5.4.3 FLOOD

This section provides a profile and vulnerability assessment for the flood hazard.

HAZARD PROFILE

This section provides hazard profile information including description, extent, location, previous occurrences and losses and the probability of future occurrences.

Description

Floods are one of the most common natural hazards in the U.S. They can develop slowly over a period of days or develop quickly, with disastrous effects that can be local (impacting a neighborhood or community) or regional (affecting entire river basins, coastlines and multiple counties or states) (Federal Emergency Management Agency [FEMA], 2006). Most communities in the U.S. have experienced some kind of flooding, after spring rains, heavy thunderstorms, coastal storms, or winter snow thaws (George Washington University, 2001). Floods are the most frequent and costly natural hazards in New York State in terms of human hardship and economic loss, particularly to communities that lie within flood prone areas or flood plains of a major water source.

The FEMA definition for flooding is "a general and temporary condition of partial or complete inundation of two or more acres of normally dry land area or of two or more properties from the overflow of inland or tidal waters or the rapid accumulation of runoff of surface waters from any source (FEMA, Date Unknown)." The New York State Disaster Preparedness Commission (NYSDPC) and the National Flood Insurance Program (NFIP) indicates that flooding could originate from one of the following:

- Riverine flooding, including overflow from river channels, flash floods, alluvial fan floods, ice-jam floods and dam-break floods;
- Local drainage or high groundwater levels;
- Fluctuating lake levels;
- Coastal flooding from storm surge or coastal storms;
- Coastal erosion;
- Unusual and rapid accumulation or runoff of surface waters from any source;
- Mudflows (or mudslides);
- Collapse or subsidence of land along the shore of a lake or similar body of water caused by erosion, waves or currents of water exceeding anticipated cyclical levels that result in a flood as defined above (NYSDPC, 2008; Floodsmart.gov, 2008);
- Sea Level Rise; or
- Climate Change (Global Warming)

A floodplain is defined as the land adjoining the channel of a river, stream, ocean, lake, or other watercourse or water body that becomes inundated with water during a flood. Most often floodplains are referred to as 100-year floodplains. A 100-year floodplain is not the flood that will occur once every 100 years, rather it is the flood that has a one-percent chance of being equaled or exceeded each year. Thus, the 100-year flood could occur more than once in a relatively short period of time. With this term being misleading, FEMA has properly defined it as the one-percent annual chance flood. This one-percent

annual chance flood is now the standard used by most Federal and State agencies and by the National Flood Insurance Program (NFIP) (FEMA, 2002).

As presented by the Association of State Floodplain Managers (ASFPM), FEMA's NFIP Floodplain Management Requirements: A Study Guide and Desk Reference for Local Officials (FEMA-480), indicates that most floods fall into three categories: Riverine, Coastal and Shallow (ASFPM, 2005). Other types of floods could include ice-jam floods, alluvial fan floods, dam failure floods, and floods associated with local drainage or high groundwater (as indicated in the previous flood definition). For the purpose of this HMP and as deemed appropriate by the County; Riverine, Flash, Ice-Jam and Dam Failure flooding are main flood types of concern that could impact the County and are discussed as follows:

Riverine/Flash Floods – Riverine floods, the most common flood type, occur along a channel and include overbank and flash flooding. Channels are defined features on the ground that carry water through and out of a watershed. They may be called rivers, creeks, streams or ditches. When a channel receives too much water, the excess water flows over its banks and inundates low-lying areas. Theses floods usually occur after heavy rains, heavy thunderstorms, or snowmelt, and can be slow or fast-rising, and generally develop over a period of hours to days (FEMA, Date Unknown; The Illinois Association for Floodplain and Stormwater Management, 2006).

According to the National Weather Service (NWS), flash floods are "a rapid and extreme flow of high water into a normally dry area, or a rapid water level rise in a stream or creek above a predetermined flood level, beginning within six hours of the causative event (e.g., intense rainfall, dam failure, ice jam). However, the actual time threshold may vary in different parts of the country. Ongoing flooding can intensify to flash flooding in cases where intense rainfall results in a rapid surge of rising flood waters" (NWS, 2005). FEMA's "Are You Ready" Flood Preparedness Guide, indicates that flash floods often have a dangerous wall of roaring water that carries rocks, mud, and other debris and can sweep away most things in its path. They usually result from intense storms dropping large amounts of rain within a brief period with little or no warning; can reach their peak in only a few minutes. They normally occur in the summer during the thunderstorm season. The most severe flooding conditions usually occur when direct rainfall is augmented by snowmelt. If the soil is saturated or frozen, stream flow may increase due to the inability of the soil to absorb additional precipitation. Flooding can also occur when a dam fails or breaks, producing effects similar to flash floods. Areas that are most susceptible to the effects of floods are low-lying areas that are near water or downstream from a dam (FEMA, 2006).

Ice-Jam Floods - As indicated by the Northeast States Emergency Consortium (NESEC), an ice jam is an accumulation of ice in a river that acts as a natural dam and can flood low-lying areas upstream. Downstream areas also can flood if the jam releases suddenly, releasing a wave of ice and water. *Freezeup jams* are composed primarily of frazil ice, with some fragmented ice included, and occur during early winter to midwinter. The floating frazil may slow or stop due to a change in water slope from steep to mild because it reaches an obstruction to movement such as a sheet ice cover, or because some other hydraulic occurrence slows the movement of the frazil. *Breakup jams* occur during periods of thaw, generally in late winter and early spring, and are composed primarily of fragmented ice formed by the breakup of an ice cover or freezeup jam. The ice cover breakup is usually associated with a rapid increase in runoff and corresponding river discharge due to a significant rainfall event or snowmelt. Late season breakup is often accelerated by increased air temperatures and solar radiation.

An ice jam occurs when warm temperatures and heavy rains cause rapid snow melt. The melting snow combined with the heavy rain, causes frozen rivers to swell. The rising water breaks the ice layers into large chunks, which float downstream and often pile up near narrow passages and

obstructions, such as bridges and dams. The ice jam may then build to a thickness great enough to raise the water level and cause flooding (NESEC, Date Unknown). Some of the most devastating winter floods have been associated with a combination of heavy rainfall, rapid snowmelt, and ice jams. The severity of an ice jam is a function of the preceding rise in water level (and velocity), the amount of ice traveling with the break-up front, and the nature of the obstacle that initiates the jam. Ice jams can be expected when the ice is thick, snow accumulations are heavy, and the temperature increases dramatically or there is a heavy rainfall. As indicated by the U.S. Army Corps of Engineers (USACE) November 1994 Engineer Pamphlet 1110-2-11 "Ice Jam Flooding: Causes and Possible Solutions," the following influence or cause ice jam events:

- River geometries, weather characteristics, and floodplain land-use practices;
- When ice transport capacity or ice conveyance of the river is exceeded by the ice transported to that location by the river's flow;
- Location (the confluence of a tributary stream and a larger river, lake, or reservoir);
- Collection of ice in riverbends limiting movement or flow;
- Obstructions to ice movement, for example closely spaced bridge or dam piers; and/or
- Structural or operational changes in reservoir regulation (USACE, 1994).

It is difficult to identify particular areas that are generally prone to ice jams because the hazard can be very localized. However, based on causal characteristics, ice jam flood hazard is most prevalent in locations of flat terrain but also where climate includes extended periods of below freezing temperatures.

Most ice jam events create significant economic, environmental and social impacts to areas located along rivers, streams, reservoirs and/or tributaries. Impacts can include structural damages, disruption of geomorphology (bank erosion, channel shifting), and natural habitat loss to fish populations and microbial communities. Ice jams can result in damage to infrastructure through direct impact or through associated flooding of roads, bridges, buildings, and homes. This can cost communities thousands to millions of dollars. However, ice jam damages tend to be localized and often do not meet the requirements for FEMA disaster assistance. Given its responsibility to support water infrastructure (rivers, bridges, etc.), the USACE plays a large role in ice jam emergency response and long-term mitigation (Darling, 2001).

Dam Failure Floods – A "dam" is an artificial barrier that has the ability to impound water, wastewater, or any liquid-borne material for the purpose of storage or control of water (different types of dams). Dams are man-made structures built for the purpose of power production, agriculture, water supply, recreation, and flood protection. A levee is a natural or artificial barrier that diverts or restrains the flow of a stream or other body of water for the purpose of protecting an area from inundation by flood waters. According to FEMA, dam failure is a catastrophic type of failure characterized by the sudden, rapid, and uncontrolled release of impounded water or the likelihood of such an uncontrolled release. It is recognized that there are lesser degrees of failure and that any malfunction or abnormality outside the design assumptions and parameters that adversely affect a dam's primary function of impounding water is properly considered a failure. These lesser degrees of failure can progressively lead to or heighten the risk of a catastrophic failure. They are, however, normally amenable to corrective action (FEMA, 2008). A dam failure can result in severe loss of life, economic disaster and extensive environmental damage, primarily due to their unexpected nature and high velocity floodwater. According to FEMA, dams can fail for one or a combination of the following reasons:

- Overtopping caused by floods that exceed the capacity of the dam (inadequate spillway capacity);
- Prolonged periods of rainfall and flooding;
- Deliberate acts of sabotage (terrorism);
- Structural failure of materials used in dam construction;
- Movement and/or failure of the foundation supporting the dam;
- Settlement and cracking of concrete or embankment dams;
- Piping and internal erosion of soil in embankment dams;
- Inadequate or negligent operation, maintenance and upkeep;
- Failure of upstream dams on the same waterway; or
- Earthquake (liquefaction / landslides) (FEMA, 2006).

All types of flooding can cause widespread damage throughout rural and urban areas, including but not limited to: water-related damage to the interior and exterior of buildings; destruction of electrical and other expensive and difficult-to-replace equipment; injury and loss of life; proliferation of disease vectors; disruption of utilities, including water, sewer, electricity, communications networks and facilities; loss of agricultural crops and livestock; placement of stress on emergency response and healthcare facilities and personnel; loss of productivity; and displacement of persons from homes and places of employment.

Any type of agricultural, commercial, residential and recreational development and natural communities (e.g., wetlands, marshes) located in a floodplain (inland or coastal) are vulnerable to flooding. Increased urbanization, and thus increase in paved surfaces, enhances the threat of flooding where drainage systems cannot cope with the increased input of stormwater runoff and decrease in natural water infiltration into the soil (increasing runoff). In rural areas, property damage caused by flooding can be devastating to farmers. When flooding occurs during the growing season, farmers can suffer widespread crop loss. Livestock farmers may lose livestock if they are unable to find safe ground during rising floodwaters. This threat to agricultural areas is primarily associated with flash flooding (Foster, Date Unknown).

Flooding can also pose several threats to industrial, residential and commercial properties. Industrial facilities of all types typically handle and store various quantities of hazardous materials for their operations. These materials can potentially come into contact with flood waters and be released into the environment impacting local water sources, natural resources and threaten public health. Buildings can experience significant water-related damage, sometimes beyond repair, due to flooding. Household furnishings and business inventories can be lost if there is not adequate time to remove items to safe locations. In addition to being at risk because of floodwater, people face the threat of explosions and fires caused by leaking gas lines along with the possibility of being electrocuted. Even wild animals, forced out of their homes and brought into contact with humans by floodwaters, can be a threat. Post-flood concerns could include mold growth on structures, creating an increased health concern (Foster, Date Unknown).

Severe flooding can cause extensive damage to public utilities and disruptions to the delivery of services. Loss of power and communications can be expected. Drinking water and wastewater treatment facilities may be temporarily out of operation. Impacts of flooding on transportation are particularly noteworthy. Flooded streets and road blocks make it difficult for emergency vehicles to respond to calls for service. Floodwaters can washout sections of roadway and bridges. Most importantly, the majority of fatalities that occur in floods are the result of people trying to drive on roads covered by floodwaters (Foster, Date Unknown).

Extent

In the case of riverine or flash flooding, once a river reaches flood stage, the flood extent or severity categories used by the NWS include minor flooding, moderate flooding, and major flooding. Each category has a definition based on property damage and public threat;

- Minor Flooding - minimal or no property damage, but possibly some public threat or inconvenience
- Moderate Flooding - some inundation of structures and roads near streams. Some evacuations of people and/or transfer of property to higher elevations are necessary.
- Major Flooding - extensive inundation of structures and roads. Significant evacuations of people and/or transfer of property to higher elevations (NWS, 2008).

The severity of a flood depends not only on the amount of water that accumulates in a period of time, but also on the land's ability to manage this water. One element is the size of rivers and streams in an area; but an equally important factor is the land's absorbency. When it rains, soil acts as a sponge. When the land is saturated or frozen, infiltration into the ground slows and any more water that accumulates must flow as runoff (Harris, 2008).

Flood severity from a dam failure can be measured with a low, medium or high severity, which are further defined as follows:

- Low severity - No buildings are washed off their foundations; structures are exposed to depths of less than 10 feet.
- Medium severity - Homes are destroyed but trees or mangled homes remain for people to seek refuge in or on; structures are exposed to depths of more than 10 feet.
- High severity - Floodwaters sweep the area clean and nothing remains. Locations are flooded by the near instantaneous failure of a concrete dam, or an earthfill dam that turns into "jello" and washes out in seconds rather than minutes or hours. In addition, the flooding caused by the dam failure sweeps the area clean and little or no evidence of the prior human habitation remains after the floodwater recedes (Graham, 1999).

Two factors which influence the potential severity of a full or partial dam failure include (1) The amount of water impounded; and (2) The density, type, and value of development and infrastructure located downstream (City of Sacramento Development Service Department, 2005)

Location

Flooding has always been and continues to be a statewide concern for New York State. Although some areas are more prone to certain types of flooding than others, there is no area of the State that is exempt from flood hazards altogether, including Onondaga County. In New York State, there are over 52,000 miles of river and streams, and along their banks there are 1,480 communities that are designated as flood prone. It is estimated that one and a 1.5 million people live in these flood prone areas. Millions more work, travel through or use recreational facilities located in these areas. Areas outside recognized and mapped flood hazard zones can also experience flooding (NYSDPC, 2008).

Flooding is the primary natural hazard in New York State because the State exhibits a unique blend of weather (climatological and meteorological) features that influence the potential for flooding. Factors

include: temperature, which is affected by latitude, elevation, proximity to water bodies and source of air masses; and precipitation which includes snowfall and rainfall. Precipitation intensities and effects are influenced by temperature, proximity to water bodies, and general frequency of storm systems. The Cornell Climate Report indicates that the geographic position of New York State (Northeast U.S.) makes it vulnerable to frequent precipitation events. This is because nearly all storms and frontal systems moving eastward across the continent pass through, or in close proximity to, New York State. Additionally, the potential for prolonged periods of heavy precipitation is increased due to the available moisture from the Atlantic Ocean. The heavy rain can quickly saturate the ground, leading to increased runoff and flooding. Heavy rain in New York State comes in the form of coastal storms (Nor'Easters, tropical storms, and hurricanes) as well as thunderstorms. Flood problems in the State are most acute in the Susquehanna, Genessee, Chemung, Hudson, Mohawk, and Alleghany River Basins. These major waterways, along with their tributary streams in the basins, are subject to direct flooding throughout the New York State (NYSDPC, 2008).

As indicated in the Onondaga County Profile (Section 4), the land area within Onondaga County drains into two major river drainage basins: the Oswego River Basin and the Susquehanna River Basin. However, most of Onondaga County falls within the Oswego River Basin (New York State Department of Environmental Conservation [NYSDEC], 2007). The major waterbodies and tributaries within the Oswego River basin in Onondaga County that experience frequent flooding include, but are not limited to, the Oswego River (of the Oswego River Watershed); the Oneida Lake, Oneida River, Butternut Creek, Limestone Creek (of the Oneida River Watershed); and the Onondaga Lake, Skaneateles Lake, Otisco Lake, Onondaga Creek, Nine Mile Creek, Ley Creek, Bloody Brook, Harbor Brook, Skaneateles Creek, Seneca River (of the Seneca River [Lower] Watershed) (NYSDEC, 2007). As a result of the flooding that has historically occurred within Onondaga County, the County has been ranked as the 9th most flood vulnerable county in New York State based on potential flood exposure and vulnerability to loss (NYSDPC, 2008).

The most documented location of historical flooding lies within the Onondaga Lake subwatershed, particularly along Onondaga Creek. Other locations throughout the County may experience severe flooding; however, information pertaining to such locations is scarce. Historically, the waters of Onondaga Creek meandered 34 miles, from Tully to Onondaga Lake. In the early 1800s, European settlers constructed mills to utilize the water that flowed through the City of Syracuse. Mid-Century, City leaders concerned with sewage disposal and the risk of flooding, straightened and deepened the creek channel to hasten flood water and sewage removal. Major flooding that occurred in the early 1900s (1902 and 1915) prompted the City of Syracuse, New York State and the USACE to implement extensive channelization and damming of the Onondaga Creek. A flood control dam and reservoir constructed by the USACE in the late 1940s, located within the Onondaga Nation Reservation, regulates the peak flow of the Onondaga Creek that reaches the City (OurLake, 2008). By 1963, construction was complete, leaving Onondaga Creek completely altered (Onondaga Environmental Institute, 2008). This structure influences the stream's flow pattern only for large runoff events. Accordingly, a portion of the very high flow is diverted into the reservoir during these intervals and then released back into the stream during recession (OurLake, 2008). The current creek channel conditions, and the large flood control structure (dam) located just below the junction of Onondaga Creek and its West Branch, located on the Onondaga Nation, has reduced flooding within the City of Syracuse, but because of historical straightening of the creek, flood waters have been known to rapidly move through the City and are so dangerous during high-water events that the stream and its banks are fenced off to prevent injury and death during these flood periods (Onondaga Lake Partnership, 2006).

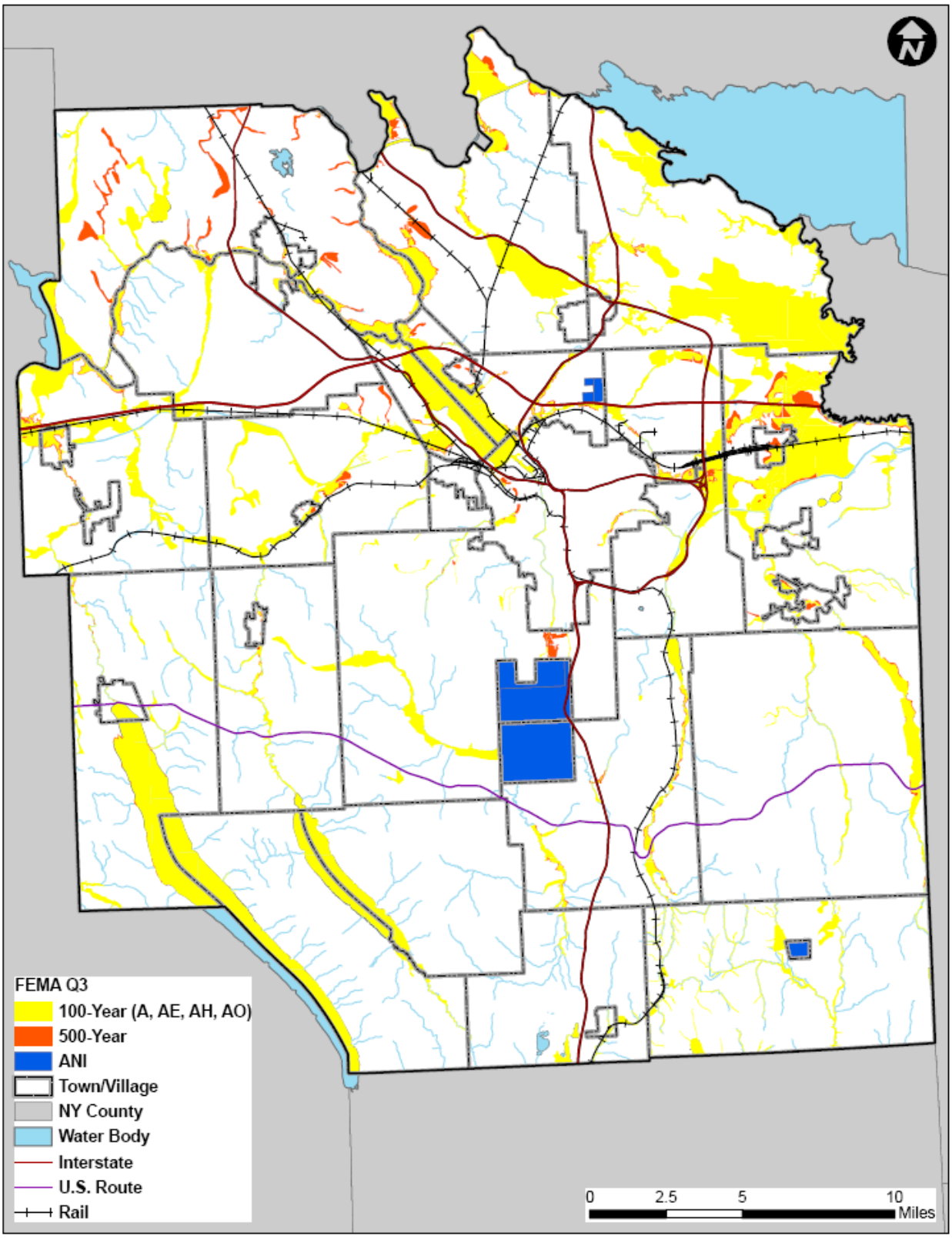
Federal Emergency Management Agency (FEMA) Flood Hazard Areas

According to FEMA, flood hazard areas are defined as areas that are shown to be inundated by a flood of a given magnitude on a map. These areas are determined using statistical analyses of records of riverflow, storm tides, and rainfall; information obtained through consultation with the community; floodplain topographic surveys; and hydrologic and hydraulic analyses. Flood hazard areas are delineated on FEMA's Flood Insurance Rate Maps (FIRM), which are official maps of a community on which the Federal Insurance and Mitigation Administration has delineated both the Special Flood Hazard Areas (SFHA) and the risk premium zones applicable to the community. These maps identify the SFHAs; the location of a specific property in relation to the SFHA; the base (100-year) flood elevation (BFE) at a specific site; the magnitude of flood a flood hazard in a specific area; the undeveloped coastal barriers where flood insurance is not available and locates regulatory floodways and floodplain boundaries (100-year and 500-year floodplain boundaries) (FEMA, 2003; FEMA, 2004; FEMA, 2006; FEMA, 2006).

The land area covered by the floodwaters of the base flood is the SFHA on a FIRM. It is the area where the National Flood Insurance Programs (NFIP) floodplain management regulations must be enforced and the area where the mandatory purchase of flood insurance applies. The SFHA includes Zones A, AO, AH, A1-30, AE, A99, AR, AR/A1-30, AR/AE, AR/AO, AR/AH, AR/A, VO, V1-30, VE, and V. (FEMA, 2007). This regulatory boundary is a convenient tool for assessing vulnerability and risk in flood-prone communities since many communities have maps showing the extent of the base flood and likely depths that will be experienced. The base flood is often referred to as the "100-year" flood designation. The BFE on a FIRM is the elevation of a base flood event, or a flood which has a 1-percent chance of occurring in any given year as defined by the NFIP. The BFE describes the exact elevation of the water that will result from a given discharge level, which is one of the most important factors used in estimating the potential damage to occur in a given area. A structure located within a 100-year floodplain has a 26-percent chance of suffering flood damage during the term of a 30-year mortgage. The 100-year flood is a regulatory standard used by Federal agencies and most states, to administer floodplain management programs. The 100-year flood is used by the NFIP as the basis for insurance requirements nationwide. FIRMs also depicts 500-year flood designations, which is a boundary of the flood that has a 0.2-percent chance of being equaled or exceeded in any given year (FEMA, 2003; FEMA, 2006). Currently, FEMA has partnered with the NYSDEC to update all FIRMs and Digital FIRMS (DFIRMS) for Onondaga County as a part of a nationwide FEMA Map Modernization Program. Preliminary flood studies of the County are being conducted at the present time, prior to updating the FIRMs. The projected date for completion and adoption of updated flood studies and flood maps for the County is unknown (FEMA, 2006). If made available, updated FIRMs and associated flood information will be incorporated within later versions of this HMP.

Figure 5.4.3-1 illustrates the FEMA Q3 100- and 500-year flood boundaries of the County.

Figure 5.4.3-1. FEMA Q3 100- and 500-Year Flood Boundaries within Onondaga County



Source: FEMA Q3

In addition to FIRM and DFIRMs, FEMA also provides Flood Insurance Studies (FISs) for entire counties and individual jurisdictions. These studies aid in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. They are narrative reports of countywide flood hazards, including descriptions of the flood areas studied and the engineered methods used, principal flood problems, flood protection measures and graphic profiles of the flood sources (FEMA, Date Unknown).

The countywide and jurisdictional FISs for Onondaga County were originally completed between the 1978 and 1999. Since these studies are outdated, these FISs are in the preliminary stages of being updated as a part of FEMA's Flood Map Modernization program. Although these studies are outdated, they give a general indication of when and where flooding typically occurs throughout the County. These studies identify that the past history of flooding on the streams of Onondaga County indicate that flooding occurs in the late winter and early spring months, usually as a result of heavy rainfall, snowmelts, ice jams and debris build-up. Flooding has also occurred during the late summer months as a result of tropical storms tracking northward along the Atlantic coastline, or due to regional thunderstorm activity.

Specific flood prone areas identified within the FISs for the County are summarized in Table 5.4.3-1. FISs were not available for review for the Towns of Fabius, Otisco, Spafford and Tully and Villages of Fabius, North Syracuse and Solvay; therefore, details regarding specific flood problems areas within those jurisdictions in not available. The information provided is taken directly from the available FIS reports for each jurisdiction; therefore, if there are inconsistencies, incorrect information and/or flood control measures have been implemented to correct the flooding issues since the FISs were published, clarification from the County or individual jurisdictions is recommended.

