APPENDIX H. SUPPLEMENTARY DATA

This appendix contains information and details to support information provided in Section 5 (Risk Assessment).

H.1 HISTORY OF HAZARD EVENTS WITHIN THE COUNTY

To supplement the information provided in this plan, events prior to the update of this plan are included below by hazard of concern type. Many sources provided historical information regarding previous occurrences and losses associated with hazards throughout New York and Westchester County. It is noted that, with a number of sources reviewed for the purpose of this HMP, loss and impact information for many events could vary depending on the sources.

For more information on past events and impacts, refer to the 2015 Westchester County Hazard Mitigation Plan.

H.1.1 Earthquake

Known earthquakes events that have impacted New York State and Westchester County between 1737 and 2014 are identified in Table H.1. Many sources were researched for historical information regarding earthquake events in Westchester County; therefore, Table H.1 may not include all earthquake events that have impacted the County.

Table H.1. Earthquake History in New York State, 1737-2014

Dates of Event	Event Type	Location	FEMA Declaration Number	County Designated?	Losses / Impacts
December 18, 1737	Earthquake 5.2	New York City	N/A	N/A	Bells rang, several chimneys fell
1783	Earthquake 5.0	Westchester-Putnam County Line	N/A	N/A	Felt as far south as Philadelphia
September 2, 1847	Earthquake 3.5	Offshore New York City	N/A	N/A	No reference and/or no damage reported.
July 11, 1872	Earthquake	Westchester County	N/A	N/A	Houses were shaken to their foundations and crockery and glassware in the closets were disturbed by the shock. Impacted the Villages of East Chester, Mt. Vernon, and Pelhamville.
December 11, 1874	Earthquake 3.4	Tarrytown	N/A	N/A	No reference and/or no damage reported.
August 10, 1884	Earthquake 5.2	New York City	N/A	N/A	Chimneys and bricks fell; walls cracked. This was the largest and probably best documented event in the New York City area. It was a strong shock centered off Rockaway Beach and felt over 70,000 square miles, from Vermont to Maryland.
September 3, 1951	Earthquake 3.6	Rockland County	N/A	N/A	No reference and/or no damage reported.
July 9, 1937	Earthquake 3.5	Brooklyn	N/A	N/A	No reference and/or no damage reported.
May 23, 1971	Earthquake 3.5 – 4.1	Blue Mountain Lake, NY	N/A	N/A	No reference and/or no damage reported.
June 7, 1974	Earthquake 3.0	Wappingers Falls, NY	N/A	N/A	Windows broken
June 9, 1975	Earthquake 3.5	Plattsburgh, NY	N/A	N/A	Chimneys and fireplaces cracked
December 30, 1979	Earthquake 2.5	Armonk, NY	N/A	N/A	No reference and/or no damage reported.
January 17, 1980	Earthquake 2.9	Peekskill, NY	N/A	N/A	No reference and/or no damage reported.
February 2, 1983	Earthquake 3.0	Scarsdale-Lagrangeville	N/A	N/A	Chimneys cracked
August 1984	Earthquake 1.4 and 1.8	Greenburgh, between Ardsley and Yonkers	N/A	N/A	No reference and/or no damage reported.
January 26, 1985	Earthquake 2.2	Greenburgh, between Ardsley and Yonkers	N/A	N/A	No reference and/or no damage reported.
October 1985	Earthquake 4.1	Greenburgh, between Ardsley and Yonkers	N/A	N/A	This was widely felt in the New York City area and was centered near the northern border of the City of Yonkers. Tremors shook the metropolitan area and were felt in Philadelphia, southern Canada, and Long Island.

Dates of Event	Event Type	Location	FEMA Declaration Number	County Designated?	Losses / Impacts
October 19, 1985	Earthquake 2.0	Greenville, NY	N/A	N/A	No reference and/or no damage reported.
October 19, 1985	Earthquake 3.6	Greenville, NY	N/A	N/A	No reference and/or no damage reported.
October 21, 1985	Earthquake 2.8	Greenville, NY	N/A	N/A	No reference and/or no damage reported.
January 4, 1986	Earthquake 1.8	Greenville, NY	N/A	N/A	No reference and/or no damage reported.
April 22, 1986	Earthquake 2.7	Greenville, NY	N/A	N/A	No reference and/or no damage reported.
December 20, 1986	Earthquake 1.9	Greenville, NY	N/A	N/A	No reference and/or no damage reported.
November 1988	Earthquake 6.0	90 miles north of Quebec, Canada	N/A	N/A	This earthquake was felt in the Lower Hudson Valley and in New York City.
June 1991	Earthquake 4.4	West of Albany	N/A	N/A	Rattled homes throughout the area
April 12, 1991	Earthquake 2.0-2.7	Westchester County, NY and Fairfield, CT	N/A	N/A	Last just five seconds and caused no damage
1994	Earthquake 4.7	Reading, PA	N/A	N/A	This event caused millions of dollars of damage and was found to have been triggered by a rock quarry. The seismicity began in May 1993, six months after the quarry was abandoned and flooded; the main shock occurred in January 1994. No reference and/or no damage reported in the Westchester County area.
August 22, 2000	Earthquake 2.5	Carmel, NY	N/A	N/A	The epicenter was located approximately 2.5 miles northeast of the Town of Carmel in Putnam County.
April 20, 2002	Earthquake 5.2	Au Sable Forks, NY	DR-1415	No	Some roads, bridges, chimneys and water lines damaged in Clinton and Essex Counties. Many buildings in the area had cracked walls and foundations, broken windows and small items knocked from shelves. Maximum intensity (VII) at Au Sable Forks. Felt from New Brunswick and Maine to Ohio and Michigan and from Ontario and Quebec to Maryland.
January 2003	Earthquake 1.2 and 1.4	Hastings-on-Hudson	N/A	N/A	Two small earthquakes struck the area surrounding Hastings-on-Hudson.
March 2006	Earthquake 1.1 and 1.3	Rockland, NY	N/A	N/A	Two earthquakes struck Rockland County. The first, 1.1, struck 3.3 miles southwest of Pearl River and the second, 1.3, was centered in the West Nyack-Blauvelt-Pearl River area.
February 18, 2009	Earthquake 2.3	Greater New York Area	N/A	N/A	In Westchester County, residents in Briarcliff Manor reported having felt the earthquake.
June 23, 2013	Earthquake 2.1	Greater New York Area	N/A	N/A	No reference and/or no damage reported.

Dates of Event	Event Type	Location	FEMA Declaration Number	County Designated?	Losses / Impacts
February 1, 2014	Earthquake 1.8	Rye Brook, NY	N/A	N/A	No reference and/or no damage reported.
May 11, 2014	Earthquake 1.7	Heritage Hills, NY	N/A	N/A	No reference and/or no damage reported.
July 5, 2014	Earthquake 2.5	5.2 miles from Peekskill	N/A	N/A	No reference and/or no damage reported.

Source(s): *NYS DHSES, 2014; USGS, 2014; Kim, 1999; Stover and Coffman, 1989; Journal News Online 2011; PIX11 News 2014; FEMA 2014; Westchester County GIS 2001*

CT *Connecticut*
DR *Major Disaster Declaration (FEMA)*
FEMA *Federal Emergency Management Agency*
N/A *Not Applicable*
NY *New York*
USGS *U.S. Geological Survey*

H.1.2 Extreme Temperature

Information regarding specific details of temperature extremes in Westchester County is scarce; therefore, previous occurrences and losses associated with extreme temperature events are limited. Table H.5 summarizes the extreme temperature events in the County from 1950 through 2014.

Table H.2. Extreme Temperature Events between 1950 and 2014

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts
January 16, 1994	Extreme Cold	N/A	N/A	A homeless man died early Sunday in Mount Vernon. Subzero temperatures were blamed for his death.
July 4-6, 1999	Extreme Heat	N/A	N/A	On July 4th, temperatures soared into the mid and upper 90s. The combination of high temperatures and moderate humidity caused most heat indices to range from 100 to 105 degrees. On July 5th, heat indices peaked from 110 to 115 degrees. "Rolling" electrical blackouts occurred across the Metropolitan Region. On July 6th, heat indices peaked around 110 degrees. Widespread blackouts occurred across the Metro area, including Westchester County's sound shore from Pelham Manor to Port Chester. This heat wave was directly responsible for killing 2 people from Pelham.
January 17-18, 2000	Extreme Wind-chill	N/A	N/A	On January 17, wind chill values ranged from 20 to 30 degrees below 0 across the Lower Hudson Valley. On January 18, wind chills across the Lower Hudson Valley were 30 to 35 degrees below 0.
January 21, 2000	Extreme Cold/Wind Chill	N/A	N/A	The combination of a quickly intensifying low pressure system off the New England Coast and a strong high pressure system west of the Great Lakes caused strong and gusty northwest winds. Wind chill values plummeted to 25 to 35 degrees below zero.
January 27-28, 2000	Extreme Wind-chill	N/A	N/A	At Westchester County Airport in White Plains, the lowest wind chill of 26 degrees below zero occurred around 4 am on the 28th when the temperature was 9 degrees above zero and the wind speed was 21 mph.
August 8-10, 2001	Excessive Heat	N/A	N/A	Heat indices ranged from 105 to 110 degrees. Scattered power outages spread across the suburbs.
July 29-31, 2002	Excessive Heat	N/A	N/A	Heat indices ranged from 100 to 105 degrees on the 29th and from around 95 to 100 on the 30th and 31st
January 15-16, 2004	Extreme Cold/wind Chill	N/A	N/A	The large difference in pressure between a strong low pressure system northeast of New England and a strong arctic high pressure system in Southeast Canada resulted in the combination of extremely low temperatures, high winds, and extremely low wind chill index values. Record low temperatures were set and tied. In Westchester County, the lowest wind chill index temperature was reported at the Westchester Airport (-26°F) and a low of -1°F. Sustained winds of 30 mph were also reported at the airport.
July 4-7, 2010	Heat Wave	N/A	N/A	A hot airmass developed over the central portion of the U.S. and moved eastward. It settled over the New York City region during the second half of the 4th of July weekend. Several records were broken. In Westchester County, temperatures ranged from 95°F to 102°F during this timeframe.
July 22-23, 2011	Excessive Heat	N/A	N/A	Excessive heat between 95 and 105 degrees, along with heat indices in excess of 105 degrees occurred for a couple of days. The heat index was as high as 109 degrees at 1 PM at Westchester County Airport (KHPN) on July 22nd.
July 18, 2012	Excessive Heat	N/A	N/A	The heat index reached or exceeded 107 degrees at Newburgh airport (Stewart Field).

