

Town of Warwick, Village of Warwick, Village of Florida,
Village of Greenwood Lake

MULTI-JURISDICTIONAL MULTI-HAZARD MITIGATION PLAN



Draft: July 2013

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SECTION 1: INTRODUCTION

1.1 Purpose

Natural hazards often create emergencies and disasters that pose significant threats to public safety and health, infrastructure, private property and the overall economic wellbeing of a community. As one of the critical elements of the emergency management process, hazard mitigation focuses on actions taken prior to disaster occurrences that reduce the impact of future disasters on the community.

The Town of Warwick has joined with the Villages of Warwick, Florida and Greenwood Lake (referred to herein as ‘participating jurisdictions’) to develop a multi-jurisdictional mitigation plan. A Planning Team, consisting of representatives from each of the Jurisdictions, was put together to spearhead the development of the mitigation Plan. Additionally, Tectonic Engineering and Surveying, PC (Tectonic), was retained by the Town of Warwick to provide consulting and facilitation services in guiding the planning process as part of the Planning Team.

The Town of Warwick’s Multi – Jurisdictional, Multi – Hazard Mitigation Plan (Plan) identifies all natural hazards that may potentially impact the area and assesses the vulnerability and risks posed to community; develops strategies for the mitigation of those identified hazards; presents future plan maintenance procedures, and documents the planning of the entire process. Through developing this Plan in compliance with Disaster Mitigation Act (DMA) 2000 requirements, the participating jurisdictions can become eligible to apply and receive Federal funding. The State of New York as well as the Federal Emergency Management Agency’s (FEMA) review of this Plan will serve as the base criteria for updated future plans.

1.2 Document Organization

1.2.1 General Content and Arrangement

This Plan is arranged and formatted to facilitate its review based on the review guidelines recently published by FEMA¹ and is comprised of the following major sections:

¹ 2011, FEMA, Local Mitigation Plan Review Guide

Section 1: Introduction – This section provides the plan purpose, introductory information (Town and Village overviews), document organization and key terms.

Section 2: Plan Development Process – This section provides detail description of the Planning Team; summarizes public involvement efforts; outlines reference documents and plan integration methods.

Section 3: Identification of Potential Hazards – This section provides the Planning Team’s documentation for the evaluation of a full range of natural hazards, and indication of which hazards were identified and included in this plan and why they were included in contrast to those that were not addressed.

Section 4: Risk Assessment – This section provides a summary of the identification and profiling of natural hazards that impact the Town and Villages, and details the vulnerability analysis methodology for each hazard using a Calculated Priority Risk Index evaluation (CPRI), critical facilities and infrastructure, loss estimations and development trend analysis.

Section 5: Mitigation Strategy – This section provides a summary of the Town of Villages’ capabilities and resources for hazard mitigation, National Flood Insurance Program (NFIP) participation, hazard mitigation goals and a summary of mitigation actions considered by the participating jurisdictions. New mitigation actions/projects and their implementation strategies are also touched on in this section.

Section 6: Plan Maintenance Procedures – This section outlines the proposed strategy for evaluating and monitoring the Plan, updating the Plan in the next 5 years, incorporating plan elements into existing planning mechanisms and continued public involvement.

Appendices: Appendices are provided for documenting various elements of and details of the planning process.

1.3 Regulatory Compliance

1.3.1 DMA 2000 Requirements

The Town of Warwick Multi – Jurisdictional, Multi – Hazard Mitigation Plan has been produced in compliance with Section 322 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1988 (Stafford Act), 42 U.S.C 5165, as amended by Section 104 of the Disaster Mitigation Act of 2000 (DMA 2000) Public Law 106 – 930 enacted October 30, 2000. The regulations governing the mitigation planning requirements for local mitigation plans are published under the Code of Federal Regulations (CFR) Title 44, Section 201.6 (44 CFR §201.6). Additionally, the Plan addresses flooding and meets the minimum planning requirements for the Flood Mitigation Assistance Program as provided for under 44 CFR §78.

DMA 2000 provides requirements for states, tribes and local governments to undertake a risk-based approach for reducing risks to natural hazards through mitigation planning². The local mitigation plan is the representation of the jurisdiction’s commitment to reduce risks from natural hazards, serving as a guide for decision makers as they commit resources to reducing the effects of natural hazards. Local plans also serve as a tool for a state to provide technical assistance and prioritize project funding.

