME COUNTY, NEW YORK

1. Introduction and Purpose

To qualify for credit under the Community Rating System the Town of Union is required to prepare a Floodplain Management Plan. Under this program, the flood insurance rate for residents will be reduced if the Town implements the activities outlined in the document.

The Floodplain Management Plan defines the flood hazards and determines what appropriate actions will be required to reduce flood loss. The section headings correspond to the criteria under Section 241 of the Community Rating System Coordinator's Manual.

In the original 1990 CRS application, the Town recommended strategies in reducing flood losses in the Endwell and Fairmont Park areas impacted by the Susquehanna River. Over the years the Floodplain Management Plan has been expanded to also address the flood hazards associated with Nanticoke Creek and Little Choconut Creek.

2.0 Problem Identification

2.1 Flood History

The repetitive loss areas include properties in the Endwell and Fairmont Park areas. These properties are located in the designated 100-year floodplain along the Susquehanna River. These areas are subject to frequent flooding with the most severe flood occurring in June of 2006, surpassing flood levels that occurred in 1936. These areas also have been flooded in 1940, 1942, 1948, 1964, 1972, 1979, 1983, and 1986, 1996, 2004, 2005, and 2006. (1) The extent of the 1936 flooding in the Town is shown as the designated 100-year floodplain or numbered Zone A along the Susquehanna River. The flood of June 2006 surpassed the 1936 level and the floodplain maps are being redrawn as a result. Digital versions of the new maps are expected to be available during 2009.

The most severe floods tend to occur in the late winter or early spring during which a thaw causes the river to seek and reach flood stage. The ground is thoroughly saturated. Heavy rains measuring from 2.5 to 3.0 inches become runoff causing the river, streams, and creeks to rise even further. These weather conditions existed during the floods in 1936 and 1964. Floods occurring in December of 1942 and 1983 also had similar weather conditions. With the ground frozen, there was a period of intense rain in a short period of time causing the Susquehanna River to rise to a flood stage of 27.4 feet in 1942 and 27.03 feet in 1983. Binghamton Regional Airport (formerly known as Link Field) recorded 5.10 inches of rain in 48 hours in December of 1983.

On April 2nd and April 11th, 1993, the Susquehanna River crested at flood stage of 25.6 feet and 26.3 feet. Argonne Avenue and adjacent streets were flooded. Residents were evacuated from this area. On January 19th and 20th, 1996, the Susquehanna River crested at a flood stage of 27.25 feet and 24.6 feet respectively. A 30-inch snow pack

Peak Streamflow for the Nation USGS 01513500 SUSQUEHANNA RIVER AT VESTAL NY

Broome County, New York
 Hydrologic Unit Code 02050103
 Latitude 42°05'27", Longitude 76°03'23" NAD27

Drainage area 3,941.00 square miles
 Gage datum 799.19 feet above sea level NGVD29

Water Year	Date	Gage Height (feet)	Stream-flow (cfs)
1935	Jul. 08, 1935	25.2	77,000 ²
1936	Mar. 1936	30.50	107,000 ⁷
1937	Apr. 07, 1937	17.58	41,300
1938	Sep. 23, 1938	19.14	47,600
1939	Feb. 21, 1939	21.34	56,200
1940	Apr. 01, 1940	26.58	85,500
1941	Apr. 07, 1941	20.29	53,400
1942	Mar. 18, 1942	18.14	43,900
1943	Dec. 31, 1942	27.41	90,500
1944	Mar. 18, 1944	19.90	53,900
1945	Mar. 18, 1945	19.13	50,400
1946	Mar. 09, 1946	20.30	54,700
1947	Apr. 06, 1947	20.77	58,400
1948	Mar. 22, 1948	27.73	92,400
1949	Dec. 31, 1948	18.54	46,800
1950	Apr. 05, 1950	21.29	59,300
1951	Dec. 05, 1950	20.27	54,500
1952	Mar. 12, 1952	18.37	46,000
1953	Jan. 25, 1953	17.41	41,800
1954	Feb. 18, 1954	17.13	40,600
1955	Mar. 13, 1955	17.29	41,300
1956	Mar. 08, 1956	22.74	64,000
1957	Apr. 06, 1957	16.69	37,400
1958	Apr. 08, 1958	22.80	64,300
1959	Jan. 22, 1959	20.59	53,700
1960	Apr. 01, 1960	23.45	67,600
1961	Feb. 26, 1961	24.09	70,800
1962	Apr. 01, 1962	21.74	59,100
1963	Mar. 28, 1963	22.46	62,600
1964	Mar. 06, 1964	25.79	79,200
1965	Feb. 13, 1965	13.03	24,300
1966	Feb. 14, 1966	16.55	36,800
1967	Mar. 30, 1967	15.83	34,200
1968	Mar. 23, 1968	18.18	43,200
1969	Jan. 31, 1969	18.61	45,000
1970	Apr. 03, 1970	18.48	44,500

Water Year	Date	Gage Height (feet)	Stream-flow (cfs)
1971	Mar. 16, 1971	16.66	37,300
1972	Jun. 23, 1972	22.35	50,400
1973	Nov. 09, 1972	19.79	46,400
1974	Dec. 28, 1973	18.24	40,000
1975	Sep. 26, 1975	23.09	61,500
1976	Feb. 19, 1976	19.43	44,900
1977	Mar. 14, 1977	22.68	59,600
1978	Apr. 05, 1978	21.13	54,200
1979	Mar. 06, 1979	26.62	81,700
1980	Mar. 22, 1980	18.26	44,000
1981	Feb. 21, 1981	19.43	48,700
1982	Oct. 29, 1981	16.64	37,600
1983	Apr. 16, 1983	20.51	53,000
1984	Dec. 14, 1983	27.03	84,200
1985	Mar. 13, 1985	15.96	34,800
1986	Mar. 15, 1986	25.11	73,100
1987	Nov. 27, 1986	18.46	44,800
1988	May 20, 1988	16.41	36,600
1989	May 11, 1989	17.67	41,600
1990	Feb. 17, 1990	16.69	34,400
1991	Oct. 24, 1990	21.07	52,000
1992	Mar. 12, 1992	13.51	24,500
1993	Apr. 11, 1993	26.25	79,400
1994	Apr. 07, 1994	19.39	44,700
1995	Mar. 09, 1995	13.80	25,400
1996	Jan. 20, 1996	27.86	89,100 ⁹
1997	Dec. 02, 1996	22.51	58,800
1998	Jan. 09, 1998	21.56	54,300
1999	Jan. 25, 1999	21.27	52,900
2000	Feb. 28, 2000	23.62	64,500
2001	Apr. 10, 2001	19.49	45,100
2002	Mar. 27, 2002	17.09	35,800
2003	Mar. 23, 2003	21.01	51,800
2004	Sep. 18, 2004	25.94	77,600
2005	Apr. 3, 2005	29.14	97,000
2006	June 28, 2006	33.70	123,000

Peak Streamflow Qualification Codes.

2 -- Discharge is an Estimate

7 -- Discharge is an Historic Peak

9 -- Discharge due to Snowmelt, Hurricane, Ice-Jam or Debris Dam breakup

Source: USGS

melted within a 48-hour period with 2 to 3 inches of rain causing creeks and small streams to overflow. River Road and Argonne Avenue in Endwell were evacuated. Nanticoke Drive at Bradley Creek Road in Union Center was also flooded. These areas included Fairmont Park area and Glendale Drive in the west part of the Town. Rural areas such as Boswell Hill Road and Bornt Hill Road were also damaged. Roadside ditches could not handle the runoff and overflow. The road eroded in some places due to the velocity of the water.



Photograph 1 – Flood debris along Kent Avenue

In the past, extensive flood damage has been caused by periods of intense rain and high winds like Hurricane Hazel in November 1950, Hurricane Agnes in June 1982, and Hurricane Eloise in 1975.

Ice jams have also caused flooding along the Chenango and Susquehanna Rivers.

2.2 Endwell

Since the 1930's, two dams constructed in Whitney Point and Sidney Lake have contributed to the reduction in flood downstream on the Chenango and Susquehanna Rivers.

River Road, Argonne Avenue, Scarborough Drive, and Chaumont Drive in the Endwell area are frequently flooded by the Susquehanna River since there are no flood levees in place. When the Susquehanna River reaches a flood stage of 20 to 21 feet (Vestal Gauge) basement