Table 5.4.3-1. Flood Insurance Studies – Historical Flood Problem Areas in Onondaga County

Jurisdiction(s)	Flood Problem Areas
Baldwinsville (Village)	Flooding typically occurs along Seneca River. In the southeastern portion of the Village, the Seneca River has been known to back up into the flood plain of Crooked Brook posing a flood treat to any development occurring there. Tannery Creek is also subject to flash flooding during the summer and fall, primarily due to its small drainage basin and relatively steep gradient. These conditions have historically caused widespread flooding from Oneida Street downstream to State Route 31. Two major flood events occurred in March 1956 and June 1972 (Tropical Storm Agnes) (FEMA, 1984).
Camillus (Town)	Flooding occasionally occurs along Ninemile Creek; however, records do not indicate significant flooding. One event in 1865 resulted in a dam failure at the north end of Otisco Lake, which has since been replaced with a modern structural dam. Documented flood events within the Township occurred on March 1960, June 1970, March 1971 and June 1972 (Tropical Storm Agnes). No information has been found concerning historic flooding associated with Geddes Brook, Unnamed Stream East and Unnamed Stream Near Garden Terrace within the Town (FEMA, 1999).
Camillus (Village)	Same as the Town of Camillus (FEMA, 1999).
Cicero (Town)	Flooding occurs throughout the Township during all season, but most notable floods have occurred between the months of February and April. A major flood event within the Township occurred in June 1972 (Tropical Storm Agnes), which produced 5.5 inches of rainfall throughout the duration of the storm. (FEMA, 1994)
Clay (Town)	Flooding typically occurs along the Seneca and Oneida Rivers. When the river levels are high, the backwater effect increase flooding along Mud Creek and Willow Stream. A major flood event within the Township occurred in June 1972 (Tropical Storm Agnes) (FEMA, 1992).
Dewitt (Town)	Flooding typically occurs along Ley Creek and Butternut Creek within the lowland portions of the Town. Major flood events within the Town occurred in 1898, September 1915, April 1940, March 1950, March 1960, March 1964 and July 1974 (FEMA, 1979).

Jurisdiction(s)	Flood Problem Areas
East Syracuse (Village)	Flooding typically occurs along South Branch Ley Creek and Butternut Creek. Flooding usually is a result of snowmelt combined with heavy rain. Major flood events within the Town occurred in September 1915, April 1940, March 1950, March 1960, March 1964, May 1969 and June 1972 (Tropical Storm Agnes). The May 1969 rainstorm caused flooding along Phelps and West Second Street in the Village and did approximately $4,600 worth of damage. (FEMA, 1981)
Elbridge (Town)	Flooding typically occurs along Seneca River. A rise in the river level upstream of the control structure at Baldwinsville during peak runoff periods causes a backwater effect on Cross Lake and upstream along the Seneca River. Flooding also occurs along Skaneateles Creek during the winter and early spring as a result of discharges in excess of channel capacity. A major flood event within the Township occurred in June 1972 (Tropical Storm Agnes) (FEMA, 1982)
Elbridge (Village)	Flooding typically occurs along Skaneateles Creek. A major flood event within the Village occurred in March 1936, causing the inundation of camps and cottages at Quimby's Bridge. (FEMA, 1982).
Fayetteville (Village)	Overbank flooding typically occurs along Limestone Creek, particularly in the northwestern portion of the Village. Major flood events within the Village occurred in March 1950; March 1964; June 1972 (Tropical Storm Agnes) and October 1981. The flood of 1981 caused a levee on the western bank of Limestone Creek to breach in several places, causing a splitting in the flow of Limestone Creek (FEMA, 1985).
Geddes (Town)	Flooding occasionally occurs along Ninemile Creek; however, records do not indicate significant flooding. One event in 1865 resulted in a dam failure at the north end of Otisco Lake, which has since been replaced with a modern structural dam. Heavy rains, especially those occurring in the spring combined with snowmelt, have frequently caused high waters and local flooding. Major flood events within the Township occurred in March 1960, June 1970, March 1971 June 1972 (Tropical Storm Agnes). Local flooding occurs in the northwest portion of the Town when the Seneca River overflows its banks. One such example occurred on April 4, 1960 (FEMA, 1981).
Jordan (Village)	Flooding typically occurs along Skaneateles Creek during the winter and early spring as a result of spring rains coupled with ice and snow melt. Ice jams and inadequate bridge areas have also exacerbated flooding throughout the Village. A major flood event within the Village occurred in 1925, putting Elbridge, North Main and Mechanic Streets underwater. The June 1972 (Tropical Storm Agnes) flood also crated flooding throughout the Village (FEMA, 1982)
Lafayette (Town)	Flooding typically occurs along Onondaga Creek. Flooding in the Township typically occurs during the months of March, April and May as a result of snow melts or spring rain (FEMA, 1984).
Liverpool (Village)	Flooding typically occurs along the Onondaga Lake shoreline. Flooding can occur at any time of the year, but is usually the result of intense cyclonic disturbances. In the Village streets there have been some areas of flooding resultant of storm sewers backing up during peak runoff periods of severe storms. Lake levels of Onondaga Lake are controlled by the water-surface elevation of the barge canal (the Seneca River). The outflows of the Canandaigua, Cayuga, Keuka, Owasco, Seneca and Skaneateles Lakes contribute to the barge canal. Large outflows from these lakes are a major factor in raising the level of Onondaga Lake (FEMA, 1981).
Lysander (Town)	Flooding typically occurs along Seneca River. When the river is high there are also some backwater effects along the downstream portions of several tributaries to Seneca River. Floods which cause a water level more than 1.0 foot above the banks of the Seneca River have a 30-percent chance of happening in any year. A major flood event within the Township occurred in June 1972 (Tropical Storm Agnes) (FEMA, 1981).
Manlius (Town)	In the northern portion of the Town, Limestone Creek, Butternut Creek and Chittenango Creek are each separated by a distance of approximately one mile. With this are being relatively flat and swampy, flooding from one or all three streams occurs regularly. Flooding occurs on Limestone Creek from the Village of Manlius to the Erie Canal Aqueduct. Downstream from the aqueduct the probability of the stream overtopping its banks increases. West Branch Limestone Creek also has a history of flooding near the Village. Low-duration, high-intensity storms cause small streams like Pools Brook, Sweet Road Tributary and Bishop Broo to exceed the capacity of the stream channels, thus causing localized flooding. Major flood events within the Township occurred in December 1942; June 1947; March 1950; March 1960; and March 1964 (FEMA, 1992).

Jurisdiction(s)	Flood Problem Areas
Manlius (Village)	Limestone Creek has caused flood problems in the State Route 173-Tyler Court area of the Village. Portions of State Route 173 have been inundated and houses on Tyler Court are threatened by rising waters. West Branch Limestone Creek creates flood problems at the State Route 173 crossing and in the area of Westbrook Circle. When the stream leaves its banks, the shopping center on State Route 173 near Troop K Road has experienced flooding of the parking area and nearby roads. Sweet Road Tributary causes flooding from just upstream of Glencliffe Road to the corporate limits (FEMA, 1984).
Marcellus (Town)	Flooding typically occurs along Ninemile Creek. Flood problems are due to high discharges in excess of channel capacity occurring primarily between early February and late June. A major flood event within the Township occurred in March 1960 (FEMA, 1982).
Marcellus (Village)	Same as the Town of Marcellus (FEMA, 1981).
Minoa (Village)	Overbank flooding typically occurs along Limestone Creek, particularly in the southeastern portion of the Village. Major flood events within the Village occurred on March 1950, March 1964, and June 1972 (Tropical Storm Agnes) (FEMA, 1982).
Onondaga (Town)	Flooding typically occurs along Onondaga Creek during the winter and early spring as a result of a flow in excess of channel capacities. Flooding is occasionally aggravated by ice jams. Major flood events within the Township occurred on March 1920 and July 1974. (FEMA, 1991)
Pompey (Town)	Minimal flooding occurs along Limestone Creek. Most flooding within the Township occurs in the watersheds of the smaller streams where cloudburst type, short-duration storms cause runoff which easily exceeds the capacities of stream channels and culverts and overflows the banks and cross roads. Major flood events within the Township occurred on June 1947, March 1950, June 1958, January 1959; March 1960, February 1961, and March 1964. (FEMA, 1978)
Salina (Town)	Flooding typically occurs along Bloody Brook, Ley Creek and Beartrap Creek. Low-lying areas adjacent to Onondaga Lake are flooded whenever a rise in the water level occurs. Flooding is most common in the spring when snowmelt runoff occurs, following long duration rainstorms and is further aggravated by frozen or previously saturated soil. Widespread damages occurred throughout the Township during flood events in March 1950, March 1960, March 1964, May 1966 and June 1972 (Tropical Storm Agnes). The May 1966 flood event resulted in over $90 K in damages to the Town. The flood of record in June 1972 caused the Onondaga Lake to rise 370.8 feet, causing nearly $150 K in damages to the Town (which is 40-percent of the estimated $375 K in damages that occurred within the surrounding communities of Onondaga Lake) (FEMA, 1982).
Skaneateles (Town)	Flooding typically occurs along the Skaneateles Creek usually during the winter or early Spring. Flood conditions in the Town are occasionally aggravated by ice jams and debris build-up. A major flood event within the Township occurred on June 1972 (Tropical Storm Agnes) (FEMA, 1981).
Skaneateles (Village)	Flooding typically occurs along Skaneateles Creek usually during the winter or early Spring. The most critical flood event between 1920 and 1981 was in June 1972 (Tropical Storm Agnes). Other overbank flood events along Skaneateles Creek during intense rainstorms occurred in 1968, May 1969, June 1970 and June 1972 (Tropical Storm Agnes). Most flood damage within the Village is due to overloaded storm sewers and street runoff (FEMA, 1981).
Syracuse (City)	Flooding typically occurs along Harbor Brook, Meadow Brook, Ley Creek and Onondaga Lake. Heavy rain, especially those occurring in the spring which combines with snowmelt, have frequently caused high water and local flooding. Some of the more frequent flooding occurs in the area north of Rowland Street and west of Geddes Street, caused by Harbor Brook and the areas west of MacArther Stadium and southwest of the Seventh Street Bridge, both caused by Ley Creek. A major flood event within the City occurred on June 1972 (Tropical Storm Agnes), resulting in extensive damage to properties located along the Onondaga Lake shoreline (FEMA, 1986).
Tully (Village)	Flooding typically occurs along West Branch Tioughnioga River and its tributaries during the spring thaw. Flooding in this area has resulted in the overtopping of three bridges and flooding of many properties along the stream, causing minor damages (FEMA, 1982).
Van Buren (Town)	Flooding typically occurs along the Seneca River. When the river level is high, the backwater from the Seneca River affects flooding along the downstream portions of Dead Creek. A major flood event within the Township occurred on June 1972 (Tropical Storm Agnes) (FEMA, 1984).

Source: FEMA, Date Unknown

Areas identified by participating jurisdictions as particularly vulnerable to flooding:

- Town of Dewitt
  - Flooding along Butternut Drive has caused property damage and business closures.
  - Butternut Creek and Ley Creek overflow as a result of heavy rainfall events.
  - Drainage issues occur in the Franklin Park, DunRovin and Park Hill neighborhoods along Butternut Creek.
  - Meadowbrook Creek experiences flooding and stream-bank erosion.

- Town of Onondaga
  - Kasson Road, Onondaga Boulevard and Harris Road experience flash flooding as a result of undersized road culverts.

- Village of Fayetteville
  - Limestone Creek floods the lower village (Simms Place, Warner Road and N. Burdick Street)
  - Condos on High Bridge Road experience flooding

The Beartrap-Ley Creek Drainage District was formed in 1969 to address persistent flooding, implement drainage improvements and provide watercourse maintenance within the Ley Creek watershed. In 2006, the Beartrap-Ley Creek Drainage District Study evaluated the District's watershed because of 'recurring localized severe flood events affecting both residential and commercial properties.' Improvement opportunities identified in the study are summarized as potential mitigation actions in Volume 2, Section 9 of this Plan. The major watercourses included in the study were Ley Creek-Main Stem; Ley-Creek-North Branch; Ley Creek-South Branch, Beartrap Creek, Teall Brook and Sanders Creek which flow through the City of Syracuse, Towns of Cicero, Dewitt, Manlius and Salina and Villages of East Syracuse and North Syracuse. According to the Executive Summary provided and reviewed as part of this planning process, the following were identified as critical flood areas within the District:

- Severe flooding has been identified in the business corridor at the upstream limits of the Ley Creek Main Stem at the confluence of Ley Creek – North Branch, Ley Creek – South Branch and Ley Creek – Main Stem. This area is bounded to the west by the Townline Road Bridge crossing, with the greatest flooding impacts occurring between Townline Road and the confluence of the three branches, as well as to the southeast along Ley Creek – South Branch to Court Street Road.

- Historical flooding has taken place in residential, commercial and industrial development along the upper reach of Ley Creek-South Branch, bounded by Interstate-690 to the south and Thompson Road to the northeast; as well as the residential areas surrounding the existing detention basin (Contract No. 5 Basin) along the reach north of I-690.

- The Village of East Syracuse has had significant historical flooding issues as a result of storm events including areas adjacent to West Manlius Street and West Second Street.

- Lower limits of the Ley Creek-South Branch from Court Street Road to the confluence with Ley Creek-North Branch and Ley Creek-Main Stem (bottleneck confluence) are significantly impacted by flooding.

- Franklin Park neighborhood area tributary to Sanders Creek located in the Town of DeWitt, bounded by the Carrier manufacturing plant and Kinne Street to the west, Fly Road to the east, Kirville Road to the south and Sanders Creek to the north. This area is underlain by soils which poorly infiltrate

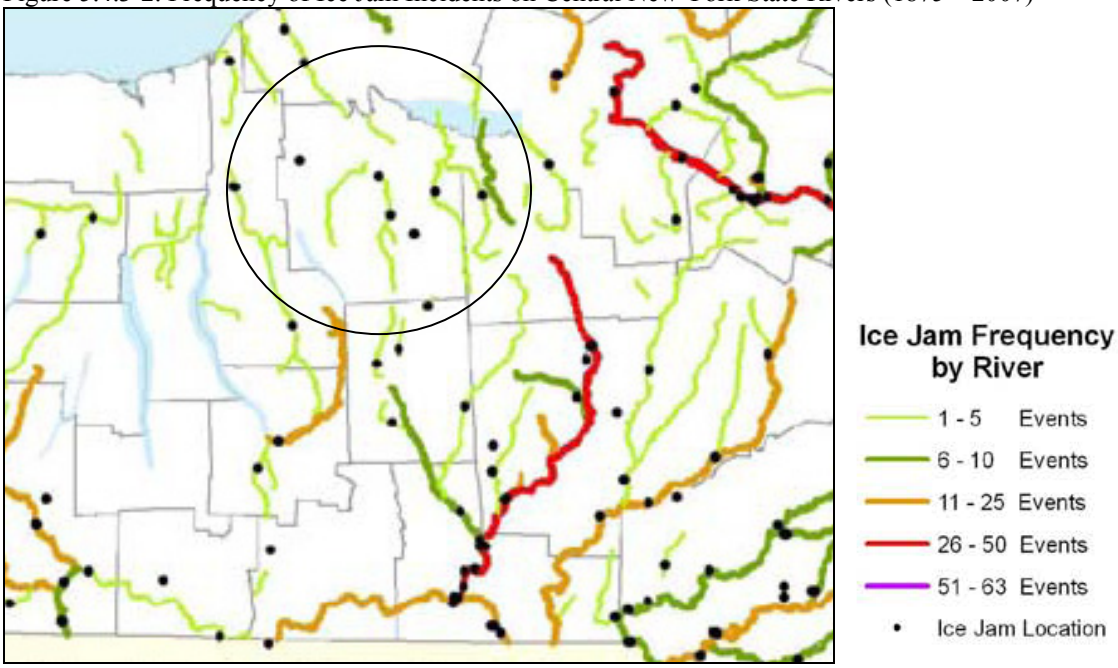
rainfall and has large impervious surfaces throughout increasing runoff volume and subsequent flooding potential.

- The residential neighborhood located immediately to the north and south of Teall Brook, bounded by Shaffer Avenue to the west and Hazelburst Avenue to the east has been impacted by historic flood events.

Ice Jam Hazard Areas

Ice jams are common in the northeast U.S. and New York State is not an exception. In fact, according to the USACE, New York State ranks second in the country for total number of ice jam events, with over 1,435 incidents documented between February 1, 1867 and March 16, 2007. Areas of New York State that include characteristics lending to ice jam flooding include the northern counties of the Finger Lakes region and far western New York State, the Mohawk Valley of Central and eastern New York State and the North Country. Ice jam incidences within the vicinity of Onondaga County are less frequent then many other counties in New York State. The many streams, creeks and rivers that extend through the County have experienced less then 10 documented ice jams between 1875 and 2007. Figure 5.4.3-2 presents the frequency of ice jam incidences within the vicinity of Onondaga County (NYSDPC, 2008).

Figure 5.4.3-2. Frequency of Ice Jam Incidents on Central New York State Rivers (1875 – 2007)



Source: NYSDPC, 2008
Note (1): Circle indicates location of Onondaga County
Note (2): This map displays the number of instances a river was referenced as being the location for an ice jam in the USACE Cold Regions Research and Engineering Laboratory (CRREL) database.
Note (3): Multiple instances of ice jams can be associated to a single point location.

The Ice Jam Database, maintained by the Ice Engineering Group at the USACE Cold Regions Research and Engineering Laboratory (CRREL), currently consists of approximately 15,000 records of ice jams from across the U.S. According to the USACE-CRREL and the NYS HMP, Onondaga County experienced approximately seven historic ice jam events between 1936 and 2007 (Ice Engineering Research Group, Date Unknown; NYSDPC, 2008). Historical events and their locations are further discussed in the "Previous Occurrences" section of this hazard profile.

Dam Break Hazard Areas

According to the NYSDEC Division of Water Bureau of Flood Protection and Dam Safety, the hazard classification of a dam is assigned according to the potential impacts of a dam failure pursuant to 6 NYCRR Part 673.3. Dams are classified in terms of potential for downstream damage if the dam were to fail. These hazard classifications are identified and defined below:

- *Low Hazard (Class A)* is a dam located in an area where failure will damage nothing more than isolated buildings, undeveloped lands, or township or county roads and/or will cause no significant economic loss or serious environmental damage. Failure or misoperation would result in no probable loss of human life. Losses are principally limited to the owner's property
- *Intermediate Hazard (Class B)* is a dam located in an area where failure may damage isolated homes, main highways, minor railroads, interrupt the use of relatively important public utilities, and/or will cause significant economic loss or serious environmental damage. Failure or misoperation would result in no probable loss of human life, but can cause economic loss, environment damage, disruption of lifeline facilities, or impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.
- *High Hazard (Class C)* is a dam located in an area where failure may cause loss of human life, serious damage to homes, industrial or commercial buildings, important public utilities, main highways or railroads and/or will cause extensive economic loss. This is a downstream hazard classification for dams in which more than 6 lives would be in jeopardy and excessive economic loss (urban area including extensive community, industry, agriculture, or outstanding natural resources) would occur as a direct result of dam failure (NYSDEC, 2006).

According to information provided by the NYSDEC, National Inventory of Dams (NID) and the Dam Incident Notification (DIN) system maintained by the National Performance of Dam Program (NPDP) and the Planning Committee, there are 36 dams throughout Onondaga County. However, according to NID only 11 dams within the County are labeled as Class C (high hazard) dams and 17 are classified as Class B (intermediate hazard). All other dams within the County are either a low hazard or have not been officially classified (NYSDPC, 2008; USACE, Date Unknown; Department of Civil and Environmental Engineering [DCEE], Date Unknown). Refer to Table 4-17 in Section 4 for a complete list of dams in Onondaga County.

Previous Occurrences and Losses

Many sources provided historical information regarding previous occurrences and losses associated with flooding throughout New York State and Onondaga County. With so many sources reviewed for the purpose of this HMP, loss and impact information for many events could vary depending on the source. Therefore, the accuracy of monetary figures discussed is based only on the available information identified during research for this HMP.

Between 1953 and 2008, FEMA declared that New York State experienced over 36 flood-related disasters classified as one or a combination of the following disaster types: flooding, heavy rains, severe storms, coastal storms and/or high tides (FEMA, 2008). Of those events, the NYS HMP and FEMA indicate that Onondaga County has been declared as a disaster area as a result of six flood events between 1953 and 2007 (NYSEMO, 2006; NYSDPC, 2008).

Table 5.4.3-2 summarizes the FEMA Presidential Disaster (DR) or Emergency (EM) Declarations for flood events in Onondaga County. Many of these federal disasters were associated with a severe storm or

tropical or extra tropical disturbance (hurricanes, tropical storms, Nor'Easters) either passing over or located within proximity to the State. These disasters resulted in flooding in the County, hence the reason for the occasional categorization by FEMA as a "severe storms and flooding" event. Because flooding was the primary impact of many of these types of hazard events, only the severe flooding impact of major events are discussed in this Hazard Profile and are also mentioned in their designated sections of this HMP: Section 5.4.1 (Severe Storm) and Section 5.4.3 (Severe Winter Storm).

Table 5.4.3-2. Presidential Disaster Declarations for Flooding Events in Onondaga County

Type of Event*	Date**	Declaration Number	Cost of Losses (approximate)
Tropical Storm Agnes	July 1972	DR-338	New York State experienced 24 deaths and had approximately $703 M in damages as a result of flooding. Onondaga County experienced approximately $1.6 M in property damages and crop damages. For the calendar year of 1972, many rivers and streams within the County experienced record peak streamflows during this flood, particularly along Seneca River, Onondaga Creek, Ninemile Creek and Limestone Creek. Onondaga Creek at the City of Syracuse reached its second highest flood stage at 6.2 feet (1.2 feet above 5-foot flood stage). This event caused the Onondaga Lake to rise 370.8 feet, causing nearly $150 K in damages to the Town of Salina (which is 40-percent of the estimated $375 K in damages that occurred within the surrounding communities of Onondaga Lake). FISs for the county indicate that this event created widespread flooding within most jurisdictions of the County.
Severe Storms and Flooding	July 1974	DR-447	The NYSDPC indicates that this is an undeclared event for four counties in New York State; however, FEMA and NYSEMO indicate that it was a declared disaster. Onondaga County experienced approximately $7.2 M in property damages, with $6.5 M in personal property losses (more then any other county impacted by the event). For the calendar year of 1974, many rivers and streams within the County experienced peak streamflows during this flood, particularly along Harbor Brook, Onondaga Creek, Butternut Creek and Limestone Creek. Onondaga Creek at the City of Syracuse reached its highest flood stage at 6.48 feet (1.48 feet above 5-foot flood stage). 3.09 inches of rain fell within a 24-hour period in Syracuse. When Harbor Brook overflowed, it forced more than 200 persons to evacuate their homes on the south side of the City of Syracuse. Underpasses were flooded and houses along Meadow Brook had water in their cellars. Many streets in the city were flooded with water 1.5 ft (0.5 m) deep. Almost all the entrance and exit ramps on Route 81 were blocked by water. Roads in the Towns of Camillus, Solvay, and Cicero were flooded; some were impassable. More than 1,000 city and county residents were evacuated from their homes in the City of Syracuse. The major flooding was along Onondaga Creek and its tributaries. Also, almost all low-lying areas were affected as well. In the Town of Liverpool area, Bloody Brook overflowed and flooded a drive-in theatre with more than 4 feet of water.
Severe Storms, Heavy Rain, Landslides, Flooding	September 1975	DR-487	Remnant flooding occurred in New York State as a result of Hurricane Eloise. Losses in New York State are unknown; however, it is reported that Onondaga County experienced approximately $6.3 M in property damages. Rain totals during this event within the vicinity of Onondaga County totaled between 3 and 5 inches. For the year of 1975, peak streamflows occurred along Ley Creek in the City of Syracuse during this event.
Severe Storms, Heavy Rain, Landslides, Flooding	September 1975	DR-487	Remnant flooding occurred in New York State as a result of Hurricane Eloise. Losses in New York State are unknown; however, it is reported that Onondaga County experienced approximately $6.3 M in property damages. Rain totals during this event within the vicinity of Onondaga County totaled between 3 and 5 inches.

Type of Event*	Date**	Declaration Number	Cost of Losses (approximate)
			For the year of 1975, peak streamflows occurred along Ley Creek in the City of Syracuse during this event.
Severe Storms and Flooding	January 1996	DR-1095	New York State experienced between $100 and 160 M in eligible damages, road closures, closed businesses, and 10 deaths (NYSDPC). New York State received $16.7 M in individual assistance and $103.7 M in public assistance. Onondaga County experienced approximately $7.6 M in flood damages. USGS indicated, through information provided by FEMA, which Onondaga County received approximately $1.1 M in public assistance (1997 USD).
Severe Storms	May - September 2000	DR-1335	New York State experienced approximately $34.6 M in eligible damages (NYSDPC). Losses in Onondaga County are unknown. In Syracuse, heavy rains caused significant ponding of water on Park Street, McBride Street, and Burt Street on June 21, 2000. Route 174 as well as the northbound lanes of Interstate 81 were closed for a short time. On July 16, 2000 significant ponding of water was reported on roadways from the Towns of Manlius to Fayetteville.
Severe Storms and Flooding	August – September 2004	DR-1564	New York State experienced approximately $18.03 M in eligible damages (NYSDPC). Onondaga County experienced approximately $2.0 M in flood damages. In the Towns of Pompey, Lafayette, Tully, Lafayette and Manlius, roads were either washed out, closed or impassable. A golf course flooded in Manlius. There was significant flooding along Limestone Creek (mainly in the southern part of town but spreading north). A bridge was washed out in near the Village of Manlius. An animal hospital was evacuated in Fayetteville. Many basements were flooded. This event was reported as the worst flooding in 20 years within the Village of Manlius. Rainfall totals in Onondaga County ranged between 2.2 inches in Camillus and 4.87 inches in Tully. As of December 10, 2004, more than $1.8 M in disaster aid has been approved for the State. Disaster aid for Onondaga County is unknown.

Source(s): FEMA, 2008; NYSDPC, 2008; Hazards & Vulnerability Research Institute (SHELDUS), 2008; NCDC, 2008; NYSEMO, 2006

* The 'Type of Event' is the disaster classification that was assigned to the event by FEMA.

** Represents the date of the event

Note: Dollars rounded to nearest thousand. Recorded losses indicate the dollar value of covered losses paid, as available through the public records reviewed. Some of these events overlap with events shown under the Severe Storm and Severe Winter Storm hazard profiles of this Plan.