Under 44 CFR §201.6, local governments must have a FEMA – approved local mitigation plan in order to apply for and/or receive project grants under the following hazard mitigation assistance programs:

- Hazard Mitigation Grant Program (HMGP)
- Pre – Disaster Mitigation (PDM)
- Flood Mitigation Assistance (FMA)
- Severe Repetitive Loss (SRL)

FEMA, at its discretion, may also require a local mitigation plan under the Repetitive Flood Claims (RFC) program as well.

² FEMA, 2008, *Local Multi-Hazard Mitigation Planning Guidance*

1.3.2 FEMA Plan Review Criteria

In developing this Plan, the Planning Team used FEMA’s Local Mitigation Plan Review Guide and the Multi – Hazard Mitigation Planning Guidance document (October 1, 2011) as guides. The Multi – Hazard Mitigation Planning Guidance acts a Crosswalk permitting FEMA reviewers to track whether various criteria have been addressed in the Plan.

Table 1.1 lists requirements that are specified in the DMA 2000 Interim Final Rule and where implementation of the required regulation is addressed in this plan.

Table 1.1	
FEMA PLAN REVIEW CRITERIA	
FEMA Plan Review Criteria	Addressed in this Plan
Prerequisites	
Adoption by the Local Governing Body §201.6(c)(5)	Section 1.4 and Appendix E
Multi – Jurisdictional Plan Adoption §201.6(c)(5)	Not Applicable
Multi – Jurisdictional Planning Participation §201.6(a)(3)	Section 2
Planning Process	
Documentation of the Planning Process: §201.6(b)	Section 2 and Appendix C
Risk Assessment	
Identifying Hazards §201.6(c)(2)(i)	Section 3
Profiling Hazards §201.6(c)(2)(i)	Section 4.2
Assessing Vulnerability: Overview: §201.6(c)(2)(ii)	Section 4
Assessing Vulnerability: Addressing Repetitive Loss Properties: §201.6(c)(2)(ii)	Section 4
Assessing Vulnerability: Estimating Potential Losses: §201.6(c)(2)(ii)(B)	Section 4
Assessing Vulnerability: Analyzing Development Trends: §201.6(c)(2)(ii)(C)	Section 4
Multi – Jurisdictional Risk Assessment: §201.6(c)(2)(iii)	Section 4
Mitigation Strategy	
Local Hazard Mitigation Goals: §201.6(c)(3)(i)	Section 5.2
Identification and Analysis of Mitigation Actions §201.6(c)(3)(ii)	Section 5
Identification and Analysis of Mitigation Actions: NFIP Compliance: §201.6(c)(3)(iii)	Section 5
Implementation of Mitigation Actions: §201.6(c)(3)(iii)	Section 5.32 and Appendix D
Multi – Jurisdictional Mitigation Actions: §201.6(c)(3)(iv)	Section 5.32 and Appendix G
Plan Maintenance Process	

Monitoring, Evaluating and Updating the Plan: §201.6(c)(4)(i)	Section 6
Incorporation into Existing Planning Mechanisms: §201.6(c)(4)(ii)	Section 6
Continued Public Involvement: §201.6(c)(4)(iii)	Section 6

1.4 Official Jurisdiction Participation and Record of Adoption and Approval

Adoption of the Plan is accomplished by the governing body for each participating jurisdiction in accordance with the authority and powers granted to those jurisdictions by the State of New York. The officially participating jurisdictions in the Plan include:

Plan Participants	
Ñ	Town of Warwick
Ñ	Village of Florida
Ñ	Village of Greenwood Lake
Ñ	Village of Warwick

Each jurisdiction will keep a copy of their official resolution of adoption that is located in Appendix E of their copy of the Plan.

The Plan was submitted to the New York State Office of Emergency Management (NYSOEM) and FEMA for review and approval. FEMA’s approval letter is also included in Appendix E.

1.5 Town and Village Overview

1.5.1. Town of Warwick

The Town of Warwick contains 3 villages and 16 hamlets. The villages consist of Florida, Greenwood Lake and Warwick; and the hamlets of Amity, Bellvale, Big Island, Black Walnut Hill, Durland, Edenville, Hoopstick, Lakeville, Liberty Corners, Little York, New Milford, Newport, Pine Island, Quaker Creek, Snufftown and Wisner.