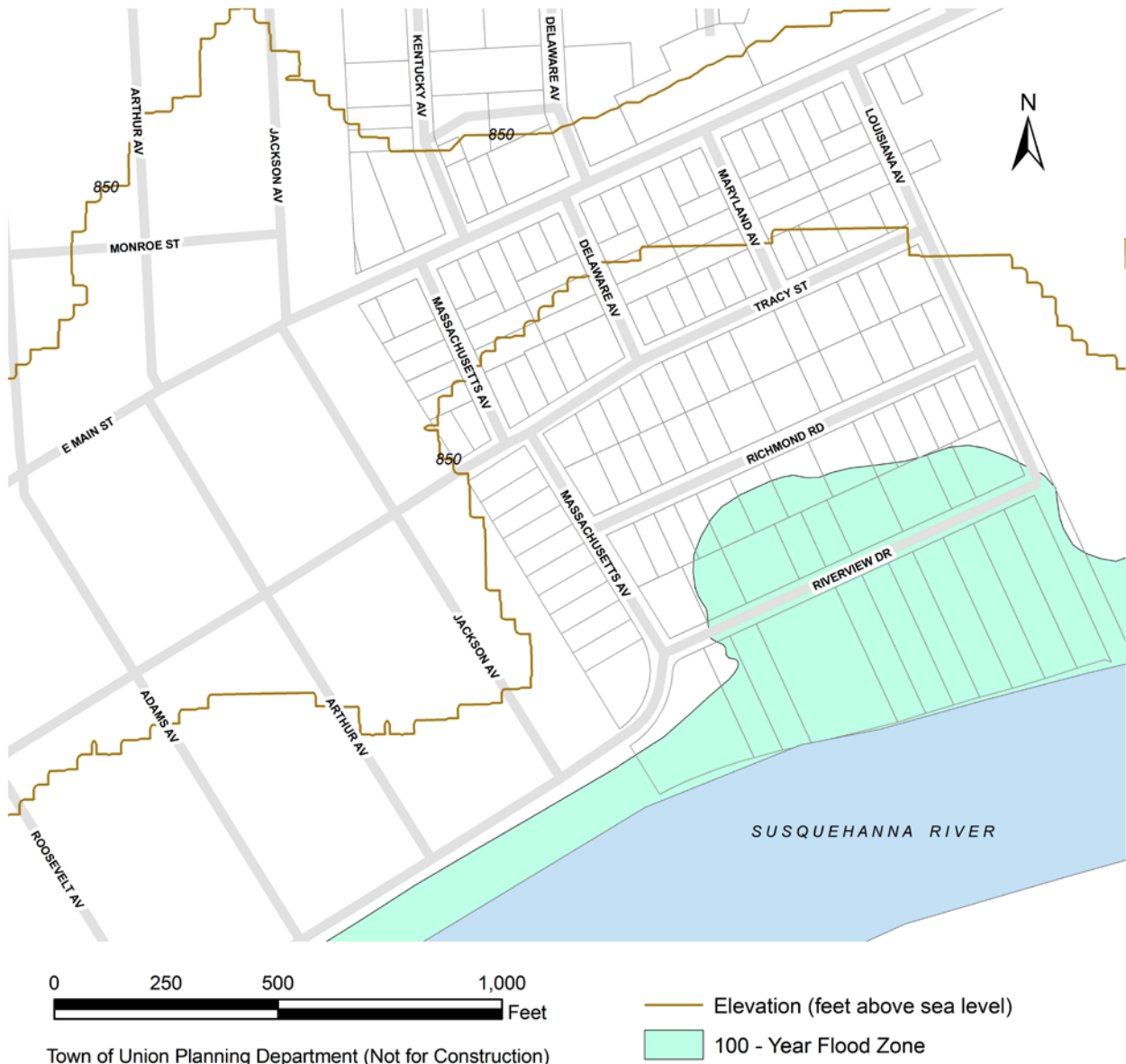


Photograph 2 – 2006 Floodwaters in Southeast Endwell

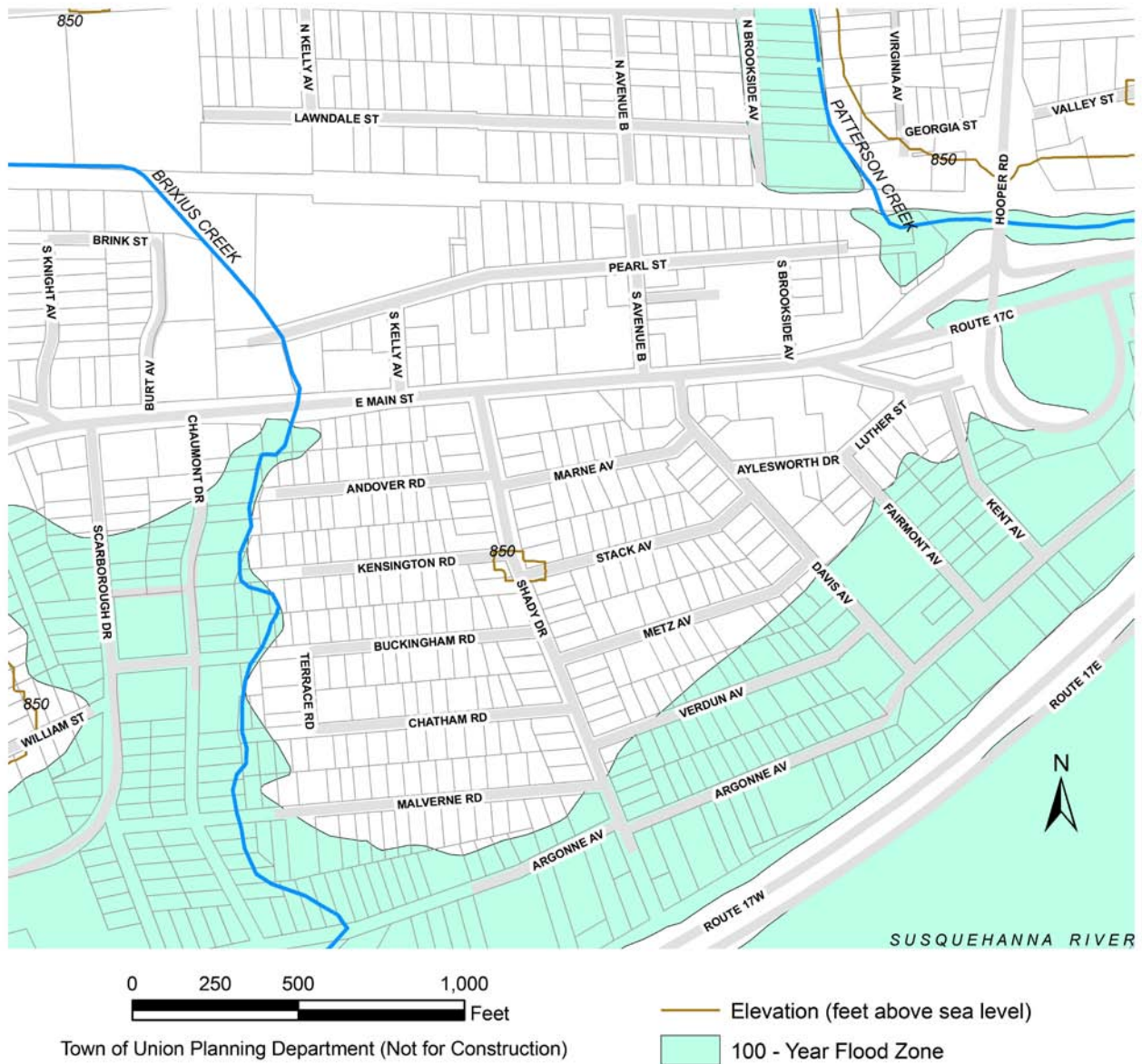
flooding occurs on the south side of Argonne Avenue. With more severe flooding at flood stage of 22 to 23 feet, flooding occurs at the site of the former Kent Avenue Trailer Park and at the lower end of Davis Avenue, Shady Drive, Verdun Avenue, Davis Avenue, and Fairmont Avenue. At a flood stage of 25 to 26 feet, the mobile home park is flooded with four (4) feet of water. Houses on Kent Avenue, Shady Drive, Verdun Avenue, Davis Avenue, and Fairmont Avenue are also flooded. These conditions have occurred in December 1983, March 1996, September 2004, and April 2005. During the flood event of June 28 2006, the Vestal gauge reached a height of 33.70 feet, easily surpassing the previous historic level established in 1936. Damage to property extended beyond the 100-year boundaries.

On April 2nd and 11th of 1993 residences on Argonne Avenue, the south side of Verdun Avenue, Kent Avenue, Davis Avenue, and Shady Drive were all flooded. Residents lost personal items and water heaters. The mobile home park was under four (4) feet of water. The first floor apartments at 3212 and 3214 Verdun Avenue suffered water damage. These apartments were built illegally with the first floor below the base flood elevation. Businesses located on Chaumont Drive and Scarborough Drive lost

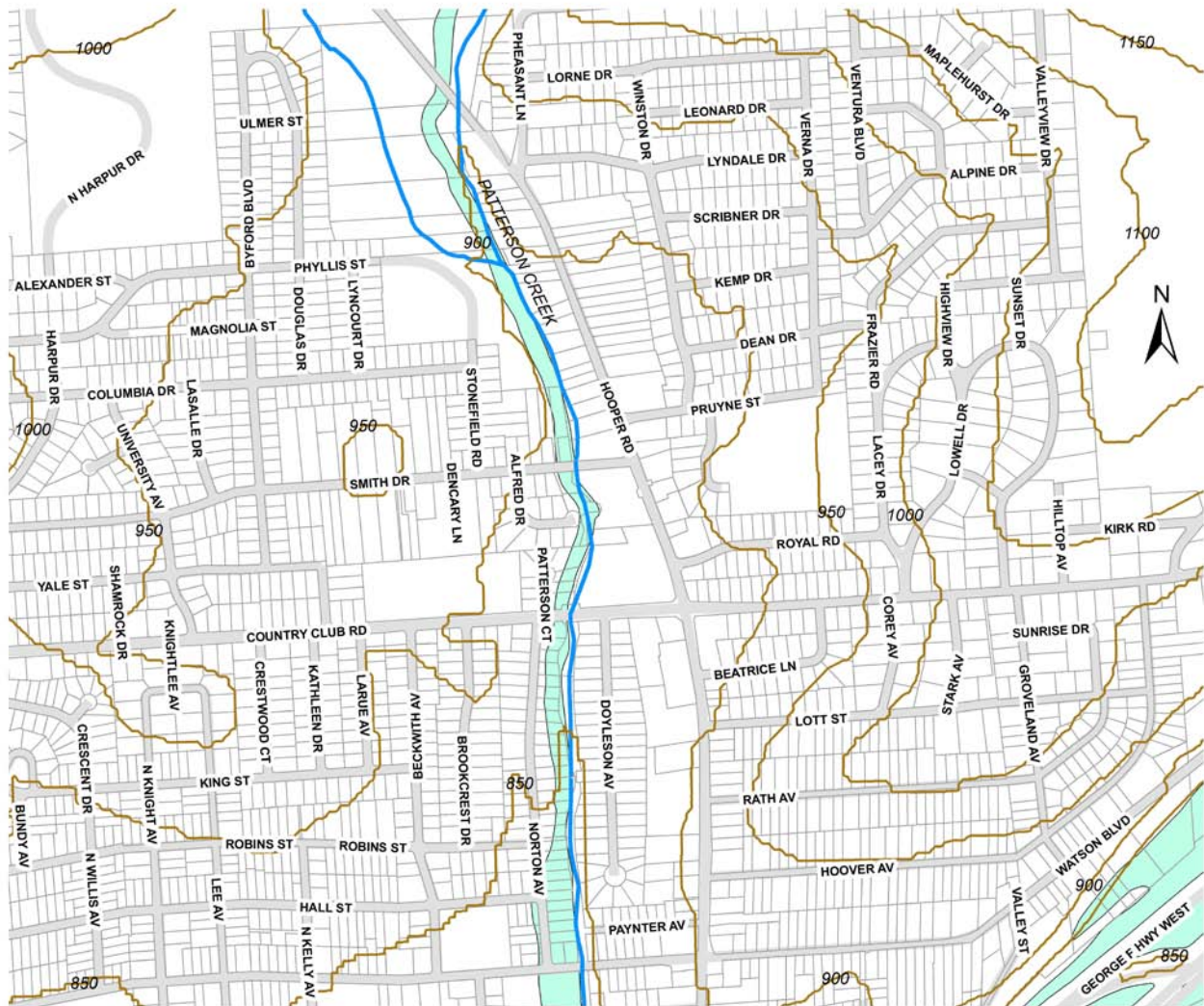
Southwest Endwell



Southeast Endwell



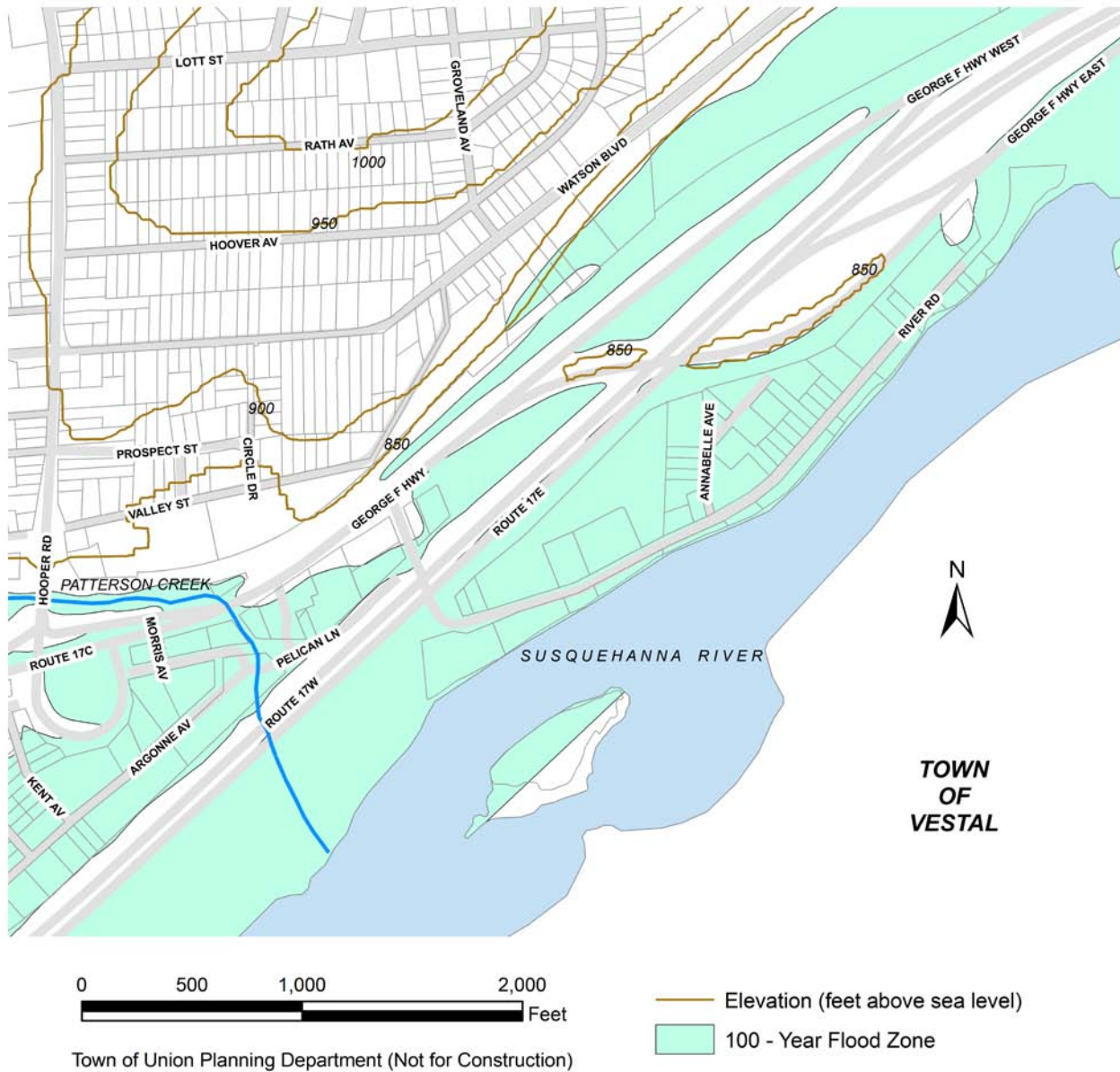
North Endwell



0 500 1,000 2,000
 Feet
 Town of Union Planning Department (Not for Construction)

— Elevation (feet above sea level)
 100 - Year Flood Zone

River Road



carpeting and furniture. U.C. Polymer located on Scarborough Drive lost inventory. Westbound traffic from Route 17 could not exit to George F. Highway due to flooding.

In September 1997 and in 1999 the Town of Union received a listing of Repetitive Loss properties in the Endwell area located on Argonne Avenue, Kent Avenue, Fairmont Avenue, and Verdun Avenue. Two of the properties located on Argonne Avenue had houses demolished under Town of Union Argonne Avenue/River Road Buyout Program (1988-1993). The properties located on Argonne Avenue, Shady Drive, Verdun Avenue, Davis Avenue, and Fairmont Avenue are existing residences that are located in the flood prone area and have suffered flood damage from the Susquehanna River.