K = Thousands ($)

M = Millions ($)

USD = U.S. Dollars

As part of the USGS's program for disseminating water data within USGS, to USGS cooperators, and to the general public, the USGS maintains a distributed network of computers and fileservers for the acquisition, processing, review, and long-term storage of water data. This network of computers is called the National Water Information System (NWIS) and the data is continuously collected at over 1.5 million sites, also known as stream flow stations or gages, around the country and at some border and territorial sites. Many types of data are stored in NWIS, including comprehensive information for site characteristics, well-construction details, time-series data for gage height, streamflow, ground-water level, precipitation, and physical and chemical properties of water. Additionally, peak stream flows, chemical analyses for discrete samples of water, sediment, and biological media are accessible within NWIS (USGS, 2008).

Onondaga County consists of 28 stream flow stations; with each station having different periods of record up to 2007 (USGS, 2008). For the purpose of this HMP, the peak stream flows of each of these stations during their period of record were reviewed to identify the record peak events at those stations. Peak flow data identifies the *annual flood* or largest flood with the highest maximum instantaneous peak streamflow (or discharge) and gage height for a given station of each water year. Stations with the longest periods of record indicate that the most prominent events that have impacted the stations of the County appear to have occurred in March 1936, March 1960, June 1972, July 1974, September 1975, and October 1981.

Table 5.4.3-3. USGS Stations and Record Peak Flows for Onondaga County

USGS Station ID	Currently Active	USGS Station Name	Period of Record				Record Peak(s)	
			Begin Date	End Date	Daily Average Discharge (Cubic Feet / Second) (approx. range) [1]	Total Peak Events	Event Date	Peak Discharge (Cubic Feet / Second) [2]
04237500	Yes	Seneca River at Baldwinsville	3/25/1936	3/28/2007	1,000 – 7,400	59	3/25/1936	22,100
04237946	No	Onondaga Creek Tributary 6 below mudboil area at Tully	3/27/1992	11/30/2006	0.1 – 2.3	16	3/27/1992	45
04237962	Yes	Onondaga Creek near Cardiff	4/15/2002	3/15/2007	17 - 225	6	4/3/2005	1,070
04239000	Yes	Onondaga Creek at Dorwin Ave. in Syracuse	3/11/1952	3/14/2007	30 - 400	56	7/3/1974	3,260
04239500	No	Onondaga Creek at Syracuse	4/1/1940	1/6/1949	20 - 550	10	12/30/1942	3,980
04240010	Yes	Onondaga Creek at Spencer St. in Syracuse	3/15/1971	6/19/2007	60 - 500	37	7/3/1974	4,050
04240100	Yes	Harbor Brook at Syracuse	3/30/1960	3/14/2007	4 - 30	48	7/3/1974	726
04240105	Yes	Harbor Brook at Hiawatha Blvd. in Syracuse	7/24/1971	3/14/2007	5 - 40	37	7/3/1974	824
04240120	Yes	Ley Creek at Park Street in Syracuse	4/5/1973	3/14/2007	10 - 120	35	9/26/1975	1,310
0424014980	No	Spafford Creek tributary near Sawmill Road near Spafford	1/8/1998	2/4/2003	0.01 – 0.20	6	1/8/1998	2.5
04240180	No	Ninemile Creek near Marietta	2/8/1965	3/26/2007	8 - 130	43	6/23/1972	1,030
04240200	No	Ninemile Creek at Camillus	1/22/1959	1/24/1999	40 - 300	35	3/30/1960	2,760
04240300	Yes	Ninemile Creek at Lakeland	3/16/1971	3/15/2007	70 - 430	36	6/23/1972	2,110
04245000	No	Limestone Creek at Fayetteville	3/31/1940	11/2/1994	30 - 470	56	10/28/1981	7,490
04245200	No	Butternut Creek near Jamesville	1/22/1959	3/15/2007	9 - 160	49	10/28/1981	1,880
04245236	No	Meadowbrook at Hurlburt Road in Syracuse	7/24/1971	3/14/2007	0.9 - 6	37	7/3/1974	418

Source: USGS, 2008

Note (1): Daily average discharge is the daily mean discharge amount for the period of record based on surface-water daily statistics provided by the USGS data for each station. A constant discharge amount is not assigned to an individual station since stream flow is always changing.

Note (2): Record peaks are only available during the "Period of Record" for the station.

NA Daily discharges were unavailable

Based on all sources researched, many flood events have impacted Onondaga County, as summarized in Table 5.4.3-4. With flood documentation for New York State being so extensive, not all sources may have been identified or researched. Hence, Table 5.4.3-4 may not include all events that have occurred throughout the region. This summary table does not include ice jam events which are listed separately in Table 5.4.3-5.

Table 5.4.3-4. Flooding Events between 1865 and 2007

Event Date / Name	Location	Losses / Impacts	Source(s)
Flood Winter 1864 – Spring 1865	City of Syracuse	Unusual winter snowfall combined with heavy March rains result in floods over large parts of eastern and southeastern City of Syracuse, damaging and destroying many bridges.	Stone
Flood December 15, 1901	City of Syracuse	Sudden rising of Onondaga Creek caused great property damage and drove several hundred people from their homes in the City of Syracuse. The water rose six feet in eight hours, but is now receding. Many people were rescued by police and firemen in boats and no lives are known to have been lost.	Horton
Flood September 1915	Town of Dewitt, Village of East Syracuse	Major flood event within both jurisdictions of the County.	FEMA
Flood March 13, 1920	Town of Onondaga	Major flood event within this Town.	FEMA
Flood June 2-3, 1922	City of Syracuse	4.79 inches of rain fell within a 24-hour period in the City of Syracuse.	USGS, NYSC
Flood June 18, 1922	City of Syracuse	The City of Syracuse and neighboring towns were impacted by a cloudburst, tying up railroads, paralyzing the local trolley and telephone services, flooding immense areas in the low-lying districts. Unofficial estimates of property loss in the City of Syracuse were nearly $800 K.	New York Times
Flood 1925	Jordan	A major flood event within the Village occurred in 1925, putting Elbridge, North Main and Mechanic Streets underwater.	FEMA
Flood July 6-10, 1935	Countywide	Rainfall totals within Onondaga County ranged between 2.0 and 8.0 inches during this storm.	NWS
Flood March 25, 1936	Countywide	Heavy rains and high winds caused severe flooding in the Onondaga Valley and along Onondaga Lake. The greatest local danger was to the Towns of Marcellus and Camillus when strong south winds and heavy rain threatened to break up Otisco ice and send it over the spillway. Residents of the two villages feared the ice would jam Nine Mile Creek. Resulted in peak stream flows along Seneca River in the Village of Baldwinsville (USGS) 22,100 cfs. In the Town of Elbridge, this flood event causing the inundation of camps and cottages at Quimby's Bridge.	Scripophily.com, USGS, FEMA
Flood March 31 - April 1, 1940	Town of Dewitt, Village of East Syracuse	Resulted in peak stream flows for the year of 1940 along Onondaga Creek and Limestone Creek. Major flood event within both jurisdictions of the County.	USGS, FEMA
Flood	Countywide	Resulted in peak stream flows for the year of 1942 along Limestone Creek at the	USGS, FEMA

Event Date / Name	Location	Losses / Impacts	Source(s)
December 30, 1942		Village of Fayetteville. It was a major flood event in the Town of Manlius.	
Heavy Rain August 1943	City of Syracuse	3.26 inches of rain fell within a 24-hour period in the City of Syracuse.	NYSC
Flood June 3, 1947	Countywide	Resulted in peak stream flows for the year of 1947 along Limestone Creek at the Village of Fayetteville. It was a major flood event in the Town of Manlius.	USGS, FEMA
Flood March 20, 1950	Town of Dewitt, Village of East Syracuse, Village of Fayetteville, Town of Salina	Major flood event within these jurisdictions of the County.	FEMA
Flood March 28, 1950	Village of Fayetteville, Towns of Manlius and Pompey	Resulted in peak stream flows for the year of 1950 along Limestone Creek at the Village of Fayetteville. It was a major flood event in the Towns of Manlius and Pompey.	USGS, FEMA
Heavy Rain October 1955	City of Syracuse	3.55 inches of rain fell within a 24-hour period in the City of Syracuse.	NYSC
Flood March 12, 1956	Village of Baldwinsville	Major flood event within this Village. Resulted in peak stream flows for the year of 1956 along Seneca River.	FEMA, USGS
Flood June 1-2, 1958	Town of Pompey	Major flood event within this Town. Resulted in peak stream flows for the year of 1958 along Onondaga Creek and Limestone Creek.	USGS, FEMA
Flood January 22, 1959	Town of Pompey	Major flood event within this Town. Resulted in peak stream flows for the year of 1959 along Onondaga Creek, Ninemile Creek, Limestone Creek and Butternut Creek.	USGS, FEMA
Flood March 30-31, 1960	Countywide	Resulted in peak stream flows for the year of 1960 along Limestone Creek, Onondaga Creek, Harbor Brook, Ninemile Creek and Butternut Creek. It was a major flood event in the Village of East Syracuse, and Towns of Camillus, Geddes, Manlius, Marcellus, Pompey and Salina. Onondaga Creek at the City of Syracuse reached its 5th highest flood stage at 5.06 feet (.06 feet above 5-foot flood stage).	USGS, FEMA, AHPS
Flood April 4, 1960	Multi-Jurisdictional	Resulted in peak stream flows along Seneca River in the Village of Baldwinsville (USGS) 17,200 cfs. Major flood event within both jurisdictions of the County.	USGS, FEMA
Flood February 25-26, 1961	Town of Pompey	Major flood event within this Town. Resulted in peak stream flows for the year of 1961 along Onondaga Creek, Harbor Brook, Ninemile Creek, Limestone Creek and Butternut Creek	USGS, FEMA
Flood February 4, 1963	Village of Baldwinsville, City of Syracuse	The Syracuse Herald American reported that floodwaters broke a beaver dam on the Village of Baldwinsville's Tannery Creek, and up to 'four feet of water' covered several streets and flooded 50 cars.	Endreny and Hassett

Event Date / Name	Location	Losses / Impacts	Source(s)
Flood June 26, 1963	City of Syracuse	The Syracuse Herald Journal reported that nearly 2.5 inches of rain had fallen on Central New York and flooded hundreds of cellars and numerous roads. The Claramont Park tract in the City of Syracuse was surrounded by 3 to 4 feet of water.	Endreny and Hassett
Flood March 4-5, 1964	Multi-Jurisdictional	Major flood event within these jurisdictions of the County. Resulted in peak stream flows for the year of 1964 along Onondaga Creek, Harbor Brook, Ninemile Creek, Limestone Creek and Butternut Creek.	USGS, FEMA
Flood May 1966	Town of Salina	This flood event resulted in over $90 K in damages to the Town.	FEMA
Flood July 29-31, 1967	City of Syracuse	The Syracuse Herald Journal indicated that the Syracuse Department of Public Works crews were on the cleanup brigade after rainwater flowed down West Seneca Turnpike in Syracuse. Lawns, driveways and sidewalks were inundated. A series of cloudbursts brought on the deluge and a clogged storm drain at Hopper Brook was blamed for the flooding.	Robison (USGS)
Flood February 3-4, 1968	Village of Baldwinsville	The Syracuse Herald Journal indicated that local fire department, power, and telephone company personnel were busy cleaning up water that flooded several streets and a bowling alley after a beaver dam broke in Baldwinsville's Tannery Creek. The creek was plugged up at West Genesee Street and flooded streets with up to four feet of water. Parts of Elizabeth, Warner, and Oneida Avenues were flooded as well as the parking lot and bowling lanes of the Sports Bowl. More than 50 cars were flooded above the engines. Many cars required towing.	Robison (USGS)
Flood June 26, 1968	Multi-Jurisdictional	The Syracuse Herald Journal indicated that nearly 2.5 inches of rain had fallen on Central New York, flooding hundreds of cellars and putting many roads under water. At least 250 homes in the Claramont Park tract in Syracuse were surrounded by three to four feet of water. West Genesee Street and Erie Boulevard, east, were under water in many spots. Young Road in Mattydale was also flooded.	Robison (USGS)
Flood July 9, 1968	Multi-Jurisdictional	The Syracuse Herald Journal indicated that Jordan officials were seeking the aid of the Army Corps of Engineers to clean up silt, rocks and debris strewn about Skaneateles Creek by flood waters on July 9th. During this storm a large amount of water was released from Skaneateles Lake. This water filled the stream to the top of its banks in the Village of Jordan and left boulders, tree limbs and a large amount of gravel and silt when it receded. The Camillus Advocate indicated that Nine Mile Creek and a small connecting creek overflowed its banks in the Town of Camillus, causing minor flooding of yards and streets.	Robison (USGS)
Flood May 18-20, 1969	Multi-Jurisdictional	This event resulted in flooding in the City of Syracuse, the Towns of Elbridge, and Skaneateles and the Villages of East Syracuse and Liverpool. The flooding in these jurisdictions resulted in over $105 K in property damages, particularly in Syracuse.	FEMA, USGS, Robison (USGS)
Flood	Multi-	1.3 inches of rain fell in 37 minutes at the City of Syracuse based U.S. Weather	Endreny and Hassett, FEMA,

Event Date / Name	Location	Losses / Impacts	Source(s)
June 18, 1970	Jurisdictional	Bureau Airport station, causing streets and roads to flood by two feet of water. Town of Skaneateles received from 3.0 to 4.6 inches of rain in 24 hours. This was also a major flood in the Towns of Camillus and Geddes.	USGS
Flood July 3, 1970	Countywide	Onondaga County experienced approximately $250 K in property damages.	Hazards & Vulnerability Research Institute (SHELDUS)
Flood March 15, 1971	Towns of Camillus, and Geddes	Major flood event within both jurisdictions of the County.	FEMA
Flood May 15, 1972	Town of Cicero, City of Syracuse	The NYS HMP indicated that Cicero experienced a flood event on this date. Resulted in peak stream flows for the year of 1972 along Meadow Brook in the City of Syracuse.	NYSDPC, USGS
Flood June 20-25, 1972 (Remnants of Tropical Storm Agnes) (FEMA DR-338)	Multi-State	See FEMA Disaster Declarations (Table 5.4.3-2)	FEMA, Hazards & Vulnerability Research Institute (SHELDUS), NYSEMO History of Declarations, USGS, NYSDPC, USACE, NWS
Flood January 2, 1973	Villages of Baldwinsville, and Liverpool	The Syracuse Herald Journal indicated that heavy precipitation during November and December 1972, ground saturation after the June (Tropical Storm Agnes) flooding, and recent warm weather that melted snow were among factors that caused the worst winter flooding potential since 1942. The most serious conditions were along the Seneca River in the Village of Baldwinsville area. Trouble spots include shore areas west of the Village of Baldwinsville, some places near the Village of Liverpool, and the low-lying Hayes Road neighborhood east of the Village of Baldwinsville.	USGS, Robison et al.
Flood March 17, 1973	Countywide	Onondaga County experienced approximately $200 K in property damages.	Hazards & Vulnerability Research Institute (SHELDUS)
Flood April 5-6, 1973	City of Syracuse, Village of Baldwinsville, Town of Cicero, Village of East Syracuse	The Syracuse Herald Journal indicated that heavy rainfall today pushed area lakes and streams to abnormally high levels, and flooded yards and cellars of some homes in the Town of Cicero and the Village of Baldwinsville. The Syracuse Post-Standard indicated that rainfall in the City of Syracuse area totaled .58 inches. This event also resulted in the flooding of some streets, yards, and basements in the Village of East Syracuse.	Endreny and Hassett, Robison et al.
Flood June 6, 1973	City of Syracuse, Village of Baldwinsville	Minor flooding occurred in the City of Syracuse and Village of Baldwinsville. The Syracuse Herald Journal indicated that thunderstorms hit the City of Syracuse area last night and flooded several streets when the storm drains could not handle the runoff. Meadowbrook Drive and Euclid Avenue were the most seriously affected.	Endreny and Hassett, Robison et al.
Severe	Multi-County	See FEMA Disaster Declarations	FEMA, NYSEMO, Endreny and

Event Date / Name	Location	Losses / Impacts	Source(s)
Storms and Flooding July 3-5, 1974 (FEMA DR-447)		(Table 5.4.3-2)	Hassett, NYSC
Flood April 4-5, 1974	Multi-Jurisdictional	Minor flooding was reported which resulted in inundation of 50 basements in the Syracuse Harbor and Furnace brook watersheds. The Syracuse Herald Journal indicated that the rapid melting of heavy snow resulted in flooded basements on this city's south side and the inundation of two roads in the towns of Marcellus and Elbridge. A cutlery plant at the Town of Camillus was forced to move some of its equipment and personnel when Ninemile Creek flooded parts of the building.	Endreny and Hassett, Robison et al.
Severe Storms, Heavy Rain, Landslides, Flooding September 22-27, 1975 (FEMA DR-487) (Remnants of Hurricane Eloise)	Multi-State	See FEMA Disaster Declarations (Table 5.4.3-2)	FEMA, HPC, USGS, NYSEMO, Perry et al.
Flood April 1, 1976	Countywide	Onondaga County experienced approximately $313 K in property damages.	Hazards & Vulnerability Research Institute (SHELDUS)
Flood July 16, 1977	City of Syracuse	Resulted in peak stream flows for the year of 1977 along Ley Creek at Park Street in the City of Syracuse 1,250 cfs.	USGS
Flood October 1, 1977	Countywide	Onondaga County experienced approximately $313 K in crop damages and $3 K in property damages.	Hazards & Vulnerability Research Institute (SHELDUS)
Flood March 5-6, 1979	City of Syracuse	Onondaga Creek at the City of Syracuse reached its 3rd highest flood stage at 5.49 feet (.49 feet above 5-foot flood stage).	AHPS, USGS
Flood October 27-28, 1981	Countywide	Resulted in peak stream flows for the year of 1981 along Ley Creek, Onondaga Creek, Butternut Creek, Ninemile Creek, Meadow Brook, Harbor Brook and Limestone Creek. Onondaga County experienced approximately $833 K in property damages. In the Village of Fayetteville, the flood caused a levee on the western bank of Limestone Creek to breach in several places, causing a splitting in the flow of the Creek.	USGS, Hazards & Vulnerability Research Institute (SHELDUS), FEMA
Flood March 27, 1992	Town of Tully	Major flood event within this Town.	FEMA
Flood April 27-28, 1993	Village of Baldwinsville, City of Syracuse,	Residents of Cayuga, Onondaga, Oswego, Seneca, Tompkins, Cortland and Wayne Counties were declared eligible to apply for Small Business Administration loans as a result of flood damages. In the Town of Van Buren, west of the City of Syracuse, Town officials have hired armed guards to patrol flooded homes along	New York Times, USGS

Event Date / Name	Location	Losses / Impacts	Source(s)
	Towns of Lafayette and Van Buren	the Seneca River. A mudslide in the Town of LaFayette, left a crater 40 feet deep and a quarter of a mile wide. Resulted in peak stream flows for the year of 1993 along Seneca River and Ninemile Creek.	
Flood March 23-25, 1994	Multi-County	Three counties in New York State experienced approximately $500 K in property damages. Resulted in peak stream flows for the year of 1994 along Onondaga Creek, Ley Creek, Ninemile Creek, Limestone Creek, Butternut Creek.	NOAA-NCDC, USGS
Flood August 15, 1995	Countywide	Onondaga County experienced approximately $25 K in property damages.	Hazards & Vulnerability Research Institute (SHELDUS)
Severe Storms and Flood January 18-20, 1996 (FEMA DR-1095) "Deluge of 1996"	Northeastern U.S.	See FEMA Disaster Declarations (Table 5.4.3-2)	FEMA, NOAA-NCDC, NYSDPC , NWS, Lumia (USGS WRIR 97-4252), Hazards & Vulnerability Research Institute (SHELDUS), NYSEMO, USGS
Flood November 8-9, 1996	Countywide	Onondaga County experienced approximately $100 K in property damages. Resulted in peak stream flows for the year of 1996 along Onondaga Creek, Harbor Brook, Ley Creek, Ninemile Creek and Butternut Creek. 3.56 inches of rain fell within a 24-hour period in the City of Syracuse.	Hazards & Vulnerability Research Institute (SHELDUS), USGS, NYSC
Flood August 24, 1998	Town of Manlius	As a severe thunderstorm moved through the region, it dumped torrential rains within the County. Rainfall amounts of 1 to 2 inches were observed in less than 30 minutes in the Town of Manlius. This caused the Limestone Creek to quickly rise out of its banks. One fatality occurred within Manlius, when a four year old girl was swept downstream by floodwaters. Some minor damage was also incurred to portions of other properties from the force of the water. The Town of Manlius experienced approximately $20 K in property damages.	NOAA-NCDC
Severe Storms May 3, – September, 14, 2000 (FEMA DR-1335)	Statewide	See FEMA Disaster Declarations (Table 5.4.3-2)	Chittenden, FEMA, NYSDPC, NOAA-NCDC, Hazards & Vulnerability Research Institute (SHELDUS), NYSEMO
Flood June 14, 2002	Countywide	Heavy thunderstorm rains caused flash flooding across northern Onondaga County. The worst flooding was reported in Baldwinsville. Flooding also occurred in the Towns of Lysander, Clay, Liverpool, and Cicero and the Village of North Syracuse. Resulted in peak stream flows for the year of 2002 along Harbor Brook and Ley Creek. Onondaga County experienced approximately $2 M in property damages.	NOAA-NCDC, Hazards & Vulnerability Research Institute (SHELDUS), USGS
Flood June 27, 2002	City of Syracuse	Heavy thunderstorm rains caused street and basement flooding throughout the City of Syracuse. Some cars were under water. Sump pumps in the Hotel Syracuse were overwhelmed. The City experienced approximately $20 K in property damages.	NOAA-NCDC

Event Date / Name	Location	Losses / Impacts	Source(s)
Flood May 24, 2004	Town of Cicero	Several Town parks flooded. A storm culvert collapsed under Eastwood Road south of Route 31. The Town of Cicero experienced approximately $20 K in property damages.	NOAA-NCDC
Flood June 2004	Cross Lake (Onondaga and Cayuga Counties)	Flooding found along the shorelines of Cross Lake.	CNY Waterways
Severe Storms August 13 – September 16, 2004 (FEMA DR-1564)	Multi-County	See FEMA Disaster Declarations (Table 5.4.3-2)	FEMA, NYSEMO, NWS, Hazards & Vulnerability Research Institute (SHELDUS), NOAA-NCDC
Severe Storms and Flood April 2-4, 2005	Multi-State	Resulted in a Disaster Declaration for 20 New York State counties (DR-1589), however, it did not include Onondaga County. New York State experienced approximately $66.2 M in eligible damages. The County experienced approximately $100 K in property damages. There were some road closures and flooded basements in the Towns of DeWitt, Manlius, and Lafayette and the Village of East Syracuse. Streams and creeks came out of their banks including Butternut Creek. Onondaga Creek at the City of Syracuse reached its 4th highest flood stage at 5.16 feet (.16 feet above 5-foot flood stage).	NCDC, NWS, FEMA, NYSDPC, NOAA-NCDC, Hazards & Vulnerability Research Institute (SHELDUS), NYSEMO, AHPS, USGS
Flood July 13-14, 2005	Countywide	Nearly stationary thunderstorms with heavy rain caused a flash flood in the City of Syracuse, the Town of DeWitt, and the Hamlet of Mattydale. Rainfall was two to four inches in less than two hours in the City. Flooding closed and damaged numerous roads and train tracks, including State Route 5 and State Route 41A. Dozens of cars were under water and dozens of homes and businesses had several feet of water in them. Onondaga County experienced approximately $500 K in property damages.	NYSDPC, NOAA-NCDC, Hazards & Vulnerability Research Institute (SHELDUS)
Flood / High Winds November 29, 2005	Countywide	1.16 inches of rain fell in the City of Syracuse. Overflowing roads caused several cars to break down and contributed to numerous crashes in the Town of Onondaga County. Several drivers reported that rain had washed out parts of Route 80, near Griffen Road in South Onondaga. Winds were strong enough to blow over an elderly man in the County.	The Post Standard
Severe Storms and Flood June 25 - July 12, 2006	Multi-State	This event was the largest and most costly natural disaster that New York State has encountered since Hurricane Agnes hit the State in 1972. Resulted in a Disaster Declaration for 19 New York State counties (DR-1650), however, it did not include Onondaga County. New York State experienced approximately $246.3 M in eligible damages (NYSDPC). Onondaga County experienced approximately $29 K in property damages. Although Onondaga County was not declared as an official disaster area under this declaration, all counties of the State were eligible to apply for federal assistance under the Hazard Mitigation Grant Program. As of December 29, 2006, more than $227 M in disaster aid	FEMA, NOAA-NCDC, NWS, NYSEMO, NYSDPC, USGS, NOAA, Lanza, USGS, Goldberg and Greene (The Post Standard), Doherty (The Post Standard), Weiner, Baker

Event Date / Name	Location	Losses / Impacts	Source(s)
		was approved for the State. Disaster aid in Onondaga County is unknown. Peak streamflows within Onondaga County for the year of 2006 occurred during this event along Seneca River, Onondaga Creek, Harbor Brook, Ley Creek, Ninemile Creek and Meadow Brook. Streams and creeks overflowed their banks in the Village of Liverpool. There was standing water on many roadways and surrounding areas within the Village. In the Village of Baldwinsville, several roads were impassable and State Route 370 was closed. The water covered many roads and bridges in the Village. In the Town of Cicero, Volmer Creek overflowed its banks flooding Thompson Road. The water rose into the first floor of several homes. In the Towns of Van Buren and Cicero, many roads were closed. In the Hamlet of Mattydale, the Hollywood Theatre and many homes were flooded. In the Town of Dewitt, over 100 homes throughout the town had significant level of water in their basements. In the Town of Camillus, a mudslide closed Gorge Road. 4.29 inches of rain fell at Hancock Airport in the City of Syracuse. The storm overwhelmed county sewer systems, causing raw sewage to seep in Onondaga Lake. A tornado spawned, cutting a three-mile swath from the Towns of Marcellus to Onondaga, with the heaviest amount of damage reported in the Town of Cicero.	
Flood March 14-18, 2007	City of Syracuse, Town of Lysander	Minor flooding occurred on the Onondaga Creek at the City of Syracuse from the evening hours of March 14th to the morning of the 15th. The creek at the City crested at 5.1 feet (.1 feet over 5 foot flood stage). Over an inch of rain combining with snowmelt caused the minor flooding. Peak streamflows within Onondaga County for the year of 2007 occurred during this event along Seneca River, Onondaga Creek, Harbor Brook, Ley Creek, Willow Brook, Ninemile Creek, Butternut Creek and Meadow Brook.	NOAA-NCDC, USGS
Flood December 24, 2007	City of Syracuse	The Syracuse Post-Standard indicated that rainfall and melting snow flooded roads and basements throughout Central New York. The weather led to the evacuation of a City of Syracuse home when part of its foundation crumbled. Cars stalled in the midst of flooded streets that police officers said looked like lakes. Firefighters and National Grid workers spent the night responding to reports of basement flooding that threatened furnaces and other utilities.	The Post Standard

Note (1): This table does not represent all events that may have occurred throughout the County. NOAA/NCDC storm query indicated that Onondaga County has experienced 28 flood events between January 1, 1950 and February 28, 2008 (including flash floods). However, not all of these events were identified in this table due to a lack of detail and /or their minor impact upon the County.