Figure 1.1 on the following page details the location of the Town of Warwick in relation to Orange County and the State of New York.

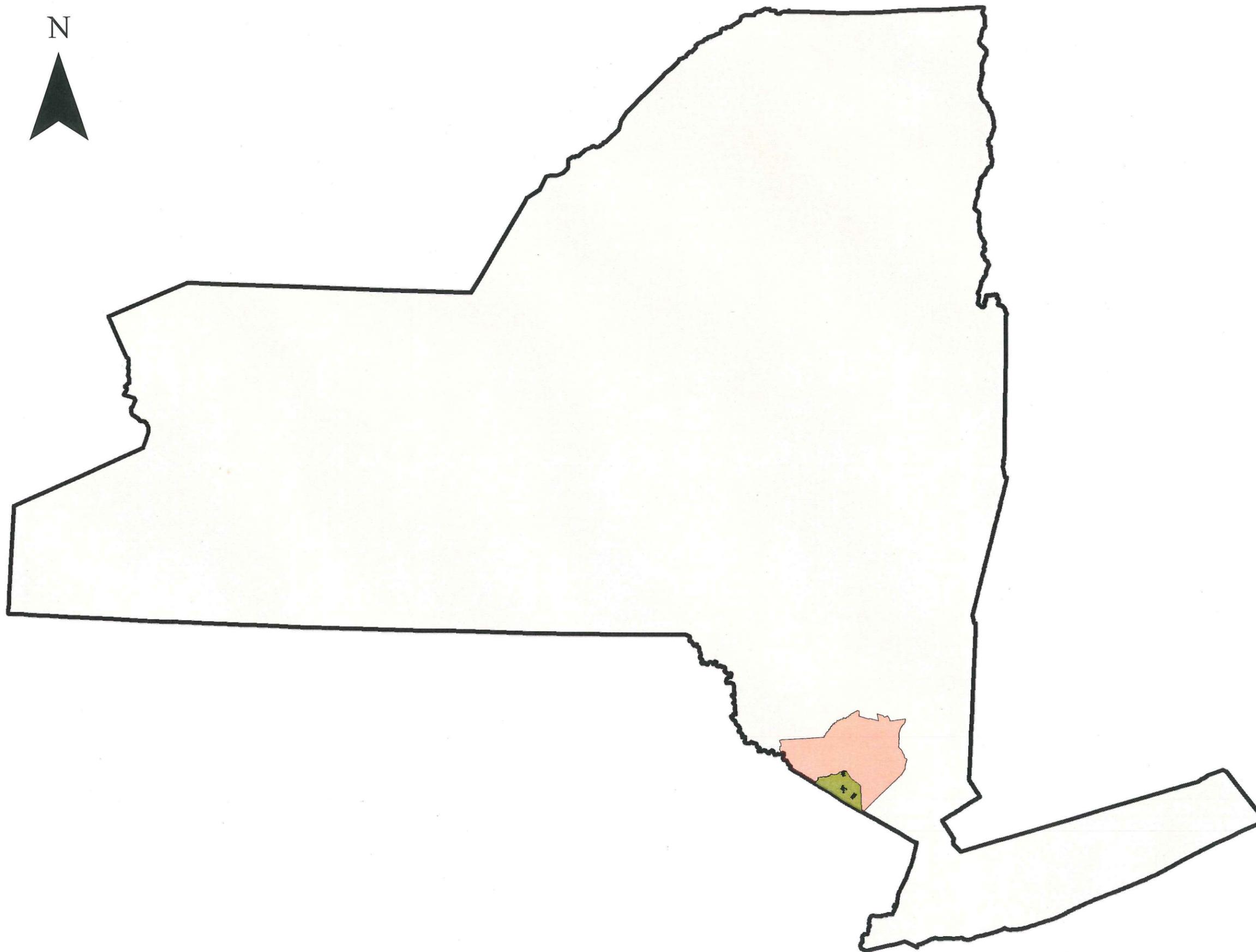
**Figure 1.1
LOCATION MAP**

**WARWICK HMP
ORANGE COUNTY
NEW YORK**

APRIL 2013

Legend

-  Villages Within Warwick
-  Warwick Boundary
-  Orange County Boundary
-  New York State Boundary