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts
July 14-19, 2013	Heat Wave	N/A	N/A	A week-long heat wave struck the New York City metropolitan area. Seven consecutive days with highs in the 90s were recorded. Numerous locations saw 100°F and other locations had daily record highs set. In Westchester County, more than 7,600 customers were without power.

Sources: NOAA-NCDC 2014; NWS 2014
Note (1): 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 increased U.S. Inflation Rates.

NOAA-NCDC National Oceanic Atmospheric Administration – National Climatic Data Center
NWS National Weather Service
NYS New York State

H.1.3 Flood

Known flooding events that occurred from 1971 to 2014 are identified in Table H.3. With flooding documentation for New York State and Westchester County being so extensive, not all sources have been identified or researched. Therefore, Table H.3 may not include all events that have occurred in the County.

Table H.3. Flooding Events in Westchester County Between 1971 and 2014

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts
September 1971	Severe Storms and Flooding (Tropical Storm Doria)	DR-311	Yes	This storm caused seven deaths and $147.6 million in damage throughout its path. New York State experienced approximately $7.4 million in total eligible damages. Westchester County experienced approximately $29,000 in property and crop damages.
June 20-25, 1972	Tropical Storm Agnes (FEMA did not identify this as a flooding declaration)	DR-338	Yes	New York State experienced approximately $703 million in total eligible damages. Storm either severely damaged or destroyed 5,000 homes and killed 24 people. Westchester County experienced approximately $806,000 in property and crop damages. Approximately 5.2 inches of rain fell within a 12 hour period.
June 28, 1973	Flood	DR-401	No	The Northeast U.S. was affected by flooding, causing 40 counties in New Hampshire, Vermont, New York and Pennsylvania to be declared major disaster areas by FEMA. In New York State, six counties were declared (FEMA DR-401); however, Westchester County was not included in this declaration. According to SHELDUS, the County experienced approximately $38 million in property damages from this event. However, no other sources were found that indicated this information.
September 25-27, 1975	Severe Storms, Heavy Rain, Landslides, Flooding (Hurricane Eloise)	DR-487	Yes	New York State experienced approximately $25 million in property damages and 2 fatalities. Total rain amounts exceeded 10 inches within southeastern New York State (including Westchester County).
November 7, 1977	Flash Flood	N/A	N/A	Westchester County experienced approximately $833,000 in property damages.
May 23, 1979	Flash Flood	N/A	N/A	Westchester County experienced approximately $1.3 million in property damages.
December 12, 1983	Flash Flood	N/A	N/A	Westchester County experienced approximately $227,000 in property damages.
April 5, 1984	Coastal Storms and Flood	DR-702	Yes	New York State experienced approximately $11.9 million in property damages. Losses in the County are unknown.
May 28, 1984	Flash Flood	N/A	N/A	Westchester County experienced approximately $2.4 million in property damages.

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts
March 14, 1986	Flash Flood	N/A	N/A	Westchester County experienced approximately $238,000 in property damages.
March 31, - April 8, 1987	Flash Flood / Heavy Rain	DR-801	No	Intense rainfall in New York State during April 3 and 5 caused widespread flooding in the State. Five counties in southeastern New York State were declared disaster areas by FEMA (FEMA DR-801). A total of ten deaths resulted from this storm when a New York State Thruway bridge collapsed over the Schoharie Creek. Westchester County was not included in the disaster declaration. The County received between 7 and 8 inches of rain from this storm.
December 11-14, 1992	Coastal Storm, High Tides, Heavy Rain, Flooding	DR-974	Yes	New York State experienced approximately $31.2 million in property damages, mostly due to flooding. Flooding in New York City and Boston was recorded between four and five feet. In Westchester County, between eight and 11 inches of rain, causing flooding. All public schools were closed. Several major roadways were closed due to flooding. Overall, Westchester County had approximately $7.1 million in flood damages. Over 20,000 power failures occurred throughout the County.
January 28, 1994	Flooding	N/A	N/A	The combination of warm temperatures melting snow and the arrival of heavy rains caused significant and widespread urban flooding across the area. Many roads were closed for hours during this event. Numerous cars stalled out attempting to cross some of these flooded roads. Several of these motorists had to be rescued from their vehicles.
July 26, 1995	Flash Flood	N/A	N/A	A tropical airmass across the region generated some heavy thunderstorms. One of these storms downed some trees across Westchester County and also caused some significant flooding problems as heavy rains were also generated. Lightning caused a blaze that heavily damaged the roof and top floor of a house in Scarsdale.
October 28, 1995	Flood	N/A	N/A	Several inches of rain caused the Mahwah River at Suffern to rise slightly above flood stage. Flooding occurred along the Saw Mill River at Elmsford. There was also some widespread flooding of roadways throughout the area.
May 11, 1996	Flash Flood	N/A	N/A	Torrential rain flooded the Saw Mill River Parkway in Chappaqua.
June 13, 1996	Flash Flood	N/A	N/A	Rainfall rates of up to 2 inches in less than 1 hour produced significant flooding along the Palisades Parkway (from Exits 12 through 15) in Rockland County and on the Saw Mill Parkway near Bedford.
October 19-20, 1996	Severe Storms / Flooding	DR-1146	Yes	Coastal flooding event that caused over $16.1 million in property damages throughout Westchester and Suffolk Counties. Approximately $3.5 million in disaster aid to the two counties. Flooding caused the closures of the Hutchinson River Parkway between Wolfs Lane and East 3rd Street and the Bronx River Parkway between Sprain Brook Parkway and Scarsdale Road. Rainfall totals in Westchester County ranged from 2.37 inches at Ossining to 4.98 inches at Dobbs Ferry.
March 9, 1998	Flood	N/A	N/A	Scattered power outages.

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts
June 13, 1998	Flash Flood	N/A	N/A	Torrential rains resulted in widespread serious flooding of streets, poor drainage and low-lying areas, home basements, and small streams. Lightning struck many homes and ignited fires that damaged them.
September 14-17, 1999	Hurricane Floyd	DR-1296; EM-3149	Yes	New York State experienced approximately $62.2 million in eligible damages as a result of property damage and debris accumulation (NYSDPC). The worst damage in the New York metropolitan region occurred in Rockland and Westchester Counties. Orange, Putnam, Rockland and Westchester Counties were declared disaster areas. NOAA-NCDC, SHELDUS and other sources indicated that Westchester County experienced between $6.6 and $14.6 million in damages. Many Westchester County officials proclaimed the storm as one of the worst storms ever to hit the area at that time, with the most rain ever recorded dropped on the county in 24 hours. Nearly all of the state-controlled parkways in Westchester County flooded during Floyd, causing about $2.8 million in damage. As of December 6, 1999, FEMA indicated that the County was approved for over $1.8 million in public assistance. Other sources indicate that Westchester municipalities were reimbursed about $14 million by FEMA for damages; local businesses received $2.3 million, and homeowners received approximately $1.6 million.
June 17, 2001	Flash Flood	N/A	N/A	Excessive rainfall also led to severe flooding conditions across portions of Westchester County.
August 9-15, 2004	Remnants of Hurricane Charley	N/A	N/A	Significant flooding throughout the County.
September 8, 2004	Flash Flood	N/A	N/A	Flash flooding on the Sawmill River Parkway. Flash flooding filled basements with water. Rowboats and payloaders were used to rescue people from flooded homes and vehicles in Mamaroneck, Rye and Harrison. The White Plains Times Newspaper called the flash flooding in Westchester County the worst in 28 years. The remnants of Hurricane Frances produced torrential rainfall across Southeastern New York on September 8th. Rainfall amounts ranging from an inch to up to 6 inches were common across the area. This caused extensive flash flooding across the region, resulting in rescues of people from homes and cars.
September 13-27, 2004	Remnants of Hurricane Jeanne	N/A	N/A	Nearly a foot of rain fell on Westchester county within a 24-hour period. The result was severe, widespread damage, especially in northern areas of the County, where the landscape was transmogrified by floating cars, downed trees, collapsed railroad embankments and impassable roadways. In Cortlandt, several major roadways were submerged.
April 2-4, 2005	Severe Storms and Flooding	DR-1589	Yes	Widespread heavy rain along with heavy showers and thunderstorms impacted the region bringing rainfall totals of one to four inches. The heavy rain caused widespread urban flooding. Most small streams and rivers overflowed their banks. In addition, high wind gusts from 46 to 57 mph downed trees. New York State experienced approximately $66.2 million in eligible damages. FEMA approved more than $5 million in disaster aid to the State to help fund recovery efforts in several counties and jurisdictions.

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts
				In Westchester County, rainfall totals ranged from 2.25 inches in Armonk to 3.52 inches in Yorktown Heights. A 40mph wind gust was recorded at Westchester County Airport. Westchester County experienced approximately $4.3 million in flood damages.
June 29, 2005	Flooding	N/A	N/A	Heavy rain caused major damage to municipalities in southern Westchester County along the Hudson River. Roads buckled, parks flooded and cars were submerged. More than 70 submerged cars had to be towed along the New York State Thruway from the Villages of Tarrytown to Ardsley.
June 26 – July 12, 2006	Severe Storms and Flooding	DR-1650	Yes	This event was the largest and most costly natural disaster that New York State encountered since Hurricane Agnes in 1972. Resulted in a Disaster Declaration for 19 New York State counties. New York State experienced approximately $246.3 million in eligible damages. As of December 29, 2006, more than $227 million in disaster aid was approved for the State. June 29th – slow moving thunderstorms produced a wide array of severe weather to the area. Flash flooding, large hail, and damaging winds struck Westchester County. The storms downed trees and brought penny size hail to the Mount Kisco area of the County. July 12th - a weak F1 tornado touched down in Grandview-on-Hudson in Rockland County. The tornado moved east to northeast across the Hudson river. It over turned a boat near the Tappan Zee Bridge then moved across the western shores of Westchester County over the Town of Sleepy Hollow. Houses and businesses along Beekman Avenue, Depyster Street, and Chestnut Street in the Town experienced roof and siding damage associated with a F1 tornado intensity. As the tornado moved towards Pacantico Hills (Sleepy Hollow), it damaged trees and structures which included the destruction of two small barns. As it moved into Mount Pleasant and Hawthorne, it caused extensive tree damage. The tornado moved into the Kensico Reservoir across Routes 22 and 120 in North Castle. The path width was estimated at 200 to 300 yards and caused approximately $10 million in damages.
April 15-16, 2007	Severe Storms and Inland and Coastal Flood (also identified as a Nor'Easter)	DR-1692	Yes	A Nor'Easter struck the area between the 15th and 16th, bringing heavy rains and high winds that caused widespread and significant river, stream and urban flooding. High winds downed many trees and power lines. The combination of high winds, heavy rain, and high water table produced widespread moderate tidal flooding across parts of New York City and Long Island Sound shores. Rainfall totals from this event ranged from 1.47 inches to 8.41 inches. Wind speed gusts ranged from 35 to 55 mph. New York State experienced millions in eligible damages. FEMA gave out more than $61 million in assistance to affected counties within the State. In Westchester County, rainfall totals ranged from 5.85 inches in Yorktown Heights to 8.22 inches in East White Plains. State Police reported flooding closures of Exit 7 of I-287, Exits 18A, 18B, and 22 of I-95, and I-95 southbound between exits 19 and 17. Roads were also closed along the Hutchinson River Parkway due to flooding at Linden Avenue in the Town of Harrison. The Bronx River Parkway was also closed in the City of White Plains. Private