On January 19th and 20th, 1996, the Susquehanna River essentially cut off access to River Road and residents had to be evacuated by the Endwell Fire Department, Argonne Avenue, Kent Avenue, Davis Avenue, Fairmont Avenue, Verdun Avenue and Shady Drive were all flooded. Residents lost personal possessions, furnaces, water heaters, and heavy appliances. Approximately 49 residential buildings and 18 trailers suffered flood damage estimated by the Town to be \$150,000 to \$200,000.

Exit 69 from Route 17 westbound was closed due to flooding. Businesses located on the George F. Highway were not affected.

Water infiltrated the sanitary sewer system causing sewer backups town-wide. The town's storm sewer system overflowed in some areas and some homes located in the Endwell area between Taft Avenue on the west and Hooper Road on the east, Country Club Road on the north and Watson Boulevard on the south were affected. Damage losses were difficult to determine. The Town Commissioner of Public Works estimated that about 500 households were affected.

Several businesses located on Scarborough Drive and Chaumont Drive in the Endwell area suffered damage losses up to \$287,000 (inventory and equipment). Estimates do not include clean up costs and revenue losses due to business closure. The town does not have a final estimate on flood damage losses that businesses recouped from their insurance companies.

The western end of River Road is located in the floodway and the eastern end is located in the floodplain fringe. When flooding occurs from 23 to 24 feet, the water rises to the bank on the south side of River Road. When flood stage reaches 26 to 27 feet, the west end of River Road is flooded. During the April 2005 flooding, the residents on River Road were told to evacuate because emergency vehicles would not be able to reach residents due to the strong current.

When a flood stage of 30 feet (as in the 1936 flood) occurs, floodwaters from the Susquehanna River cover the George F. Highway east of Hooper Road and floodwaters almost reach East Main Street in the Scarborough Drive/Chaumont Drive area. In 1972 and 1983, flooding was extensive in the Endwell area with a flood stage of 27 feet. Refer to the Flood Forecast Maps to see the extent of the flooding at each flood stage.

As a result of the flooding of 2005 and 2006, the Town of Union received two rounds of funding from FEMA to acquire and demolish repetitive loss properties. To date, 41 properties

have been acquired and demolished, including the complete removal of the trailer park on Kent Avenue. The Town used federal Community Development Block Grant (CDBG) funds to provide the required match for the first funding round and New York State provide the funds to match the second round. A third round of buyouts has been completed.

2.3 Fairmont Park

The area is subject to the backwater effect from the Susquehanna River along existing water conveyance paths and Gray Creek. The minimum flood elevation for flooding from the west is 824.1 feet and from the east is 830.5 feet. Essentially, flooding occurs when rising water elevations in the Susquehanna River effectively blocks all water conveyance drainage structures and prevents interior drainage from occurring. (2)

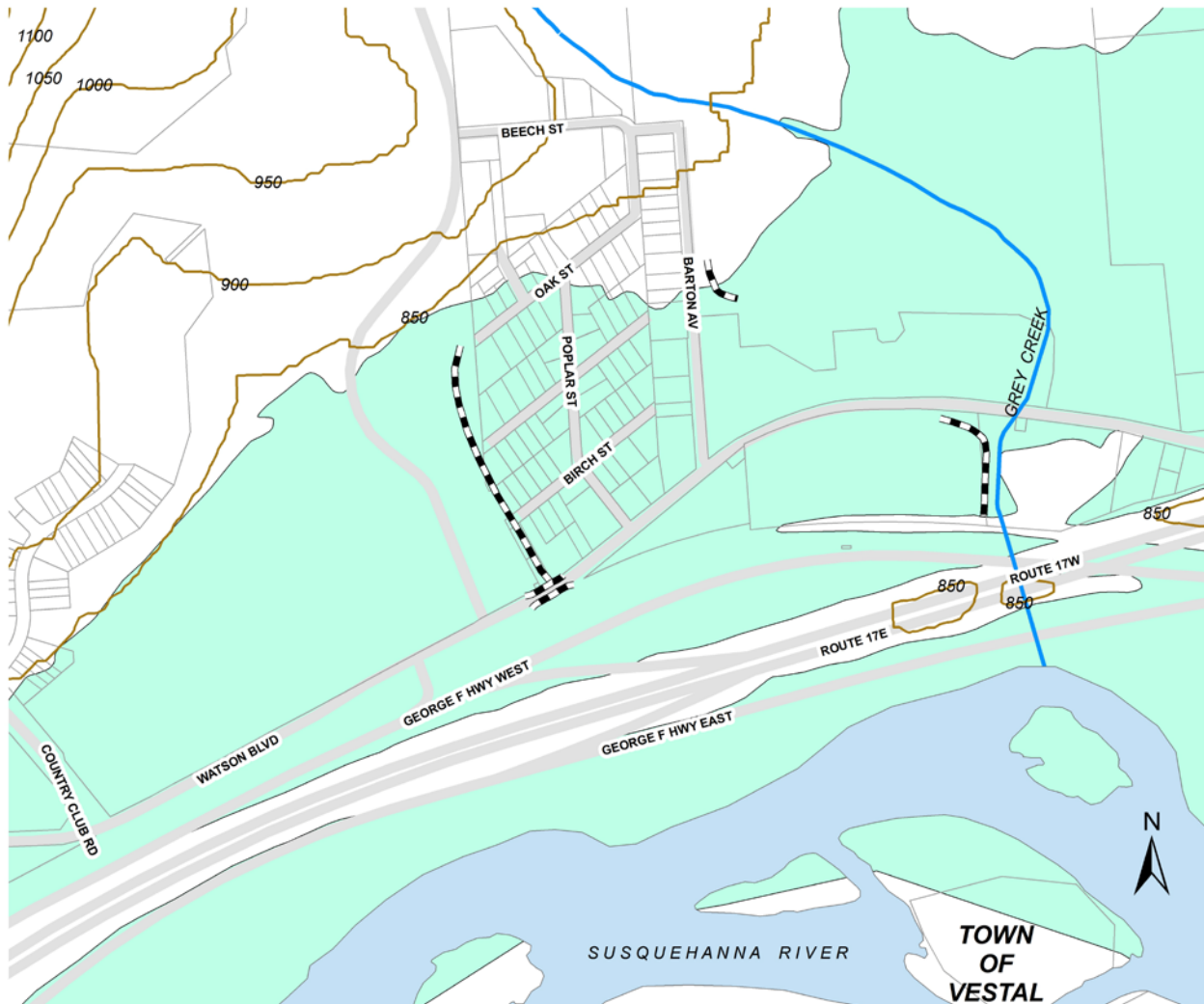
The Town constructed a levee system around Fairmont Park in December, 1989 to protect this residential area from 100-year flood at a base flood elevation of 838 feet. An earth berm was constructed along the Westside of Fairmont Park with a mechanical enclosure over Watson Boulevard. Another earth berm was constructed to the east of Traditions at the Glen (formerly known as the IBM Country Club) recreational area between Watson Boulevard and the Conrail Railroad embankment. The southeast berm effectively prevents flooding from the east. In order to maintain the 3 feet of freeboard over the 100-year base flood elevation, sandbags would have to be placed across the southeast abutment to the Traditions at the Glen (formerly IBM) clubhouse when necessary. A flap gate was installed in the storm sewer line on both sides of the Fairmont Park development to prevent backflow through the sanitary sewer line. Since July of 1990, the Town has been working with the Federal Emergency Management Agency to process a map amendment to the Flood Insurance Rate Map for the Fairmont Park area. Federal officials have requested other information such as the design of the levee, etc. The amendment process request is ongoing.

FEMA's recent repetitive loss listing includes flood damage to properties at 27 and 29 Birch Street and 38 Poplar Street (located in the Fairmont Park Subdivision). In speaking to the Town's Engineering Department, no residential properties located in the Fairmont Subdivision reported any damage due to the flooding in the spring of 1993.

During the floods on April 2nd and 11th, 1993, the Town had to erect the stoplog wall over Watson Boulevard. The residential properties protected by the levee system did not suffer any damage from floodwaters. Basement flooding did occur due to the ground being supersaturated. This was a common occurrence throughout the Town since the intense rain followed a spring thaw of 21 inches of snow.

During the flooding that occurred on January 19th and 20th of 1996, the Town again erected the stoplog wall over Watson Boulevard. The floodwaters from the Susquehanna River began to recede so that the flooding in this area was very shallow. No residences suffered any water damage. Access to the Fairmont Park was permitted through the Traditions at the Glen (formerly known as the IBM-Homestead) property.

Fairmont Park



2.4 Patterson Creek

Patterson Creek has been subject to flash floods in the past. On April 5, 1960, 3 inches of rain fell causing flooding along Pearl Street, Lawndale Street, and Brookside Avenue in Endwell. One house was carried off its foundation when a gas line exploded. The house burned from the ignited gas. A dam was constructed on Patterson Creek above Struble Road to provide flood control. Flash floods have not occurred since the dam's construction. (3)

2.5 Nanticoke Creek

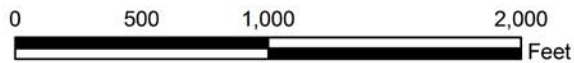
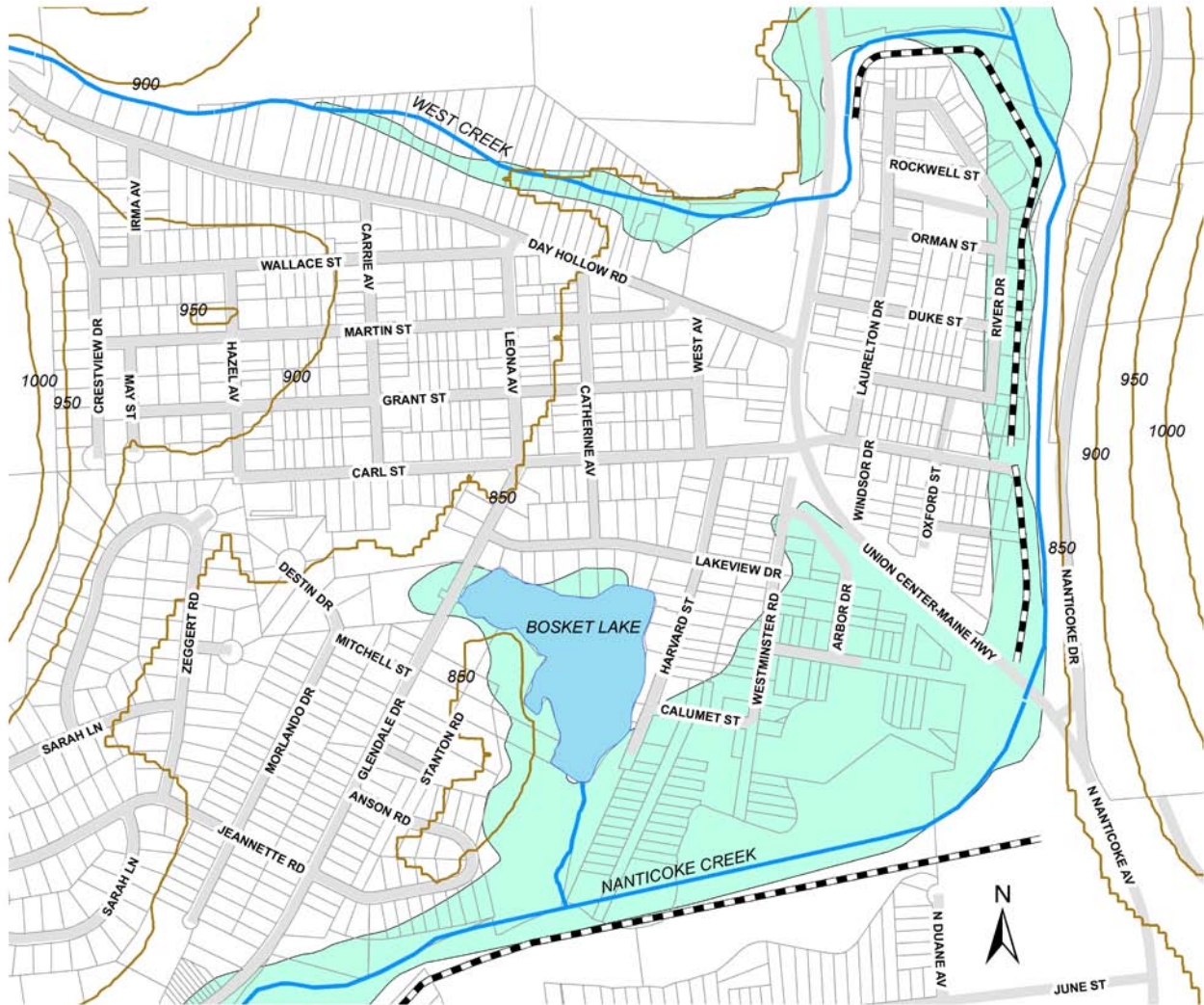
The Nanticoke Creek affects areas in the western part of the Town including the Route 26, West Corners area, Glendale Drive, and West Endicott. These areas also are subject to the backwater effect of the Susquehanna River. That is, once the Susquehanna River rises above a certain stage, floodwaters from the Susquehanna River will back up into the Nanticoke Creek affecting the property north of the West Corners area.