0 12.5 25 50 75 100
Miles

Source: Orange County GIS (2009), Municipalities (2013)

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Geodatabase Location:
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History – The Town of Warwick is one of the 42 municipalities located in the County of Orange, New York. It was formed in 1788 by an act of the State Legislature and is still considered one of the largest towns in total area within the state of New York. The Town was initially divided into three districts: eastern, middle and western. Within each district there was a Collector, Commissioner of roads and an Assessor. Up until 1845, the Town of Warwick was able to keep its original boundaries, when the northeast east area was separated to become what is presently known as the Town of Chester. Several other hamlets were in existence before the town was formed. Early settlers made good use of the Longhouse Creek, building dams and mills and an iron forge thus giving the Hamlet of Bellvale its start. Doublekill was another stream used for water-power and mills, and from there the Hamlet of New Milford grew. The community of Florida was also established by the middle of the 1700's³. During the 1800's, Amity, Edenville and Pine Island became centers of population in the midst of the surrounding dairy, fruit and vegetable farms. Iron mining, charcoal burning and lumbering were occupations of settlers in the mountains from Sterling to Cascade; quarrying provided work near Mount Adam and Mount Eve. Greenwood Lake became well-known to hunters and fishermen and evolved into a popular resort and recreation area⁴.

Geography – The Town of Warwick is located in the southwest region of Orange County, New York. It is bordered to the north by the Town of Chester, to the east by the Town of Tuxedo and to the south and west by New Jersey townships of West Milford and Vernon.

The Town is the second largest township for the State of New York, according to the U.S Census. The topography for the Town is divided into three districts that include: a black dirt farmland region (located in the west), a rolling hills region (located in the central portion) and the Ramapo Mountains region (located in the east). The total area of the Town covers 104.9 square miles with approximately 3.2 square miles of that attributed to water. There are two major drainage basins. The majority of the water in the Town drains north toward the Hudson River via the Wallkill River, which is a tributary to the Rondout Creek. Greenwood Lake and the Sterling Forest area drain southward toward the Passaic River in New Jersey.⁵ The Greenwood Lake, located on the eastern part of the town, extends towards the southern New York border and is the largest in Orange

³ Town of Warwick, 2012, webpage URL: <http://www.townofwarwick.org/about.shtml>

⁴ Ibid

⁵ *Town of Warwick Comprehensive Plan*, 2008, Pg.41.

County. Four other smaller lakes are located within the Town of Warwick which includes Cascade, Glenmere, Sterling and Wickham Lakes.

Transportation – There are two major roadway transportation routes that serve the Town of Warwick and its jurisdictions; New York State routes 17A and NY 94. State Route 94 runs north and south connecting Warwick with New Jersey and passes through the Villages of Warwick and Florida to Route 17 in Chester. Route 17A provides a major east – west link passing through Warwick and Greenwood Lake and finally joining to the New York State Thruway (I-87)⁶.

Two major railroad lines run through the Town. With both running in a northeasterly/southwesterly direction, one line runs through the center of the Village of Warwick while the other runs along the northwestern boarder of the Town. Western Railway, New York Susquehanna and ConRail all operate on these rail lines.

In addition to road and rail transportation, The Town of Warwick also owns the Warwick Municipal Airport which acts as a public-use airport. Figure 1.2 on the following page details the transportation routes in the Town of Warwick.

Population – The following Table provides population estimates for the participating Jurisdictions.