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts
				property losses in Westchester County were estimated at $83 million and public property losses were estimated at $2 million. Disaster assistance to the County totaled $30 million.
April 27, 2007	Flash Flood	N/A	N/A	A band of heavy rain occurred across northeast New Jersey and southern Westchester County. It then moved across southern Fairfield and New Haven Counties in Connecticut. Storm totals ranged from two to three inches, which resulted in flash flooding across parts of the region. In Westchester County, totals of 2.71 inches was measured in the southern portion of the County. Flash flooding was reported along the Cross County Parkway in both directions at the Bronx River Parkway on ramp and the Hutchinson River Parkway in both directions at Lincoln Avenue in the City of Mount Vernon. The Sprain Brook Parkway southbound after Route 100 was also flooded in the City of Yonkers.
March 13-15, 2010	Severe Storms and Flooding (also identified as a Nor'Easter)	DR-1899	Yes	On April 16, 2010, FEMA announced that federal disaster aid was made available for the State of New York due to the severe storms and flooding that struck between March 13 and 15. Nassau, Orange, Richmond, Rockland, Suffolk and Westchester Counties were all included in this declaration. This storm caused seven deaths in Northeast U.S. and more than 300,000 customers were without power. Hurricane-force winds knocked down trees and power lines. Heavy rain caused flooding across the region. Flood warnings were issued from northern Virginia to southern New Hampshire. Some coastal areas received more than six inches of rain. Con Ed reported that more than 86,000 customers were without power in New York City and Westchester County. In Westchester County, schools were closed.
October 1, 2010	Flash Flood	N/A	N/A	Fourteen families living in a two-story apartment building in Harrison were evacuated after a ceiling in the hallway collapsed, causing flooding throughout the building. Approximately $50,000 in damages.
March 6 – 7, 2011	Heavy Rain and Flooding	N/A	N/A	Rainfall totals in Westchester County ranged between 2.15 inches and 4.64 inches. Power outages were reported in several areas of Westchester County. Numerous road closures were reported.
August 28, 2011	Hurricane Irene (FEMA did not identify this as a flooding declaration)	DR-4020; EM-3328	Yes	As Hurricane Irene moved north along the Atlantic coast, it weakened and made its second landfall as a Tropical Storm near Little Egg Inlet along the southeast New Jersey coast. The storm made its third landfall in New York City on August 28th. This storm brought sustained winds, heavy rain, destructive storm surge and two confirmed tornadoes. Heavy rainfall resulted in widespread moderate flooding across the area. Seven deaths resulted from Irene. At least 600,000 people were ordered to evacuate their homes from storm surge and inland flooding. Widespread power outages of up to one week followed the storm. The strong winds from Irene pushed a three to five foot storm surge of water along western Long Island South, New York Harbor, the southern and eastern bays of Long Island, and southern bays of New York City. This resulted in moderate to major coastal flooding, wave damage and erosion along the coast, with heavy damage to public beaches and other public and private facilities. In Westchester County, a raft carrying five men capsized on the Croton River just south of Silver Lake Park. The men were rescued from the raging river, but not before three of the rescue workers were tossed from their rescue boat and were swept under a trestle bridge just

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts
				south of the Croton-Harmon station. Babbitt Court in Elmsford was under several ft. of water from the Saw Mill River rising out of its banks, requiring one family to be rescued from their home by the local fire department. The overflowing river also caused portions of Rt. 119 and several side streets throughout Elmsford to be closed, causing untold damage to homes and businesses. The NOS tidal gauge at Kings Point recorded a maximum water level of 12.36 feet MLLW on August 28th. A peak wind gust of 56 mph was recorded at the County Airport.
September 6-10, 2011	Remnants of Tropical Storm Lee	DR-4031	No	Ten days after Hurricane Irene struck, the remnants of Tropical Storm Lee produced record setting rainfall over the same area and lead to historical flooding in some areas of New York State. In Westchester County, on September 8th, in the City of Mount Vernon, the entire Bronx River Parkway was closed due to flooding. In the Village of Briarcliff Manor, the entire Saw Mill River Parkway was closed due to flooding. In the Town of Mamaroneck, I-95 exit ramps at Mamaroneck were closed due to flooding. In the Village of Pelham, the Hutchinson River Parkway in both directions between the New York City line and the Cross County Parkway was closed due to flooding. In the City of Mount Vernon, all on- and off-ramps were closed due to flooding on the Cross County Parkway in both directions at Bronx River Parkway. Overall rainfall totals from this event ranged from 5.14 inches in Thornwood (Town of Mount Pleasant) to 6.8 inches in the City of White Plains.
October 28, 2012	Hurricane Sandy (FEMA did not identify this as a flooding declaration)	DR-4085; EM-3351	Yes	Hurricane Sandy was the 19th named tropical cyclone of the 2012 Atlantic hurricane season. The track of Hurricane Sandy resulted in a worse-case scenario for storm surge for coastal regions from New Jersey north to Connecticut, including New York City and Long Island. It was the costliest natural disaster in southeast New York State. It caused record breaking tides and wave action, as well as sustained winds of 40 to 60 mph and wind gusts of 80 to 90 mph. These extreme conditions resulted in at least 60 deaths and widespread property damage of at least $42 billion. Emergency managers recommended mandatory evacuations of more than 500,000 people that lived in low-lying areas. Widespread significant power outages of more than two million people lasted up to two weeks. In Westchester County, Sandy did not result in significant rainfall; however, it still caused extreme coastal flooding from storm surge and high winds. Low lying areas along the Hudson River experienced moderate coastal flooding as storm surge moved north along the River as Sandy made landfall in southern New Jersey. This coincided with widespread record coastal flooding occurring in Lower New York Harbor exceeding the FEMA 100 year BFE. Up to two to feet of inundation occurred in the low lying areas. Coastal communities in Westchester County along the southern portions of the County experienced two successive tidal cycles with at least moderate coastal flooding on the 28th. Maximum wind gusts ranged between 80 and 90mph. A wind gust of 64 mph was recorded at the Tappan Zee Bridge. A wind gust of 72 mph was measured at the White Plains Airport. The County at least three fatalities related to Sandy and over $527 million in damages and recovery needs. Overall, the County experienced power outages, school and business closings, flooding, fuel shortages, downed utility poles and trees. Over 156,000 customers lost power in New York City and Westchester County. FEMA

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts
				Public Assistance topped $38 million to fund emergency efforts, remove debris, and rebuild infrastructure.
November 27, 2013	Heavy Rain and Flash Flood	N/A	N/A	Several inches of rain fell in the tristate area, which resulted in isolated flash flooding in Westchester County. In the Village of Elmsford, the intersection of Tarrytown Road and Knollwood Road was closed due to flooding. Total reported rainfall totals ranged from 2.75 inches in Mamaroneck to 3.7 inches at the County Airport.
April 30, 2014	Heavy Rain and Flooding	N/A	N/A	Periods of heavy rain impacted portions of New York City, Nassau, Rockland and Westchester Counties, which resulted in flooding in these areas. In Westchester County, a mudslide occurred near the Glenwood Metro North station in the City of Yonkers due to the heavy rain. Storm totals ranged from 2.85 inches in the City of Peekskill to 5.28 inches in Village of Bronxville. In the City of White Plains, the Bronx River Parkway was closed in both directions from Walworth Crossing to Chatterton Avenue due to flooding. The Hutchinson River Parkway (northbound) was also closed in White Plains due to flooding between Lincoln Avenue and Ridge Street.
May 1, 2014	Heavy Rain and Flooding	N/A	N/A	Heavy rain fell across the area resulting in flooding across Westchester and Rockland Counties, as well as the Bronx in New York City. In Westchester County, the northbound Hutchinson River Parkway was closed between exits 7 and 12. The Saw Mill River Parkway was closed southbound from exit 16 to Farragut Parkway and northbound between exits 20 and 21 in the Village of Elmsford due to flooding. In the Village of Bronxville, the southbound Bronx River Parkway was closed between Route 100/119 and the Sprain Brook Parkway due to flooding.
July 14-15, 2014	Heavy Rain and Flash Flooding	N/A	N/A	On July 14th, Westchester County had rainfall totals exceeding 1.6 inches. In the Town of Mount Pleasant, several cars were stranded in flood waters up to the car doors near Bradhurst Avenue. Sprain Brook Parkway was closed in due to flooding; multiple cars were under water. In Chappaqua, North Greeley Avenue was closed due to flooding. In Thornwood, water rescues were performed along the Taconic Parkway near Stevens Avenue. On July 15th, between 1.46 and 1.8 inches of rain fell in the County. In White Plains, Bloomingdale Road and the Bronx River Parkway southbound were closed due to flooding. In Mount Vernon, the Hutchinson River Parkway was closed between exits 10 and 12.

Source: *FEMA 2014; NOAA-NCDC 2014; SHELDUS 2014; Lohud.com 2011; Courson et al. 2010; MyFox New York 2010; Chas. H. Sells, Inc.2007; SPC 2014*

Note (1): *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 increased U.S. Inflation Rates.*

DR *Federal Disaster Declaration*
EM *Federal Emergency Declaration*
FEMA *Federal Emergency Management Agency*
IA *Individual Assistance*
K *Thousand ($)*
M *Million ($)*
MARFC *Middle Atlantic River Forecast Center*
N/A *Not applicable*
NCDC *National Climate Data Center*
NOAA *National Oceanic Atmospheric Administration*
NWS *National Weather Service*
NYS DHSES *New York State Division of Homeland Security & Emergency Services*
PA *Public Assistance*
SHELDUS *Spatial Hazard Events and Losses Database for the U.S.*
USACE *U.S. Army Corps of Engineer*

H.1.4 Severe Storm

Known severe storm events that occurred from 1990 to 2014 are identified in Table H.7. With severe storm documentation for New York State and Westchester County being so extensive, not all sources have been identified or researched. Therefore, Table H.7 may not include all events that have occurred in the County.