Hydrologic analyses were done in the more recent flood insurance studies issued with FIRM maps in September of 1988. Hydraulic analyses were done to provide estimates of the elevation of floods at selected recurrent intervals. (4) A levee was constructed during the mid-1980's protecting the West Corners area. The levee varies in height from 14 feet to 17 feet from the Route 26 bridge north to Phil's Chicken House on Route 26. The Flood Forecast Map completed in 1984 shows the 30 feet flood stage (Vestal gauge) being the designated 100-year floodplain. With the levee constructed, this area in West Corners is now considered protected from a 100-year flood.

The most severe flooding along the Nanticoke Creek occurred in 1936, 1942, 1948, and 1964. During each of these flood events, flooding extended over Route 26 to the north of the West Corners area, into the trailer park on Rockwell, Ormond, and Duke Streets, into the area south of Carl Street, around Bosket Lake, and near Glendale Drive (properties adjacent to the creek). As mentioned in the previous section on severe floods, a spring thaw is accompanied by a period of intense rains causing the river and creek to rise above flood stage. Flash floods also have occurred along the Nanticoke Creek. On April 5, 1960, 3 inches of rain fell within a three-day period causing the creek to rise over a several hour period causing flooding in West Corners.

A series of dams were constructed along the Nanticoke Creek including East Branch, Ketchumville Branch, and Bradley Creek that provide flood control for the Nanticoke Creek. (5) Each detention structure has a certain capacity to retain water. If the detention area is at capacity, there is a spillover that allows excess water to escape. Broome County owns and maintains these structures. There is a series of earth levees, concrete walls, channel clearings, and drainage structures that protect the West Corners area including the trailer park and West Endicott. These levees are designed to protect an area from a 100-year flood event. The Federal Emergency Management Agency

West Corners - Route 26



Town of Union Planning Department (Not for Construction)

— Elevation (feet above sea level)

--- Flood Levees

100 - Year Flood Zone

recently approved a map amendment to the Flood Insurance Rate Maps for West Corners. As a result, residents have a substantial savings on their flood insurance.

During the flood event of January 19th and 20th, 1996, the flooding occurred along Union Center Maine Highway north of West Corners, Nanticoke Drive at Bradley Creek Road, and the Town Park on Glendale Drive was also flooded. A few houses on Union Center Maine Highway had to have their basements pumped out. Damage to the Town Park included restoring 8 ballfields, resurfacing of parking lots, and equipment loss.

Ice jams have also been a problem along Nanticoke Creek. As on the Susquehanna River, the ice jams are monitored very closely. Attempts are made to use a backhoe to break up the ice jams if conditions permit.

2.6 Little Choconut Creek

Little Choconut Creek runs south through Choconut Center into the Village of Johnson City emptying into the Susquehanna River. Flash floods from the Little Choconut Creek caused severe damage in Choconut Center on June 17, 1960 and on October 11, 1962 after a period of intense rain. The last known serious flood threat was on June 22, 1972 with 4 inches of rain from Hurricane Agnes. The creek level rose over several hours, flooding Middle Stella Ireland Road above Lewis Road. Floodwater levels rose to the first floor levels of the houses adjacent to the creek on Middle Stella Ireland Road. With the construction of several dams along the Choconut Creek in the mid 1970's, the risk of flash floods along the Choconut Creek is substantially reduced.

The Flood Insurance Rate Maps do not show any designated A zones or designated 100-year floodplain in Choconut Center.

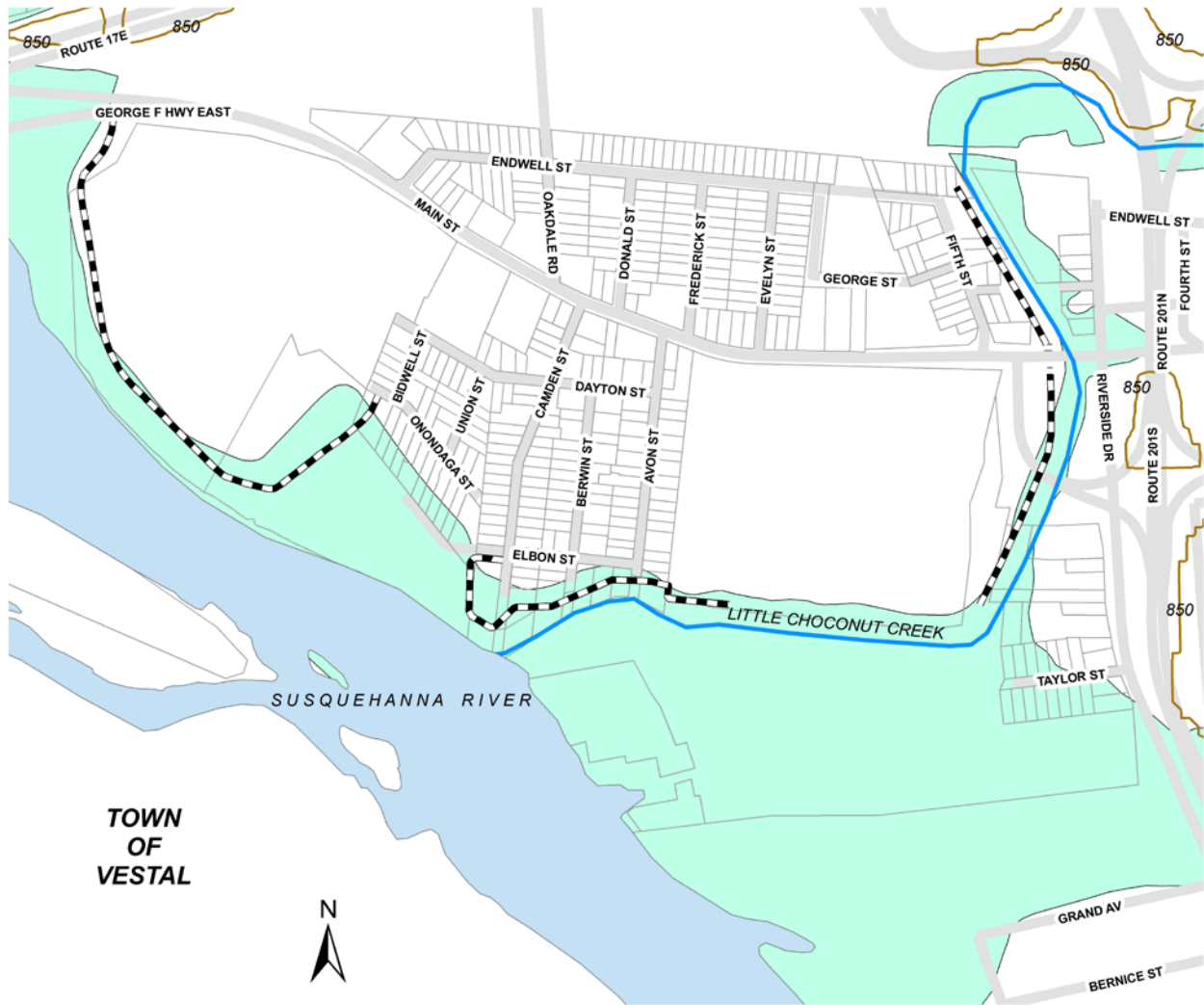
Ice jams are also a problem. If heavy rains occur, an ice jam can impede the water flow causing flooding in low-lying areas such as Choconut Center. In February of 1981, an ice jam occurred on the Little Choconut Creek along with heavy rains causing some flooding.

2.7 Westover

The Westover area is impacted by the backwater effect from the Little Choconut Creek and high water from the Susquehanna River. The area is protected by a system of levees, floodwalls, and closures located on the east, west, and south sides of area. These flood protection works were completed in 1958 and 1960. Improvements also have been made including the raising of Main Street to an elevation at the same height of the levee on the western side. Closures are required on the east side to prevent flooding from the Little Choconut Creek. The last time this area received extensive damage was during the mid-1950s.

The area includes River Plaza (Home Depot), BAE (formerly General Electric), Johnson City Water Works, and the Goudey Power Plant. The area is designated on the

Westover



0 500 1,000 2,000 Feet

Town of Union Planning Department (Not for Construction)

Elevation (feet above sea level)

100 - Year Flood Zone

Flood Levees

Flood Insurance Rate Maps as Zone B since the levee system protects the area from 100-year flood.

The New York State Department of Environmental Conservation (NYSDEC) is responsible for initiating closures, manning the emergency station, and patrolling the levee system during high water periods. If the National Weather Service predicts a flood stage of 18 to 23 feet, NYSDEC would initiate patrolling levees and activate closure procedures. The closure across Main Street is initiated at 25.6 feet. As a result of the closure, access to Route 201 south is cut off.

During the flooding of April 2nd and 11th, 1993, the Westover area did not suffer any damage from the floodwaters. The closure across Main Street to the east of BAE (formerly General Electric) did not have to be installed. According to the Operational Manual for the Flood Protection Works, the closure should have been initiated at 25.6 feet. The river stage level on April 11th was 26.3 feet NYSDEC did not have to initiate closure because the river level did not go any higher.

During the flooding of January 19 and 20, 1996, the Susquehanna River crested at 24.6 feet and 27.25 feet. No closure was initiated over Route 17C. There was some erosion damage to the levees and embankments north and south of Route 17C along the Little Choconut Creek. New York State Department of Environmental Conservation repaired the damage.

3.0 Development in the Flood Hazard Areas

3.1 Endwell

The designated A zones along the Susquehanna River show the extent of the flooding occurring in March of 1936. The Endwell area is not protected by a levee because the cost for construction is exorbitant. Most of the houses on Argonne Avenue and River Road were constructed in the 1920's and 1930's. Housing between Shady Drive and Francis Avenue was constructed prior to 1950.

Since the 1920's, there has been significant commercial development along Route 17C. This was a major state route prior to the construction of Route 17. In the 1960's, commercial redevelopment was a major consideration in the Town of Union 1968 Master Plan.

The 1979 Town of Union Future Land Use and Transportation Plan designated the area adjacent to the Susquehanna River for conservation purposes. Other areas in Endwell are designated for residential, commercial, and light industrial uses. Any construction in this area is limited by three factors:

1. A portion of River Road is within the floodway and construction is prohibited;
2. Any residential or commercial development would have to have its lowest floor at the base flood elevation or flood proofed;

3. Residential development is further limited due to the fact that eight feet of fill would be required for the house to be at the base flood elevation. This is a near impossible feat since the minimum lot size is only 4,000 sq. feet

3.2 Fairmont Park

The Fairmont Park area is designated by the A zone on the Flood Insurance Rate Map. Most of the housing in this area was constructed in the 1930's and 1940's. Some houses were constructed after the 1950's.

Any new housing construction in the Fairmont Park still must meet the Town's floodplain regulations. The lowest floor of a new house would have to be several feet higher than the existing ground. Relief from the Town's floodplain regulations is only allowed when Federal Emergency Management Agency (FEMA) grants a map amendment to the Flood Insurance Rate Map (FIRM). That is, Fairmont Park being protected by a levee system would be shown on the FIRM map as a Zone B. To date, no action has been taken by FEMA to approve the Town's request for a map amendment. Another alternative would be a variance. The Town Zoning Board of Appeals recently granted an area variance for a house to be constructed. In its decision, it determined that the newly constructed levee could withstand the hydrostatic forces of a 100-year flood.(6)

Under the Town's 1979 Future Land Use and Transportation Plan, Fairmont Park is designated as Urban Low Density which allows for single family and two family homes on small lots. Development in a floodplain area is supported only if an appropriate constructive measure is in place. The levee system is such a measure.

The surrounding area includes Traditions at the Glen (formerly the IBM Country Club) and golf course. The 1979 Town of Union Future Land Use and Transportation Plan designated the area for recreational use. If the area is flooded, there would be only minimal damage to a recreational area.

3.3 West Corners and Route 26

Route 26, or Union Center Maine Highway, is rural with some businesses such as a motor vehicle garage, florist, etc. The lack of utilities and flooding from the Nanticoke Creek area have prevented development along this corridor. West Corners is a small hamlet that has existed since the 1800s.