Note (2): Monetary figures within this table were U.S. Dollar (USD) figures calculated during or within the approximate time of the event. If such an event would occur in the present day, monetary losses would be considerably higher in USDs as a result of inflation.

AHPS	Advanced Hydrologic Prediction Service	HPC	Hydrometeorological Prediction Center
CNY	Central New York	K	Thousand ($)
DR	Federal Disaster Declaration	M	Million ($)
FEMA	Federal Emergency Management Agency	NCDC	National Climate Data Center

NOAA	National Oceanic Atmospheric Administration
NWS	National Weather Service
NYSC	New York State Climate Office
NYSDPC	New York State Disaster Preparedness Commission
NYSEMO	New York State Emergency Management Office
SHELDUS	Spatial Hazard Events and Losses Database for the U.S.
USGS	U.S. Geological Survey
WRIR	Water Resources Investigation Report

According to the CRREL database, ice jam incidences in Onondaga County are not common in comparison to many other counties of the State (Ice Engineering Research Group, Date Unknown). Figure 5.4.3-3 identifies the approximate location of where all ice jams have formed throughout the County between 1936 and 2007.

Figure 5.4.3-3. Onondaga County Ice Jam Events

Source: Ice Engineering Research Group, Date Unknown.

Based on review of all available sources, Table 5.4.3-5 lists seven ice jam events that have occurred in Onondaga County between 1936 and 2007. Information regarding losses associated with these reported ice jams was unavailable or limited.

Table 5.4.3-5. Ice Jam Events in Onondaga County between 1941 and 2004

Event Date	River / Stream	Location	Description	Source(s)
March 19, 1941	Limestone Creek	Fayetteville	Gage height of 4.48 feet, affected by backwater from ice, reported at USGS gage Limestone Creek at Fayetteville, on March 19, 1941. Not maximum gage height for year. Both banks are high and not subject to overflow.	CRREL
March 16, 1948	Limestone Creek	Fayetteville	Maximum annual gage height of 5.92 feet, affected by backwater from ice, reported at USGS gage Limestone Creek near Fayetteville, on March 16, 1948. Both banks were high and subject to overflow.	CRREL
March 20, 1948	Onondaga Creek	Syracuse	Maximum annual gage height of 5.93 feet, with ice effect of 0.38 feet, reported at USGS Onondaga Creek at Syracuse, on March 17, 1948.	CRREL

Event Date	River / Stream	Location	Description	Source(s)
February 28, 1962	Butternut Creek	Jamesville	An ice jam caused the maximum annual gage height of 7.51 ft on Butternut Creek at Jamesville, NY on Feb. 28, 1962. The associated discharge was 120 cfs.	CRREL
January 1, 1966	Hemlock Creek	Nedrow	At Hemlock Creek at Nedrow, New York the ice jam was broken up by dynamiting before serious flooding occurred.	CRREL
January 2, 1979	Butternut Creek	Jamesville	The USGS reported backwater from ice and/or sluggish intakes on the Butternut Creek near Jamesville, NY on January 2, 1979. The water discharge was 772 cubic feet per second. The gage height was 7.69 ft.	CRREL
January 20, 2004	Seneca River	Jacks Reef	The NY State Emergency Management Office reported on Jan. 20 that there is an ice jam near Jacks Reef, NY (on the border of Onondaga and Cayuga counties) on the Senceca River that has raised the level at the Port Byron gauge. The water level at the Baldwinsville dam is down indicating a constriction up stream (near Jacks Reef).	CRREL

Further descriptions of select flood events that have impacted Onondaga County are provided below with details regarding their impact (where available). These descriptions are provided to give the reader a context of the flood events that have affected the County and to assist local officials in locating event-specific data for their municipalities based on the time and proximity of these events. Flood impacts associated with hurricanes, tropical storms or Nor'Easters, are discussed in this profile and are also mentioned in their designated hazard profiles (Section 5.4.1 Severe Storm and Section 5.4.2 Severe Winter Storm).

Monetary figures within the event descriptions were U.S. Dollar (USD) figures calculated during or within the approximate time of the event (unless present day recalculations were made by the sources reviewed). If such an event would occur in the present day, monetary losses would be considerably higher in USDs as a result of inflation.

June 18, 1922: A cloudburst of heavy rain impacted the City of Syracuse and neighboring towns, resulting in the tying up of railroads, paralyzing the local trolley and telephone services, and the flooding low-lying areas. According to the NWS, the downpour from this even broke all previous records. In a 90-minute span, the heavy rains brought great damage to the City of Syracuse (New York Times, 1922).

A dozen streams in Syracuse, within the vicinity of Syracuse University, poured rushing water in the New York Central tunnel, where a train was stalled from a previous flood the week before. The tunnel was filled to a new high water mark and all trains were routed over the old West Shore tracks (New York Times, 1922).

Unofficial estimates of property damage in Syracuse alone were nearly $800,000. Overbank flooding of one brook in Syracuse inundated an area containing 12 blocks, toppled two houses from their foundations, causing over $100,000 in damages. Two families were rescued during the flood's peak. Four women and three children climbed out of windows of their home, into boats piloted by fireman. Two more women and a child were rescued from another home. For the first time in history, the downstream business district of Syracuse was flooded, causing damage to several factories. The Franklin Automobile Factory suffered an estimated $200,000 in damages. Trains on the Lackawanna Railroad were held up for five hours by a 200-foot washout (New York Times, 1922).

May 18-20, 1969: During this time period, very heavy rains affected central New York State (Cayuga and Onondaga Counties) and the southwestern Adirondacks. Rain fall totals ranged from 3.5 inches to

6.5 inches. Due to a large part of the affected area being rural, most of the damage was done to highways, bridges and farmland (Robison, 1973).

In the City of Syracuse, total rainfall between May 19th and 20th measured 3.13 inches. The heavy rain caused the Ley Creek to overflow, flooding city streets, low-lying areas and basements. One furniture store in the City reported $100,000 in damages. Wellington Road and the New York State Thruway in the City of Syracuse were entirely inundated from this event. In the Town of Skaneateles, commercial establishments suffered thousands of dollars in damages when their basements flooded. Many businesses suffered serious losses in merchandise when the water rose in their basements, between seven and eight feet. The Village of Liverpool and the Hamlet of Mattydale were hit hard, with four to five feet of water in basements (Robison, 1973). Total damages throughout Onondaga County were not disclosed in the materials reviewed to develop this plan.

June 20-25, 1972 (Remnants of Tropical Storm Agnes) (FEMA DR-338): Tropical Storm Agnes dropped as much as 19 inches of rain as it left the Gulf of Mexico as a hurricane. Agnes downgraded to a tropical storm as it hit every state from Florida to New York State. More than 210,000 people were forced to evacuate their homes. The storm broke long-standing flood records in six states, resulting in $3.2 billion in property damage and 122 fatalities. Tropical Storm Agnes remained the most costly disaster until Hurricane Andrew (1992). Pennsylvania and New York State experienced the greatest rainfall totals and suffered the most losses from this storm (NOAA, 1997; USACE, 1973). New York State experienced 24 deaths and approximately $703 million in damages as a result of flooding from this storm (NYSDPC, 2008; Middle Atlantic River Forecast Center [MARFC], 2006).

In Onondaga County, Tropical Storm Agnes was documented as one of the major flood events of the County. The County experienced approximately $1.6 million in property and crop damages (Hazards & Vulnerability Research Institute, 2007). According to FEMA FIS's for each municipality of Onondaga County, most experienced widespread flooding of varying degrees from this event. Record peak streamflows within Onondaga County for the year of 1972 occurred during this event along Seneca River, Onondaga Creek, Ninemile Creek and Limestone Creek (USGS, 2008). Onondaga Creek at the City of Syracuse reached its second highest historical flood stage at 6.2 feet (1.2 feet above 5-foot flood stage) (AHPS, 2007). Onondaga Lake rose to 370.8 feet, causing nearly $150,000 in damages to the Town of Salina (which is 40-percent of the estimated $375,000 in damages that occurred within the surrounding communities of Onondaga Lake) (FEMA, 1982).

This storm resulted in a FEMA Disaster Declaration (FEMA DR-338) for New York State on June 23, 1972. Through this declaration, the following 26 counties were declared eligible for Federal and State disaster funds: Allegany, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, Chenango, Livingston, Madison, Monroe, Oneida, Onondaga, Ontario, Orange, Oswego, Rockland, Schuyler, Seneca, Steuben, Tioga, Tompkins, Ulster, Wayne, Westchester, Wyoming, Yates (NYSEMO, 2006; FEMA, 2008; NYSDPC, 2008). Disaster assistance for all counties affected in the State was not disclosed in the materials reviewed to develop this plan.

July 3-5, 1974 (FEMA DR-447): A wide region of central and eastern New York State suffered from a storm system moving northward across the State, causing showers and thunderstorms in the Oswego-Syracuse-Cobleskill region. Precipitation totals ranged between 3.8 and 5.0 inches throughout the State. The City of Syracuse experienced over 4.5 inches of rain (Robison et al., 1976).

In New York State, Governor Wilson declared seven counties a major disaster area, including Chenango, Herkimer, Onieda, Onondaga, Oswego, Otsego and Schoharie Counties. The Governor applied to the Federal Government for financial aid under provisions of U.S. Public Law 93-228. Preliminary estimates

of overall damage in New York State to private property, public property, and agricultural land and crops, as used in the application for aid, was approximately $12.6 million (Robison et al., 1976).

Onondaga County experienced the most damage over any other county in the State, estimated at $7.2 million. The County suffered $6.5 million in damages to private property; $500,000 to public property; and $200,000 to agricultural land (Robison et al., 1976). Peak streamflows within Onondaga County for the year of 1974 occurred during this event along Harbor Brook, Onondaga Creek, Ley Creek, Ninemile Creek, Meadow Brook, Butternut Creek and Limestone Creek (USGS, 2008). Onondaga Creek at the City of Syracuse reached its highest historical flood stage at 6.48 feet (1.48 feet above 5-foot flood stage) (AHPS, 2007). In the City of Syracuse, Harbor Brook overflowed its banks, forcing more than 200 persons to evacuate their homes on the south side of the City. Underpasses were flooded and houses along Meadow Brook had water in their cellars. Many streets in the City were flooded with water 1.5 feet deep. Almost all the entrance and exit ramps on Route 81 were blocked by water. Roads in the Towns of Camillus, Solvay, and Cicero were flooded; with some being impassable. Bloody Brook in the Town of Liverpool overflowed and flooded a drive-in theatre with more than 4 feet of water (Robison et al., 1976).

This storm resulted in a FEMA Disaster Declaration (FEMA DR-447) for New York State on July 23, 1974. Through this declaration, the following 4 counties were declared eligible for Federal and State disaster funds: Herkimer, Oneida, Onondaga, Oswego (NYSEMO, 2006; FEMA, 2008; NYSDPC, 2008). Disaster assistance for all counties affected in the State was not disclosed in the materials reviewed to develop this plan.

September 22-27, 1975 (Remnants of Hurricane Eloise) (FEMA DR-487): Hurricane Eloise caused flooding throughout the eastern U.S and in Puerto Rico. This storm made landfall in southeastern Louisiana and then followed a northeasterly path from Mississippi and Alabama and further along the East Coast, up through New York State. Total storm damages were estimated at $415 million. Counties in New York, Pennsylvania, Maryland, Florida, and Alabama were declared disaster areas (Perry et al., 2005).

Total losses in New York State are unknown; however, it was reported that Onondaga County experienced approximately $6.3 million in property damages from this event (Hazards & Vulnerability Research Institute, 2007). Rain totals within the vicinity of Onondaga County totaled between 3 and 5 inches (Roth, 2006). Peak streamflows within Onondaga County for the year of 1975 occurred during this event along Seneca River, Harbor Brook, Ninemile Creek, Ley Creek, Limestone Creek, Butternut Creek, Meadow Brook and Onondaga Creek (USGS, 2008).

This storm resulted in a FEMA Disaster Declaration (FEMA DR-487) for New York State on October 2, 1975. Through this declaration, the following 17 counties were declared eligible for Federal and State disaster funds: Allegany, Broome, Cayuga, Chemung, Cortland, Madison, Onondaga, Oswego, Putnam, Queens, Richmond, Rockland, Steuben, Tioga, Tompkins, Westchester, Yates (NYSEMO, 2006; FEMA, 2008; NYSDPC, 2008). Disaster assistance for all counties affected in the State was not disclosed in the materials reviewed to develop this plan.

January 18-20, 1996 (FEMA DR-1095): A strong storm produced significant precipitation between January 18th and 20th. Combined with unseasonably warm temperatures, causing rapid snowmelt, extensive flooding occurred throughout New York State. The storm and flooding claimed ten lives, stranded hundreds of people, destroyed or damaged thousands of homes and businesses, and closed hundreds of roads. The areas within and surrounding the Catskill Mountains were severely affected by this event. More than 4.5 inches of rain fell on at least 45 inches of melting snow in the Catskill Mountain region and caused major flooding throughout the southeastern section of the State. New York

State experienced between $100 and $160 million in property damages from this event (Lumia, 1998; NYSDPC, 2008).

Onondaga County received between 1.0 and 2.0 inches of rain during this event, resulting in widespread flooding along the major rivers and small streams of the County. Onondaga County experienced approximately $7.6 million in flood damages from this event (NCDC, 2008; Hazards & Vulnerability Research Institute, 2007).

This storm resulted in a FEMA Disaster Declaration (FEMA DR-1095) on January 24, 1996. Through this declaration, the following 41 counties were declared eligible for Federal and State disaster funds: Albany, Allegany, Broome, Cattaraugus, Cayuga, Chemung, Chenango, Clinton, Columbia, Cortland, Delaware, Dutchess, Essex, Franklin, Greene, Herkimer, Jefferson, Lewis, Livingston, Madison, Montgomery, Onondaga, Ontario, Orange, Otsego, Putnam, Rensselaer, St. Lawrence, Saratoga, Schenectady, Schoharie, Schuyler, Steuben, Sullivan, Tioga, Tompkins, Ulster, Warren, Washington, Wyoming and Yates (NYSEMO, 2006; FEMA, 2008; NYSDPC, 2008). Disaster assistance for all counties affected in the State totaled approximately $16.7 million in individual assistance and $103.7 million in public assistance (1997 USD). Onondaga County received $1.1 million in public assistance (1997 USD) (Lumia, 1998).

May through September 2000 (FEMA DR-1335): Between May and September 2000, multiple severe storm events occurred throughout New York State resulting in significant flooding and over $34.6 million in damage throughout various New York State counties. In Onondaga County, NOAA-NCDC indicated that flooding during this time period particularly occurred as a result of heavy thunderstorms between June 21st and July 16th. On June 21st, heavy rains caused significant ponding of water on Park Street, McBride Street, and Burt Street in the City of Syracuse. Route 174 and the northbound lanes of Interstate 81 were closed for a short time. On July 16th, significant ponding of water was reported on roadways from the Town of Manlius to the Village of Fayetteville (NCDC, 2008). Total damages throughout Onondaga County were not disclosed in the materials reviewed to develop this plan.

These storms resulted in a FEMA Declaration Disaster (FEMA DR-1335) on July 21, 2000. Through this declaration, the following 27 counties were declared eligible for Federal and State disaster funds: Albany, Allegany, Cattaraugus, Columbia, Dutchess, Erie, Essex, Greene, Herkimer, Lewis, Livingston, Madison, Montgomery, Niagara, Oneida, Onondaga, Orleans, Otsego, Rensselaer, Schenectady, Schoharie, Steuben, Sullivan, Tioga, Tompkins, Ulster and Yates (FEMA, 2003). Disaster assistance for all counties affected in the State was not disclosed in the materials reviewed to develop this plan.

June 14, 2002: Heavy thunderstorm rains caused flash flooding across northern Onondaga County, with the worst flooding occurring in the Village of Baldwinsville. Tannery Creek overflowed its banks, resulting in the declaration of a state of emergency that closed all streets of the Village of Baldwinsville. Water in the streets was two to three feet deep, flooding an estimated 80 homes. A bowling alley in the Village suffered major water damage. The bowling alley was recently renovated and worth more than one million dollars. This event resulted in the evacuation of an eight block area within the Village of Baldwinsville. The area was bordered by Route 31, Virginia Street, East Oneida Street, and Mechanic Street. The Elden elementary school closed as a result of a leaky roof and high water (NCDC, 2008).

Flooding was also reported in the Towns of Lysander, Clay, and Cicero and the Villages of Liverpool and North Syracuse. Route 370 was closed in the Town of Lysander due to high water. In the Town of Clay, a plugged catch basin flooded a ballpark and Caughdenoy Road. Nearby streets had as much as 2 feet of water on them. Also in the Town of Clay, high water was reported on many roads including Route 31 and in Cold Springs. In the Village of Liverpool, the basement of Mother's Restaurant flooded. In North Syracuse, many roads had water on them. In the Town of Cicero, East Gillette Road, Hogan Road Beach

Road and Thompson Road were inundated by floodwaters. Onondaga County experienced approximately $2 million in flood damages from this event (NCDC, 2008; Hazards & Vulnerability Research Institute, 2007).

August 13 – September 16, 2004 (FEMA DR-1564): A series of storms occurred between August and September 2004 within New York State, resulting in approximately $18 million in eligible damages (NYSDPC, 2008). NOAA-NCDC indicated that flooding during this time period in Onondaga County particularly occurred as a result of heavy thunderstorms August 30-31, 2004. Roads were either washed out, closed or impassable in the Towns of Pompey, Lafeyette and Manlius.

In the Town of Manlius, a golf course flooded and a bridge was washed out and significant flooding was reported within the vicinity of Limestone Creek. This event was reported as the worst flooding in 20 years within the Town. In the Village of Fayetteville, an animal hospital was evacuated and many basements were flooded. According to the Post-Standard, Butternut Creek in the Town of Dewitt, Limestone Creek in the Village of Fayetteville and the southern section of Onondaga Creek were flooded. In the Town of Otisco, the Town supervisor declared a state of emergency after the heavy rain made several roads impassable and flooded 10 to 15 basements. The biggest flooding occurred on Barker Street, Case Hill and Otisco Valley roads, causing most the road shoulders to be washed away. In the Town of Tully, low-lying sections of Woodmancy Road were closed indefinitely after water eroded the shoulders to the point where the road became too narrow. In the Town of Lafeyette, nearly 200 feet of Tully Farm Road was under water (McKeever, 2004). Rainfall totals in Onondaga County ranged between 2.2 inches in the Town of Camillus and 4.87 inches in the Town of Tully (NCDC, 2008; NWS, 2004). Onondaga County experienced approximately $2 million in flood damages from this event (NCDC, 2008).

These storms resulted in a FEMA Declaration Disaster (FEMA DR-1564) on October 1, 2004. Through this declaration, the following 17 counties were declared eligible for Federal and State disaster funds: Allegany, Broome, Cattaraugus, Columbia, Delaware, Madison, Monroe, Niagara, Oneida, Onondaga, Orange, Orleans, Steuben, Sullivan, Ulster, Warren, and Wayne Counties (FEMA, 2005). As of December 10, 2004, more than $1.8 million in disaster aid had been approved for the State (FEMA, 2004). Disaster assistance for all counties affected in the State was not disclosed in the materials reviewed to develop this plan.

April 2-4, 2005 (FEMA DR-1589): A slow moving storm moved up through the Appalachians and into the northeast U.S. The heavy rainfall from this event produced flooding throughout New York State, New Jersey and Pennsylvania (NCDC, 2005). Prior to this storm, the rivers and streams in the area had high flow-rates due to a previous rainstorm on March 28th and snowmelt; therefore, flooding increased substantially and created additional damage as a result of this April storm. New York State experienced approximately $66.2 million in damages from this event (NYSDPC, 2008).

In Onondaga County, there were some road closures and flooded basements in the Towns of DeWitt, Manlius, and Lafayette and the Village of East Syracuse. Streams and creeks overflowed their banks, including Butternut Creek (NCDC, 2008). Onondaga Creek at the City of Syracuse reached its 4th highest flood stage at 5.16 feet (.16 feet above 5-foot flood stage) (AHPS, 2007). Peak streamflows within Onondaga County for the year of 2005 occurred during this event along Seneca River, Onondaga Creek, Harbor Creek, Ninemile Creek and Butternut Creek (USGS, 2008). Onondaga County experienced approximately $100,000 in flood damages from this event (NCDC, 2008; Hazards & Vulnerability Research Institute, 2007)

This storm resulted in a FEMA Disaster Declaration (DR-1589) on April 19, 2005. Through this declaration, the following 20 counties were declared eligible for Federal and State disaster funds:

Broome, Cayuga, Chautauqua, Chenango, Columbia, Cortland, Delaware, Greene, Madison, Montgomery, Niagara, Orange, Otsego, Putnam, Rensselaer, Schoharie, Sullivan, Tioga, Ulster and Westchester (NYSDPC, 2008; FEMA, 2008). Although Onondaga County suffered flood damages during this storm, it was not declared a disaster area by FEMA.

June 25 – July 12, 2006 (FEMA DR-1650): This severe storm event resulted in a significant flooding that affected much of the Mid-Atlantic region. The flooding was widespread, affecting numerous rivers, lakes and communities from North Carolina to New York State. Rain totals throughout the eastern U.S. ranged from 2 to 17 inches, particularly between June 27th and 29th, with the largest accumulations falling in Maryland, Pennsylvania and New York State (Feuer, 2006). Overall, the storm resulted in over 16 deaths and millions of dollars in damages throughout the affected states (NWS, 2006). Some sources indicated that this flooding event was the largest and most costly natural disaster that New York State has encountered since Hurricane Agnes in 1972. The NYS HMP indicated that the counties affected throughout the State experienced approximately $246.3 million in damages during this flood (NYSDPC, 2008).

In Onondaga County, precipitation totals from June 25th through June 28th averaged between 0 and 6 inches of rain, with largest accumulations generated in the southeastern portion of the County (NWS, 2006). Over 4.29 inches of rain fell at the Hancock Airport in Syracuse, shattering a 31-year-old rainfall record of 3.9 inches on July 3, 1974 (Goldberg and Greene, 2006).

On July 12th, NOAA-NCDC reported that streams and creeks overflowed their banks in the Village of Liverpool resulting in standing water along many roadways in the Village and surrounding areas. Several roads were impassable and State Route 370 was closed. Volmer Creek overflowed its banks, flooding Thompson Road. The water rose into the first floor of several homes (NCDC, 2008). Flash flooding was also reported throughout the City of Syracuse, and the Village of North Syracuse (Figure 5.4.3-4) and the Village of Baldwinsville (Figure 5.4.3-5) during this event (Syarcuse.com, 2008).

Figure 5.4.3-4. 207 Palmer Drive, North Syracuse.

Source: Syracuse.com, 2006
Note: Photograph taken by Chrissie Cowan

Figure 5.4.3-5. Floral Park Mobile Home Park, Baldwinsville

Source: Syracuse.com, 2006
Note: Photograph taken by Jim Commentucci

In the Hamlet of Mattydale, the Hollywood Theatre was flooded out. Estimated repairs of the theatre averaged between $500 and $1,000 (Goldberg and Greene, 2006). The storm overwhelmed Onondaga County's sewer system, sending raw sewage into Onondaga Lake after the Metropolitan Sewage Treatment Plant exceeded its capacity (Baker et al., 2006). Overall, Onondaga County experienced approximately $29,000 in total property damages from this event (NCDC, 2008; Hazards & Vulnerability Research Institute, 2007).

This event resulted in a FEMA Emergency Declaration (FEMA EM-1650) on July 1, 2006. Through this declaration, the following 12 Counties were declared eligible for Federal and State disaster funds: Broome, Chenango, Delaware, Herkimer, Montgomery, Oneida, Orange, Otsego, Schoharie, Sullivan, Tioga, and Ulster Counties (FEMA, 2008). Although Onondaga County was not declared as an official disaster area under this declaration, all counties of the State were eligible to apply for federal assistance under the Hazard Mitigation Grant Program. This program provides assistance to State and local governments and certain private nonprofit organizations for actions taken to prevent or reduce long term risk to life and property from natural hazards. As of December 29, 2006, FEMA indicated that nearly $227 million in disaster aid was made available to all declared counties as result of this event (FEMA, 2008). Disaster assistance for Onondaga County affected in the State was not disclosed in the materials reviewed to develop this plan.

National Flood Insurance Program

According to FEMA's 2002 *National Flood Insurance Program (NFIP): Program Description*, the U.S. Congress established the NFIP with the passage of the National Flood Insurance Act of 1968. The NFIP is a Federal program enabling property owners in participating communities to purchase insurance as a protection against flood losses in exchange for State and community floodplain management regulations that reduce future flood damages. The NFIP collects and stores a vast quantity of information on insured structures, including the number and location of flood insurance polices number of claims per insured property, dollar value of each claim and aggregate value of claims, repetitive flood loss properties, etc. NFIP data presents a strong indication of the location of flood events among other indicators (NYSDPC, 2008).