Table H.4. Severe Storm Events between 1990 and 2014

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts
June 12, 1991	Tornado (F0)	N/A	N/A	A squall line moving across Rockland and Westchester Counties produced a tornado at Briarcliff Manor. A man was killed when the tornado threw a tree on top of his car. In New Rochelle, a woman was killed and her children were injured by a falling tree. At White Plains Airport, 13 planes and about 12 cars were damaged or destroyed. This tornado event caused approximately $25,000 in damages to the County.
December 11-14, 1992	Coastal Storm, High Tides, Heavy Rain, Flooding	DR-974	Yes	New York State experienced approximately $31.2 million in property damages, mostly due to flooding. Flooding in New York City and Boston was recorded between four and five feet. In Westchester County, between eight and 11 inches of rain, causing flooding. All public schools were closed. Several major roadways were closed due to flooding. Overall, Westchester County had approximately $7.1 million in flood damages. Over 20,000 power failures occurred throughout the County.
July 3, 1996	Lightning	N/A	N/A	A home was struck by lightning in the City of New Rochelle. The roof was damaged, causing approximately $5,000 in damages.
October 19-20, 1996	Severe Storms / Flooding	DR-1146	Yes	Coastal flooding event that caused over $16.1 million in property damages throughout Westchester and Suffolk Counties. Approximately $3.5 million in disaster aid to the two counties. Flooding caused the closures of the Hutchinson River Parkway between Wolfs Lane and East 3rd Street and the Bronx River Parkway between Sprain Brook Parkway and Scarsdale Road. Rainfall totals in Westchester County ranged from 2.37 inches at Ossining to 4.98 inches at Dobbs Ferry.
September 14-17, 1999	Hurricane Floyd	DR-1296; EM-3149	Yes	New York State experienced approximately $62.2 million in eligible damages as a result of property damage and debris accumulation (NYSDPC). The worst damage in the New York metropolitan region occurred in Rockland and Westchester Counties. Orange, Putnam, Rockland and Westchester Counties were declared disaster areas. NOAA-NCDC, SHELDUS and other sources indicated that Westchester County experienced between $6.6 and $14.6 million in damages. Many Westchester County officials proclaimed the storm as one of the worst storms ever to hit the area at that time, with the most rain ever recorded dropped on the county in 24 hours. Nearly all of the state-controlled parkways in Westchester County flooded during Floyd, causing about $2.8 million in damage. As of December 6, 1999, FEMA indicated that the County was approved for over $1.8 million in public assistance. Other sources indicate that Westchester municipalities were reimbursed about $14 million by FEMA for damages; local businesses received $2.3 million, and homeowners received approximately $1.6 million.
August 9-15, 2004	Remnants of Hurricane Charley	N/A	N/A	Significant flooding throughout the County.
September 13-27, 2004	Remnants of Hurricane Jeanne	N/A	N/A	Nearly a foot of rain fell on Westchester county within a 24-hour period. The result was severe, widespread damage, especially in northern areas of the County, where the landscape

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts
				was transmogrified by floating cars, downed trees, collapsed railroad embankments and impassable roadways. In Cortlandt, several major roadways were submerged.
April 2-4, 2005	Severe Storms and Flooding	DR-1589	Yes	Widespread heavy rain along with heavy showers and thunderstorms impacted the region bringing rainfall totals of one to four inches. The heavy rain caused widespread urban flooding. Most small streams and rivers overflowed their banks. In addition, high wind gusts from 46 to 57 mph downed trees. New York State experienced approximately $66.2 million in eligible damages. FEMA approved more than $5 million in disaster aid to the State to help fund recovery efforts in several counties and jurisdictions. In Westchester County, rainfall totals ranged from 2.25 inches in Armonk to 3.52 inches in Yorktown Heights. A 40mph wind gust was recorded at Westchester County Airport. Westchester County experienced approximately $4.3 million in flood damages.
June 26 – July 12, 2006	Severe Storms and Flooding	DR-1650	Yes	This event was the largest and most costly natural disaster that New York State encountered since Hurricane Agnes in 1972. Resulted in a Disaster Declaration for 19 New York State counties. New York State experienced approximately $246.3 million in eligible damages. As of December 29, 2006, more than $227 million in disaster aid was approved for the State. June 29th – slow moving thunderstorms produced a wide array of severe weather to the area. Flash flooding, large hail, and damaging winds struck Westchester County. The storms downed trees and brought penny size hail to the Mount Kisco area of the County. July 12th - a weak F1 tornado touched down in Grandview-on-Hudson in Rockland County. The tornado moved east to northeast across the Hudson river. It over turned a boat near the Tappan Zee Bridge then moved across the western shores of Westchester County over the Town of Sleepy Hollow. Houses and businesses along Beekman Avenue, Depyster Street, and Chestnut Street in the Town experienced roof and siding damage associated with a F1 tornado intensity. As the tornado moved towards Pacantico Hills (Sleepy Hollow), it damaged trees and structures which included the destruction of two small barns. As it moved into Mount Pleasant and Hawthorne, it caused extensive tree damage. The tornado moved into the Kensico Reservoir across Routes 22 and 120 in North Castle. The path width was estimated at 200 to 300 yards and caused approximately $10 million in damages.
September 2, 2006	Remnants of Tropical Storm Ernesto	N/A	N/A	Remnants of Tropical Storm Ernesto brought heavy rain and gusty winds across Long Island and Southeast New York State. This resulted in many trees and power lines down with hundreds of thousands of people without power. Westchester County had between 0.5 and 1 inches of rain, with wind gusts of up to 49 mph.
April 15-16, 2007	Severe Storms and Inland and Coastal Flood (also identified as a Nor'Easter)	DR-1692	Yes	A Nor'Easter struck the area between the 15th and 16th, bringing heavy rains and high winds that caused widespread and significant river, stream and urban flooding. High winds downed many trees and power lines. The combination of high winds, heavy rain, and high water table produced widespread moderate tidal flooding across parts of New York City and Long Island Sound shores. Rainfall totals from this event ranged from 1.47 inches to 8.41 inches. Wind

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts
				speed gusts ranged from 35 to 55 mph. New York State experienced millions in eligible damages. FEMA gave out more than $61 million in assistance to affected counties within the State. In Westchester County, rainfall totals ranged from 5.85 inches in Yorktown Heights to 8.22 inches in East White Plains. State Police reported flooding closures of Exit 7 of I-287, Exits 18A, 18B, and 22 of I-95, and I-95 southbound between exits 19 and 17. Roads were also closed along the Hutchinson River Parkway due to flooding at Linden Avenue in the Town of Harrison. The Bronx River Parkway was also closed in the City of White Plains. Private property losses in Westchester County were estimated at $83 million and public property losses were estimated at $2 million. Disaster assistance to the County totaled $30 million.
March 20, 2008	Strong Wind	N/A	N/A	Strong winds downed a tree on a car in Westchester County, killing one person and injuring two in the Town of Cortlandt. Wind speeds reached 46 mph
June 10, 2008	Thunderstorm Wind	N/A	N/A	A strong cold front moved across southeast New York State causing multiple severe thunderstorms across the region. In the City of New Rochelle, multiple trees were reported down. In Dunwoodie, two large trees and wires were reported down on Parkhill Avenue. Trees were also reported down on Yonkers Avenue and the Saw Mill Parkway. In Mount Vernon, numerous trees were down with some falling onto three homes and 17 cars. Overall, there was approximately $37,000 in damages in the County.
June 22, 2008	Lightning; Thunderstorm Wind	N/A	N/A	Thunderstorms produced frequent intense lightning that struck a condo complex in Pleasantville. Lightning blew out windows and ignited a fire that caused eight families to evacuate. In Peekskill, numerous trees were reported down. Overall, there was approximately $200,000 in damages from this event.
August 15, 2008	Hail; Lightning; Thunderstorm Wind	N/A	N/A	A slow moving cold front that crossed the tri-state area produced severe thunderstorms across portions of New York City, Long Island, and the Lower Hudson Valley. This included a microburst in southern Westchester County. In the City of New Rochelle, lightning struck the high school and caused significant damage. A wind gust of 65 mph was measured just northwest of the City. Hail was also reported as a result of this storm. Overall, the County had over $30,000 in damages.
September 6, 2008	Tropical Storm Hanna	N/A	N/A	Tropical Storm Hanna impacted southeast New York State, making landfall near the Nassau/Suffolk County border on the 6th. Rainfall totals ranged from 1.66 inches to 5.92 inches. The highest sustained wind of 38 mph and a peak gust of 52 mph was reported at Shinnecock Inlet (Suffolk County). Coastal storm tides of two feet or less above astronomical tide levels were common, with only minor beach erosion reported. Near the coast, as well as inland, only scattered trees were reported down to the wind. In Westchester County, scattered trees were reported down in the County. A wind gust of 37 mph occurred at White Plains Airport. Rainfall totals in the County ranged from 3.32 inches in the City of Rye to 4.42 inches at White Plains Airport. Overall, the County had approximately $8,000 in damages.
July 7, 2009	Thunderstorm Wind; Hail	N/A	N/A	Straight-line winds impacted southern Westchester County. A large area of very strong downburst winds downed numerous large trees that fell on structures, powerlines, and cars. The worst damage was observed in the area of Trevor Park near the Hudson River Museum.