Areas on Route 26, West Corners, and Glendale Drive are within the designated 100-year floodplain. Any residential or nonresidential structure must have its lowest floor (including the basement) at the base flood elevation or flood proofed. Prior to 1980, there were not any flood studies done on the Nanticoke Creek. Therefore, no flood insurance rate map was issued for the area. The current Flood Insurance Rate Map now shows designated A zones. It is very difficult to determine the placement of a structure in the floodplain area. Ground elevations are not easily available.

The 1979 Town of Union Future Land Use and Transportation Plan designated the area along the east side of Route 26 as a conservation area. The west side of Route 26 and portions of the eastside are designated as secondary areas of Suburban Low Density development. No

residential development can occur in this area until the infrastructure is in place. The Town does not have any immediate plans to extend water and sewer service.

Since most of Route 26 is subject to flooding, it is recommended that a conservation designation be expanded to include other areas that may not be appropriate for development. The conservation designation would be most appropriate since the designation is used for areas unsuitable for development due to topographic conditions, such as floodplains, steep slopes, wetlands, etc.

3.4 Choconut Center

Choconut Center is a rural hamlet that has existed since the 1700's. This area maintained its rural nature until the more suburban development occurred in the 1970's and 1980's.

Choconut Center is impacted by flooding from the Little Choconut Creek. With the dams constructed upstream from the area, the chances of flooding in this area have been substantially reduced. However, houses adjacent to the stream still can be affected. Increased development in this area and upstream can cause increased runoff in the watershed area. The Town should evaluate the impact of future residential development on increased storm water runoff and possible flooding. The Town's Subdivision Regulations require a developer to provide storm water runoff calculations for the entire development to determine if there is increased storm water runoff. If this occurs, the developer is required to provide storm water detention structures to handle the additional flow. The Town requires storm drainage structures to be designed for a 10-year storm. The watershed area includes the Village of Johnson City and the Towns of Chenango and Maine. Each municipality has its own design standards for storm water runoff. It would be to the Town's best interest to discuss with the other municipalities developing common design standards for storm water runoff. A watershed management plan should be discussed to determine the most appropriate land uses. The concept could also apply to the Nanticoke Creek Watershed area.

The 1979 Town of Union Future Land Use and Transportation Plan designated Choconut Center for Suburban Low and High Density. These designations maintain the suburban development in the area allowing for single and two-family homes. Choconut Center is also home to the Airport Corporate Center. This area provides level land and good road access for industrial development. In revising the Town's Comprehensive Plan, an important issue is raised. Should industrial and residential development be allowed under the present land use designations considering increased storm water runoff and possible flooding as a consequence?

3.5 Westover

Westover includes an older residential area with commercial businesses, offices, and light industrial uses including BAE (formerly General Electric). This area is impacted by flooding from the backwater effect of the Little Choconut Creek and high water levels of the Susquehanna River.

Westover is protected by a levee system and floodwalls on the east, west, and south sides. A closure (X-1) is required across Main Street near the Johnson City village limits.

There are no longer any large tracts of vacant land available for development in Westover. Some young families moving in the area have been rehabilitating older homes. The most recent new enterprise in the area is the YMCA located on a former school site.

The 1979 Town of Union Future Land Use and Transportation Plan designated the BAE and River Plaza as industrial uses. The residential area is designated as Urban High Density and allows multifamily units. This designation also provides the opportunity for private redevelopment to reinvest in slum and blighted areas. The designations for the Westover area will have a negligible effect on flooding.

4.0 Damage Assessments from Previous Flood Events

There are no cost estimates available for property losses from previous flood events from 1936 through 1978. However, information from recent flood events provides at least the number of houses and businesses that were damaged in Fairmont Park, Endwell, West Corners, Route 26, and Choconut Center. Please see attachment.

The extent of the flooding was determined by speaking to officials and residents in these areas since 1979.



Photograph 3 – Picnic Shelter At Glendale Park Nearly Submersed By 2006 Flood

During the flood events of April 2nd and 11th, 1993, residences and businesses in the Endwell area did suffer water damage from flooding. Basement flooding did occur to residences on Argonne Avenue, Kent Avenue, Davis Avenue, Shady Drive, and Verdun Avenue. The Town did a survey of residences. Most residents lost personal items stored in the basement. Water heaters and furnaces were replaced.



Photograph 4 – 2006 Flood Debris Southeast Endwell

During the 1996 flood events of January 19th and 20th, 49 residences and several businesses suffered an estimated \$500,000 in flood damage.

5.0 Recommended Activities

5.1 River Road/Argonne Avenue Buyout Program

From 1988 to 1993, the Town purchased flood prone properties along Argonne Avenue and River Road in the Endwell area through the River Road/Argonne Avenue Buyout Program. Most of the houses were more than 50 years old and considered structurally unsound. The only option was to provide residents with an opportunity to relocate. For a five-year period, the Town used Community Development funds to purchase properties, demolish homes, and restore the area to its natural state. The Town demolished 35 houses on

Argonne Avenue and River Road and purchased 4 parcels of vacant land. The Town plans on preserving the area as open space. The Town received credit under Activity 520 – Acquisition and Relocation. Since the flood events of 2004, 2005, and 2006 the Town purchased additional properties in the floodplain and received funding from FEMA to acquire and demolish a total of 41 properties in the Argonne Avenue and River Road areas.

5.2 Open Space

Over the years, the Town of Union and Villages of Endicott and Johnson City have considered constructing a walking path along the Susquehanna River. One portion of the trail was actually built by the Endicott Rotary Club. The Binghamton Metropolitan Transportation Study completed a “Greenways” study. It proposes pedestrian/bikeway trail along the Susquehanna and Chenango Rivers. Another portion of the trail is being constructed on a former rail bed in Vestal with transportation enhancement grants. Since the Town of Union will now own significantly more property due to buyouts, the possibility of creating passive recreational uses has been enhanced. The Town is currently working with twenty one other communities to create a regional Local Waterfront Revitalization Plan (LWRP) in order to secure construction funding for this effort.

5.3 Watershed Management Plan

As discussed in the previous section, the Town should work with the towns of Maine and Chenango and the Village of Johnson City to discuss appropriate land uses for the Little Choconut Creek watershed.

5.4 Flood Warning Dissemination System

The National Weather Service issues flood warnings for major rivers and small streams. The information is shared with the Broome County Office of Emergency Service via communications link. If there is a flood prediction for the Susquehanna River reaching a flood stage of 18 feet, the National Weather Service will issue a warning over the communications network with Broome County Office of Emergency Services (BOES) and the New York State Department of Environmental Conservation (NYSDEC). An alert procedure is initiated by the New York State Department of Environmental Conservation, Broome County, and the Town of Union to maintain and repair levee systems in the Town.

An action chart has been prepared by Broome County Office of Emergency Services, National Weather Service, and NYSDEC to initiate contacts for the closing of floodgates, the operation of pump stations, contacting utilities, and evacuating residents.

The National Weather Service, U.S. Army Corps of Engineers, and U.S. Geologic Survey own a system of river stage gauges on the Chenango River and Susquehanna River (Conklin and Vestal). For the Vestal Gauge, the flood stage is 18 feet. There are no gauges on Nanticoke Creek or Little Choconut Creek. The flood warning system also lacks gauges on streams.

The Town should work with the Broome County Office of Emergency Services and New York State Department of Environmental Conservation to acquire funding to expand this system.

The National Weather Service can provide 12 to 18 hours warning to residents in the Endwell area affected by the Susquehanna River. The Town can assist in the effort to warn residents by the use of Flood Forecast Profiles on U.S.G.S. Maps. (Scale is 1 inch equals 200 feet). The maps show contours that represent various flood stages of the Susquehanna River. The National Weather Service will issue a flood warning for the Susquehanna River to reach a flood stage of 18 feet or above (Vestal Gauge). This means any properties located within the 18 feet contour will be flooded. Residents should be prepared to evacuate prior to reaching that river stage forecast. The Flood Forecast profiles were prepared by the Susquehanna River Basin Commission dated March 4, 1985.

The Flood Forecast Maps can be used by the Town to assist residents in the flood prone area to safely evacuate at a lower river height stage. Each year the Town acquaints residents with the flood warning system by sending a pamphlet which advises residents at what river stage their property be flooded and to be prepared to evacuate before then. The pamphlet also notifies residents what radio stations they should tune to and what emergency precautions should be taken. This activity is being carried out under Activity 310 – Outreach Project.

Since 1993, an effort is ongoing within the National Weather Service to modernize and make improvements to its weather and hydrologic forecasting capabilities. In addition to rainfall gauges in the Susquehanna River watershed area, the new Doppler weather radar system is a technological advance that will assist in estimating real time rainfall rates and amounts. This Doppler weather radar has the capability to estimate and display one hour, three hour, and storm total precipitation amounts. The National Weather Service Office in Binghamton, together with improved guidance and river forecasts from the Middle Atlantic River Forecast Center at State College Pennsylvania will be able to issue more accurate river stage forecasts for the Chenango and Susquehanna Rivers.

During the recent flood events on January 19th and 20th, 1996, the National Weather Service accurately predicted the river stage level for the Susquehanna River. A flash flood watch was issued for small streams and creeks. The Town had a 12-hour notice to evacuate residents from flood prone areas.

Residents can also listen to National Oceanic and Atmospheric Administration (NOAA) Weather radio, which provides continuous broadcasts on the latest information directly from the National Weather Service offices.

Special flood statements including watches and warnings are also broadcast over the Weather Service radio.

The National Weather Service also issues a flood warning for streams. In the Town of Union Nanticoke Creek and Little Choconut Creek are classified as streams. The National Weather Service cannot predict the elevation of the stream without gauges. However, the National Weather Service can forecast the magnitude of the flooding problem by classifying it as being minor, moderate, or severe. Residents in the flood prone areas can be alerted to the fact that their property may be affected. A system of stream gauges should be developed for all streams in the Town and Broome County. In the Town of Union stream monitoring includes Nanticoke Creek and Little Choconut Creek.

The Town should work with Broome County Office of Emergency Services and the National Weather Service in acquiring monies for additional stream gauges.

In the areas affected by flooding, the Broome County Office of Emergency Services will alert local fire department personnel that a severe thunderstorm warning is being issued. This way the fire departments are aware that residents may have to be evacuated or that flooded basements will need to be pumped. The Town can raise residents' awareness about flood safety by sending them a pamphlet discussing the flood warning system and what to do during a flood event. The pamphlet will also tell residents that other resource material is available on flood insurance, flood proofing a building, and other topics at their local library. These activities are being carried out by the Town under Activity 310 – Outreach Project and Activity 340 – Flood Protection Library.

5.5 Property Owner Protection Measures

One of the ways to reduce flood losses is to make residents aware of flood hazards. As mentioned in the previous section residents in flood areas will receive a pamphlet (Activity 310-Outreach Project) acquainting residents with the flood warning system, how much warning time is allowed, what radio station to tune to, and what emergency precautions to take. Flood insurance is recommended since flood damage is not usually covered by normal homeowner's insurance. Pamphlets are sent to residents in flood prone areas affected by the Susquehanna River, Nanticoke Creek, and Little Coconuts Creek. Each pamphlet is tailored in terms of the type of flood warning that residents should listen for. For example, since the Fairmont Park area is now protected by a levee system, residents should be made aware of when the stoplog structure is being placed across Watson Boulevard so that they will not try to use it as an access to and from their place of residence.

Included in the pamphlet sent to residents in flood prone areas is a list of reference sources that residents can use from their local library including the following; how to read a FIRM map, guidelines on flood damage reduction, flood proofing nonresidential structures, purchasing flood insurance, retrofitting flood prone buildings, and flood proofing regulations. There is also a list of names, addresses and telephone numbers of agencies that can assist in learning about flood insurance, flood proofing, and floodplain management. This activity is included under Activity 350- Flood Protection Library. Both the George F. Johnson Memorial Library in Endicott and Your Home Library in Johnson City have these references available for the public.

5.6 Drainage System Maintenance

Smaller storms can cause over bank flooding because debris, silt, and vegetation are allowed to accumulate in drainage structures. Each spring, the Town of Union checks all closed and open storm drainage systems to see if debris has hindered water flow. Before and after any storm, the Town's Highway crews will inspect certain drainage structures.

Debris clogging of all small streams affecting the Town's drainage system will be cleared by Town crews. Broome County clears all debris from the ponding areas around the dam structures on the Nanticoke Creek, Little Choconut Creek, Brixius Creek, and Patterson Creek in the spring. Broome County personnel periodically check dam structures and ponding areas before and after each storm occurrence.

NYSDEC will inspect and clear open channels, ditches, and outlets in the Westover area that may impact the flood protection works. The time periods for inspection of these structures are listed in an agreement signed between the U.S. Army Corps of Engineers and NYSDEC.

5.7 Storm Water Management

Any new development residential, commercial or industrial shall be designed so that the storm water discharge from the subdivision does not exceed the discharge that emanated from the property when it was undeveloped. Storm water runoff from new developments shall not be permitted to increase into inadequate downstream storm sewers during the time of peak runoff. The design and size of the facilities shall be based upon anticipated runoff for a ten-year storm.