Participation in the NFIP is based on an agreement between communities and the Federal Government. If a community adopts and enforces a floodplain management ordinance to reduce future flood risk to new construction and substantial improvements in floodplains, the Federal Government will make flood insurance available within the community as a financial protection against flood losses. This insurance is designed to provide an insurance alternative to disaster assistance to reduce the escalating costs of repairing damage to buildings and their contents caused by floods (FEMA, 2002).

There are three components to NFIP: flood insurance, floodplain management and flood hazard mapping. Nearly 20,000 communities across the U.S. and its territories participate in the NFIP by adopting and enforcing floodplain management ordinances to reduce future flood damage. In exchange, the NFIP makes federally backed flood insurance available to homeowners, renters, and business owners in these communities. Community participation in the NFIP is voluntary. Flood insurance is designed to provide an alternative to disaster assistance to reduce the escalating costs of repairing damage to buildings and their contents caused by floods. Flood damage is reduced by nearly $1 billion a year through communities implementing sound floodplain management requirements and property owners purchasing of flood insurance. Additionally, buildings constructed in compliance with NFIP building standards suffer approximately 80 percent less damage annually than those not built in compliance (FEMA, 2008).

According to the most recent NFIP statistics for the State (which are updated regularly), there is an extensive history of flood claims with NFIP which indicates a total of more than 79,500 claims since the inception of the program in the late 1970s. New York State is ranked within the top five states of the U.S. with the highest number of claims and is also amongst the highest in repetitive flood claims (as defined by FEMA/NFIP). In Onondaga County, all towns and villages participate in the NFIP (FEMA, 2008, NYSDPC, 2008). According the most recent data provided by NFIP, Onondaga County has filed 592 flood-related claims, resulting in approximately $4.9 million in flood related losses paid to the County. The Town of Cicero filed the most claims out of any other community in the County, totaling 130 claims, and received the most payment estimated at $1.2 million (FEMA, 2008). All NFIP data for the County is presented further in Table 5.4.3-11 in the "Vulnerability Assessment" section of this hazard profile.

The NFIP program also tracks properties that file several claims of a certain value over a specific period of time, termed Repetitive Loss Properties (RLPs). These properties, as defined by FEMA, are NFIP-insured properties that, since 1978 and regardless of any changes in ownership during that period, have experienced any of the following:

- Four or more paid losses in excess of $1,000
- Two paid losses in excess of $1,000 within any rolling 10-year period
- Three or more paid losses that equal or exceed the current value of the insured property (FEMA, 2005; FEMA, 2006)

RLPs make up only one to two percent of the flood insurance policies currently in force nationally, yet they account for 40-percent of the country's flood insurance claim payments. The NFIP is concerned with RLPs because structures that flood frequently strain the National Flood Insurance Fund. In fact, the RLPs are the biggest draw on the Fund by not only increasing the NFIP's annual losses and the need for borrowing; but they drain funds needed to prepare for catastrophic events. Community leaders and residents are also concerned with the RLP problem because residents' lives are disrupted and may be threatened by the continual flooding (FEMA, 2005).

The key identifiers for RLPs are the existence of flood insurance policies and claims paid by those policies. FEMA-sponsored programs, such as the Community Rating System (CRS), require participating communities to identify repetitive loss areas. A repetitive loss area is that portion of the floodplain where

buildings have been subject to repetitive flooding. The key identifier for these areas is the structures that have been identified by FEMA as meeting the definition of repetitive loss due to the existence of a flood insurance policy. The repetitive loss list maintained by FEMA is based on flood insurance payments paid. The purpose of identifying repetitive loss areas is to identify those structures in addition to those on FEMA's list that were subject to the same risk, but are not on FEMA's list because a flood insurance policy was not in force at the time of loss (City of Roseville, 2004).

FEMA NFIP statistics indicate that over 8,000 RLPs exist in New York State. The distribution of RLPs is a clear indicator of the location of the flood hazard in the State. According to FEMA, Onondaga County has 27 RLPs as of January 31, 2009, mostly in the Towns of Cicero (13), Town of Dewitt (5), and Town of Manlius (2) (FEMA, 2009). See Table 5.4.3-11 in the Vulnerability Assessment Section for more detailed information on NFIP policies, claims and repetitive loss properties in each municipality.

Probability of Future Events

Given the history of flood events that have impacted Onondaga County, it is apparent that future flooding of varying degrees will occur and people, property and infrastructure are at risk from the flood hazard. In Section 5.3, the identified hazards of concern for the County were ranked. The NYS HMP conducts a similar ranking process for hazards that affect the State. The probability of occurrence, or likelihood of the event, is one parameter used in this ranking process. Based on historical records and FIRMs provided through FEMA, the probability of occurrence for flood events in the County is considered "frequent" (likely to occur within 25 years). It is estimated that Onondaga County and all of its jurisdictions, will continue to experience flooding annually that may induce secondary hazards such as ground failure and water quality and supply concerns and experience evacuations, infrastructure deterioration and failure, utility failures, power outages, transportation delays/accidents/inconveniences and public health concerns.

The Role of Global Climate Change on Future Probability

Global climate change poses risks to human health and to terrestrial and aquatic ecosystems. Important economic resources such as agriculture, forestry, fisheries, and water resources also may be affected. Warmer temperatures, more severe droughts, storms and floods, and sea level rise could have a wide range of impacts. All these stresses can add to existing stresses on resources caused by other influences such as population growth, land-use changes, and pollution.

Climate is defined not simply as average temperature and precipitation but also by the type, frequency and intensity of weather events. Human-induced climate change has the potential to alter the prevalence and severity of extremes such as heat waves, cold waves, severe storms, floods and droughts. Though predicting changes in these types of events under a changing climate is difficult, understanding vulnerabilities to such changes is a critical part of estimating future climate change impacts on human health, society and the environment.

It is important to understand that directly linking any one specific extreme event (e.g., flood, severe hurricane) to climate change is not possible. However, climate change and global warming may increase the probability of some ordinary weather events reaching extreme levels or of some extreme events becoming more extreme (U.S. Environmental Protection Agency [USEPA], 2007). It remains very difficult to assess the impact of global warming on extreme weather events, in large part because this analysis depends greatly on regional forecasts for global warming. Global warming will almost certainly have different effects on different regions of the Earth, so areas will not be equally susceptible to increased or more intense extreme weather events. Although regional climate forecasts are improving, they are still uncertain. Although many uncertainties may exist regarding magnitude or severity, many

sources indicate that future weather patterns and increased intensities are anticipated as a result of climate change, along with atmospheric, precipitation, storm and sea level changes (USEPA, 2007).

VULNERABILITY ASSESSMENT

To understand risk, a community must evaluate what assets are exposed or vulnerable in the identified hazard area. For the flood hazard, areas identified as hazard areas include the 100- and 500-year flood plains. The following text evaluates and estimates the potential impact of flooding in the County including:

- Overview of vulnerability
- Data and methodology used for the evaluation
- Impact, including: (1) impact on life, safety and health of County residents, (2) general building stock, (3) critical facilities and infrastructure, (4) economy and (5) future growth and development
- Further data collections that will assist understanding of this hazard over time
- Overall vulnerability conclusion

Overview of Vulnerability

Flood is a significant concern for Onondaga County. To assess vulnerability, potential losses were calculated for the County for riverine flooding for 100- and 500-year MRP flood events. Historic loss data associated with ice jam events and dam failures is limited. Flooding, impacts and losses associated with ice jam and dam failure events are similar to flash flooding events. The flood hazard exposure and loss estimate analysis is presented below.

Data and Methodology

The 100- and 500-year MRP flood events were examined to evaluate Onondaga County's vulnerability to the flood hazard. These MRP flood events are generally those considered by planners and evaluated under federal programs such as the NFIP.

Onondaga County does not have Digital Flood Insurance Rate Maps (DFIRMs) available to use for analysis. FEMA Quality 3 (Q3) flood data, a digital representation of certain features of FEMA's Flood Insurance Rate Maps, is available for Onondaga with the exception of riverine reaches within Onondaga Nation, the Village of Fabius and an approximate 0.5 mile area in the eastern portion of the Town of Salina. These areas are mapped as 'ANI' zones, meaning the areas are not mapped on any published FIRM (Figure 5.4.3-1, earlier in this profile).

A modified Level 1 HAZUS-MH MR3 analysis was performed to analyze the flood losses for Onondaga County. The default demographic data in HAZUS-MH MR3, based on the 2000 U.S. Census, was used for analysis. The valuation of general building stock and the loss estimates determined in Onondaga County were based on the default general building stock database provided in HAZUS-MH MR3. The general building stock valuations provided in HAZUS-MH MR3 are Replacement Cost Value from RSMeans as of 2006. The critical facility inventory (essential facilities, utilities, transportation features, high-potential loss facilities and user-defined facilities) was updated and used to estimate losses. This comprehensive inventory was developed by gathering input from numerous sources including HAZUS-MH MR3, Onondaga County and input from the Planning Committee.

To estimate exposure, the Q3 flood boundaries were used. HAZUS-MH MR3 ran the hydrology and hydraulics for the selected river reaches in the County and generated the flood-depth grid and flood boundary for the specified return periods (100- and 500-year mean return period). HAZUS-MH MR3

calculated the estimated damages to the general building stock and critical facilities based on this depth grid.

Ice jam formation causes a rapid rise of water at the dam and extending upstream. HAZUS-MH does not estimate impacts on population, general building stock, critical facilities and the economy due to flooding upstream associated with ice jams. Additionally, FEMA's Q3 and FIRMs do not reflect ice jam flood threats.

Dam breach inundation maps represent the best estimate of where water would flow if a dam failed completely and suddenly with a full reservoir. Inundation maps were not made available and used as of the date of this Draft.

For ice jam events, impacts and losses can be expected to be similar to flood events. Additional impacts may include physical damage to property and structures caused by moving ice floes. Flash floods caused by dam failures, have caused great loss of life and property damage due to their unexpected nature and high velocity floodwater. For dam failures, inundation areas are likely to be similar to the 500-year floodplain. Due to limited historical loss information and the unavailability of dam breach inundation maps, exposure and loss estimates for a 500-year flood event can be used as an estimate for this event.

Impact on Life, Health and Safety

The impact of flooding on life, health and safety is dependent upon several factors including the severity of the event and whether or not adequate warning time is provided to residents. Exposure represents the population living in or near floodplain areas that could be impacted should a flood event occur. Additionally, exposure should not be limited to only those who reside in a defined hazard zone, but everyone who may be affected by the effects of a hazard event (e.g., people are at risk while traveling in flooded areas, or their access to emergency services is compromised during an event). The degree of that impact will vary and is not measurable.

To estimate the population exposed to the 100- and 500-year flood events, the floodplain boundaries provided by the FEMA Q3 were overlaid upon the population data available in HAZUS-MH MR3. The Census blocks with their center within the flood boundary were used to calculate the estimated population exposed to this hazard. Because the Village of Fabius and an approximate 0.5-mile area in the eastern portion of the Town of Salina are not mapped on the FEMA Q3 (ANI zones), the flood boundary generated by HAZUS-MH MR3 was used instead to estimate their population exposure. Table 5.4.3-6 lists the estimated population located within the 100- and 500-year flood zones.

Table 5.4.3-6. Onondaga Population Vulnerable to the 100-Year and 500-Year MRP Flood Hazard (Number in Flood Zone)

Jurisdiction	Population	Population in 100 Year Flood Zone		Population in 500 Year Flood Zone	
	Number	Number	% of Total	Number	% of Total
Village of Baldwinsville	7,053	52	0.7	80	1.1
Town of Camillus	21,903	341	1.6	341	1.6
Village of Camillus	1,249	169	13.5	230	18.4
Town of Cicero	25,961	1,747	6.7	1,747	6.7
Town of Clay	53,964	3,210	5.9	4,553	8.4
Town of DeWitt	20,893	119	0.6	120	0.6
Village of East Syracuse	3,178	17	0.5	17	0.5
Town of Elbridge	3,674	387	10.5	387	10.5
Village of Elbridge	1,103	7	0.6	7	0.6
Town of Fabius	1,619	140	8.6	140	8.6
Village of Fabius	355	66	18.6	66	18.6
Village of Fayetteville	4,190	264	6.3	454	10.8
Town of Geddes	10,895	264	2.4	264	2.4
Village of Jordan	1,314	302	23.0	358	27.2
Town of Lafayette	4,833	70	1.4	70	1.4
Village of Liverpool	2,505	36	1.4	595	23.8
Town of Lysander	14,594	355	2.4	1,310	9.0
Town of Manlius	19,515	2,242	11.5	2,502	12.8
Village of Manlius	4,819	1,139	23.6	1,196	24.8
Town of Marcellus	4,493	137	3.0	137	3.0
Village of Marcellus	1,826	43	2.4	44	2.4
Village of Minoa	3,348	563	16.8	852	25.4
Village of North Syracuse	6,862	0	0.0	0	0.0
Town of Onondaga	21,063	369	1.8	936	4.4
Town of Otisco	2,561	118	4.6	118	4.6
Town of Pompey	6,159	230	3.7	233	3.8
Town of Salina	30,785	2,423	7.9	2,759	9.0
Town of Skaneateles	4,707	42	0.9	42	0.9
Village of Skaneateles	2,616	1	0.0	1	0.0
Village of Solvay	6,845	0	0.0	0	0.0
Town of Spafford	1,661	115	6.9	115	6.9
City of Syracuse	147,306	1,250	0.8	1,612	1.1
Town of Tully	1,785	221	12.4	221	12.4
Village of Tully	924	23	2.5	23	2.5
Town of Van Buren	10,305	219	2.1	219	2.1
Onondaga County	**456,863**	**16,681**	**3.7**	**21,749**	**4.4**

Source: HAZUS-MH MR3, 2007; FEMA Q3

Note: Because the Village of Fabius and an approximate 0.5-mile area in the eastern portion of the Town of Salina are not mapped on the FEMA Q3 (ANI zones), the flood boundary generated by HAZUS-MH MR3 was used instead to estimate their population exposure. The population in the 100- and 500-year flood zones for all other municipalities were estimated using the FEMA Q3 boundaries.

Table 5.4.3-6 shows that approximately 4-percent of the total population of 456,863 (excluding Onondaga Nation) in Onondaga County is exposed to the 100- and 500-year flood events.

Of the population exposed, the most vulnerable include the economically disadvantaged (households with an income of less than $20,000) and the population over the age of 65. Economically disadvantaged populations are more vulnerable because they are likely to evaluate their risk and make decisions to evacuate based on the net economic impact to their family. The population over the age of 65 is also more vulnerable because they are more likely to seek or need medical attention which may not be available to due isolation during a flood event and they may have more difficulty evacuating.

HAZUS-MH MR3 estimates the potential sheltering needs of the Town's population as a result of a 100- and 500-year MRP flood event. Table 5.4.3-7 summarizes the estimated number of displaced persons and persons seeking temporary shelter from the 100- and 500-year MRP events. Figures 5.4.3-6 through 5.4.3-8 illustrate the general population density, elderly population density and low-income population density relative to the 100- and 500-year regulatory floodplains in Onondaga County.

The total number of injuries and casualties resulting from flooding is generally limited based on advance weather forecasting, blockades and warnings. Therefore, injuries and deaths generally are not anticipated if proper warning and precautions are in place. Ongoing mitigation efforts should help to avoid the most likely cause of injury, which results form persons trying to cross flooded roadways or channels during a flood.

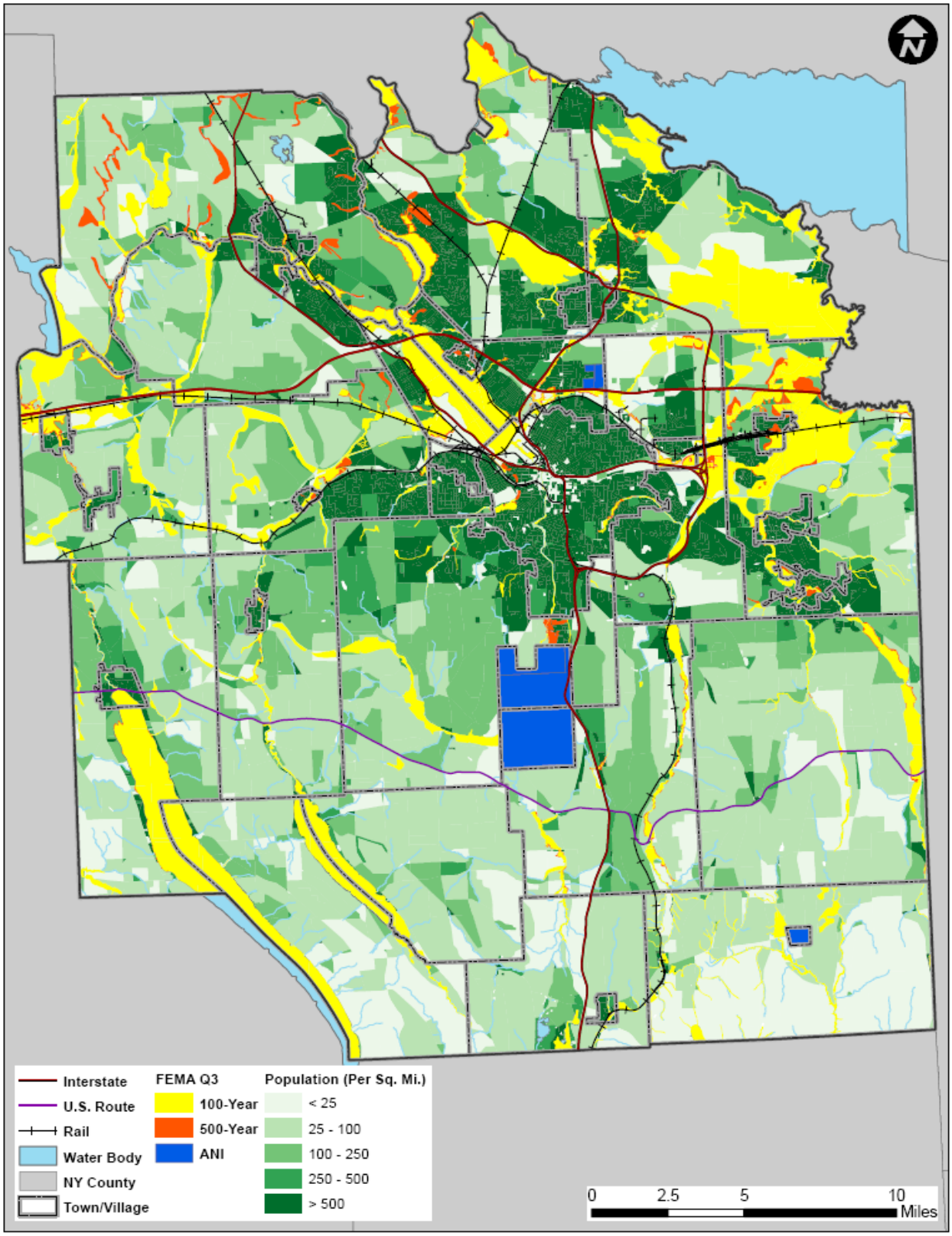
Table 5.4.3-7. Estimated Onondaga County Population Displaced or Seeking Short-Term Shelter from the 100-Year and 500-Year MRP Events

Jurisdiction	Total Population	100-Year				500-Year			
		Displaced Persons	Percent Displaced	Persons Seeking Short-Term Sheltering	Percent Seeking Shelter	Displaced Persons	Percent Displaced	Persons Seeking Short-Term Sheltering	Percent Seeking Shelter
Village of Baldwinsville	7,053	1,218	17.3	953	13.5	1,414	20.0	1,126	16.0
Town of Camillus	21,903	1,122	5.1	622	2.8	1,152	5.3	629	2.9
Village of Camillus	1,249	175	14.0	85	6.8	190	15.2	97	7.8
Town of Cicero	25,961	1,087	4.2	925	3.6	2,448	9.4	1,981	7.6
Town of Clay	53,964	3,406	6.3	2,886	5.3	5,008	9.3	4,352	8.1
Town of Dewitt	20,893	639	3.1	470	2.2	654	3.1	488	2.3
Village of East Syracuse	3,178	133	4.2	56	1.8	137	4.3	58	1.8
Town of Elbridge	3,674	297	8.1	103	2.8	337	9.2	108	2.9
Village of Elbridge	1,103	0	0	0	0	48	4.4	8	0.7
Town of Fabius	1,619	125	7.7	10	0.6	116	7.2	11	0.7
Village of Fabius	355	18	5.1	3	0.8	19	5.4	4	1.1
Village of Fayetteville	4,190	480	11.5	364	8.7	552	13.2	404	9.6
Town of Geddes	10,895	311	2.9	208	1.9	339	3.1	234	2.1
Village of Jordan	1,314	15	1.1	2	0.2	222	16.9	131	10.0
Town of Lafayette	4,833	160	3.3	21	0.4	178	3.7	37	0.8
Village of Liverpool	2,505	97	3.9	91	3.6	89	3.6	83	3.3
Town of Lysander	14,594	1,813	12.4	1,259	8.6	1,922	13.2	1,381	9.5
Town of Manlius	19,515	1,944	10.0	1,373	7.0	2,055	10.5	1,387	7.1
Village of Manlius	4,819	360	7.5	327	6.8	869	18.0	764	15.9
Town of Marcellus	4,493	124	2.8	6	0.1	133	3.0	10	0.2
Village of Marcellus	1,826	89	4.9	35	1.9	89	4.9	34	1.9
Village of Minoa	3,348	170	5.1	118	3.5	189	5.6	141	4.2
Village of North Syracuse	6,862	46	0.7	30	0.4	151	2.2	74	1.1
Town of Onondaga	21,063	1,162	5.5	734	3.5	1,288	6.1	843	4.0
Town of Otisco	2,561	10	0.4	1	0.0	88	3.4	12	0.5
Town of Pompey	6,159	149	2.4	14	0.2	202	3.3	30	0.5
Town of Salina	30,785	2,283	7.4	2,133	6.9	2,870	9.3	2,695	8.8

Jurisdiction	Total Population	100-Year				500-Year			
		Displaced Persons	Percent Displaced	Persons Seeking Short-Term Sheltering	Percent Seeking Shelter	Displaced Persons	Percent Displaced	Persons Seeking Short-Term Sheltering	Percent Seeking Shelter
Town of Skaneateles	4,707	147	3.1	10	0.2	154	3.3	12	0.3
Village of Skaneateles	2,616	111	4.2	27	1.0	139	5.3	47	1.8
Village of Solvay	6,845	1	0.0	0	0.0	0	0.0	0	0.0
Town of Spafford	1,661	31	1.9	1	0.1	41	2.5	2	0.1
City of Syracuse	147,306	12,150	8.2	11,267	7.6	14,389	9.8	13,505	9.2
Town of Tully	1,785	47	2.6	1	0.1	43	2.4	1	0.1
Village of Tully	924	35	3.8	14	1.5	37	4.0	15	1.6
Town of Van Buren	10,305	873	8.5	555	5.4	934	9.1	604	5.9
Onondaga County (Total)	**456,863**	**30,828**	**6.7**	**24,704**	**5.4**	**38,496**	**8.4**	**31,308**	**6.9**

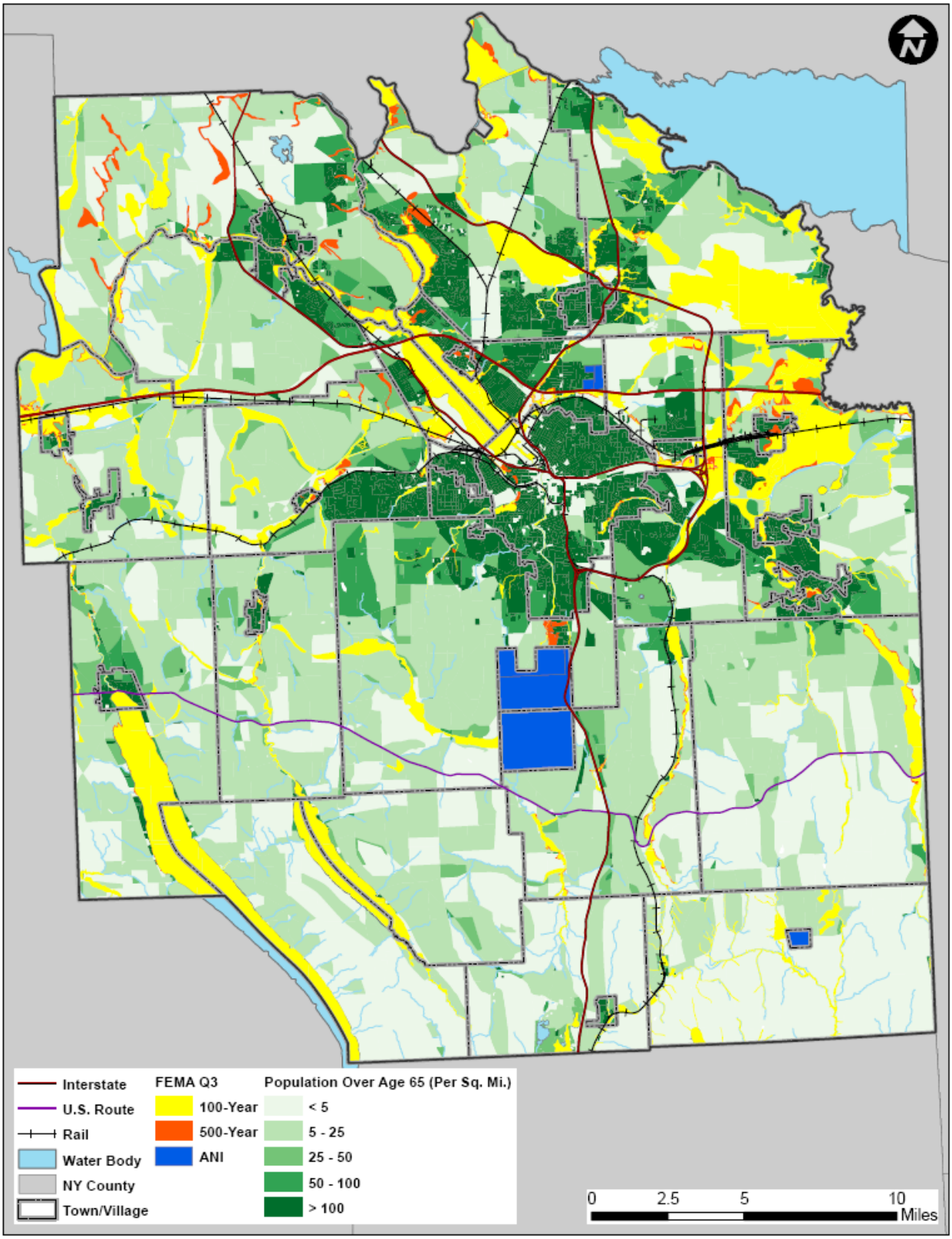
Source: HAZUS-MH MR3, 2007
Note: Estimated Town population does not include the total for their Village(s).