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts
				Winds in this area were estimated at 100 mph. Some minor damage to the roof of the museum was observed. Nearly all trees appeared to have fallen to the east or southeast. The damage area extended east to North Broadway and into Grant Park on Park Avenue where numerous large trees were knocked over. Large trees in Oakland Cemetery were also downed. In Mount Vernon and Bronxville, downed trees were also reported. Winds in the area of Eastchester and Tuckahoe were estimated at 80 mph. In addition to wind damage, extensive hail from the storm along with torrential rain impacted the area. The hail accumulated to several inches in Yonkers. Rain swept the hail into some locations to a depth of over a foot. In one location in northern Yonkers, up to four feet of hail accumulated inside a home after the drainage become clogged. One injury was reported as a result of this event. The County had over $1 million in damages.
July 17, 2009	Thunderstorm Wind	N/A	N/A	Severe weather impacted Orange and Westchester Counties. In Westchester County, in the Town of Somers, trees and wires were reported down along Route 100. At Sparkle Lake (Town of York Town), State Route 35 was closed between Broad Street and Brookside Avenue due to downed trees and wires. Overall, the County had approximately $9,000 in damages.
August 10, 2009	Thunderstorm Wind	DR-1857	No	Several severe thunderstorms impacted in the Lower Hudson Valley, including Westchester County. Numerous trees were reported down throughout the County. Some trees took down power lines with them, causing sporadic power outages. Overall, the County had approximately $16,000 in damages.
August 21, 2009	Thunderstorm Wind	N/A	N/A	Strong winds caused damage throughout Westchester County. In Yorktown Heights (Town of Yorktown), dozens of trees were reported down throughout and a funnel cloud was spotted over the hamlet. This event caused approximately $10,000 in damages to the County.
January 25, 2010	High Wind	N/A	N/A	A cold front produced strong southerly winds in Westchester County. In the southern part of the County, a 62 mph wind gust was reported at the County Airport. A six car Metro North train ran into a tree that had fallen on power lines near the Pleasantville station. Rainfall totals ranged from 1.27 in the City of Rye to 2.01 inches in the City of White Plains. Peak wind gusts in the County ranged from 52 mph in Tarrytown to 62 mph in White Plains. The County had approximately $10,000 in damages.
March 13-15, 2010	Severe Storms and Flooding (also identified as a Nor'Easter)	DR-1899	Yes	On April 16, 2010, FEMA announced that federal disaster aid was made available for the State of New York due to the severe storms and flooding that struck between March 13 and 15. Nassau, Orange, Richmond, Rockland, Suffolk and Westchester Counties were all included in this declaration. This storm caused seven deaths in Northeast U.S. and more than 300,000 customers were without power. Hurricane-force winds knocked down trees and power lines. Heavy rain caused flooding across the region. Flood warnings were issued from northern Virginia to southern New Hampshire. Some coastal areas received more than six inches of rain. Con Ed reported that more than 86,000 customers were without power in New York City and Westchester County. In Westchester County, schools were closed.

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts
July 19, 2010	Thunderstorm Wind; Lightning	N/A	N/A	Lightning struck two trees and then traveled through the roots into wires going into houses. A fire was caused, with an occupant treated for smoke inhalation. Multiple trees and power lines were reported down in Yonkers. Damages of $43,500 were reported.
July 21, 2010	Thunderstorm Wind	N/A	N/A	Severe thunderstorms impacted the Lower Hudson Valley and Long Island. In Westchester County, numerous trees were reported down, with some falling on top of cars. Multiple power lines were reported down as well. Trees fell into homes in Pound Ridge. The County had approximately $56,000 in damages.
September 22, 2010	Thunderstorm Wind	N/A	N/A	Severe thunderstorms in Westchester County downed a large tree and power lines on Anderson Hill Road in the City of White Plains. The storm caused approximately $7,500 in damages.
September 30, 2010	Strong Wind	N/A	N/A	Strong winds were responsible for the loss of power to 1,200 customers in Westchester County due to downed power lines and trees. Approximately $100,000 in property damage.
October 1-2, 2010	Heavy Rain / Wind	N/A	N/A	Remnants of Tropical Storm Nicole moved up the coast of the U.S. which resulted in heavy rain, strong winds, and flooding in portions of New York City, Nassau, Rockland, and Westchester Counties. In Westchester County, in the Town of Somers, the stream off of Route 118 overflowed its banks washing away the front yard of a house and inundating the garage of another home. In other areas of the County, flooding caused portions of major roads to close. Rainfall totals ranged from 3.58 inches in White Plains to 6.25 inches in Yorktown Heights. Peak wind gusts ranged from 41 mph in White Plains to 53 mph in Bronxville. The County had approximately $30,000 in damages.
February 19, 2011	High Wind	N/A	N/A	Max wind gusts in Westchester County ranged from 51 mph in Hastings-on-Hudson to 60 mph in White Plains. Sustained winds ranged from 46 mph in Croton Falls to 48 mph in White Plains. The strong winds resulted in downed trees and tree limbs across portions of the County. Overall, the County had approximately $100,000 in damages.
March 6 – 7, 2011	Heavy Rain and Flooding	N/A	N/A	Rainfall totals in Westchester County ranged between 2.15 inches and 4.64 inches. Power outages were reported in several areas of Westchester County. Numerous road closures were reported.
July 29, 2011	Microburst	N/A	N/A	Damage from a downburst began on the Croton River along Route 9 and spread south-southeast towards central Ossining. The damage consisted of snapped trees primarily. A large three to four foot diameter tree fell on Route 9 near Eagle Bay Drive in Ossining. It took down power lines and snapped telephone poles. The estimated maximum wind speed was 80 mph. The microburst had a path wide of 0.4 miles and length of 1.4 mile. The County had approximately $241,000 in damages from this event.
August 28, 2011	Hurricane Irene	DR-4020; EM-3328	Yes	As Hurricane Irene moved north along the Atlantic coast, it weakened and made its second landfall as a Tropical Storm near Little Egg Inlet along the southeast New Jersey coast. The storm made its third landfall in New York City on August 28th. This storm brought sustained winds, heavy rain, destructive storm surge and two confirmed tornadoes. Heavy rainfall resulted in widespread moderate flooding across the area. Seven deaths resulted from Irene.

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts
				At least 600,000 people were ordered to evacuate their homes from storm surge and inland flooding. Widespread power outages of up to one week followed the storm. The strong winds from Irene pushed a three to five foot storm surge of water along western Long Island South, New York Harbor, the southern and eastern bays of Long Island, and southern bays of New York City. This resulted in moderate to major coastal flooding, wave damage and erosion along the coast, with heavy damage to public beaches and other public and private facilities. In Westchester County, a raft carrying five men capsized on the Croton River just south of Silver Lake Park. The men were rescued from the raging river, but not before three of the rescue workers were tossed from their rescue boat and were swept under a trestle bridge just south of the Croton-Harmon station. Babbitt Court in Elmsford was under several ft. of water from the Saw Mill River rising out of its banks, requiring one family to be rescued from their home by the local fire department. The overflowing river also caused portions of Rt. 119 and several side streets throughout Elmsford to be closed, causing untold damage to homes and businesses. The NOS tidal gauge at Kings Point recorded a maximum water level of 12.36 feet MLLW on August 28th. A peak wind gust of 56 mph was recorded at the County Airport.
September 6-10, 2011	Remnants of Tropical Storm Lee	DR-4031	No	Ten days after Hurricane Irene struck, the remnants of Tropical Storm Lee produced record setting rainfall over the same area and lead to historical flooding in some areas of New York State. In Westchester County, on September 8th, in the City of Mount Vernon, the entire Bronx River Parkway was closed due to flooding. In the Village of Briarcliff Manor, the entire Saw Mill River Parkway was closed due to flooding. In the Town of Mamaroneck, I-95 exit ramps at Mamaroneck were closed due to flooding. In the Village of Pelham, the Hutchinson River Parkway in both directions between the New York City line and the Cross County Parkway was closed due to flooding. In the City of Mount Vernon, all on- and off-ramps were closed due to flooding on the Cross County Parkway in both directions at Bronx River Parkway. Overall rainfall totals from this event ranged from 5.14 inches in Thornwood (Town of Mount Pleasant) to 6.8 inches in the City of White Plains.
October 29, 2012	Hurricane Sandy	DR-4085 / EM-3351	Yes	Hurricane Sandy was the 19th named tropical cyclone of the 2012 Atlantic hurricane season. The track of Hurricane Sandy resulted in a worse-case scenario for storm surge for coastal regions from New Jersey north to Connecticut, including New York City and Long Island. It was the costliest natural disaster in southeast New York State. It caused record breaking tides and wave action, as well as sustained winds of 40 to 60 mph and wind gusts of 80 to 90 mph. These extreme conditions resulted in at least 60 deaths and widespread property damage of at least $42 billion. Emergency managers recommended mandatory evacuations of more than 500,000 people that lived in low-lying areas. Widespread significant power outages of more than two million people lasted up to two weeks. In Westchester County, Sandy did not result in significant rainfall; however, it still caused extreme coastal flooding from storm surge and high winds. Low lying areas along the Hudson River experienced moderate coastal flooding as storm surge moved north along the

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts
				River as Sandy made landfall in southern New Jersey. This coincided with widespread record coastal flooding occurring in Lower New York Harbor exceeding the FEMA 100 year BFE. Up to two to feet of inundation occurred in the low lying areas. Coastal communities in Westchester County along the southern portions of the County experienced two successive tidal cycles with at least moderate coastal flooding on the 28th. Maximum wind gusts ranged between 80 and 90mph. A wind gust of 64 mph was recorded at the Tappan Zee Bridge. A wind gust of 72 mph was measured at the White Plains Airport. The County had at least three fatalities related to Sandy and over $527 million in damages and recovery needs. Overall, the County experienced power outages, school and business closings, flooding, fuel shortages, downed utility poles and trees. Over 156,000 customers lost power in New York City and Westchester County. FEMA Public Assistance topped $38 million to fund emergency efforts, remove debris, and rebuild infrastructure.
November 27, 2013	Heavy Rain and Flash Flood	N/A	N/A	Several inches of rain fell in the tri-state area, which resulted in isolated flash flooding in Westchester County. In the Village of Elmsford, the intersection of Tarrytown Road and Knollwood Road was closed due to flooding. Total reported rainfall totals ranged from 2.75 inches in Mamaroneck to 3.7 inches at the County Airport.
April 30, 2014	Heavy Rain and Flooding	N/A	N/A	Periods of heavy rain impacted portions of New York City, Nassau, Rockland and Westchester Counties, which resulted in flooding in these areas. In Westchester County, a mudslide occurred near the Glenwood Metro North station in the City of Yonkers due to the heavy rain. Storm totals ranged from 2.85 inches in the City of Peekskill to 5.28 inches in Village of Bronxville. In the City of White Plains, the Bronx River Parkway was closed in both directions from Walworth Crossing to Chatterton Avenue due to flooding. The Hutchinson River Parkway (northbound) was also closed in White Plains due to flooding between Lincoln Avenue and Ridge Street.
May 1, 2014	Heavy Rain and Flooding	N/A	N/A	Heavy rain fell across the area resulting in flooding across Westchester and Rockland Counties, as well as the Bronx in New York City. In Westchester County, the northbound Hutchinson River Parkway was closed between exits 7 and 12. The Saw Mill River Parkway was closed southbound from exit 16 to Farragut Parkway and northbound between exits 20 and 21 in the Village of Elmsford due to flooding. In the Village of Bronxville, the southbound Bronx River Parkway was closed between Route 100/119 and the Sprain Brook Parkway due to flooding.
July 14-15, 2014	Heavy Rain and Flash Flooding	N/A	N/A	On July 14th, Westchester County had rainfall totals exceeding 1.6 inches. In the Town of Mount Pleasant, several cars were stranded in flood waters up to the car doors near Bradhurst Avenue. Sprain Brook Parkway was closed in due to flooding; multiple cars were under water. In Chappaqua, North Greeley Avenue was closed due to flooding. In Thornwood, water rescues were performed along the Taconic Parkway near Stevens Avenue. On July 15th, between 1.46 and 1.8 inches of rain fell in the County. In White Plains, Bloomingdale Road and the Bronx River Parkway southbound were closed due to flooding. In Mount Vernon, the Hutchinson River Parkway was closed between exits 10 and 12.