Soil erosion is controlled in two ways. Under the Town's Subdivision Regulations, a developer is required to expose the smallest area of land that is practical to prevent soil erosion. Erosion and sedimentation controls must be in place if grading or construction is taking place.

Under the Town's Soil Erosion Law, no person can simply clear his land of vegetation without first submitting a grading and drainage plan to the Planning Board for approval. The Soil Erosion Law also pertains to any land disturbance activity such as excavating or grading.

New York State Department of Environmental Conservation issued new storm water discharge regulations in compliance with new federal regulations issued in 1990 for National Pollutant Discharge Elimination System (NPDES) Program. (Refer to 40 CFR Part 122, 123, and 124, 11/16/90). The NPDES program regulates point discharges of any pollutants into the water of the United States. These new comprehensive regulations were needed after nation-wide water quality studies show that storm water runoff from various land uses such as light industrial, commercial, and residential activities have a significant impact on the water quality of receiving waters. Some of the studies showed that illicit connections of sanitary, commercial and industrial discharges to storm water systems had particularly large amounts of wastes particularly used oils improperly disposed of. Intense construction activities may also result in severe localized impact on water quality because of high unit load of pollutants, primarily of sediments, phosphorous and nitrogen from fertilizer, pesticides, petroleum products and solid wastes.

For any residential or commercial development that disturbs 1 or more acres, the developer must provide a Storm Water Pollution Prevention Plan that will reduce the rate of runoff from new land development to prevent increases in flooding provide infiltration practices to capture contaminants from the storm water runoff by controlling first ½ inch of runoff for all development phases including grading and construction. The Town of Union is a regulated MS4 under general permit GP-02-02 in accordance with Phase II regulations. The Town recently adopted comprehensive storm water ordinance to address this issue.

6.0 Deficiencies in Flood Preparedness Plans

The Town's and County's Emergency Preparedness plans outlines the roles and responsibilities of each agency on the County and local level. It further discusses additional

steps to be taken in case a state of disaster is declared and coordination is required with State and federal agencies.

During flood events, the Town and County plans include various steps that the Town, NYSDEC, and the County must take. These include initiating levee patrols, manning pumping stations, erecting closures, alerting police for barricades, and monitoring river and creek levels. The local fire departments, emergency services, and Town public works crews ordinarily notify residents when to evacuate. The Red Cross is also notified if emergency shelters need to be set up to provide medical care and other emergency needs for evacuees. (7) (8)

The Town's Emergency Preparedness plan lists equipment maintained for flood events. The West Corners, Union Center, Choconut Center, and Endwell Fire departments maintain equipment to pump out flooded basements. NYSDEC also maintains equipment specifically used during flood events including assembly parts for installing closures in the Westover area and West Endicott. Other heavy equipment also is maintained at the NYSDEC Kirkwood office such as backhoes, trucks, etc. (9)

The Town and County plans do not include alerting all critical facilities in advance including industries in flood prone areas. There are no nursing homes or hospitals located in the flood prone areas of the Town. The Endicott Water Department, Johnson City Water Works, and NYSEG are notified if these facilities are impacted. For example, the water pump station in Endwell area is shut off if flooding occurs. The Goudey Power Plant in Westover is also notified if flooding occurs in the Westover area. The West Corners Fire Department monitors the Route 26 Bridge over the Nanticoke Creek. The George F. Highway in Endwell and Watson Boulevard in Fairmont Park are monitored by the Town. In the Westover area, NYSDEC will monitor water levels during high water periods and install closures if need be.

There are no provisions in the Town or County plans to maintain emergency power sources to all critical facilities such as fire stations or designated emergency shelters. There is no provision to maintain emergency vehicular access to and from the Town Emergency Control Center, to and from hospitals in Binghamton and Johnson City for emergency medical care, to and from local fire stations, or in and out of flood prone areas.

The flood preparedness plan does not include a listing of industries that should receive advance warning for flooding such as Primary Plastics. During the January 19th and 20th, 1996 flood event, the Town did notify businesses on Scarborough Drive and Chaumont Drive of possible flooding. There are no emergency shelters designated for the West Corners, Union Center, and Choconut Center areas. In the past, residents in these areas have often gone to relatives and friends. A listing of equipment should be maintained by the Town and Fire departments specifically relating to flood events.

7.0 Flood Response Plan

7.1 Introduction

In this section, the roles and responsibilities of the Town's officials are discussed during a flood event according to the predicted river stages at the Vestal gauge.

When the predicted river stage level is 20 feet but less than 30 feet at the Vestal gauge the National Weather Service issues a flood watch for a predicted river stage of 20 feet but less than 30 feet..

7.2 Conditions

At a predicted river stage of 23 feet or more, Argonne Avenue, River Road, the former Kent Avenue Trailer Park, Fairmont Avenue, Verdun Avenue, Shady Drive, and Davis Avenue would be flooded. At a predicted river stage of 25 feet or more, the George F. Highway or Route 17C and the exit to Route 17C would be closed.

At a predicted river stage of 20 feet or more, Watson Boulevard would be closed to the Fairmont Park area. The stoplog structure across Watson Boulevard would be installed at a river stage level of 23 feet. At a river stage of 26.5 feet, the closure (X-1) extending across Main Street is installed on the eastside of Fifth St. and the BAE facility.

Route 26 north of West Corners area would be flooded. Access to Endicott via Route 26 south would be limited with flooding under the Conrail Railroad crossing near the Cider Mill. Access to points south or east would be via Glendale Drive to Main Street.

At a predicted river stage of 24 feet, River Road is closed to vehicular traffic. The west end of River Road is subject to flooding with higher river stages and emergency vehicular traffic is not possible.

7.3 Notification For A Watch

1. The Town Commissioner of Public Works will notify the Town Supervisor that a flood watch is in effect.
2. The Commissioner of Public Works will monitor weather updates through the media and with Broome County Office of Emergency Services.
3. If the Flood Watch is lifted or upgraded to a Flood Warning, the Commissioner of Public Works will notify the Town Supervisor.
4. If the Town Supervisor is notified by staff or learns of the Flood Watch through the media.
 - a. The Town Supervisor will inform the Commissioner of Public Works that a Flood Watch is in effect.
 - b. The Commissioner of Public Works will monitor weather updates through the media and with Broome County Office of Emergency Services.
 - c. If the Flood Watch is lifted or upgraded to a Flood Warning, the Commissioner of Public Works notifies the Town Supervisor.

7.4 Initiation of Response for A Warning

A Flood Warning has been issued with a predicted river stage of 20 feet but less than 30 feet at the Vestal gauge.

1. Highway Superintendent will report to the Commissioner of Public Works.
2. The Commissioner of Public Works will report to the Town Supervisor.
3. The Commissioner of Public Works will initiate the notification procedure or calling tree.
4. The Commissioner of Public Works will contact Broome County to see if it has declared a state of emergency.
5. The Town Highway Garage will be used as the Town's Emergency Control Center. All public works personnel must report to the highway garage for service.
6. The Highway Superintendent will alert personnel from the Highway Department and from other Public Works departments.
7. The Deputy Commissioner of Public Works for Environmental Services (DCPW-ES) will institute operational procedures at pump stations.
8. Upon call from the NYSDEC Kirkwood Office, the Superintendent of Highway will provide levee patrol and barrier installation in the Westover area.
9. With a predicted river stage level of 23 feet or more, the NYSDEC will man its emergency operations center at Kirkwood at river stage of 18 feet and begin planning for levee patrol and critical closures such as Conrail, BAE (formerly General Electric) and Main Street in Johnson City.
10. The Highway Superintendent and Commissioner of Public Works shall prepare and update Manning Table, procedures, and equipment requirements for Levee Patrol and Barrier Installation.
11. At river stage level of 18 feet, the Endwell Fire Department will notify New York State Electric and Gas to shut off electricity at its poles servicing Argonne Avenue, Kent Avenue, Davis Avenue, Shady Drive and Verdun Avenue with a predicted river stage level of 21 feet or more.
12. At a river stage level of 18 feet or 19 feet, the Endwell Fire Department will notify residents on Argonne Avenue, Davis Avenue, the lower ends of Shady Drive and Davis Avenue, and Verdun Avenue to evacuate with a predicted river stage of 20 feet or more. Businesses on Scarborough Drive and Chaumont Drive are also notified to evacuate the premises.
13. With a predicted river stage of 23 to 25 feet, the Town of Union Emergency Control will notify the Red Cross that an emergency shelter should be set up for Endwell evacuees at the Endwell Fire Station on Country Club Road.

14. With a predicted river stage of 21 feet or more, the Town of Union notifies residents on River Road to evacuate at river stage 18 or 19 feet
15. At a predicted river stage level of 25 feet, Route 17, the exit to Route 17C or George F. Highway will be closed.
16. At an actual river stage of 20 feet or more, Watson Boulevard will be closed to the Fairmont Park area. The Town's Commissioner of Public Works would contact Traditions at the Glen (formerly IBM) to open the road through the former IBM Homestead property for vehicular traffic to and from Fairmont Park. The stoplog structure will be installed across Watson Boulevard by the Town of Union Highway personnel at a river stage level of 23 feet. Barricades will be placed by the Town on Hooper Road at the intersections of Country Club Road and Watson Boulevard to prevent traffic entering into the flooded area.
17. At a predicted river stage of 23 feet or more, NYSDEC will man the emergency operations center in Kirkwood in Westover, begin planning for levee patrols, and critical closures such as Conrail, BAE, and Main Street in Johnson City.
18. At a predicted river stage of 27 feet or more, NYSDEC would initiate the levee closure (X-1) across Main Street which is situated to the east of Fifth St. and BAE.
19. In the West Corners and Route 26 areas, West Corners Fire Department would monitor the Nanticoke Creek level if river stage for the Susquehanna River would reach a predicted river stage of 22 feet or more.
20. West Corners Fire Department will warn residents on Route 26 to evacuate at 27 feet if the river stage level is predicted to rise to a level of 30 feet or more.
21. If flooding from the Nanticoke Creek is more severe, Route 26 north of West Corners will be flooded at a river stage of 28 feet or more.
22. The Town of Union would notify employees at 21 feet Glendale Park to evacuate if the river stage level is 25 feet or more.
23. NYSDEC will initiate levee patrols in the West Endicott area when the predicted river stage is for 25 feet or more.
24. At river stage level of 26 feet, the X-6 closure over the Conrail Railroad tracks near Main Street will be initiated. The sill elevation height is 32 feet

7.5 Evacuation Routes and Blockades

20 feet to less than 30 feet – Vestal Gauge

1. There is no easy access from Endwell area to points east since Watson Boulevard, George F. Highway and the on-ramp to Hooper Road would be flooded. Access would be by Struble Road to Robinson Hill Road or by Country Club Road to Robinson Hill Road.

2. All roads from Endwell heading west would be opened. Access to points north would be available by taking North Street or Main Street. To get to emergency shelters, evacuees can take North Street west to Hayes Avenue north.
3. The Westover area would have no direct access to the east with the levy closure (X-1) across Main Street. There would be no access to the west because the George F. Highway would be flooded. Access would be by Oakdale Road to Robinson Hill Road.
4. The West Corners area would be protected from flooding by the levee. Route 26 to the north of West Corners would be flooded. Access from West Corners to points south would be cut off since flooding could occur on Nanticoke Drive near the Conrail underpass (near the Cider Mill).
5. From Route 26 to points east and south, persons will have to use Day Hollow Road west to Boswell Hill Road. Glendale Drive would be flooded.
6. To get to points north from West Corners, residents would have to use Day Hollow Road west to Boswell Hill north.

7.6 Conditions

The National Weather Service issues a Flood Warning at a predicted river stage of 30 feet but less than 35 feet at Vestal Gauge. At 30 feet or more, the conditions outlined in the previous section will exist. In Endwell, George F. Highway, Argonne Avenue, River Road, Verdun Avenue, Shady Drive, Fairmont Avenue, and Davis Avenue would be flooded. Scarborough Drive and Chaumont Drive would be flooded extending to Main Street. Brookside Avenue, Watson Boulevard, Wayne Street, and Lawndale Street would be flooded from Patterson Creek.

Access to and from Binghamton or Johnson City via Route 17 would be limited due to flooding at the 30 feet river stage level or above.

Access to the east and west via Main Street from the Westover area will be blocked off. Access to and from the Westover area would be via Oakdale Road north, Harry L. Drive east, and Route 201 south.

Access to and from the West Corners area via Route 26 north and south would be blocked off. The only route to points east would be to take Day Hollow Road west to Boswell Hill Road north and seek an easterly route. Glendale Drive will be partially flooded to the north of the Mews and south of the intersection of Glendale Drive and Jeannette Road. To travel north or west from West Corners area, residents would use Day Hollow Road west to Boswell Hill Road north.