Figure 5.4.3-6. Distribution of Population Density Relative to the 100- and 500-Year Regulatory Floodplains in Onondaga County



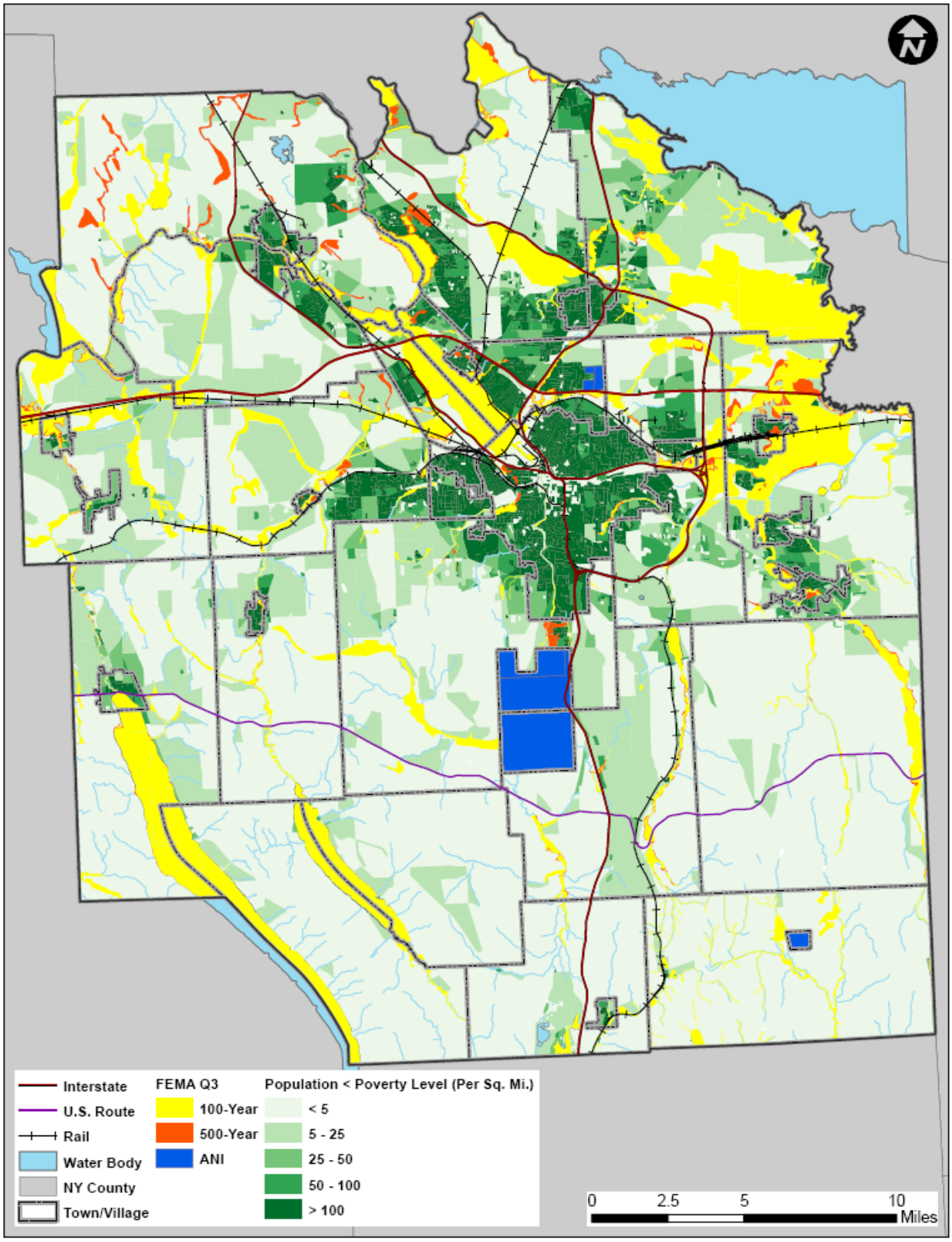
Source: HAZUS-MH MR3, 2007; FEMA Q3

Figure 5.4.3-7. Distribution of Elderly Population Density Relative to the 100- and 500-Year Regulatory Floodplains in Onondaga County



Source: HAZUS-MH MR3, 2007; FEMA Q3

Figure 5.4.3-8. Distribution of Low-Income Population Density Relative to the 100- and 500-Year Regulatory Floodplains in Onondaga County



Source: HAZUS-MH MR3, 2007; FEMA Q3

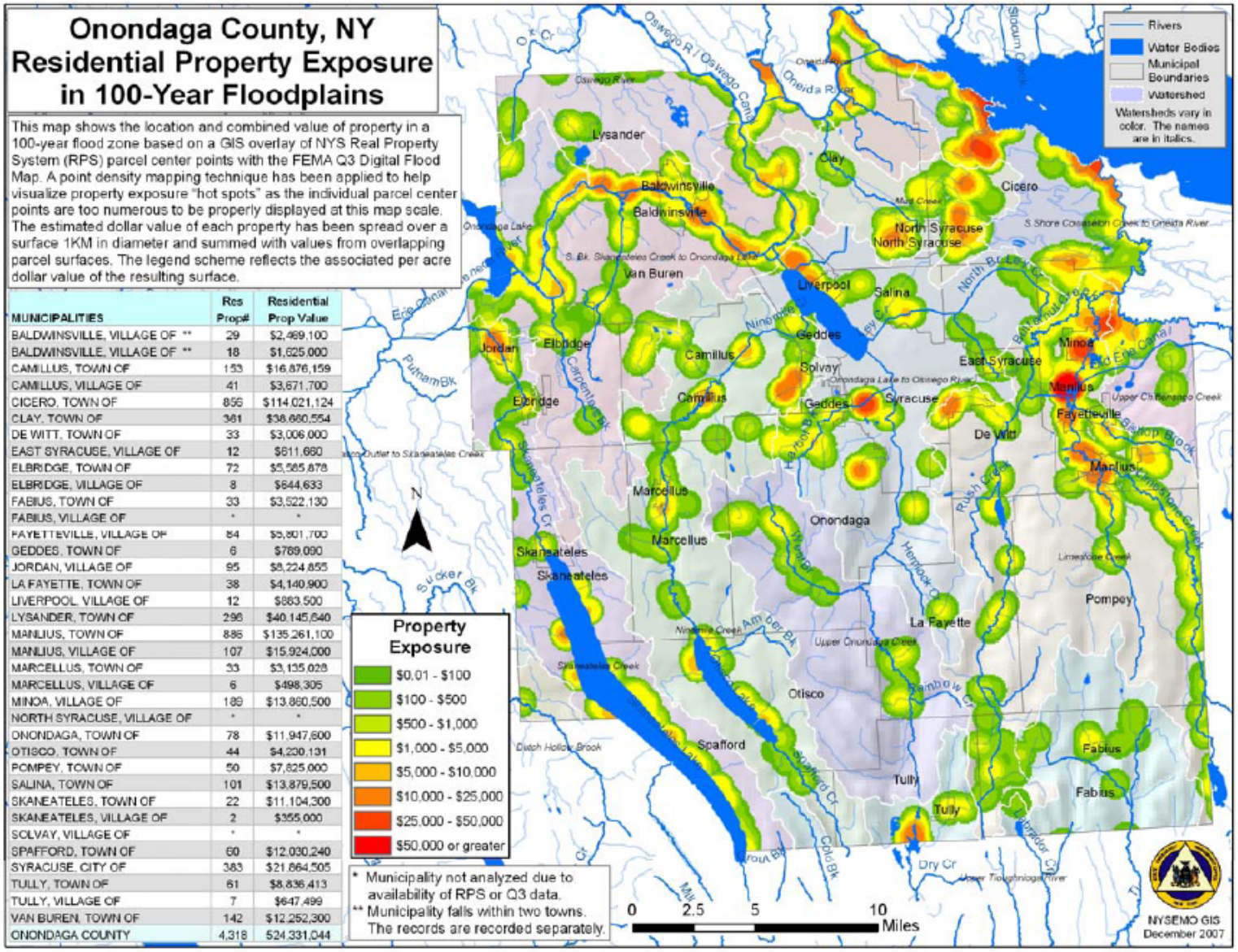
The NID identifies 11 dams in Onondaga County with a high hazard potential and 17 dams with a significant hazard potential. Dams assigned the significant and high hazard potential classifications are those dams where failure or mis-operation can cause economic loss, environment damage, and/or disruption of lifeline facilities. Additionally, dams assigned the high hazard classification are those that if breached, will probably cause loss of life. Refer to Section 4, Table 4-17 for a complete listing of the high and significant hazard potential dams located throughout Onondaga County. The dam breach inundation areas are likely to be larger than the base floodplain. Due to limited historical loss information and the unavailability of dam breach inundation maps, exposure and loss estimates were not completed at this time.

Impact on General Building Stock

After considering the population exposed to the flood hazard, the general building stock exposed to, and damaged by, the 100- and 500-year MRP flood events was evaluated. Exposure in the flood zone includes those buildings located within the regulatory floodplain boundaries. Potential damage is the modeled loss that could occur to the exposed inventory, including structural and content value.

The NYS HMP analyzed property exposure to the 100-year floodplain using FEMA's Q3 digital flood maps and NYS Real Property System parcel centroids. This analysis provides an indication of the extent and distribution of a community's flood risk. According to this analysis, Onondaga County has 4,318 residential properties with an estimated property value of nearly $525 Million located in a 100-year flood zone. Figure 5.4.3-9 illustrate the residential properties exposed to the 100-year floodplain in Onondaga County (NYSDPC, 2008).

Figure 5.4.3-9. Onondaga County Residential Property Exposure in 100-Year Floodplains



MUNICIPALITIES	Res Prop#	Residential Prop Value
BALDWINSVILLE, VILLAGE OF **	29	$2,469,100
BALDWINSVILLE, VILLAGE OF **	18	$1,625,000
CAMILLUS, TOWN OF	153	$16,876,159
CAMILLUS, VILLAGE OF	41	$3,671,700
CICERO, TOWN OF	856	$114,021,124
CLAY, TOWN OF	361	$38,660,554
DE WITT, TOWN OF	33	$3,006,000
EAST SYRACUSE, VILLAGE OF	12	$611,660
ELBRIDGE, TOWN OF	72	$5,585,878
ELBRIDGE, VILLAGE OF	8	$644,633
FABIUS, TOWN OF	33	$3,522,130
FABIUS, VILLAGE OF	*	*
FAYETTEVILLE, VILLAGE OF	84	$5,801,700
GEDDES, TOWN OF	6	$789,090
JORDAN, VILLAGE OF	95	$8,224,855
LAFAYETTE, TOWN OF	38	$4,140,900
LIVERPOOL, VILLAGE OF	12	$883,500
LYSANDER, TOWN OF	296	$40,145,640
MANLIUS, TOWN OF	886	$135,261,100
MANLIUS, VILLAGE OF	107	$15,924,000
MARCELLUS, TOWN OF	33	$3,135,028
MARCELLUS, VILLAGE OF	6	$498,305
MINOA, VILLAGE OF	189	$13,860,500
NORTH SYRACUSE, VILLAGE OF	*	*
ONONDAGA, TOWN OF	78	$11,947,600
OTISCO, TOWN OF	44	$4,200,131
POMPEY, TOWN OF	50	$7,625,000
SALINA, TOWN OF	101	$13,879,500
SKANEATELES, TOWN OF	22	$11,104,300
SKANEATELES, VILLAGE OF	2	$355,000
SOLVAY, VILLAGE OF	*	*
SPAFFORD, TOWN OF	60	$12,030,240
SYRACUSE, CITY OF	383	$21,864,505
TULLY, TOWN OF	61	$8,836,413
TULLY, VILLAGE OF	7	$647,499
VAN BUREN, TOWN OF	142	$12,252,300
ONONDAGA COUNTY	4,318	524,331,044

Source: NYSDPC, 2008

HAZUS-MH MR3 does not estimate general building stock exposure to the flood hazard. To provide a general estimate of building/content replacement value exposure, the 100- and 500-year FEMA Q3 flood boundaries were overlaid upon the HAZUS-MH MR3 general building stock data inventory. The Census blocks with their center within the flood boundary were used to estimate the building count (for residential single-family dwellings and manufactured housing only) and replacement cost value exposed to this hazard (Table 5.4.3-8). Only RES1 and RES2 occupancy class building counts are provided because they are based on census housing unit costs. All other occupancy class building counts are calculated in HAZUS-MH MR3 based on regional average square footage values for specific occupancy class/building types, and may significantly over- or under-estimate actual structure counts and therefore, those building counts were not included in the summary table.

To provide a general estimate of building/content replacement value exposure for all occupancy classes, the 100- and 500-year MRP Q3 floodplain boundaries were overlaid upon the HAZUS-MH MR3 general building stock data inventory replacement value and the Census blocks with their center within the flood boundary were used. These results are summarized in Table 5.4.3-8. Figure 5.4.3-10 illustrates the distribution of residential general building stock density relative to the regulatory FEMA Q3.

There is greater than approximately $2.7 billion of building/contents exposed to the 100-year flood in the County. This represents approximately 4.1-percent of the County's total general building stock replacement value inventory (greater than $68 billion; see Section 4). For the 500-year event, it is estimated there is greater than $3.3 billion of buildings/contents exposed in Onondaga County. This is approximately 5.0-percent of the County's total general building stock replacement value inventory.

Table 5.4.3-8. Estimated Number of Residential Buildings (Single-Family Dwellings and Manufactured Housing) Located in the 100- and 500-year Floodplains

Jurisdiction	Total in County		RES1		RES2	
	RES1	RES2	100-Year	500-Year	100-Year	500-Year
Village of Baldwinsville	2,011	2	15	22	0	0
Town of Camillus	7,610	9	119	119	0	0
Village of Camillus	320	0	59	73	0	0
Town of Cicero	8,751	143	666	666	8	8
Town of Clay	15,658	907	802	1195	516	528
Town of Dewitt	6,746	382	35	36	3	3
Village of East Syracuse	647	0	3	3	0	0
Town of Elbridge	1,051	341	104	104	52	52
Village of Elbridge	324	80	3	3	1	1
Town of Fabius	573	90	80	80	9	9
Village of Fabius	123	9	21	21	1	1
Village of Fayetteville	1,363	0	100	139	0	0
Town of Geddes	4,119	72	83	83	4	4
Village of Jordan	407	74	87	98	21	27
Town of Lafayette	1,566	222	27	27	10	10
Village of Liverpool	868	0	8	179	0	0
Town of Lysander	4,784	170	147	425	8	15
Town of Manlius	6,761	107	891	979	38	43
Village of Manlius	1,442	0	287	296	0	0
Town of Marcellus	1,500	40	54	54	3	3
Village of Marcellus	517	9	10	11	0	0
Village of Minoa	1,061	17	200	307	2	6
Village of North Syracuse	2,182	0	0	0	0	0
Town of Onondaga	6,578	21	120	353	1	1
Town of Otisco	928	170	67	67	13	13
Town of Pompey	2,105	90	85	87	5	6
Town of Salina	10,169	104	636	702	1	1
Town of Skaneateles	1,836	108	18	18	5	5
Village of Skaneateles	918	5	2	2	0	0
Village of Solvay	1,661	0	0	0	0	0
Town of Spafford	1,018	120	126	126	10	10
City of Syracuse	27,885	89	281	361	0	1

Jurisdiction	Total in County		RES1		RES2	
	RES1	RES2	100-Year	500-Year	100-Year	500-Year
Town of Tully	610	29	105	105	6	6
Village of Tully	280	8	6	6	1	1
Town of Van Buren	3,246	147	74	74	13	13
Onondaga County (Total)	**127,913**	**3,565**	**5,321**	**6,821**	**731**	**767**

Source: HAZUS-MH MR3, 2007
Notes:
RES 1 = Single-Family Dwellings
RES2 = Manufactured Housing
Town estimate does not include the total for their Village(s).
Because the Village of Fabius and an approximate 0.5-mile area in the eastern portion of the Town of Salina are not mapped on the FEMA Q3 (ANI zones), the flood boundary generated by HAZUS-MH MR3 was used instead to estimate their exposure. The building stock in the 100- and 500-year flood zones for all other municipalities were estimated using the FEMA Q3 boundaries.

Table 5.4.3-9. Estimated General Building Stock Replacement Value (Structure and Contents) Located in the 100- and 500-Year Floodplains

Jurisdiction	Total Buildings				Residential Buildings		Commercial Buildings		Industrial Buildings	
	100-Year	% Total	500-Year	% Total	100-Year	500-Year	100-Year	500-Year	100-Year	500-Year
Village of Baldwinsville	$13,689,000	1.5	$26,387,000	3.0	$4,318,000	$6,677,000	$6,260,000	$15,966,000	$175,000	$808,000
Town of Camillus	$83,781,000	3.1	$83,781,000	3.1	$28,645,000	$28,645,000	$46,577,000	$46,577,000	$2,075,000	$2,075,000
Village of Camillus	$33,067,000	18.2	$41,926,000	23.1	$22,490,000	$27,406,000	$3,590,000	$5,389,000	$4,589,000	$4,589,000
Town of Cicero	$314,697,000	9.0	$314,697,000	9.0	$176,098,000	$176,098,000	$94,361,000	$94,361,000	$33,744,000	$33,744,000
Town of Clay	$339,053,000	5.2	$469,344,000	7.2	$239,597,000	$350,419,000	$72,632,000	$87,189,000	$7,523,000	$8,663,000
Town of Dewitt	$191,282,000	3.4	$224,194,000	3.9	$7,947,000	$8,098,000	$129,852,000	$153,196,000	$36,551,000	$44,812,000
Village of East Syracuse	$8,442,000	1.9	$8,442,000	1.9	$1,318,000	$1,318,000	$4,090,000	$4,090,000	$2,578,000	$2,578,000
Town of Elbridge	$34,273,000	8.7	$34,273,000	8.7	$28,511,000	$28,511,000	$4,804,000	$4,804,000	$958,000	$958,000
Village of Elbridge	$778,000	0.6	$778,000	0.6	$778,000	$778,000	$0	$0	$0	$0
Town of Fabius	$23,804,000	12.8	$23,804,000	12.8	$19,766,000	$19,766,000	$3,024,000	$3,024,000	$900,000	$900,000
Village of Fabius	$9,076,00	21.1	$9,076,000	21.1	$4,656,000	$4,656,000	$0	$0	$414,000	$414,000
Village of Fayetteville	$57,041,000	9.5	$90,558,000	15.1	$25,481,000	$41,995,000	$23,414,000	$38,973,000	$1,576,000	$3,020,000
Town of Geddes	$87,655,000	5.7	$87,655,000	5.7	$24,247,000	$24,247,000	$26,765,000	$26,765,000	$35,337,000	$35,337,000
Village of Jordan	$32,645,000	18.5	$44,750,000	25.3	$21,454,000	$24,334,000	$5,262,000	$8,676,000	$240,000	$1,179,000
Town of Lafayette	$7,816,000	1.4	$7,816,000	1.4	$6,728,000	$6,728,000	$962,000	$962,000	$126,000	$126,000
Village of Liverpool	$21,091,000	5.6	$70,501,000	18.9	$3,575,000	$48,687,000	$13,142,000	$16,656,000	$1,182,000	$1,672,000
Town of Lysander	$59,436,000	2.9	$161,287,000	7.9	$38,786,000	$129,662,000	$17,238,000	$25,349,000	$2,098,000	$3,964,000
Town of Manlius	$384,684,000	14.7	$417,826,000	16.0	$256,580,000	$281,754,000	$85,879,000	$87,181,000	$24,471,000	$25,525,000
Village of Manlius	$236,797,000	30.4	$242,519,000	31.1	$113,663,000	$117,133,000	$117,812,000	$118,248,000	$4,626,000	$5,152,000
Town of Marcellus	$15,324,000	2.9	$15,324,000	2.9	$14,254,000	$14,254,000	$406,000	$406,000	$664,000	$664,000
Village of Marcellus	$3,495,000	1.4	$7,615,000	3.0	$3,177,000	$3,427,000	$198,000	$198,000	$120,000	$120,000
Village of Minoa	$69,398,000	19.6	$94,801,000	26.8	$54,797,000	$77,738,000	$8,520,000	$9,968,000	$1,014,000	$1,220,000
Village of North Syracuse	$0	0.0	$0	0.0	$0	$0	$0	$0	$0	$0
Town of Onondaga	$48,108,000	1.7	$104,969,000	3.7	$31,707,000	$83,204,000	$11,512,000	$15,882,000	$899,000	$1,893,000
Town of Otisco	$20,579,000	7.3	$20,579,000	7.3	$16,081,000	$16,081,000	$2,828,000	$2,828,000	$486,000	$486,000
Town of Pompey	$44,160,000	5.9	$44,549,000	5.9	$26,739,000	$27,128,000	$13,705,000	$13,705,000	$398,000	$398,000

Jurisdiction	Total Buildings				Residential Buildings		Commercial Buildings		Industrial Buildings	
	100-Year	% Total	500-Year	% Total	100-Year	500-Year	100-Year	500-Year	100-Year	500-Year
Town of Salina	$383,042,000	8.2	$412,111,000	8.8	$248,221,000	$280,440,000	$47,594,000	$44,150,000	$80,649,000	$80,943,000
Town of Skaneateles	$6,969,000	0.8	$6,969,000	0.8	$4,925,000	$4,925,000	$2,044,000	$2,044,000	$0	$0
Village of Skaneateles	$565,000	0.1	$565,000	0.1	$565,000	$565,000	$0	$0	$0	$0
Village of Solvay	$0	0.0	$0	0.0	$0	$0	$0	$0	$0	$0
Town of Spafford	$32,337,000	12.0	$32,337,000	12.0	$31,819,000	$31,819,000	$388,000	$388,000	$0	$0
City of Syracuse	$167,359,000	0.7	$224,503,000	0.9	$90,703,000	$123,689,000	$68,648,000	$81,682,000	$2,626,000	$3,102,000
Town of Tully	$30,406,000	11.9	$30,406,000	11.9	$29,090,000	$29,090,000	$1,140,000	$1,140,000	$176,000	$176,000
Village of Tully	$5,709,000	3.6	$5,709,000	3.6	$1,995,000	$1,995,000	$1,882,000	$1,882,000	$604,000	$604,000
Town of Van Buren	$19,458,000	1.5	$19,458,000	1.5	$18,264,000	$18,264,000	$792,000	$792,000	$240,000	$240,000
Onondaga County (Total)	**$2,776,940,000**	**4.1**	**$3,379,509,000**	**5.0**	**$1,596,975,000**	**$2,039,531,000**	**$815,321,000**	**$912,471,000**	**$247,039,000**	**$265,362,000**

Source: HAZUS-MH MR3, 2007

Notes:

(1) Values represent replacement values (RV) for building structure and contents.

(2) The valuation of general building stock and the loss estimates determined in Onondaga County were based on the default general building stock database provided in HAZUS-MH MR3. The general building stock valuations provided in HAZUS-MH MR3 are Replacement Cost Value from RSMeans as of 2006.

(3) Town estimate does not include the total for their Village(s).

(4) Because the Village of Fabius and an approximate 0.5-mile area in the eastern portion of the Town of Salina are not mapped on the FEMA Q3 (ANI zones), the flood boundary generated by HAZUS-MH MR3 was used instead to estimate their exposure. The building stock in the 100- and 500-year flood zones for all other municipalities were estimated using the FEMA Q3 boundaries.