Sources: FEMA, 2014; NOAA-NCDC, 2014; NWS, 2014; SHELDUS, 2014

Note: *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.*

DR	*Federal Disaster Declaration*
EM	*Federal Emergency Declaration*
FEMA	*Federal Emergency Management Agency*
IA	*Individual Assistance*
K	*Thousand ($)*
M	*Million ($)*
Mph	*Miles Per Hour*
NCDC	*National Climate Data Center*
NOAA	*National Oceanic Atmospheric Administration*
NYS	*New York State*
NWS	*National Weather Service*
PA	*Public Assistance*
SHELDUS	*Spatial Hazard Events and Losses Database for the U.S.*
TSTM	*Thunderstorms*

H.1.5 Severe Winter Storm

Known severe winter storm events that occurred in Westchester County between 1990 and 2014 are identified in Table H.5. With severe winter storm documentation for New York State and Westchester County being so extensive, not all sources have been identified or researched. Therefore, Table H.5 may not include all events that have occurred in the County.

Table H.5. Winter Storm Events Between 1990 and 2014.

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts
December 11-14, 1992	Coastal Storm, High Tides, Heavy Rain, Flooding	DR-974	Yes	New York State experienced approximately $31.2 million in property damages, mostly due to flooding. Flooding in New York City and Boston was recorded between four and five feet. In Westchester County, between eight and 11 inches of rain, causing flooding. All public schools were closed. Several major roadways were closed due to flooding. Overall, Westchester County had approximately $7.1 million in flood damages. Over 20,000 power failures occurred throughout the County.
January 3, 1993	Freezing Rain	N/A	N/A	A combination of a cold surface and warm, moist air caused freezing rain and drizzle. This resulted in over 1,000 traffic accidents around the area. Many roadways were covered with a thin sheet of ice, which caused the traffic accidents. Westchester County was affected by this event and had approximately $5 million in property damages.
March 13-17, 1993	Blizzard	EM-3107	Yes	This blizzard resulted in total eligible damages of approximately $8.5 million through New York State. County-specific damage information was not available. Total snowfall accumulations for Westchester County were between 10 and 20 inches.
January 12, 1994	Snow/Ice Storm	N/A	N/A	Snowfall totals ranged between four and eight inches. A dangerous coating of ice followed as the snow changed to sleet and freezing rain before ending. Traffic throughout the area was significantly affected.
January 17, 1994	Heavy Snow	N/A	N/A	Accumulations ranged between six and 12 inches however some isolated amounts of 17 inches were reported. This brought traffic to a standstill throughout the area. In addition, trees and power lines were snapped from the weight of the snow. This closed roads and knocked power off to thousands of residents.
February 8, 1994	Snow/Ice Storm	N/A	N/A	After depositing between six and nine inches, the snow began to mix then change to sleet and freezing rain. This added a dangerous coating of ice which caused major transportation problems.
February 11, 1994	Snow/Ice Storm	N/A	N/A	Between six and 14 inches of snow accumulated before it mixed or changed to sleet and/or freezing rain in some locations. The wintery mix caused major transportation problems throughout the region.
February 23, 1994	Snow/Ice Storm	N/A	N/A	The region saw between three and five inches before a dangerous coating of ice was added as the snow changed to sleet and/or freezing rain. Major transportation problems developed.
March 3, 1994	Snow/Ice Storm	N/A	N/A	Strong northeasterly winds of between 35 and 40 mph prevailed for several hours along coastal sections. Several locations reported gust of around 60 mph. Downed trees and branches left thousands without power. In addition, snow and ice accumulated between five and eight inches. This caused significant transportation problems for trains, planes, and motorists.

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts
February 27-28, 1995	Ice Storm	N/A	N/A	Numerous traffic accidents were reported as roadways became extremely hazardous due to ice. The ice also coasted trees and caused numerous branches to break off.
January 6-9, 1996	Blizzard	DR-1083	Yes	19 deaths were attributed to the storm; one in Westchester County (Yorktown). The major effects from this storm in New York State were felt across the southeastern sections of the State, resulting in property damages ranging from $21.3 to $70 million. Property damage information for Westchester County was not available.
March 7-8, 1996	Winter Storm	N/A	N/A	Ice accumulated on trees, power lines, and roadways. Total accumulations of sleet and snow caused tree branches to snap off, power lines to fall, and a significant increase in traffic accidents.
March 31, 1997	Winter Storm	N/A	N/A	Strong gusty winds (to at least 40 mph) combined with heavy wet snow caused numerous trees and power lines to fall. Many roads were closed due to fallen trees and power lines. Northern Westchester County, snowfall ranged from nine inches at Croton On Hudson to 16 inches at Yorktown Heights.
January 15, 1999	Winter Storm	N/A	N/A	Significant icing caused widespread disruptions to mass transit and traffic. Rte.22 in Bedford was forced to close due to significant icing. Icing downed scattered tree limbs across the region. Heavy rain showers along with wind gusts from 30 to 40 mph occurred along the Long Island Sound shore of Westchester County. This downed additional scattered ice-laden tree limbs that caused some power outages.
March 14-15, 1999	Heavy Snow	N/A	N/A	Heavy wet snow downed many tree limbs and power lines across the region. In Westchester County, snowfall amounts ranged from 6 inches at White Plains to 10 inches at Yorktown Heights.
January 25, 2000	Winter Storm	N/A	N/A	White-out conditions caused massive traffic interruptions. Light freezing rain fell along the coast with a mixture of freezing rain and sleet inland. Snowfall from 5.5 inches at Yorktown Heights to eight inches at White Plains.
February 18-19, 2000	Winter Storm	N/A	N/A	Snowfall amounts ranged from one to six inches across the Lower Hudson Valley. This first round of heavy precipitation was followed by up to a 1/8th-inch thick ice coating, which caused serious and widespread traffic disruptions. Snowfall amounts ranged from two inches at Yonkers to six inches at White Plains. Significant icing of roads occurred, which forced the closure of many metro roads overnight. Numerous traffic accidents occurred on ice-covered roads. One fatality was reported.
December 14, 2000	Ice Storm	N/A	N/A	A mixture of freezing rain and sleet created treacherous travel for the morning commute. In addition, power outages resulted as tree limbs fell due to significant ice accretion. Ice accumulated at least one quarter inch throughout the area, with some locations receiving up to one half inch of ice.
December 30, 2000	Heavy Snow	N/A	N/A	Snowfall totals ranged from 13 inches at Mount Kisco to 16.5 inches at Mamaroneck.

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts
January 20-21, 2001	Winter Storm	N/A	N/A	Heavy snow occurred across Orange, Putnam, Rockland, and northern Westchester counties. Sleet and freezing rain produced ice accumulations of up to 0.20 inches. Ice accumulations ranged from 0.25 to 0.50 inches. This accretion of ice on tree limbs caused some tree branches to fall, and led to power outages. Snowfall ranged from 5 inches at Yorktown Heights to 7.3 inches measured at White Plains.
March 5-6, 2001	Winter Storm	N/A	N/A	The combination of very heavy wet snow and strong winds with this prolonged coastal storm produced scattered power outages across southeast New York. In addition, many schools and businesses were closed for several days due to the hazardous nature of this storm. Snowfall ranged from 5.5 inches at New Rochelle, to 9.5 inches at Yonkers.
December 25-26, 2002	Nor'Easter	N/A	N/A	Snowfall totals in Westchester County ranged from eight inches in Yorktown Heights to 11 inches in Tarrytown.
February 17-18, 2003	Heavy Snow (Presidents Day Snow)	EM-3184	Yes	Periods of light snow developed as northeast winds increased to around 15 mph across the New York City metropolitan area. Snow became widespread and heavy, falling at rates up to two to three inches per hour. Heavy snow blown by northeast winds 20 to 30 mph causing near blizzard conditions throughout the area. Record snowfall totals crippled mass transit. These conditions lead to many local emergency declarations throughout the region. In Westchester County, snowfall totals ranged from 14.5 inches in Croton-on-Hudson to 26 inches in Thornwood.
January 28, 2004	Heavy Snow	EM-3195	No	A light mixture of snow, sleet, and freezing rain spread north across the area. A light coating of ice on area roads made traveling extremely hazardous toward evening. Many traffic accidents occurred across the NYC Metropolitan Area during this time. Snowfall in the county ranged from 8.0 inches at Ossining and Yorktown Heights to 10.0 inches at Thornwood and Hasting-On-Hudson.
February 11-12, 2006	Blizzard	N/A	N/A	The storm rapidly intensified as it moved northeast just off the New England coast. Snow spread north across the area, falling steadily and heavily at times in many areas. During the event, many areas had snowfall rates of up to three and four inches an hour. Reports of thunderstorm were received. The highest totals fell across New York City and Westchester and Putnam Counties. Winds ranged from 10 to 20 mph with gusts of up to 30 mph. This created blizzard conditions with very hazardous driving conditions. In Westchester County, snowfall totals ranged from 16 inches in Croton-on-Hudson to 24.5 inches in New Rochelle.
February 13-14, 2007	Ice Storm	N/A	N/A	A significant accretion of ice, especially across the northern half of the county, where nearly half an inch of ice accumulated on tree limbs, power lines, and roadways. In addition, this was further compounded by one to two inches of accumulated sleet. This resulted in major mass transit problems.