7.7 Notification for A Watch

The National Weather Service issues a flood watch for a predicted river stage of 30 feet but less than 35 feet at the Vestal Gauge.

1. The Town Commissioner of Public Works will notify the Town Supervisor that a flood watch is in effect.

2. The Commissioner of Public Works will have the Highway Superintendent monitor weather updates through the media and with Broome County Office of Emergency Services.
3. If the Flood Watch is lifted or upgraded to a Flood Warning, the Commissioner of Public Works will notify the Town Supervisor.
4. If the Town Supervisor is notified by staff or learns of the Flood Watch through the media:
 - a. The Town Supervisor will inform the Commissioner of Public Works that a Flood Watch is in effect.
 - b. The Commissioner of Public Works will have the Highway Superintendent monitor weather updates through the media and with Broome County Office of Emergency Services.
 - c. If the Flood Watch is lifted or upgraded to a Flood Warning, the Commissioner of Public Works notifies the Town Supervisor.

7.8 Initiation of Response for a Warning

A Flood Warning has been issued with a predicted river stage of 30 feet but less than 35 feet at the Vestal Gauge.

1. Highway Superintendent will report to the Commissioner of Public Works.
2. The Commissioner of Public Works will report to the Town Supervisor.
3. The Commissioner of Public Works will contact Broome County to see if a state of emergency has been declared.
4. If the Town Supervisor declares a state of emergency, the Commissioner of Public Works shall initiate the notification procedure or calling tree.
5. The Town Highway Garage will be used as the Emergency Control Center. All public works personnel must report to the Highway Garage for assignment. The Town Commissioner of Public Works will have to consider relocation of the Emergency Control Center if the predicted river stage is 30 feet or more to the Union Center Fire Department on Taft Avenue. All heavy equipment such as backhoes, trucks will have to be relocated to another location. Any equipment that cannot be removed will be placed at a higher elevation. All Town vehicles would be required to fill up with gas at the Town pumps prior to 30 feet river stage.
6. The Superintendent of Highway will alert personnel from the Services Department and from other Public Works Departments.
7. The DCPW-ES will institute operational procedures on pump stations.
8. Upon a call from the NYSDEC, the Highway Superintendent will provide levee patrol and barrier installation with Highway Department personnel in the Westover area.

9. The Highway Superintendent and Commissioner of Public Works shall prepare and update Manning Table, procedures, and equipment requirements for Levee Patrol and Barrier Installation.
10. Initiate communication with Broome County Office of Emergency Services and Red Cross and begin coordinated response.
11. Order evacuation of the areas expected to be inundated. (See List)
12. Coordinate with Fire Departments in Endwell and West Corners to begin evacuation procedures with river stage predictions of 29 feet or more.
13. The Town of Union Highway Department will begin evacuation of the Fairmont Park area prior to the predicted river stage level of 30 feet (Vestal Gauge)
14. The Town of Union and Broome County Office of Emergency Services will begin evacuation procedures of the Westover area prior to the sill height of the (X-1) closure of 29 feet. New York State Department of Environmental Conservation and other agencies may assist in the evacuation effort.
15. The Town of Union will begin evacuation procedures in West Endicott prior to levee overtopping of 32 feet (Vestal Gauge)

7.9 Evacuation Routes and Blockades

30 feet but less than 35 feet. (Vestal Gauge)

1. To go to points east or west from the Westover area, residents would have to go Oakdale Road north, Harry L. Drive east and Route 201 south to Route 17. Access to Main Street would be limited by the levee closure (X-1) and flooding to the west. Emergency shelters would be available at Johnson City High School.
2. There would be no access to points east from Endwell via Watson Boulevard, George F. Highway or Route 17C, and the on-ramp to Hooper Road.
3. Evacuation routes from the Endwell area to any points north or east would be by using Main Street or North Street to go west and Hayes Avenue to go north. Emergency shelters would be set up at Homer Brink School and Maine-Endwell Senior High School.
4. An evacuation route from Westover area would have to be by Oakdale Road north to Harry L. Drive east to Route 201. Route 17 could provide access to points east or west.
5. The West Corners area would be flooded on the north and south sides. No access could be provided via Route 26. Evacuees would have access to points east or south by taking Day Hollow Road to Boswell Hill Road. Glendale Drive would be flooded north of the Summit Chase (formerly known as the Mews). For travelers heading north using Boswell Hill Road to another road going east, it would be possible to reach a destination point in Johnson City. Nanticoke Creek often floods a portion of Nanticoke Drive near Route 26 preventing travel eastward. It should be noted that no emergency shelters have been set up in the past for evacuees in the West Corners area because most residents have gone to friends or relatives.



7.10 Emergency Care

Hospital care would be available to Town of Union residents by seeking routes that would have access to Route 17. Endicott and Endwell residents would use the McKinley Avenue Bridge to reach Route 17 to get to Wilson Hospital via Stella Ireland Road/CFJ Boulevard.

Residents in West Corners and Boswell Hill Road area would not have access to Route 17 when river stage levels reach 25 feet. Helicopter service would be required.

7.11 Mass Evacuation

Upon declaration of a state of emergency and the evacuation of the attached list of areas. The notification will be carried out door to door by Town personnel, police, and fire departments.

Evacuees should be told where emergency shelters are located. A list of emergency shelters as designated by the Red Cross should be provided to evacuees at the time they are told to evacuate. Two hours notice should be given in advance to the predicted river stage time. The Red Cross has agreements with Maine-Endwell, Johnson City, and Union-Endicott schools to set up emergency shelters. The Red Cross provides mass shelter and food for evacuees as well as for disaster workers.

In the past, emergency shelters have not been set up in the West Corners and Choconut Center areas. Evacuees usually go to the homes of relatives or friends.

Evacuees should be advised to make sure that the homes are on higher ground and that there is an adequate evacuation route.

As with all evacuees, they should be informed of major open and closed routes and advised to use longer but higher ground routes to their destinations.

Coordinating traffic routing should be done with Broome County Office of Emergency Services including the State Police and Broome County Sheriff's Department.

7.12 Water Monitoring Stations

The Town of Union monitors the water of the Susquehanna River in the Endwell area and Fairmont Park area. NYSDEC monitors water levels in Westover and West Endicott.

In the West Corners area, the West Corners Fire Department and Broome County Office of Emergency Services monitors the Nanticoke Creek water level.

In Choconut Center, the Choconut Center Fire Department will monitor the creek level.

Broome County Department of Parks will monitor the water levels of the dams on Little Choconut Creek and Nanticoke Creek to determine if there are any problems.

7.13 Inspection and Maintenance

According to the Operation and Maintenance Manual prepared by the Army Corps of Engineers, NYSDEC is required to conduct periodic inspections of flood control facilities prior to a major flood season in March, April, and May; following each major high water period; and periods not exceeding 90 days. (10) Inspection and maintenance requirements for pump stations, drainage structures, ponding area, and open channels vary.

Semiannual reports are required to be submitted to the U.S. Army Corps of Engineers covering the inspection, maintenance, and operation of protective works. Check sheets are required for each emergency. Operating records are required to be submitted for sluice gates, seepage wells, and pumping station during a flood event. (11)

Levees must be mowed and inspected. Any excavation on the landward side of the levee up to 200 feet can cause boils or blowouts. Building construction is allowed by permit in the area adjacent to the levee right-of-way. No building construction is allowed if it can cause a possible seepage path for water. All uses of the right-of way must be permitted by New York State Department of Environmental Conservation and the Army Corps of Engineers. Levee slopes should have well maintained sod. Any barren spots should be mulched and seeded for continued vegetative cover. (12)

Floodwalls should be inspected to ensure that nothing endangers its stability. A close inspection should be made of the connection between a floodwall and levee to determine if there is any leakage (particularly during high water periods).

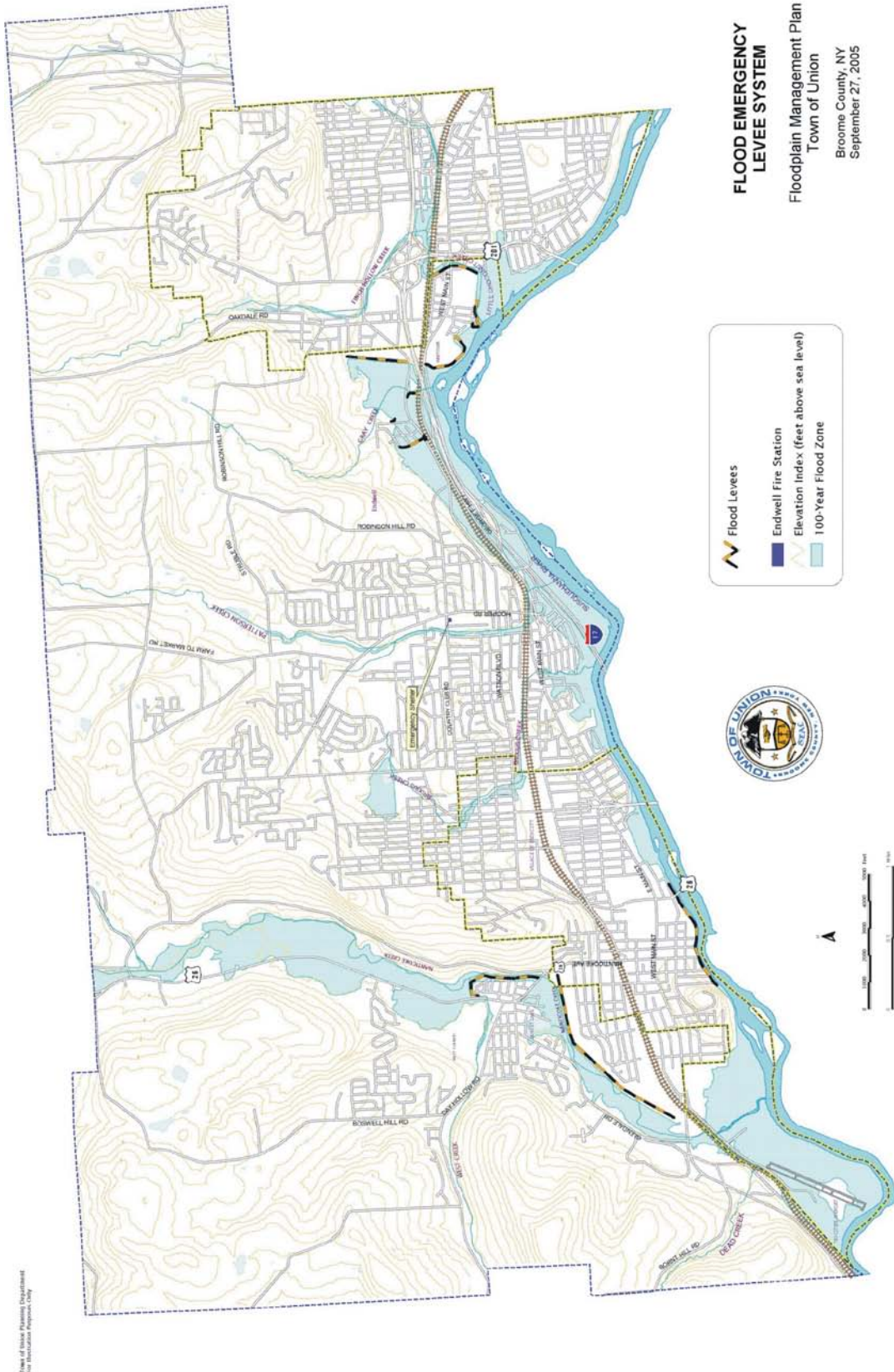
Riprap must be inspected and cleared of any vegetation growth that may impair its stability. Riprap should be replaced if it has been loosened during a recent flood event.

Closure structures should be inspected to ascertain any signs of settlement. All parts of the assembly should be inspected to determine if they are in good condition. After a flood event, all parts of the assembly should be inspected and cleaned before putting them in storage. All closure structures should be erected every three years or when there is a change in personnel. Drills should be held at least once a year. (13)

Seepage relief systems are located along the levees in Westover and West Endicott. All relief wells should be inspected after each high water period and at least once a year. (14)

All drainage pipes, gates, and culverts should be freed of debris at regular intervals. Gates and valves on drainage structures should be examined and trial operated at least once every 90 days. Periodic inspections are also required of any ponding area to prevent it from becoming filled with silt, debris, or dumped materials.

With impending high waters, all drainage gates should be inspected shortly before water reaches the invert of the pipe. Any object should be removed that prevents closure of the gate.



7.14 Floodplain Regulations

The Town meets the minimum standards under the National Flood Insurance Program under Local Law No. 8 “Flood Damage Prevention”. A property owner must apply for a development permit to construct or flood proof a building in a Special Flood Hazard area. The elevation of the lowest floor (including the cellar or basement) of a residential or nonresidential structure must be at the base flood elevation. (15) As of January 2008, new structures are required to have first floor elevations at least two feet above the base flood elevation.