Table 1.2: TOWN OF WARWICK, VILLAGES OF FLORIDA, GREENWOOD LAKE AND WARWICK POPULATION ESTIMATES			
Municipality	Population Year 1990	Population Year 2000	Population Year 2010
Town of Warwick	27,193	30,764	32,065
Villages			
Village of Florida	2,497	2,571	2,833
Village of Greenwood Lake	3,208	3,800	3,154
Village of Warwick	5,984	6,412	6,713
<i>Sources: - Figures based on US Census Bureau, Orange County Hazard Mitigation Plan 2011 and Village Comprehensive Plans</i>			

⁶ Town of Warwick Comprehensive Plan, 2008, Pg.49

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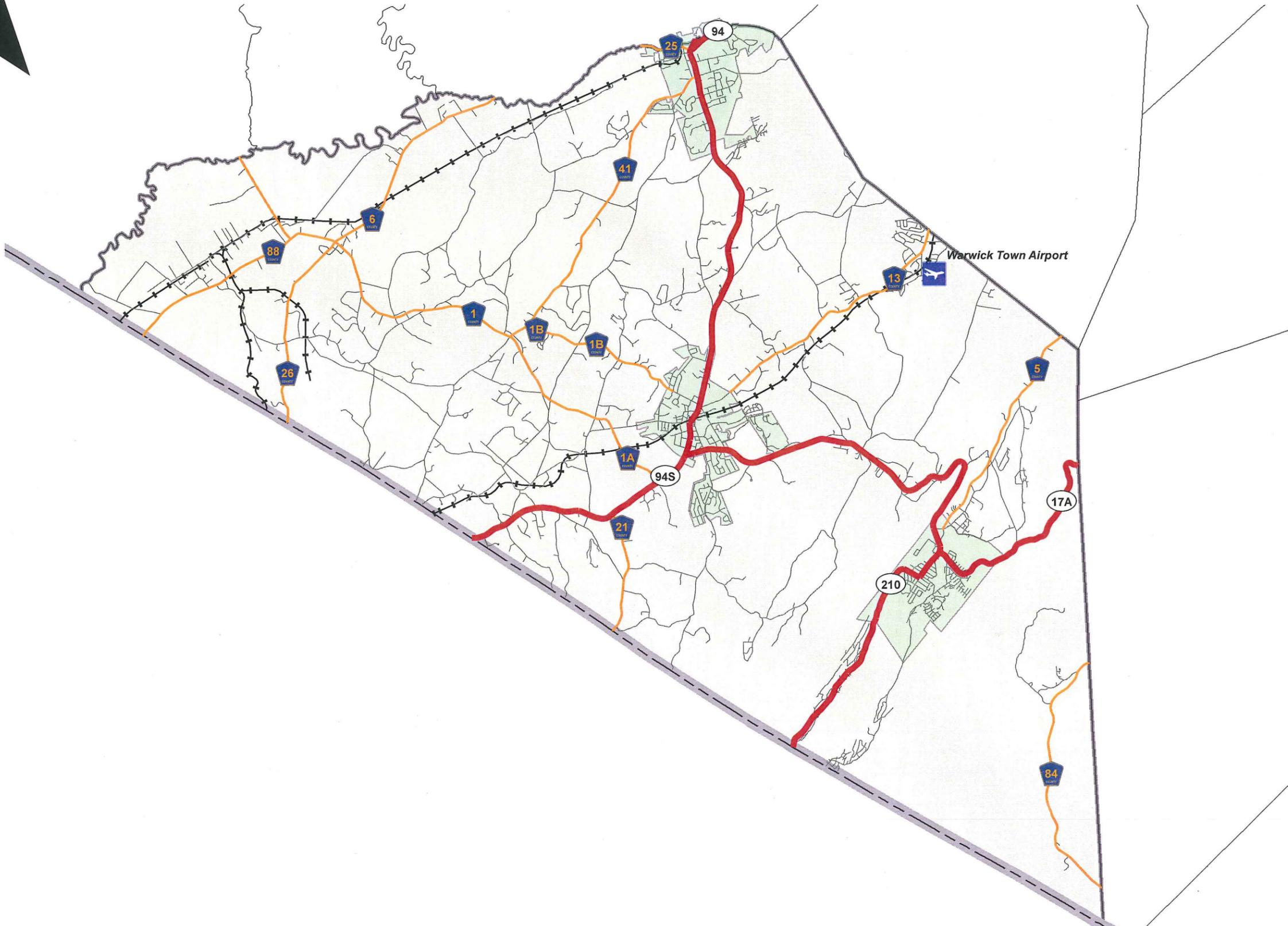


Figure 1.2 MULTI- JURISDICTIONAL TRANSPORTATION ROUTES

WARWICK HMP ORANGE COUNTY NEW YORK

APRIL 2013

Legend

-  Airport
-  State Roads
-  County Roads
-  Local Roads
-  Warwick Railroads
-  Villages
-  New York State Boundary
-  Cities/Towns
-  Warwick Town Boundary