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts
April 15-16, 2007	Severe Storms and Inland and Coastal Flood (also identified as a Nor'Easter)	DR-1692	Yes	A Nor'Easter struck the area between the 15th and 16th, bringing heavy rains and high winds that caused widespread and significant river, stream and urban flooding. High winds downed many trees and power lines. The combination of high winds, heavy rain, and high water table produced widespread moderate tidal flooding across parts of New York City and Long Island Sound shores. Rainfall totals from this event ranged from 1.47 inches to 8.41 inches. Wind speed gusts ranged from 35 to 55 mph. New York State experienced millions in eligible damages. FEMA gave out more than $61 million in assistance to affected counties within the State. In Westchester County, rainfall totals ranged from 5.85 inches in Yorktown Heights to 8.22 inches in East White Plains. State Police reported flooding closures of Exit 7 of I-287, Exits 18A, 18B, and 22 of I-95, and I-95 southbound between exits 19 and 17. Roads were also closed along the Hutchinson River Parkway due to flooding at Linden Avenue in the Town of Harrison. The Bronx River Parkway was also closed in the City of White Plains. Private property losses in Westchester County were estimated at $83 million and public property losses were estimated at $2 million. Disaster assistance to the County totaled $30 million.
February 10, 2010	Snowstorm	N/A	N/A	Periods of heavy snow and strong winds impacted the New York City and Long Island area. The high winds caused blowing and drifting snow. Snowfall totals in Westchester County ranged from 8.5 inches in Armonk to 14 inches in Bronxville. A peak wind gust of 38 mph was recorded in White Plains.
February 25-26, 2010	Heavy Snow	N/A	N/A	A combination of heavy snow, heavy rain, coastal flooding and strong winds impacted the region. Up to three feet of snow fell across interior portions of the Lower Hudson Valley, one to two feet across the New York City metropolitan area, and six to 12 inches of snow across eastern Long Island. In Westchester County, snowfall totals ranged from 10 inches in Harrison to 25.4 inches in Ossining.
January 26-27, 2011	Heavy Snow	N/A	N/A	A very heavy snow band developed over the New York City metropolitan area, southern and eastern portions of the Lower Hudson Valley and northern and western Long Island. This band was responsible for snowfall rates of three to four inches per hour over a four to six hour period. In Westchester County, snowfall totals ranged from seven inches in Peekskill to 20 inches in Irvington. A peak wind gust of 43 mph was recorded at White Plains.
October 29-30, 2011	Heavy Snow	N/A	N/A	A historic and unprecedented winter storm impacted the area on October 29th bringing over a foot of heavy, wet snow to portions of northeast New Jersey, the Lower Hudson Valley, and southern Connecticut. Thousands of people lost power during this event as heavy snow accumulated on trees causing the trees and limbs to fall, damaging power lines. Storm totals in Westchester County ranged from 6.5 inches in Hastings-on-Hudson to 12.5 inches in Armonk. A peak wind

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts
				gust of 33 mph was recorded at White Plains. In addition to the snow, 1.1 inches of rain fell in the County.
December 26-27, 2011	Blizzard	N/A	N/A	This blizzard brought between 20 and 30 inches of snow to the New York City metropolitan area, northeast New Jersey and the Lower Hudson Valley. Winds from this storm ranged between 25 and 40 mph, with gusts exceeding 60 mph. 18 inches of snow fell in the Village of Hastings-on-Hudson, along with 63 mph wind gusts. This storm was declared a major disaster (DR) by FEMA: however, Westchester County was not included in this declaration.
February 8, 2013	Winter Storm	DR-4111	No	Spotters reported snowfall ranging from 17.2 inches in Mount Vernon, to 23.3 inches in Port Chester.
March 7, 2013	Heavy Snow	N/A	N/A	Spotters reported snowfall ranging from 7.5 inches in Ardsley and Eastchester to 10 inches in Port Chester and White Plains.
March 18, 2013	Winter Weather	N/A	N/A	Spotters reported between 4.0 and 6.5 inches of snow.
December 14, 2013	Winter Storm	N/A	N/A	Spotters reported widespread snowfall totals of 6 to 7.5 inches, followed by 1/10 to 1/4 inch ice accretion.
January 3-4, 2014	Snow	N/A	N/A	Snowfall totals in Westchester County ranged from 5.4 inches in New Rochelle to over 10 inches in Rye. Maximum wind gusts of 40 mph were recorded at the White Plains Airport.
February 13-14, 2014	Snow (Nor'Easter)	N/A	N/A	Snowfall totals ranged from 12 inches in White Plains to 16.5 inches in Hastings-on-Hudson in Westchester County. In Peekskill, 0.22 inches of ice fell.

Sources: *NCDC, 2014; FEMA, 2014; Kocin & Uccellini, 2004; McFadden, 2006; Kennedy, 1996*
Note: *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.*

DR *Disaster Declaration*
EM *Emergency Declaration*
FEMA *Federal Emergency Management Agency*
HMP *Hazard Mitigation Plan*
N/A *Not Applicable*
NCDC *National Climatic Data Center*
NOAA *National Oceanic and Atmospheric Administration*
NWS *National Weather Service*
PA *Public Assistance*

H.1.6 Wildfire

Known wildfire events that have impacted Westchester County from 1990 to 2014 are identified in Table H.6. Fire departments throughout the County respond to small brush fires each year. However, many of these fires are so small that little information is available. Therefore, Table H.6 may not include a complete record of all wildfire events that have occurred within the county.

Table H.6. Wildfire Events in Westchester County, 1990 to 2014

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts
1987	Wildfire	N/A	N/A	A large fire burned in Mountain Lakes Park, destroying several County-owned storage buildings
2000	Wildfire	N/A	N/A	Approximately 20 acres burned in the Saxon Woods Park along the Mamaroneck/White Plains border
Summer of 2002	Wildfire	N/A	N/A	A 30-acre fire burned in the Pound Ridge Park
February 9, 2012	Brush Fire	N/A	N/A	A small brush fire burned behind Crescent Drive in Mohegan Lake
February 23, 2012	Brush Fire	N/A	N/A	3 to 5 acres burned in Anthony's Nose in Cortlandt
November 10, 2013	Brush Fire	N/A	N/A	A large brush fire burned in the rear of the Greenburgh Multiplex in Elmsford

Sources: *FEMA, NYS DHSES, Elmsford Fire Department 2014, Mohegan Volunteer Fire Association 2014, O'Rourke and Corcoran 2012*
Note: *Monetary figures within this table were U.S. Dollar (USD) figures calculated during or following 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.*
FEMA *Federal Emergency Management Agency*
K *Thousand ($)*
M *Million ($)*
N/A *Not applicable*

H.1.7 CBRN

This section provides a brief overview of the CBRN incidents that Westchester County has experienced, followed by a table summarizing specific incidents.

Chemical

Most chemical incidents in the County are petroleum products released from vehicles involved in transportation accidents. These incidents are generally minor, and fluids are cleaned up by the responding fire department or clean-up contractor. Other incidents may result in the release of a chemical agent from a business or infrastructure.

Biological

There are no records of biological incidents occurring in Westchester County, but the County's population is constantly infected with and affected by a wide range of biological agents such as influenza, the cold virus, chicken pox, and other diseases that are normally found in communities in the United States. Two of the most notable events in recent years is the Ebola outbreak of 2014, in which one individual was treated in nearby New York City. In 2009, individuals were diagnosed and treated for the Novel Influenza A (H1N1) during the pandemic.

Radiological

From February of 2000 to 2014, there were two reportable events at the Indian Point Energy Center that had the potential to impact offsite facilities and personnel. Neither event had an actual impact on offsite facilities or personnel. Both events required limited Westchester County Emergency Operations Center (EOC) activation for the purposes of monitoring and support. No County support was required by onsite authorities for either event.

Nuclear

There is no history of nuclear incidents in Westchester County.

H.1.8 Disease Outbreak

From 2010-2014, there were 15 reported human cases of WNV in Westchester County. Between 2007 and 2011, there were 792 confirmed cases of Lyme disease in Westchester County.

H.1.9 Cyber Attack

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

Hazard Profile

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

Description

A cyber attack is a malicious, intentional attempt to breach the information technology (IT) infrastructure of an individual or organization. Westchester County defines a cyber attack incident as an adverse event impacting one or more of the county's information assets. Examples include, but are not limited to, the following:

- Unauthorized use
- Denial of Service

- Malicious code
- Network system failures
- Application system failures
- Unauthorized disclosure or loss of information

Incidents can be the result of any of the following:

- Intentional and unintentional acts
- Actions of employees
- Actions of vendors or constituents
- Actions of third parties
- External or internal acts
- Credit card fraud
- Potential policy violations
- Natural disasters and power failures
- Acts related to violence, warfare or terrorism
- Serious wrongdoing
- Other
- Information security breach
- Structured Query Language (SQL) Injection
- Other

The motives behind cyber attacks can vary widely, but according to Verizon (Verizon 2014), with input from over 50 organizations around the world, the top three motives in 2013 were

1. Financial
2. Espionage
3. Ideology/fun

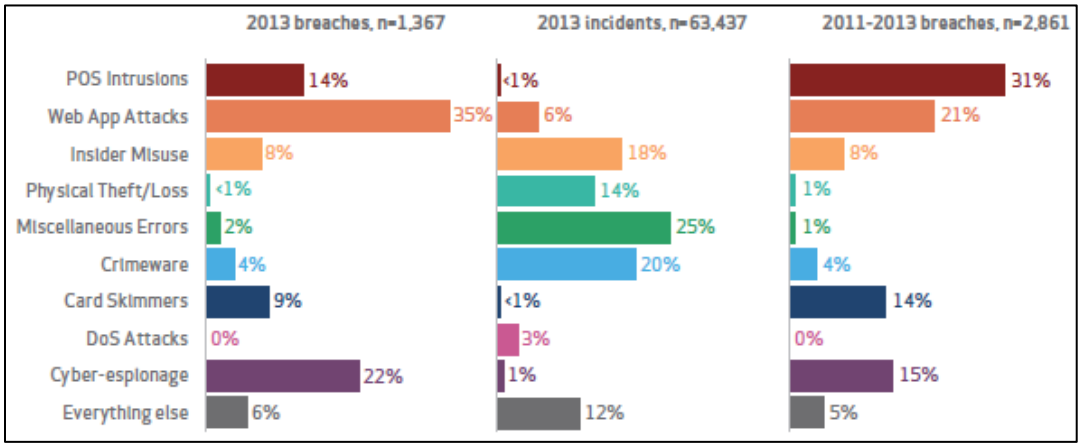
According to Verizon (Verizon 2014), 92% of over 100,000 cyber attacks over the last 10 years can be classified into nine different patterns, which are as shown for 2011-2013 in Figure 5.4.8-1. Figure 5.4.8-2 shows the percentage of all cyber attacks by pattern for several industries over that same time period.