In order to ensure compliance with National Flood Insurance requirements, the Town’s Building Official is maintaining elevation certificates developed by the Town. This activity is credited under Activity 310 – Elevation Certificates.

The Town would also like to ensure that lenders, insurance agents, and real estate agents comply with the Town’s Floodplain Regulations. The Town provides floodplain information on parcels to these groups. Upon telephone or written request, the Town will provide information if the parcel is in a Special Flood Hazard area and what FIRM map to refer to. The Town also publicizes the service through an annual mailing. The Town conducts this activity each year as part of its annual CRS recertification application.

In flood prone areas protected by levees such as West Corners and Fairmont Park, new building construction is allowed only when an amendment has been made to the Flood Insurance Rate Map from Zone A to Zone B. That is, the protected area is not considered part of the regulatory floodplain. In the case of the Fairmont Park Subdivision, the Town of Union was denied a map amendment to the Flood Insurance Rate Map because the levee system protecting the residences does not meet the three-foot freeboard requirement on the eastside. A stoplog structure would have to be installed across Watson Boulevard (east of Traditions at the Glen). The Town has applied to FEMA several times, without success, for funding to complete the missing section of floodwall and install a stop log closure system. While FEMA declined to fund this project, on October 15, 2009 Congressman Hinchey announced that he was able to secure funds from an alternate source to design and construct this important project.

The Town’s floodplain regulations allow for new housing construction in the designated 100-year floodplain if the lowest floor of the structure is at the base flood elevation. Previously, the Town required that the lowest floor of the structure be one foot above the base flood elevation. As of January 2008 all new structures must have a first floor elevation at least two feet higher than the base flood elevation.

Development along Route 26, or Union Center Maine Highway, is limited due to the lack of public utilities north of Payne Road. Flood studies were not completed on the Nanticoke Creek until 1980. Flood Insurance Rate Map was issued showing the designated 100-year floodplain. The designated A zones are shown on the FIRM maps.

The Town should consider further restrictions on development in this area. Under the State Environmental Quality Review Act (6 NYCRR Part 617), the area could be designated a critical environmentally sensitive area. Criteria could be developed which could be made as

an amendment to the zoning ordinance. The Town of Union Planning Department is investigating the feasibility of this option.

8.0 Recommendations of Activities for 2009

The following activities will be continued in 2009:

1. Activity 240

Floodplain Management Plan Revisions to the Floodplain Management Plan will be undertaken as necessary.

2. Activity 310

Elevation Certificate The Town of Union Building Official will continue to use the elevation certificate published by the Federal Emergency Management Agency.

3. Activity 320

Map Determination The Town and the Villages of Endicott and Johnson City will continue to publicize a service whereby banks, insurance companies, or real estate agents can request any floodplain information on particular property. The annual mailing to mortgage lenders and insurance agents was mailed in October of 2009. The Town of Union Planning Department and Building Official will continue to respond to any verbal or written inquiries for map determinations for properties within the floodplain. The information includes the community number, panel number, FIRM zone, FIRM suffix, date of FIRM index, and base flood elevation datum system used on the FIRM.

4. Activity 330

Outreach Project The Town of Union Planning Department will continue to send out a pamphlet to residents in flood prone areas on flood hazards and flood safety. The pamphlet also lists some references on flood proofing a building, flood insurance, etc. that residents can borrow at their local library. This activity was completed in October of 2009.

5. Activity 350

Flood Protection Library The Town of Union Planning Department will continue to have reference materials on various topics relating to flood proofing flood insurance at the George F. Johnson Memorial Library in Endicott and Your Home Library in Johnson City. The Town contacts the libraries annually to update any references. This activity was most recently carried out in October of 2009.

6. Activity 420

Open Space Preservation From 1988 to 2007, the Town of Union purchased more than 25 acres of private property under the River Road/Argonne Avenue Buyout Program. These areas are subject to frequent flooding from the Susquehanna River. The purpose of the program was to remove homes from the floodplain and return the area to its natural state.

The Town will continue to seek funds for buyouts of homes in the 100-year floodplain that have been substantially damaged during recent flooding.

7. Activity 450

Storm Water Management The Town's Subdivision Regulations require that the developer designs a storm drainage system for a ten (10) year storm. The developer must show that storm water discharge does not exceed the discharge that emanated from the property when it was undeveloped. The Town has initiated compliance requirements for the Storm Water Phase II requirements. Southern Tier East Regional Planning and Development Board has implemented informational workshops this past year for government officials and contractors. The Town of Union provided a storm sewer outfall map and has submitted its annual report to New York State Department of Environmental Conservation. The Town has adopted a model storm water ordinance to incorporate into its site plan review and subdivision approval process.

8. Activity 510

Repetitive Loss Plan Repetitive loss properties were addressed in the Town's Floodplain Management Plan. Many homes in the southeast portion of Endwell in the Argonne Avenue and Verdun Avenue areas were flooded again during recent flood events. Those properties that were acquired and demolished under the 2005, 2006, and 2007 buyout programs were updated on the RL inventory and returned to ISO for processing.

9. Activity 520

Acquisition and Relocation The Town of Union used federal Community Development funds to purchase flood prone properties, demolish the houses and return the land to its natural state. The River Road/Argonne Avenue Buyout Program ended in 1993. The Town received FEMA funds for three additional buyout programs in 2005, 2006, and 2007.

10. Activity 540

Drainage System Maintenance The Town of Union Highway Superintendent or his designees will continue to conduct inspections and debris removal programs for catch basins, man-made channels, ditches, and natural drainage ways.

11. Activity 610

Flood Warning Program The Town's flood warning dissemination system is discussed in the Floodplain Management Plan. During the period since the previous CRS recertification application the Town of Union did not have a flood that qualifies for evaluating the flood warning program. According to the CRS Coordinator's Manual a flood would have to damage more than 10 buildings, cause more than \$50,000 in property damage, or cause the death of one or more persons. There were no such incidents during the report period.

12. Activity 630

Dam Safety Broome County owns and maintains several dams along Nanticoke Creek, Patterson Creek, and Little Choconut Creek. New York State Department of Environmental

Conservation inspects the dams annually. These dams do meet safety standards developed by the Association of State Dam Safety Officials (ASDSO).

Glossary Of Flood Related Terminology

From The National Flood Mitigation Data Collection Tool User's Guide

1. Definitions

1.1 Flood Insurance Terms

Cumulative Losses – The total value of losses on a structure during a specified period of time.

Repetitive Loss (RL) Structure – The National Flood Insurance Program (NFIP) definition is any property for which two or more flood insurance claims have been paid for more than \$1,000 within any rolling 10-year period since January 1, 1978. Each RL record is identified for FEMA internal program tracking by the use of an eight-digit Repetitive Loss or Property Locator number unique to the individual record. No additional identification is provided to distinguish the various sub-categories below.

Target Group Repetitive Loss Properties – This is a subset of NFIP repetitive loss properties that have had:

- Four or more claim payments of more than \$1,000 within any rolling 10-year period since January 1, 1978, and/or
- Two or more claim payments within any rolling 10-year period since January 1, 1978, that appear to equal or exceed the reported property value.

Severe Repetitive Loss Properties – A subset of Target Group Repetitive Loss Properties defined by the Bunning-Bereuter-Blumenauer Flood Insurance Reform Act of 2004. Severe Repetitive Loss Properties are the focus of a 5-year Pilot Program that was created as a component of FEMA's Flood Mitigation Assistance Program and are defined as:

- Single-family properties (consisting of 1 to 4 residences) that have incurred flood-related damage for which 4 or more separate claims payments have been made, with the amount of each claim exceeding \$5,000 (building and contents) and with a cumulative amount of such payments exceeding \$20,000;
- Single-family properties that have incurred flood related damage for which at least 2 separate claims payments have been made with the cumulative amount of such claims (building only) exceeding the value of the property; and
- Multifamily properties (5 or more residences) that have incurred flood-related damage, but the specific number and amount of claims associated with these properties will be determined by FEMA in future regulation.

1.2 NFIP Terms and Building Code/Regulatory Standards

Appurtenant Structures – Accessory structures that are not habitable, but are located on the same property as the structure of interest. Examples of appurtenances include carports, sheds, garages, and decks.

Base Flood Elevation (BFE) – The water surface elevation resulting from the base or 100-year flood (i.e., a flood that has a 1 percent chance of equaling or exceeding that level in any given year). It is commonly referred to as the 100-year flood and is the national standard used by the NFIP and all Federal agencies for the purposes of requiring the purchase of flood insurance and regulating new development.

Code Height Restrictions – Regulations, usually at the community level, that cap the height to which a structure can be built/elevated. These are mainly used in waterfront communities where coastal/riverfront views are being protected.

Compensatory Storage – Floodwater storage created to offset the effects of development in the floodplain. Some communities require a hydraulically equivalent storage volume be created for floodwaters when development has resulted in the displacement of floodwaters from part of the floodplain.

Design Flood Elevation (DFE) – Elevation to which a building is designed to provide protection from flooding. Called the DFE, it is generally referenced to the BFE and might include some level of freeboard (see definition) above the BFE for added protection.

Dry floodproofing – Measures that eliminate or reduce the potential for flood damage by keeping floodwaters out of the structure. Examples include installation of watertight shield for doors and windows, reinforcement of walls to withstand hydrostatic and hydrodynamic pressures and debris impact, and use of sealants to reduce seepage of floodwater through walls.

Flash flood – A flood that rises and falls very quickly and is usually characterized by high flow velocities. Flash floods often result from intense rainfall over a small area and can also occur in highly urbanized areas where pavements and drainage improvements speed runoff to a stream.

Flood Insurance Rate Map (FIRM) – An official map of a community, on which FEMA has delineated both the special hazard areas and the risk premium zones applicable to the community. The map shows the extent of the base floodplain and may also display the extent of the floodway, and BFEs.

Flood Insurance Study (FIS) - A study developed in conjunction with the FIRM. The FIS, also known as a flood elevation study, frequently contains a narrative of the flood history of a community and discusses the engineering methods used to develop the FIRMs. The study also contains flood profiles for studied flooding sources and can be used to determine BFEs for some areas.

Freeboard – An additional amount of height included to provide a factor of safety. It is usually expressed in feet above a flood level for purposes of floodplain management.

Levee – A man-made structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control, or divert the flow of water to provide protection from temporary flooding.

Pre-FIRM Building -For insurance rating and floodplain management regulatory purposes, a pre-FIRM building is defined as a building constructed or substantially improved on or before December 31, 1974, or before the effective date of the initial FIRM of the community, whichever is later. Most pre-FIRM buildings were constructed without accounting for the flood hazard.

Post-FIRM Building -For insurance rating and floodplain management regulatory purposes, a post-FIRM building is defined as a building constructed or substantially improved after December 31, 1974, or after the effective date of the initial FIRM of a community, whichever is later. A post-FIRM building is required to meet the NFIP's minimum flood protection standards in effect at the time of construction.

Substantial Damage – Damage of any origin sustained by a structure whereby the cost of restoring the structure to it's before damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred.

Substantial Improvement –Any reconstruction, rehabilitation, addition, or other improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure before the start of construction of the improvement. This term includes structures that have incurred substantial damage, regardless of the actual repair work performed. The term does not, however, include either:

- (1) Any project for improvement of a structure to correct existing violations of state or local health, sanitary, or safety code specifications which have been identified by the local code enforcement official and which are the minimum necessary to assure safe living conditions or
- (2) Any alteration of a historic structure provided that the alteration will not preclude the structure's continued designation as a historic structure.

Wet floodproofing – Permanent or contingent measures applied to a structure and/or its contents that prevent or provide resistance to damage from flooding by allowing floodwaters to enter the structure. Such measures include the design of openings for intentional flooding of enclosed areas below the DFE, use of flood resistant building materials below the DFE, and protection of the structure and its contents (including utilities).

1.3 Property Value

Building Replacement Value – The value of a structure based on the cost of materials and labor to rebuild it.

Market Value – The value of a structure based on the estimated price for which a willing seller in the current real estate market would sell it to a willing buyer.

1.4 Stormwater Management

Detention Basin – A basin constructed to temporarily impound stormwater runoff and attenuate stormwater flows.

Retention Basin – A basin that has a permanent pool for water quality treatment. It temporarily impounds and retains a specified amount of stormwater runoff and then discharges excess runoff through a riser structure and spillway at a specified rate.

Debris flow – Floodwaters that have picked up and are carrying objects of all types (e.g., trees, automobiles, boats, storage tanks, dirt, oil, various chemicals, etc.).

Flood frequency – The probability, expressed as a percentage, that a flood of a specific size on a specific stream will be equaled or exceeded in any given year.