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Geodatabase Location:
G:GIS/PROJECTS/5532/5532-6001



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Source: Orange County GIS (2009), Municipalities (2013)

Economy – The Town’s most recent Comprehensive Plan⁷ discusses the economic conditions and factors impacting the Town of Warwick. Information and excerpts from that document are included below. The Town and Villages’ economic life is tied to tourism related to the various scenic landscapes, history and agriculture of the communities.

a.) Agriculture

Agriculture is part of the Town’s heritage and is still a major factor to its economy and culture. The Town of Warwick’s public has stressed the importance of preserving the Town’s rural qualities that contributes to scenic landscapes and provides local employment. Farming in Warwick has transitioned from almost exclusively wholesale distribution of milk, meat and produce to a mix of wholesale and direct consumer marketing.⁸

b.) Employment

Agricultural, industrial and commercial sector jobs are all a part of the local economy as well as numerous new private sector business jobs. Some of the largest employers for the Town of Warwick include the Tri – State Health System, the Warwick Valley Central School District, Jones Chemical, Cable Vision and Warwick Valley Telephone Company (Alteva).

Growth Trends – According to the Town of Warwick’s Comprehensive Plan (2008), a main community goal for the Town consist of concentrating denser residential development around the villages and hamlets to maintain rural densities in the remainder of the Town, all the while encouraging a mixed-use pattern of development in and around the hamlets adjacent to the villages. Subdivision regulations ensure that practices within the Town’s conservation zoning districts have environmentally sensitive areas with a lower density of development.

In the past five years the Town of Warwick has experienced minimal growth in the form of residential housing developments. During the past five years, only 41 lots have

⁷ Town of Warwick, *Warwick Comprehensive Plan – 2008*

⁸ *Warwick Comprehensive Plan – November 2008, p.59*

received approval in the Town of Warwick. The vast majority of these subdivisions have been 2nd or 31st Street subdivisions, some with existing homes on them.

The Town of Warwick has many subdivisions, some very large subdivisions, that have a conditional final approval, but have not actively pursued or been able to satisfy the conditions of approval. This is due to the current state of the residential housing market, the overall economy and the Town's active involvement in the Purchase of Development Rights Program (PDR).

1.5.2 Village of Florida

History – The Village of Florida was founded in 1760 and in the 1800's attracted immigrants due to the fertile soils (referred to as "black dirt") surrounding the area. During the 1920's, water rights and eventually full ownership of Glenmere Lake were obtained by the Village of Florida. In 1946, the Village became incorporated.

Geography – The Village of Florida is situated in the northern portion of the Town and has a total land area of 1.9 square miles. Glenmere Lake (reservoir) is located on the east side of the Village. Black dirt regions of Warwick are located west of the Village and farming in these areas is known for its abundant onion crops.

Economy – Commercial retail within the downtown area of the Village serves as one of the core economic hubs for the community.

Growth Trends – Recent past development trends for the Village of Florida concerning residential housing included Glenview Hills which was approved in 2006 for 93 single – family lots located in the northeast corner of the Village. Currently, 50% of these lots have had units built on them with 20 being built within the last three years. Several older buildings within the Central Shopping District have been renovated and upgraded to store fronts, offices and other businesses. New businesses such as Mavis Tires, Dollar Tree and Quick Chek also were developed within the General Commercial District Area.

There are a couple preliminary plans for residential housing developments such as Glenmere Preserve (a 152 unit, age 55 restricted PAC located in the southeastern part of the Village) that have received final Planning Board approval with construction being schedule to begin later this year. Chelmsford Hills (a 112 unit PAC on the north end of

the village) currently has received initial approval from the Planning Board. Future commercial developments, such as Pharmline Inc., are expanding with a new 40,000 square foot building at the end of Bridge Street.

1.5.3 *Village of Greenwood Lake*

History – The Village of Greenwood Lake was first settled in the 1700’s as a community solely based on farming. The Village served as a resort area in the late 1800’s and early 1900’s. Over the years it has progressed in becoming a residential community with attractions.