Table 5.4.3-9. Estimated General Building Stock Replacement Value (Structure and Contents) Located in the 100- and 500-Year Floodplains (Continued)

Jurisdiction	Agricultural Buildings		Religious Buildings		Government Buildings		Educational Buildings	
	100-Year	500-Year	100-Year	500-Year	100-Year	500-Year	100-Year	500-Year
Village of Baldwinsville	$0	$0	$0	$0	$2,936,000	$2,936,000	$0	$0
Town of Camillus	$0	$0	$4,382,000	$4,382,000	$2,102,000	$2,102,000	$0	$0
Village of Camillus	$868,000	$868,000	$698,000	$1,478,000	$832,000	$832,000	$0	$1,364,000
Town of Cicero	$1,410,000	$1,410,000	$8,090,000	$8,090,000	$480,000	$480,000	$514,000	$514,000
Town of Clay	$2,874,000	$3,146,000	$11,532,000	$15,032,000	$270,000	$270,000	$4,625,000	$4,625,000
Town of Dewitt	$1,018,000	$1,018,000	$13,764,000	$14,920,000	$1,166,000	$1,166,000	$984,000	$984,000
Village of East Syracuse	$456,000	$456,000	$0	$0	$0	$0	$0	$0
Town of Elbridge	$0	$0	$0	$0	$0	$0	$0	$0
Village of Elbridge	$0	$0	$0	$0	$0	$0	$0	$0
Town of Fabius	$0	$0	$0	$0	$114,000	$114,000	$0	$0
Village of Fabius	$0	$0	$1,210,000	$1,210,000	$0	$0	$2,796,000	$2,796,000
Village of Fayetteville	$868,000	$868,000	$0	$0	$5,702,000	$5,702,000	$0	$0
Town of Geddes	$0	$0	$1,306,000	$1,306,000	$0	$0	$0	$0
Village of Jordan	$0	$0	$2,204,000	$2,204,000	$3,263,000	$6,033,000	$222,000	$2,324,000
Town of Lafayette	$0	$0	$0	$0	$0	$0	$0	$0
Village of Liverpool	$1,310,000	$1,472,000	$1,882,000	$1,882,000	$0	$0	$0	$132,000
Town of Lysander	$398,000	$648,000	$0	$0	$916,000	$1,664,000	$0	$0
Town of Manlius	$4,214,000	$5,996,000	$10,460,000	$10,690,000	$2,948,000	$2,948,000	$132,000	$3,732,000
Village of Manlius	$696,000	$696,000	$0	$1,290,000	$0	$0	$0	$0
Town of Marcellus	$0	$0	$0	$0	$0	$0	$0	$0
Village of Marcellus	$0	$0	$0	$0	$0	$0	$0	$3,870,000
Village of Minoa	$292,000	$292,000	$2,552,000	$3,360,000	$2,223,000	$2,223,000	$0	$0
Village of North Syracuse	$0	$0	$0	$0	$0	$0	$0	$0
Town of Onondaga	$92,000	$92,000	$3,898,000	$3,898,000	$0	$0	$0	$0
Town of Otisco	$0	$0	$1,184,000	$1,184,000	$0	$0	$0	$0
Town of Pompey	$632,000	$632,000	$2,686,000	$2,686,000	$0	$0	$0	$0

Jurisdiction	Agricultural Buildings		Religious Buildings		Government Buildings		Educational Buildings	
	100-Year	500-Year	100-Year	500-Year	100-Year	500-Year	100-Year	500-Year
Town of Salina	$646,000	$646,000	$3,000,000	$3,000,000	$0	$0	$2,932,000	$2,932,000
Town of Skaneateles	$0	$0	$0	$0	$0	$0	$0	$0
Village of Skaneateles	$0	$0	$0	$0	$0	$0	$0	$0
Village of Solvay	$0	$0	$0	$0	$0	$0	$0	$0
Town of Spafford	$130,000	$130,000	$0	$0	$0	$0	$0	$0
City of Syracuse	$126,000	$126,000	$0	$404,000	$0	$0	$5,256,000	$15,500,000
Town of Tully	$0	$0	$0	$0	$0	$0	$0	$0
Village of Tully	$0	$0	$0	$0	$1,228,000	$1,228,000	$0	$0
Town of Van Buren	$162,000	$162,000	$0	$0	$0	$0	$0	$0
Onondaga County (Total)	**$16,192,000**	**$18,658,000**	**$68,848,000**	**$77,016,000**	**$24,180,000**	**$27,698,000**	**$17,461,000**	**$38,773,000**

Source: HAZUS-MH MR3, 2007

Notes:

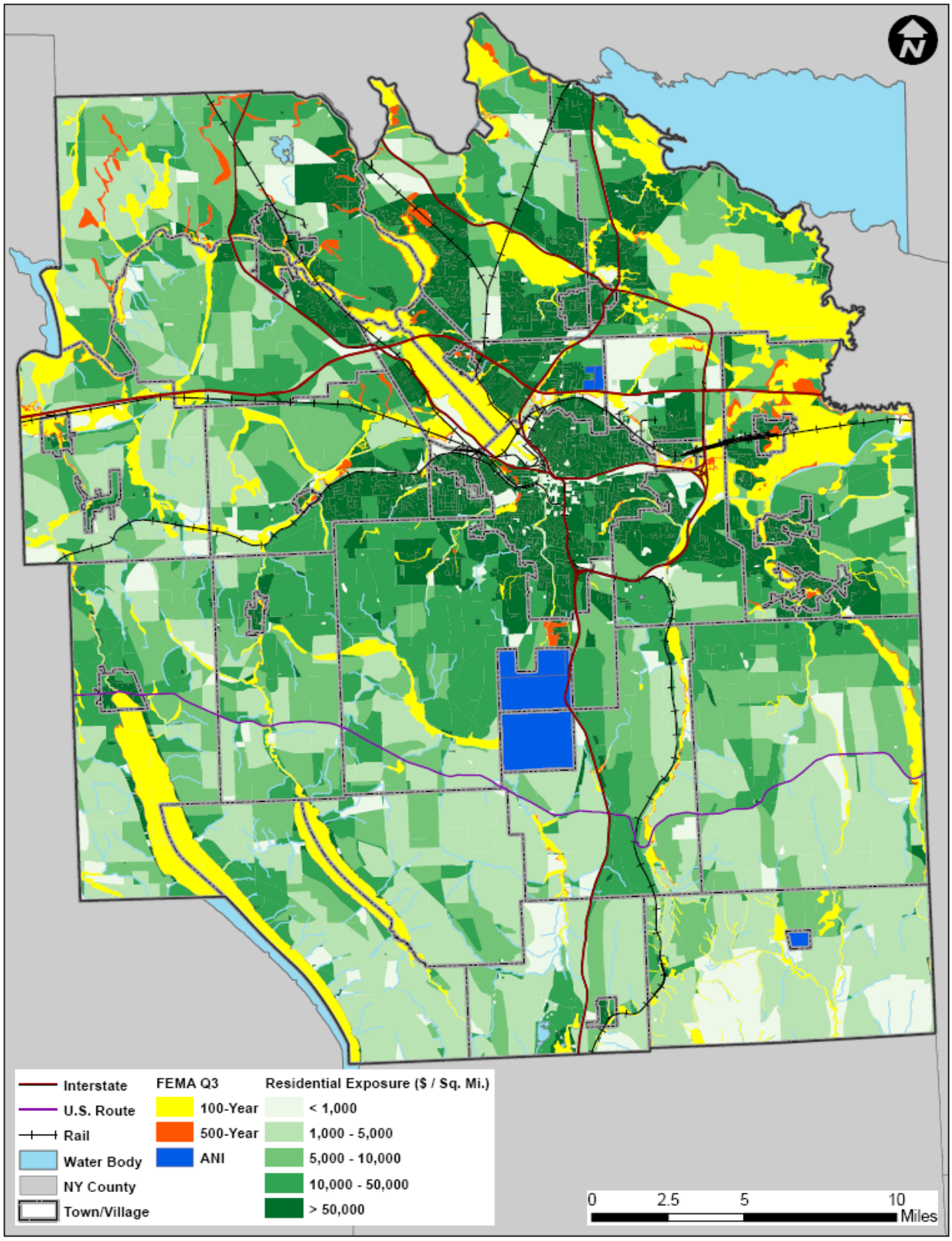
(1) Values represent replacement values (RV) for building structure and contents.

(2) The valuation of general building stock and the loss estimates determined in Onondaga County were based on the default general building stock database provided in HAZUS-MH MR3. The general building stock valuations provided in HAZUS-MH MR3 are Replacement Cost Value from RSMeans as of 2006.

(3) Town estimate does not include the total for their Village(s).

(4) Because the Village of Fabius and an approximate 0.5-mile area in the eastern portion of the Town of Salina are not mapped on the FEMA Q3 (ANI zones), the flood boundary generated by HAZUS-MH MR3 was used instead to estimate their exposure. The building stock in the 100- and 500-year flood zones for all other municipalities were estimated using the FEMA Q3 boundaries.

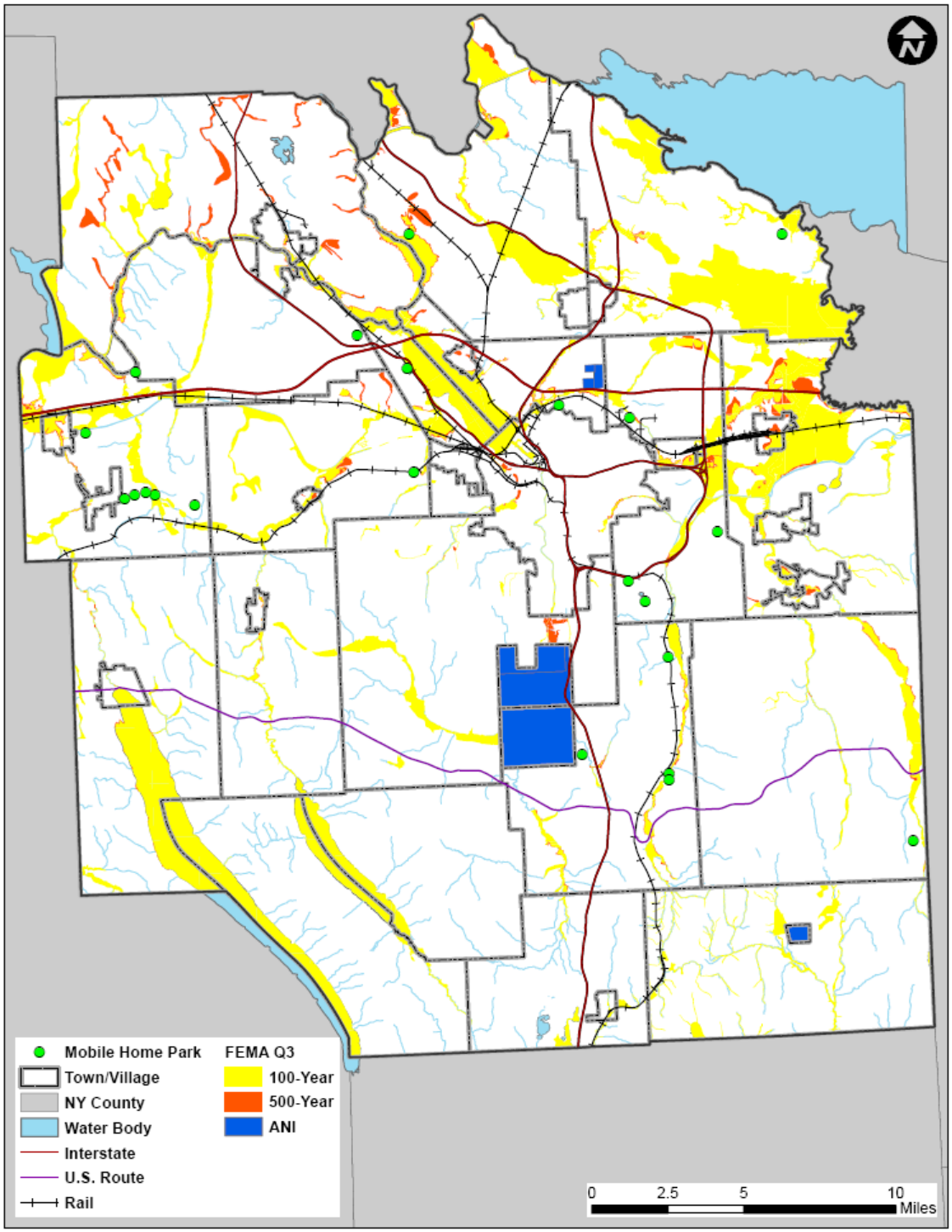
Figure 5.4.3-10. Distribution of Residential General Building Stock Density Relative to 100- and 500-Year Flood Boundaries in Onondaga County



Source: HAZUS-MH MR3, 2007; FEMA Q3

Mobile homes are considered highly vulnerable structures to flooding and other natural hazards including severe storms. Figure 5.4.3-11 shows the extents of the 100 and 500-year flood zones (FEMA Q3) in relation to the location of mobile home parks in the County. Several parks are proximate to the floodplains, however, only Casual Estates Trailer Park is located in the 500-year flood boundary.

Figure 5.4.3-11. Mobile Home Parks Relative to the 100- and 500-Year MRP Floodplains in Onondaga County



Source: Data provided by the Planning Committee

Table 5.4.3-10 summarizes the estimated replacement cost value of building loss associated with the 100- and 500-year MRP flood events as calculated by HAZUS-MH MR3. The potential damage estimated to the general building stock inventory associated with the 100-year flood is greater than $1.5 billion or 2.3-percent of the County's general building stock inventory. For the 500-year event, the potential damage estimate is more nearly $2 billion (structure and contents) or 2.8-percent of the County's general building stock inventory. This shows significant flood hazard risk.

Table 5.4.3-10. Estimated General Building Stock Loss (Structure and Contents) Damaged by the 100-Year and 500-Year MRP Flood Events

Jurisdiction	Total (All Occupancies)		Percentage of Total Building Value		Residential Buildings		Commercial Buildings		Industrial Buildings	
	100 Year	500 Year	100 Year	500 Year	100 Year	500 Year	100 Year	500 Year	100 Year	500 Year
Village of Baldwinsville	$86,487,000	$103,284,000	9.7	11.6	$34,927,000	$43,234,000	$30,856,000	$36,266,000	$5,054,000	$5,467,000
Town of Camillus	$26,246,000	$26,821,000	1.0	1.0	$10,678,000	$10,928,000	$13,282,000	$13,486,000	$755,000	$822,000
Village of Camillus	$11,303,000	$13,698,000	6.2	7.6	$4,498,000	$5,902,000	$1,716,000	$2,010,000	$3,592,000	$4,047,000
Town of Cicero	$19,487,000	$43,122,000	0.6	1.2	$13,410,000	$16,500,000	$2,918,000	$17,065,000	$2,998,000	$4,251,000
Town of Clay	$82,905,000	$105,964,000	1.3	1.6	$44,941,000	$58,206,000	$27,155,000	$33,881,000	$3,770,000	$4,440,000
Town of Dewitt	$105,826,000	$121,019,000	1.9	2.1	$10,255,000	$13,444,000	$58,820,000	$68,160,000	$26,183,000	$28,272,000
Village of East Syracuse	$7,890,000	$13,900,000	1.8	3.1	$274,000	$393,000	$5,757,000	$10,272,000	$1,851,000	$3,031,000
Town of Elbridge	$4,475,000	$7,637,000	1.1	1.9	$1,561,000	$2,869,000	$1,505,000	$1,662,000	$918,000	$2,677,000
Village of Elbridge	$0	$2,119,000	0	1.6	$0	$1,019,000	$0	$429,000	$0	$374,000
Town of Fabius	$1,623,000	$2,054,000	0.9	1.1	$996,000	$1,323,000	$246,000	$331,000	$155,000	$174,000
Village of Fabius	$342,000	$354,000	0.8	0.8	$73,000	$72,000	$0	$0	$52,000	$70,000
Village of Fayetteville	$30,649,000	$44,236,000	5.1	7.4	$13,936,000	$18,680,000	$14,432,000	$18,730,000	$1,018,000	$1,260,000
Town of Geddes	$30,340,000	$36,532,000	2.0	2.4	$5,769,000	$6,351,000	$14,611,000	$17,826,000	$8,649,000	$10,785,000
Village of Jordan	$417,000	$11,518,000	0.2	6.5	$55,000	$1,948,000	$5,000	$3,311,000	$10,000	$511,000
Town of Lafayette	$5,208,000	$5,799,000	1.0	1.1	$3,293,000	$3,814,000	$459,000	$446,000	$946,000	$1,005,000
Village of Liverpool	$1,185,000	$1,844,000	0.3	0.5	$20,000	$91,000	$1,111,000	$1,619,000	$15,000	$24,000
Town of Lysander	$105,262,000	$118,208,000	5.1	5.8	$69,974,000	$78,440,000	$30,745,000	$34,655,000	$2,525,000	$2,890,000
Town of Manlius	$59,040,000	$62,363,000	2.3	2.4	$44,432,000	$44,890,000	$9,349,000	$11,061,000	$2,072,000	$2,564,000
Village of Manlius	$15,890,000	$48,263,000	2.0	6.2	$7,620,000	$19,193,000	$8,203,000	$25,536,000	$54,000	$2,485,000
Town of Marcellus	$6,279,000	$6,920,000	1.2	1.3	$3,450,000	$3,936,000	$496,000	$563,000	$2,116,000	$2,202,000
Village of Marcellus	$4,420,000	$5,268,000	1.7	2.1	$3,471,000	$4,030,000	$386,000	$499,000	$190,000	$280,000
Village of Minoa	$5,463,000	$6,754,000	1.5	1.9	$2,993,000	$3,736,000	$1,343,000	$1,572,000	$11,000	$9,000
Village of North Syracuse	$310,000	$1,204,000	0.0	0.1	$211,000	$350,000	$82,000	$776,000	$17,000	$31,000
Town of Onondaga	$28,123,000	$32,943,000	1.0	1.2	$19,068,000	$21,902,000	$5,172,000	$6,612,000	$1,754,000	$2,018,000

Jurisdiction	Total (All Occupancies)		Percentage of Total Building Value		Residential Buildings		Commercial Buildings		Industrial Buildings	
	100 Year	500 Year	100 Year	500 Year	100 Year	500 Year	100 Year	500 Year	100 Year	500 Year
Town of Otisco	$163,000	$2,572,000	0.1	0.9	$23,000	$1,389,000	$2,000	$901,000	$19,000	$75,000
Town of Pompey	$3,581,000	$7,350,000	0.5	1.0	$2,189,000	$4,603,000	$1,008,000	$1,874,000	$202,000	$251,000
Town of Salina	$46,758,000	$69,981,000	1.0	1.5	$33,876,000	$53,087,000	$6,142,000	$8,369,000	$4,541,000	$5,775,000
Town of Skaneateles	$13,882,000	$14,401,000	1.6	1.7	$2,243,000	$2,657,000	$2,467,000	$2,979,000	$8,948,000	$8,504,000
Village of Skaneateles	$8,715,000	$9,676,000	1.8	2.0	$2,348,000	$2,669,000	$6,074,000	$6,634,000	$7,000	$16,000
Village of Solvay	$884,000	$970,000	0.1	0.1	$20,000	$18,000	$42,000	$30,000	$822,000	$922,000
Town of Spafford	$1,385,000	$1,871,000	0.5	0.7	$1,226,000	$1,697,000	$79,000	$75,000	$31,000	$28,000
City of Syracuse	$773,651,000	$926,156,000	3.2	3.8	$176,741,000	$225,156,000	$435,068,000	$516,695,000	$93,841,000	$106,040,000
Town of Tully	$518,000	$631,000	0.2	0.2	$117,000	$121,000	$86,000	$132,000	$156,000	$194,000
Village of Tully	$394,000	$431,000	0.3	0.3	$31,000	$36,000	$78,000	$93,000	$106,000	$112,000
Town of Van Buren	$52,191,000	$58,366,000	4.0	4.5	$26,279,000	$29,476,000	$7,684,000	$8,783,000	$17,210,000	$18,955,000
Onondaga County	**$1,541,292,000**	**$1,914,229,000**	**2.3**	**2.8**	**$540,998,000**	**$682,160,000**	**$687,379,000**	**$853,333,000**	**$190,588,000**	**$220,561,000**

Source: HAZUS-MH MR3, 2007

Notes:

1. Values represent replacement values (RV) for building structure and contents.
2. The valuation of general building stock and the loss estimates determined in Onondaga County were based on the default general building stock database provided in HAZUS-MH MR3. The general building stock valuations provided in HAZUS-MH MR3 are Replacement Cost Value from RSMeans as of 2006.
3. Town estimate does not include the total for their Village(s).

Table 5.4.3-10. Estimated General Building Stock Loss (Structure and Contents) Damaged by the 100-Year and 500-Year MRP Flood Events (Continued)

Jurisdiction	Agriculture Buildings		Religious Buildings		Government Buildings		Education Buildings	
	100 Year	500 Year	100 Year	500 Year	100 Year	500 Year	100 Year	500 Year
Village of Baldwinsville	$651,000	$746,000	$5,543,000	$6,627,000	$8,237,000	$9,228,000	$1,219,000	$1,716,000
Town of Camillus	$127,000	$145,000	$620,000	$699,000	$461,000	$462,000	$323,000	$279,000
Village of Camillus	$326,000	$371,000	$357,000	$438,000	$404,000	$462,000	$410,000	$468,000
Town of Cicero	$52,000	$121,000	$49,000	$3,572,000	$13,000	$0	$47,000	$566,000
Town of Clay	$893,000	$1,466,000	$1,929,000	$3,748,000	$1,412,000	$2,000	$2,805,000	$2,633,000
Town of Dewitt	$1,025,000	$1,119,000	$6,376,000	$6,749,000	$813,000	$0	$2,354,000	$2,432,000
Village of East Syracuse	$0	$126,000	$6,000	$70,000	$2,000	$0	$0	$0
Town of Elbridge	$121,000	$126,000	$58,000	$208,000	$94,000	$95,000	$0	$0
Village of Elbridge	$0	$197,000	$0	$31,000	$0	$51,000	$0	$18,000
Town of Fabius	$82,000	$90,000	$43,000	$50,000	$37,000	$0	$64,000	$51,000
Village of Fabius	$0	$0	$86,000	$83,000	$3,000	$0	$128,000	$126,000
Village of Fayetteville	$526,000	$667,000	$217,000	$880,000	$520,000	$0	$0	$17,000
Town of Geddes	$8,000	$9,000	$828,000	$871,000	$449,000	$72,000	$26,000	$29,000
Village of Jordan	$0	$24,000	$98,000	$3,078,000	$249,000	$1,957,000	$0	$689,000
Town of Lafayette	$135,000	$146,000	$114,000	$115,000	$2,000	$65,000	$259,000	$270,000
Village of Liverpool	$33,000	$96,000	$4,000	$4,000	$0	$0	$2,000	$10,000
Town of Lysander	$1,670,000	$1,905,000	$132,000	$155,000	$59,000	$0	$108,000	$95,000
Town of Manlius	$698,000	$935,000	$1,032,000	$1,462,000	$54,000	$0	$1,403,000	$1,350,000
Village of Manlius	$13,000	$251,000	$0	$386,000	$0	$0	$0	$103,000
Town of Marcellus	$57,000	$54,000	$0	$0	$147,000	$154,000	$13,000	$11,000
Village of Marcellus	$3,000	$11,000	$12,000	$12,000	$22,000	$86,000	$336,000	$350,000
Village of Minoa	$85,000	$92,000	$586,000	$711,000	$441,000	$0	$4,000	$4,000
Village of North Syracuse	$0	$0	$0	$44,000	$0	$0	$0	$0
Town of Onondaga	$112,000	$108,000	$1,464,000	$1,714,000	$166,000	$153,000	$387,000	$436,000
Town of Otisco	$0	$19,000	$115,000	$183,000	$4,000	$5,000	$0	$0
Town of Pompey	$50,000	$126,000	$110,000	$452,000	$22,000	$0	$0	$0
Town of Salina	$67,000	$67,000	$905,000	$1,234,000	$51,000	$0	$1,176,000	$1,387,000
Town of Skaneateles	$35,000	$45,000	$118,000	$120,000	$66,000	$89,000	$5,000	$7,000
Village of Skaneateles	$35,000	$40,000	$71,000	$121,000	$31,000	$55,000	$149,000	$141,000

Jurisdiction	Agriculture Buildings		Religious Buildings		Government Buildings		Education Buildings	
	100 Year	500 Year	100 Year	500 Year	100 Year	500 Year	100 Year	500 Year
Village of Solvay	$0	$0	$0	$0	$0	$0	$0	$0
Town of Spafford	$47,000	$69,000	$1,000	$1,000	$1,000	$1,000	$0	$0
City of Syracuse	$1,599,000	$1,693,000	$36,783,000	$42,579,000	$9,687,000	$17,807,000	$19,932,000	$22,988,000
Town of Tully	$77,000	$98,000	$79,000	$83,000	$3,000	$0	$0	$0
Village of Tully	$0	$0	$42,000	$45,000	$137,000	$0	$0	$0
Town of Van Buren	$375,000	$404,000	$615,000	$705,000	$16,000	$17,000	$12,000	$24,000
Onondaga County	**$8,902,000**	**$11,366,000**	**$58,393,000**	**$77,230,000**	**$23,603,000**	**$30,761,000**	**$31,162,000**	**$36,200,000**

Source: HAZUS-MH MR3, 2007

Notes:

1. Values represent replacement values (RV) for building structure and contents.
2. The valuation of general building stock and the loss estimates determined in Onondaga County were based on the default general building stock database provided in HAZUS-MH MR3. The general building stock valuations provided in HAZUS-MH MR3 are Replacement Cost Value from RSMeans as of 2006.
3. Town estimate does not include the total for their Village(s).

In addition to total building stock modeling, individual data available on flood policies, claims, RLP and severe RLP (SRL's) were analyzed. FEMA Region II provided a list of residential properties with NFIP policies, past claims and multiple claims (RLPs). According to the metadata provided: "The NFIP Repetitive Loss File contains losses reported from individuals who have flood insurance through the Federal Government. A property is considered a repetitive loss property when there are two or more losses reported which were paid more than $1,000 for each loss. The two losses must be within 10 years of each other & be as least 10 days apart. Only losses from (*sic* since) 1/1/1978 that are closed are considered."

Severe RLP were then examined in Onondaga County. According to section 1361A of the National Flood Insurance Act, as amended (NFIA), 42 U.S.C. 4102a, a severe RLP property is defined as a residential property that is covered under an NFIP flood insurance policy and:

- Has at least four NFIP claim payments (including building and contents) over $5,000 each, and the cumulative amount of such claims payments exceeds $20,000; or

- For which at least two separate claims payments (building payments only) have been made with the cumulative amount of the building portion of such claims exceeding the market value of the building.

- For both of the above, at least two of the referenced claims must have occurred within any 10-year period, and must be greater than 10 days apart.

A summary table of NFIP Loss Claims and Payment Data is displayed below in Table 5.4.3-11, most of which was provided by FEMA Region II in February 2009. The location of the properties with policies, claims and repetitive and severe repetitive flooding were geocoded by FEMA with the understanding that there are varying tolerances between how closely the longitude and latitude coordinates correspond to the location of the property address, or that the indication of some locations are more accurate than others. This data is more current than the properties reported in the New York State HMP and may explain any difference in property count between the two sources. This table also displays Repetitive Loss and Severe Repetitive Loss Property statistics.