Figure 5.4.8-2 shows that 34 percent of breaches in the public sector are Miscellaneous Errors – mistakes such as sending a sensitive document to the wrong person. Insider Misuse, Crimeware, and Theft/Loss are also significant sources of data breach; these three categories would constitute a cyber attack.

Westchester County's IT infrastructure includes the following components, which are potentially vulnerable to cyber attacks (2014 estimate).

- Nearly 5,900 network devices, including nearly 4,900 personal computers
- Over 600 servers
- Nearly 800 terabytes of data storage
- Over 6,000 phone instruments

Figure 5.4.8-1. Cyber Attack Patterns



Source: Verizon 2014

Figure 5.4.8-2. Cyber Attack Patterns by Industry

INDUSTRY	POS INTRUS-ION	WEB APP ATTACK	INSIDER MISUSE	THEFT/ LOSS	MISC. ERROR	CRIME-WARE	PAYMENT CARD SKIMMER	DENIAL OF SERVICE	CYBER ESPION-AGE	EVERY-THING ELSE
Accommodation [72]	75%	1%	8%	1%	1%	1%	<1%	10%		4%
Administrative [56]		8%	27%	12%	43%	1%		1%	1%	7%
Construction [23]	7%		13%	13%	7%	33%			13%	13%
Education [61]	<1%	19%	8%	15%	20%	6%	<1%	6%	2%	22%
Entertainment [71]	7%	22%	10%	7%	12%	2%	2%	32%		5%
Finance [52]	<1%	27%	7%	3%	5%	4%	22%	26%	<1%	6%
Healthcare [62]	9%	3%	15%	46%	12%	3%	<1%	2%	<1%	10%
Information [51]	<1%	41%	1%	1%	1%	31%	<1%	9%	1%	16%
Management [55]		11%	6%	6%	6%		11%	44%	11%	6%
Manufacturing [31,32,33]		14%	8%	4%	2%	9%		24%	30%	9%
Mining [21]			25%	10%	5%	5%	5%	5%	40%	5%
Professional [54]	<1%	9%	6%	4%	3%	3%		37%	29%	8%
Public [92]		<1%	24%	19%	34%	21%		<1%	<1%	2%
Real Estate [53]		10%	37%	13%	20%	7%			3%	10%
Retail [44,45]	31%	10%	4%	2%	2%	2%	6%	33%	<1%	10%
Trade [42]	6%	30%	6%	6%	9%	9%	3%	3%		27%
Transportation [48,49]		15%	16%	7%	6%	15%	5%	3%	24%	8%
Utilities [22]		38%	3%	1%	2%	31%		14%	7%	3%
Other [81]	1%	29%	13%	13%	10%	3%		9%	6%	17%

Source: Verizon 2014

Programs in Place to Reduce Impacts

Information Technology Systems

Mitigation of risk from cyber attacks is primarily handled by the County's Department of Information Technology with support from the County's security partners. The County's IT infrastructure includes the following components to reduce the impacts of cyber attacks:

- Firewall clusters
- Intrusion Prevention Systems (IPS) that alert on and block suspicious traffic
- Log collection platform that collects and analyzes logs from servers to detect potential threats
- Centrally managed security services that alert to potential threats within the IT environment, as well as emerging threats and vulnerabilities worldwide
- Endpoint protection (anti-virus/malware) on servers and PCs
- Data center security for enhanced monitoring & protection of critical servers
- Web filtering to block users from going to suspicious or known rogue websites
- Network traffic analysis
- NYS monthly Qualys scan report on public facing devices – Reporting on identified vulnerabilities
- Data Loss Prevention (DLP) for tracking Personally Identifiable Information (PII) or other sensitive data leaving the County's Network
- Daily and real-time reports from the County's security vendor on malware, viruses, phishing attacks, aggressive Secure Shell, and other intrusions based on the overall log collection apparatus.
- Ongoing security awareness program to educate and train county employees on cyber security best practices and policies

Response

Once an incident has been identified by the County, it is triaged to begin making decisions about how to address it. The County will then analyze computing devices, logs, and other files to identify the cause of the incident and to analyze and preserve evidence. It will then focus on identifying, removing and repairing the vulnerability that led to the incident, and thoroughly cleaning the system. After the cause of an incident has been removed or eradicated, and data or related information is restored, the County will confirm that all threats and vulnerabilities have been successfully mitigated and that new threats or vulnerabilities have not been introduced. The County will then decide to resume business operations, and will perform an after-action analysis. The analysis may consist of one or more meetings and/or reports. The purpose of the analysis is to give participants an opportunity to share and document details about the incident and to facilitate lessons learned. The meetings are held within one week of closing the incident.

Tabletop Exercise

In September 2014, Westchester County conducted a tabletop exercise to assess its cyber security capabilities. Participants included County departments, local municipalities, local utilities, and non-governmental organizations (NGO). The objectives of the exercises were as follows:

1. Examine government and partner organization capacity to manage the response to and short-term recovery from a non-traditional threat to the Westchester County area.
2. Examine government and partner organization continuity requirements and current preparedness posture.
3. Discuss multi-agency, multi-jurisdictional, and public-private sector communications and operational coordination structures and processes in the context of a no-notice incident with County-wide impacts and significant continuity implications.
4. Discuss key public messaging requirements and processes regarding an incident with widespread regional impacts, including electricity, communications and other lifeline infrastructure outages.
5. Identify gaps and challenges regarding the public-private sector response to and short-term recovery from an incident involving significant essential services disruptions/outages.

The exercise revealed strengths and areas for improvement regarding interagency coordination, communications, continuity planning, and cyber security planning.

Extent

When a cyber security incident occurs, Westchester County uses the following factors to evaluate its severity:

- Nature of the attack
- Criticality of systems that are (or could be) made unavailable
- Value of the information compromised (if any)
- Number of people, agencies, or functions impacted
- Business considerations
- Public relations
- Effects on the County's entire IT enterprise

Cyber attacks may range from the infection of a single machine by a common computer virus to a large-scale, organized incident that cripples an organization or infrastructure.

Location

The cyber attack hazard is not geography-based. Attacks can originate from any computer to affect any other computer in the world. If a system is connected to the Internet or operating on a wireless frequency, it is susceptible to exploitation. Targets of cyber attacks can be individual computers, networks, organizations, business sectors, or governments. Financial institutions and retailers are often targeted to extract personal and financial data that can be used to steal money from individuals and banks.

Previous Occurrences and Losses

The County's security vendor produces a daily report that summarizes potential threats and intrusion attempts. Actions are taken by the Department of Information Technology to mitigate security risks presented in this report, by, for example, blocking IP address ranges, identifying vulnerable servers, performing scans as necessary, opening Help Desk tickets to scan/check machines, etc.

Losses can include loss of productivity, financial theft, and the exposure of secure information. No specific losses from cyber attacks that affected the County are available.

Probability of Future Events

As is the case for any large government organization, Westchester County will continue to be impacted and compelled to respond to cyber attacks in the future. The nature of these attacks is projected to evolve in sophistication over time. The County has taken a proactive position in its cyber security efforts and is expected to remain vigilant in its efforts to prevent attacks from occurring and/or disrupting business operations. The reality remains that many computers and networks in organizations of all sizes and industries around the U.S. will continue to suffer intrusion attempts on a daily basis from viruses and malware that are passed through web sites and emails.

Vulnerability Assessment

To understand risk, a community must evaluate what assets are exposed or vulnerable in the identified hazard area. For the cyber attack hazard, all of Westchester County is exposed to this hazard. Therefore, all assets in the County (population, structures, critical facilities and lifelines), as described in the County Profile (Section 4), are exposed and potentially vulnerable to a cyber attack. The following text evaluates and estimates the potential impact of the drought hazard on the County including:

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

Overview of Vulnerability

The entire County is vulnerable to a cyber attack. Because it is difficult to predict the particular target of cyber terrorism, assessing vulnerability to the hazard is also difficult. All populations who directly use a computer or those receiving services from automated systems are vulnerable to cyber terrorism. Although all individuals in Westchester County are vulnerable to an attack, certain types of attacks would impact specific segments of the population.

If the cyber attack targeted the State's power or utility grid, individuals with medical needs would be impacted the greatest. These populations are most vulnerable because many of the life-saving systems they rely on require power. Also, if an attack occurred during months of extreme hot or cold weather, the County's elderly population (those 65 years of age and older) would be vulnerable to the effects of the lack of climate control. These individuals would require shelter or admission to a hospital. Other populations vulnerable to the secondary effects of cyber terrorism are young children.

If a cyber attack targeted a facility storing or manufacturing hazardous materials, individuals living adjacent to these facilities would be vulnerable to the secondary effects, should the attack successfully cause a critical failure at that facility.

Data and Methodology

For this hazard, data was obtained from Westchester County and the 2015 HMP Planning Committee.

Impact on Life, Health and Safety

Any individual in the County could be a victim of a cyber attack. If the attack targets infrastructure (such as the power grid) or individual life support systems in a healthcare facility, the effects of a cyber attack on life, health, and safety could be dire. Likewise, if a cyber attack affects the emergency response system, such as by rendering the 911 Center or the radio network inoperable, emergency services in the County could be hindered, which may result in increased injury or loss of life during emergency situations.

Impact on General Building Stock and Critical Facilities

Cyber attacks may affect structures if any critical electronic systems suffer service disruption. For instance, a cyber attack may cripple the electronic system that controls a cooling system or pressure system within critical infrastructure. This may result in physical damage to the structure from components overheating, or an explosion if pressure relief systems are rendered inoperable.

Impact on Economy

Economic impacts of cyber attacks could be severe, depending on the nature of the attack itself. Even simple malware that slows the performance of individual computers could result in lost business productivity. Any prolonged period of down time could significantly affect a business's financial performance. Retailers and financial institutions may be targeted to steal personal information so that the attacks' perpetrators can steal money from their victims, such as by opening credit cards with the stolen information.

Future Growth and Development

As discussed in Sections 4 and 9 of the 2015 HMP, areas targeted for future growth and development have been identified across Westchester County. Any areas of growth could be potentially impacted by the cyber attack hazard because the entire County is exposed and vulnerable. Please refer to the specific areas of development indicated in tabular form and/or on the hazard maps included in the jurisdictional annexes in Volume II, Section 9 of this plan.