Geography – The Village of Greenwood Lake is a small lake community located in the southern region of Orange County within the Town of Warwick as shown in Figure 1.5. The total area of the Village of Greenwood Lake encompasses 2.5 square miles, of which approximately 2 square miles of it is land and .4 square miles of it is water. The Village lies at the northern end of the lake. Greenwood Lake is 9 miles long and extends from the northern village line into the State of New Jersey. The lake is controlled by a dam outlet in Awosting, New Jersey.⁹ New York State Route 17 A, 210 and County Route 5 serves as transportation routes for the Village of Greenwood Lake. New York State Route 210 crosses the southwestern portion of the Village before it hits the intersection of Route 17A. New York State Route 17 A runs along the Village’s northeastern boundary and heads west and north into the Town of Warwick. Route 5 (county highway route) from the northeast, enters the Village where it then meets and ends at State Route 17 A.

Economy – The Village of Greenwood Lake is still known as a resort destination with an economic base relying on lake recreation activities such as fishing, skiing, boating and sledding. Commercial properties such as restaurants, marinas and small businesses are also located along sections of New York State Routes 17 A and 210.

Growth Trends – Within the past 5 years there were no significant areas available for development within the Village of Greenwood Lake. Any areas that were not developed were located in steep slope areas. Current new developments within the Village of Greenwood Lake consist of existing buildings being repurposed or improved.

⁹ *Village of Greenwood Lake Flood Mitigation Plan 2008.*

1.5.4 Village of Warwick

History – The Village of Warwick was incorporated in 1867. During the early 20th Century the Village of Warwick had its own power and telephone company and had become the area’s principal shopping center and mecca for summer vacationers.¹⁰ In the 1960’s public parking lots were built, shade trees were planted, businesses were modernized and historic homes and buildings were restored.¹¹

Geography – The Village of Warwick is located within the center of the Town and has a total land area of 2.32 square miles.¹² Communities that border the Village of Warwick include Bellvale (to the east), New Milford (southwest), Wisner (northeast) and Edenville (to the west). Located at the center of the Village is the intersection to State Route 94 and 17 A which connects the Village of Warwick to the Villages of Florida and Greenwood Lake. Other County Highways that connect and lead to the Village include County routes 1A, 1B and 13.

Economy – The Village of Warwick contains a variety of commercial retailers in the Downtown / Main Street area that include recreation, shopping, dining facilities and other various facilities that contribute to the economy for the Village.

Growth Trends – According to the Village of Warwick Comprehensive Plan¹³ the Village experienced a 7.15% population increase from 1990 through 2000. In comparison, the Village experienced its largest increase between the years of 1980 through 1990 at 38.52%. Development trends that have occurred in the Village of Warwick over the past five years include the development of the first phase of Warwick Grove (a planned 150 unit adult community).

Recently, the Village of Warwick completed the development of the Liberty Green adult community which includes approximately 300 apartment units. The Village also anticipates the completion of the second phase of Warwick Grove adult community by constructing an additional 150 units. This project will bring the total residential units in Warwick Grove to 300, consisting of a mixture of condos, townhouses and single family

¹⁰ Hull, Richard W., *Village of Warwick Comprehensive Plan 2004, History of the Village of Warwick* webpage, http://www.villageofwarwick.org/history/l_history.shtml

¹¹ Ibid

¹² Orange County GIS Parcel Data

¹³ *Village of Warwick, 2004, Comprehensive Plan*

units. Other planned developments include Warwick Meadows (a 180 unit development in 12 buildings) and Valley View Estates (a 30 single family home building development). By 2020, assuming the average population growth rate of the past 3 decades at 22%, the Village of Warwick’s estimated population projection will be at 9,520.¹⁴

1.6 FEMA Disaster Declarations

Under the authority of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (the “Stafford Act”), the President of the United States can declare disaster or emergency declarations for States and Localities that have been affected by a disaster. Tables 1.3 and 1.4 provide a summary of disaster and emergency declarations for the State of New York due to natural hazards and whether or not the County of Orange was part of the declared area . The tables also list the type of eligible assistance that was available for the County, ie; Individual Assistance (IA) or Public Assistance (PA). Since 1954, New York State has had 66 Major Disaster Declarations and 22 Emergency Declarations. Out of those declarations, Orange County was affected by a total of 15 of the Disaster Declarations and 5 of the Emergency Declarations.