Table 5.4.3-11. NFIP Policies, Claims and Repetitive Loss Statistics

Jurisdiction	# Policies (1)	Insurance (2)	# Claims (Losses) (1)	Total Loss Payments (3)	# Rep. Loss Prop. (1)	# Severe Rep. Loss Prop. (1)	# Polices in 100-year Boundary (1)	# Polices in 500-Boundary (1)	# Policies Outside the 500-year Flood Hazard (1)
Village of Baldwinsville	30	$4,566,800	30	$257,013.38	0	0	11	12	18
Town of Camillus	34	$6,391,600	1	$900.00	0	0	8	9	25
Village of Camillus	14	$1,540,800	4	$11,892.63	0	0	6	7	7
Town of Cicero	354	$51,371,100	130	$1,180,166.37	13	1	192	192	162
Town of Clay	152	$22,235,400	42	$264,557.05	0	0	68	77	75
Town of Dewitt	76	$26,078,600	26	$855,491.08	5	1	14	18	58
Village of East Syracuse	26	$6,879,800	14	$259,734.36	0	0	14	14	12
Town of Elbridge	20	$1,626,700	11	$58,256.59	2	0	8	10	10
Village of Elbridge	1	$48,900	7	$22,910.69	0	0	1	1	0
Town of Fabius	3	$265,000	1	$1,037.47	0	0	2	2	1
Village of Fabius	0	$0	0	$0	0	0	0	0	0
Village of Fayetteville	90	$10,842,000	40	$192,223.57	0	0	52	52	38
Town of Geddes	7	$2,891,000	1	$6,550.00	0	0	1	1	6
Village of Jordan	43	$4,364,600	7	$43,653.43	0	0	7	14	29
Town of Lafayette	9	$1,482,500	3	$7,673.91	1	0	1	2	7
Village of Liverpool	13	$3,418,000	8	$11,242.13	0	0	3	3	10
Town of Lysander	93	$14,166,600	35	$350,735.44	1	0	30	30	63
Town of Manlius	209	$28,275,000	45	$309,586.89	2	0	110	115	94
Village of Manlius	56	$9,542,700	10	$38,832.93	0	0	21	28	28
Town of Marcellus	18	$2,873,400	5	$8,741.73	0	0	5	5	13
Village of Marcellus	8	$1,158,100	8	$13,116.07	0	0	1	2	6
Village of Minoa	107	$9,380,600	4	$7,139.64	0	0	83	84	23
Village of North Syracuse	3	$503,400	0	$0	0	0	1	1	2
Town of Onondaga	33	$4,224,800	30	$227,118.15	0	0	11	14	19
Town of Otisco	16	$1,866,000	3	$7,041.65	0	0	0	0	16
Town of Pompey	23	$4,660,900	7	$34,678.23	0	0	3	3	20

Jurisdiction	# Policies (1)	Insurance (2)	# Claims (Losses) (1)	Total Loss Payments (3)	# Rep. Loss Prop. (1)	# Severe Rep. Loss Prop. (1)	# Polices in 100-year Boundary (1)	# Polices in 500-Boundary (1)	# Policies Outside the 500-year Flood Hazard (1)
Town of Salina	48	$5,208,900	5	$9,224.96	0	0	4	5	43
Town of Skaneateles	19	$4,948,500	3	$11,453.59	0	0	0	1	18
Village of Skaneateles	7	$1,870,000	3	$21,605.96	1	0	0	0	7
Village of Solvay	2	$210,000	6	$7,663.56	0	0	0	0	2
Town of Spafford	4	$875,000	0	$0	0	0	0	0	4
City of Syracuse	201	$26,522,600	80	$463,714.02	2	0	92	100	101
Town of Tully	8	$906,900	0	$0	0	0	1	1	7
Village of Tully	5	$478,600	0	$0	0	0	3	3	2
Town of Van Buren	69	$8,964,800	23	$241,042.95	0	0	30	30	39
Onondaga County	**1,801**	**$270,639,600**	**592**	**$4,924,998**	**27**	**2**	**783**	**836**	**965**

Source:
(1) Policies provided by FEMA Region 2, February 2009 using the "Comm_Name" located within the 100- and 500-year Q3 flood boundaries.
(2) http://bsa.nfipstat.com/reports/1011.htm#NYT as of January 31, 2009
(3) http://bsa.nfipstat.com/reports/1040.htm#36 as of January 31, 2009

Impact on Critical Facilities

In addition to considering general building stock at risk, the risk of flood to critical facilities, utilities and user-defined facilities was evaluated. Tables 5.4.3-12 and 5.4.3-13 list the facilities and percent damage HAZUS-MH MR3 estimates to structures and/or contents as a result of a 100- and 500-year MRP event, respectively. Tables 5.4.3-14 and 5.4.3-15 list the utilities and percent damage HAZUS-MH MR3 as a result of a 100- and 500-year MRP event, respectively. In select cases, HAZUS-MH did not estimate any damage to a facility even though the facility is located in the Q3 floodplain boundary.

In cases where short-term functionality is impacted by a hazard, other facilities of neighboring municipalities may need to increase support response functions during a disaster event. Mitigation planning should consider means to reduce impact to critical facilities and ensure sufficient emergency and school services remain when a significant event occurs.

Table 5.4.3-12. Estimated Damage to Critical Facilities in Onondaga County from the 100-Year MRP Event

Name	Town	Type	Percent Building Damage	Percent Content Damage
Baldwinsville Vlg Fire Dept	Baldwinsville (V)	Fire/EMS	3.5	4.0
Baldwinsville Police Dept	Baldwinsville (V)	Police	11.7	49.8
Baldwinsville Fire Dept	Baldwinsville (V)	Fire/EMS	29.9	100
GBAC - Rescue	Baldwinsville (V)	Fire/EMS	NA	NA
Camillus PD Substation	Camillus (V)	Police	NA	NA
Camillus Village Hall	Camillus (V)	User Defined	NA	NA
Brewerton FD 2	Cicero (T)	Fire/EMS	NA	NA
O.C.C. School	Clay (T)	School	10.7	69.4
De Witt Police Dept	DeWitt (T)	Police	10.6	30.3
Dewitt Town Hall	DeWitt (T)	User Defined	NA	NA
Elbridge Village Hall	Elbridge (V)	User Defined	NA	NA
Elbridge Town Hall	Elbridge (T)	User Defined	NA	NA
Tully ES	Fabius (T)	School	6.1	32.8
Fabius Fire House	Fabius (V)	Fire/EMS	NA	NA
Jordan Police Dept	Jordan (V)	Police	11.3	42.9
Jordan Village Hall	Jordan (V)	User Defined	NA	NA
Seneca River FD	Lysander (T)	Fire/EMS	27.8	100
COR East Substation	Manlius (T)	Police	NA	NA
Shining Stars Day Care	Manlius (T)	School	NA	NA
Colonial Village Apartments	Manlius (T)	User Defined	NA	NA
Alterra Wynwood of Manlius	Manlius (V)	User Defined	NA	NA
Minoa Village Hall	Minoa (V)	User Defined	NA	NA
The Crossing	Minoa (V)	User Defined	NA	NA
Onondaga HS	Onondaga (T)	School	NA	NA
Wheeler School	Onondaga (T)	School	NA	NA
Syracuse Police Dept	Syracuse (C)	Police	4.5	5.2
Faith Heritage School	Syracuse (C)	School	5.0	26.7
Blodgett ES	Syracuse (C)	School	5.1	27.4
Prekindergarten Program	Syracuse (C)	School	5.1	27.4
Van Duyn ES	Syracuse (C)	School	6.8	37.0
St Lucy S	Syracuse (C)	School	6.9	37.2
SFD Station 18	Syracuse (C)	Fire/EMS	8.3	13.3
Madrasat Al Ihsan	Syracuse (C)	School	9.0	63.0
Seymour Magnet School - International	Syracuse (C)	School	9.0	53.2
Rural Metro - Rescue	Syracuse (C)	Fire/EMS	10.3	24.9
SFD Station 6	Syracuse (C)	Fire/EMS	10.7	33.1
Syracuse Community Police Ctr	Syracuse (C)	Police	12.0	55.2
SFD 12 (OLD)	Syracuse (C)	Fire/EMS	53.9	100
Nottingham HS	Syracuse (C)	School	NA	NA

Source: HAZUS-MH MR3, 2007

Notes: NA = Not available; Facility located within Q3 100-year flood boundary. T = Town. V = Village.

Although some facilities do not have building/content damage estimated by HAZUS-MH MR3, they are located within the FEMA Q3 100-year flood boundary and listed in the table above.

Table 5.4.3-13. Estimated Damage to Critical Facilities in Onondaga County from the 500-Year MRP Event

Name	Town	Type	Percent Building Damage	Percent Content Damage
Baldwinsville Vlg Fire Dept	Baldwinsville (V)	Fire/EMS	9.4	17.5
Baldwinsville Fire Dept	Baldwinsville (V)	Fire/EMS	38.0	100
GBAC - Rescue	Baldwinsville (V)	Fire/EMS	NA	NA
Baldwinsville Police Dept	Baldwinsville (V)	Police	16.7	79.6
Camillus PD Substation	Camillus (V)	Police	NA	NA
Camillus Village Hall	Camillus (V)	User Defined	NA	NA
Union School Conversion	Camillus (V)	User Defined	NA	NA
Brewerton FD 2	Cicero (T)	Fire/EMS	NA	NA
O.C.C. School	Clay (T)	School	NA	NA
Casual Estates Tlpk	Clay (T)	User Defined	NA	NA
De Witt Police Dept	DeWitt (T)	Police	11.0	38.1
Dewitt Town Hall	DeWitt (T)	User Defined	NA	NA
Elbridge Town Hall	Elbridge (T)	User Defined	NA	NA
Elbridge Village Hall	Elbridge (V)	User Defined	NA	NA
Tully ES	Fabius (T)	School	5.9	32.0
Fabius Fire House	Fabius (V)	Fire/EMS	NA	NA
Creative Environment Day School	Fayetteville (V)	School	3.4	18.5
Jordan Police Dept	Jordan (V)	Police	15.6	73.4
School (Village of Jordan)	Jordan (V)	School	NA	NA
Jordan Village Hall	Jordan (V)	User Defined	NA	NA
Liverpool Police Dept	Liverpool (V)	Police	NA	NA
Liverpool Early Education Program	Liverpool (V)	School	NA	NA
Seneca River FD	Lysander (T)	Fire/EMS	32.9	100
COR East Substation	Manlius (T)	Police	11.4	44.1
Shining Stars Day Care	Manlius (T)	School	NA	NA
Colonial Village Apartments	Manlius (T)	User Defined	NA	NA
Alterra Wynwood of Manlius	Manlius (V)	User Defined	NA	NA
Nine Mile Landing	Marcellus (V)	User Defined	NA	NA
BOCES Bridges Alternative School	Minoa (V)	School	NA	NA
Minoa Village Hall	Minoa (V)	User Defined	NA	NA
Edgerton Estates	Minoa (V)	User Defined	NA	NA
The Crossing	Minoa (V)	User Defined	NA	NA
Onondaga HS	Onondaga (T)	School	NA	NA
Wheeler School	Onondaga (T)	School	NA	NA
SFD Rescue 1	Syracuse (C)	Fire/EMS	1.0	1.1
SFD Station 6	Syracuse (C)	Fire/EMS	7.4	9.7
Rural Metro - Rescue	Syracuse (C)	Fire/EMS	11.0	38.7
SFD Station 6	Syracuse (C)	Fire/EMS	11.1	39.2
SFD 12 (OLD)	Syracuse (C)	Fire/EMS	46.8	100
Syracuse Fire Maintenance	Syracuse (C)	Fire/EMS	NA	NA
Syracuse Police Dept	Syracuse (C)	Police	2.0	2.3
Syracuse Community Police Ctr	Syracuse (C)	Police	8.7	14.8
Blodgett ES	Syracuse (C)	School	5.4	29.0
Prekindergarten Program	Syracuse (C)	School	5.4	29.0

Name	Town	Type	Percent Building Damage	Percent Content Damage
Van Duyn ES	Syracuse (C)	School	5.8	31.4
Van Duyn ES	Syracuse (C)	School	6.9	37.7
St Lucy S	Syracuse (C)	School	7.4	40.7
Seymour Magnet School - International	Syracuse (C)	School	9.1	64.4
Madrasat Al Ihsan	Syracuse (C)	School	9.8	67.1
Nottingham HS	Syracuse (C)	School	NA	NA

Source: HAZUS-MH MR3, 2007
Notes: NA = Not available. T = Town. V = Village.
Although some facilities do not have building/content damage estimated by HAZUS-MH MR3, they are located within the FEMA Q3 500-year flood boundary and listed in the table above.

Table 5.4.3-14. Estimated Damage to Utilities in Onondaga County from the 100-Year MRP Event

Name	Town	Type	Percent Damage
CANTON STREET PS	Baldwinsville (V)	WW	2.9
BVILLE NORTH PS	Baldwinsville (V)	WW	30.0
BVILLE WEST PUMP STA	Baldwinsville (V)	WW	30.0
CAMILLUS PS	Camillus (T)	WW	5.4
GREENFIELD PS	Camillus (T)	WW	17.4
ALLIED PS	Camillus (T)	WW	NA
FIRST STREET PS	Camillus (V)	WW	30.0
HARBOUR VILLAGE PS	Cicero (T)	WW	30.0
MUSKRAT BAY PS	Cicero (T)	WW	NA
SHEPARD POINT PS	Cicero (T)	WW	NA
LONG POINT PS	Cicero (T)	WW	NA
POLAR BEACH PS	Cicero (T)	WW	NA
MAPLE BAY PS	Cicero (T)	WW	NA
CAUGHDENOY RD PS	Clay (T)	WW	0.9
HENRY CLAY PS	Clay (T)	WW	3.6
EUCLID PS	Clay (T)	WW	4.1
GATEWOOD PS	Clay (T)	WW	5.1
GASKIN RD PS	Clay (T)	WW	9.6
BEL HARBOR PS	Clay (T)	WW	18.7
CHRISTOPER'S CROSSING PS	Clay (T)	WW	19.4
WETZEL ROAD WASTE WATER TREATMENT PLANT	Clay (T)	WW	30.0
WTLA 1200	Clay (T)	Communication	NA
WKRL-FM CH 265	Clay (T)	Communication	NA
TOTMAN ROAD PS	Clay (T)	WW	NA
CHERRY ESTATES PS	Clay (T)	WW	NA
ENTERPRISE PS	DeWitt (T)	WW	0.8
AGWAY/PETROLEUM	DeWitt (T)	Oil	1.1
FREMONT PS	DeWitt (T)	WW	5.8
WNSS 1260	DeWitt (T)	Communication	NA
BUTTERNUT DR II PS	DeWitt (T)	WW	NA
FREMONT PS	DeWitt (T)	WW	NA
BURNET AV PS	East Syracuse (V)	WW	3.6
PHELPS ST PS	East Syracuse (V)	WW	3.6
FLY ROAD PS	East Syracuse (V)	WW	7.8
FARRELL RD PS	Geddes (T)	WW	8.2
LAKESIDE PS	Geddes (T)	WW	17.8
GEDDES 9 PS	Geddes (T)	WW	NA
WESTSIDE PS	Geddes (T)	WW	NA
STANFORD DRIVE PS	Lysander (T)	WW	9.9
BARGE CANAL FACILITY PS	Lysander (T)	WW	15.6
RIVER ROAD PS	Lysander (T)	WW	30.0

Name	Town	Type	Percent Damage
BALDWINSVILLE SENECA KNOLLS	Lysander (T)	WW	38.6
BELGIUM PS	Lysander (T)	WW	40.0
EMERALD COVE PS	Lysander (T)	WW	40.0
MELVIN DRIVE PS	Lysander (T)	WW	40.0
MEADOWBROOK LIMESTONE WASTE WATER TREATM	Manlius (T)	WW	13.7
MANLIUS PS	Manlius (V)	WW	NA
PLATT ROAD PS	Marcellus (V)	WW	NA
MINOA SEWAGE TREATMENT PLANT	Minoa (V)	WW	7.9
TERMINAL PARK PUMP STA	Salina (T)	WW	7.0
SAWMILL PS	Salina (T)	WW	28.3
LIVERPOOL PS	Salina (T)	WW	NA
RICHMOND AV PS	Syracuse (C)	WW	0.2
METROPOLITAN SYRACUSE WASTE WATER TREATM	Syracuse (C)	WW	3.7
Butternut FCF	Syracuse (C)	WW	9.1
TAYLOR PS	Syracuse (C)	WW	23.0
TULLY (V) STP	Tully (V)	WW	4.4
HARBOUR HEIGHTS TRT PLT	Van Buren (T)	WW	14.3
HARBOR HEIGHTS PS	Van Buren (T)	WW	30.0
BVILLE SOUTH PS	Van Buren (T)	WW	39.6

Source: HAZUS-MH MR3, 2007
Notes: NA = Not available. T = Town. V = Village. WW = Wastewater (facility or pump station).
Although some facilities do not have building/content damage estimated by HAZUS-MH MR3, they are located within the FEMA Q3 100-year flood boundary and listed in the table above.

Table 5.4.3-15. Estimated Damage to Utilities in Onondaga County from the 500-Year MRP Event

Name	Town	Type	Percent Damage
BVILLE WEST PUMP STA	Baldwinsville (V)	WW	40
BVILLE NORTH PS	Baldwinsville (V)	WW	40
CANTON STREET PS	Baldwinsville (V)	WW	5.5
ALLIED PS	Camillus (T)	WW	NA
FIRST STREET PS	Camillus (V)	WW	NA
MAPLE BAY PS	Cicero (T)	WW	4.3
HARBOUR VILLAGE PS	Cicero (T)	WW	34.2
MUSKRAT BAY PS	Cicero (T)	WW	NA
SHEPARD POINT PS	Cicero (T)	WW	NA
LONG POINT PS	Cicero (T)	WW	NA
POLAR BEACH PS	Cicero (T)	WW	NA
GASKIN RD PS	Clay (T)	WW	14
CHRISTOPER'S CROSSING PS	Clay (T)	WW	30
EUCLID PS	Clay (T)	WW	4.4
CAUGHDENOY RD PS	Clay (T)	WW	1
GATEWOOD PS	Clay (T)	WW	2.7
HENRY CLAY PS	Clay (T)	WW	4.4
TOTMAN ROAD PS	Clay (T)	WW	3.4
CHERRY ESTATES PS	Clay (T)	WW	5.5
WETZEL ROAD WASTE WATER TREATMENT PLANT	Clay (T)	WW	NA
WTLA 1200	Clay (T)	Communication	NA
WKRL-FM CH 265	Clay (T)	Communication	NA
AGWAY/PETROLEUM	DeWitt (T)	Oil	3.6
BUTTERNUT DR II PS	DeWitt (T)	WW	9.3
FREMONT PS	DeWitt (T)	WW	6.4
ENTERPRISE PS	DeWitt (T)	WW	1.2
WNSS 1260	DeWitt (T)	Communication	NA
FLY ROAD PS	East Syracuse (V)	WW	8.4
BURNET AV PS	East Syracuse (V)	WW	4
PHELPS ST PS	East Syracuse (V)	WW	4
LAKESIDE PS	Geddes (T)	WW	24.2
FARRELL RD PS	Geddes (T)	WW	12.8
GEDDES 9 PS	Geddes (T)	WW	NA
WESTSIDE PS	Geddes (T)	WW	NA
BALDWINSVILLE SENECA KNOLLS	Lysander (T)	WW	40
STANFORD DRIVE PS	Lysander (T)	WW	40
EMERALD COVE PS	Lysander (T)	WW	40
MELVIN DRIVE PS	Lysander (T)	WW	40
BELGIUM PS	Lysander (T)	WW	40
RIVER ROAD PS	Lysander (T)	WW	35.3
BARGE CANAL FACILITY PS	Lysander (T)	WW	28.7
MEADOWBROOK LIMESTONE WASTE WATER TREATM	Manlius (T)	WW	19.6
FALCONVIEW II PS	Manlius (T)	WW	2.6

Name	Town	Type	Percent Damage
MANLIUS PS	Manlius (V)	WW	NA
PLATT ROAD PS	Marcellus (V)	WW	NA
MINOA SEWAGE TREATMENT PLANT	Minoa (V)	WW	14
SAWMILL PS	Salina (T)	WW	23.8
TERMINAL PARK PUMP STA	Salina (T)	WW	8.3
LIVERPOOL PS	Salina (T)	WW	NA
METROPOLITAN SYRACUSE WASTE WATER TREATMENT	Syracuse (C)	WW	9.4
Butternut FCF	Syracuse (C)	WW	9.3
RICHMOND AV PS	Syracuse (C)	WW	0.2
TAYLOR PS	Syracuse (C)	WW	29.6
TULLY (V) STP	Tully (V)	WW	4.8
HARBOUR HEIGHTS TRT PLT	Van Buren (T)	WW	29.6
HARBOR HEIGHTS PS	Van Buren (T)	WW	30
BVILLE SOUTH PS	Van Buren (T)	WW	40

Source: HAZUS-MH MR3, 2007
Notes: NA = Not available. T = Town. V = Village. WW = Wastewater (facility or pump station).
Although some facilities do not have building/content damage estimated by HAZUS-MH MR3, they are located within the FEMA Q3 500-year flood boundary and listed in the table above.

As listed in Tables 5.4.3-12 through 5.4.3-15, there are numerous critical facilities (emergency facilities, utilities, transportation features, etc.) impacted by the flood hazard. Transportation features are not accounted for in Tables 5.4.3-12 through 5.4.3-15. To estimate the number of transportation features (i.e., highway and railroad bridges, airports, bus and rail facilities) exposed to the flood hazard, the FEMA Q3 flood zones were overlaid upon the inventory. The features with their center within the flood boundary were determined to estimate the transportation features exposed to this hazard.

In summary, for the 100-year event, the B-Ville Airpark in the Town of Lysander, 116 of the 614 highway bridges in the HAZUS-MH MR3 default inventory and five rail bridges in the HAZUS-MH MR3 default inventory (one in the Town of Lysander, two in the Town of Salina, one in the City of Syracuse and one in the Town of Camillus) are located within the flood boundary.

For the 500-year event, the B-Ville Airpark in the Town of Lysander, 124 of the 614 highway bridges in the HAZUS-MH MR3 default inventory and five rail bridges in the HAZUS-MH MR3 default inventory (one in the Town of Lysander, two in the Town of Salina, one in the City of Syracuse and one in the Town of Camillus) are located within the flood boundary. Table 5.4.3-16 below indicates the number of highway located in the FEMA Q3 100- and 500-year floodplains and therefore, vulnerable to flooding.

Table 5.4.3-16. Highway Bridges Located within the FEMA Q3 Boundary

Municipality	Number of Bridges in 100-Year Boundary	Number of Bridges in 500-Year Boundary
Village of Baldwinsville	2	2
Town of Camillus	2	2
Village of Camillus	2	2
Town of Cicero	5	5
Town of Clay	9	9
Town of Dewitt	8	8
Village of East Syracuse	2	2
Town of Elbridge	2	2
Village of Elbridge	0	0
Town of Fabius	0	0
Village of Fabius	0	0
Village of Fayetteville	2	2
Town of Geddes	11	11
Village of Jordan	2	2
Town of Lafayette	10	11
Village of Liverpool	0	0
Town of Lysander	3	3
Town of Manlius	18	19
Village of Manlius	0	2
Town of Marcellus	1	2
Village of Marcellus	0	0
Village of Minoa	0	0
Village of North Syracuse	0	0
Town of Onondaga	7	7
Town of Otisco	0	0

Municipality	Number of Bridges in 100-Year Boundary	Number of Bridges in 500-Year Boundary
Town of Pompey	8	8
Town of Salina	7	8
Town of Skaneateles	2	4
Village of Skaneateles	1	1
Village of Solvay	0	0
Town of Spafford	0	0
City of Syracuse	10	10
Town of Tully	0	0
Village of Tully	0	0
Town of Van Buren	2	2
Onondaga County	**116**	**124**

Source: HAZUS-MH MR3, 2007; FEMA Q3

Impact on Economy

For impact on economy, estimated losses from a flood event are considered. Losses include but are not limited to general building stock damages, agricultural losses, business interruption, impacts to tourism and tax base to Onondaga County. Damages to general building stock can be quantified using HAZUS-MH as discussed above. Other economic components such as loss of facility use, functional downtime and social economic factors are less measurable with a high degree of certainty. For the purposes of this analysis, general building stock damages and impacts to agriculture are discussed further.

Direct building losses are the estimated costs to repair or replace the damage caused to the building. The potential damage estimated to the general building stock inventory associated with the 100-year flood is greater than $1.5 billion. This estimate represents approximately 60% of the total value exposed (building value located in the floodplain) to the 100-year flood and greater than 2.3% of the County's overall total general building stock inventory. For the 500-year event, the potential damage estimate is nearly $2 billion (structure and contents), or approximately 65% of the total exposed building value. This is approximately 2.8% of the County's total general building stock replacement value inventory. These dollar value losses to the County's total building inventory replacement value would greatly impact Onondaga's tax base and the local economy.

When a flood occurs, the agricultural industry is at risk in terms of economic impact and damage (i.e., damaged crop, financial loss to the farmer). In 2007, the market value of production in Onondaga County (crop sales and livestock sales) totaled more than $137 million, with total sales averaging $198,515 per farm. The leading products sold were grains/seeds/beans; fruits/berries; dairy products; poultry/eggs; cattle/calves and nursery/greenhouse products (USDA NASS, 2007).

Given professional knowledge and historic loss information available, 40-percent and 60-percent loss estimates for agricultural products are considered conservative for this hazard. With crop sales totaling more than $36.5 million in 2007, this equates to $14,600,000 and $21,900,000, respectively.

Future Growth and Development

As discussed in Section 4 and Section 9 within each jurisdiction's annex, areas targeted for future growth and development have been identified across the County. Any new development within the identified

flood hazard areas will be at risk to flooding. Please refer to Section 4 (County Profile) and each jurisdictions' annex (Section 9) for hazard maps that illustrate where potential new development is located in relation to the FEMA flood boundaries.

Additional Data Needs and Next Steps

A modified Level 1 HAZUS-MH flood analysis was conducted for Onondaga County using the default model data, with the exception of the updated critical facility inventory which included user-defined data. For future plans, when updated FIRMs and DFIRMs become available, they can be used to calculate more accurate exposure and loss estimates. These maps can be included as part of a Level 2 HAZUS analysis. A Level 2 analysis provides more accurate loss estimates by replacing the national default inventories with more accurate local inventories. Updated demographic and general building stock data would be needed to conduct a Level 2 HAZUS-MH analysis. Current replacement values of critical facilities would also further support the refined analysis.

Overall Vulnerability Assessment

The flood hazard is evaluated as a significant threat, which was ranked overall as a "medium" risk by the Planning Committee (Table 5.3-6). This hazard can be managed and planned for through the mitigation strategy and specific activities outlined in Volume II Section 9, which build on efforts already undertaken these communities.