Table 1.3: NEW YORK STATE MAJOR DISASTER DECLARATION 1954 - 2012 <i>(Source: http://www.fema.gov/disasters/grid/state/38?field_disaster_type_term_tid_1=All)</i>				
Year	Date	Disaster Type	Disaster Number	Was Orange County Also Designated?
2012	10 / 30	Hurricane Sandy	4085	Yes: IA, PA
2011	9 / 13	Remnants of Tropical Storm Lee	4031	Yes: IA, PA
2011	8 / 31	Hurricane Irene	4020	Yes: IA, PA
2011	6 / 10	Severe Storms, Flooding, Tornadoes, and Straight – line winds	1993	No
2011	2 / 18	Severe Winter Storm and Snowstorm	1957	No
2010	10 / 14	Severe Storms, Tornadoes, and Straight – Line Winds	1943	No

¹⁴ Ibid (*Village of Warwick Comprehensive Plan*), p.20, *Population estimate stem from a projected 2010 base population of 7,813. Items after 2010 are assumed with no additional annexation beyond village boundaries.*

**Town of Warwick, Village of Florida, Village of Greenwood Lake and Village of Warwick
MULTI – JURISDICTIONAL, MULTI – HAZARD MITIGATION PLAN – DRAFT**

2010	4 / 16	Severe Storms and Flooding	1899	Yes: PA
2009	12 / 31	Severe Storms and Flooding Associated with Tropical Depression Ida and a Nor'easter	1869	No
2009	9 / 1	Severe Storms and Flooding	1857	No
2009	3 / 4	Severe Winter Storm	1827	No
2007	8 / 31	Severe Storms, Flooding, and Tornado	1724	No
2007	7 / 2	Severe Storms and Flooding	1710	No
2007	4 / 24	Severe Storms and Inland and Coastal Flooding	1692	Yes: IA, PA
2006	12 / 12	Severe Storms and Flooding	1670	No
2006	10 / 24	Severe Storms and Flooding	1665	No
2006	7 / 1	Severe Storms and Flooding	1650	Yes: IA
2005	4 / 19	Severe Storms and Flooding	1589	Yes: IA, PA
2004	10 / 1	Tropical Depression Ivan	1565	Yes: IA, PA
2004	8 / 3	Severe Storms and Flooding	1534	No
2003	8 / 29	Severe Storms, Tornadoes and Flooding	1486	No
2003	5 / 12	Ice Storm	1467	No
2002	5 / 16	Earthquake	1415	No
2002	3 / 1	Snowstorm	1404	No
2000	7 / 21	Severe Storms	1335	No
1999	9 / 19	Hurricane Floyd	1296	Yes: IA, PA
1998	9 / 11	Severe Storms	1244	No
1998	7 / 7	Severe Storms and Flooding	1233	No

**Town of Warwick, Village of Florida, Village of Greenwood Lake and Village of Warwick
MULTI – JURISDICTIONAL, MULTI – HAZARD MITIGATION PLAN – DRAFT**

1998	6 / 16	New York Severe Thunderstorms and Tornadoes	1222	No
1998	1 / 10	Ice Storm	1196	No
1996	12 / 9	Severe Storms / Flooding	1148	No
1996	11 / 19	Severe Storms / Flooding	1146	No
1996	1 / 24	Severe Storms / Flooding	1095	Yes: IA, PA
1996	1 / 12	Blizzard	1083	Yes: PA
1992	12 / 21	Coastal Storm, High Tides, Heavy Rain, Flooding	974	No
1991	9 / 16	Hurricane Bob	918	No
1991	3 / 21	Severe Storm, Winter Storm	898	No
1987	11 / 10	Severe Winter Storms	801	No
1987	5 / 15	Flooding	792	No
1985	10 / 18	Hurricane Gloria	750	No
1985	3 / 22	Snow Melt, Ice Jams	734	No
1985	3 / 20	Flooding	733	No
1984	9 / 25	Severe Storms / Flooding	725	No
1984	4 / 17	Coastal Storms / Flooding	702	Yes: IA, PA
1977	2 / 5	Snowstorms	527	No
1976	9 / 3	Hurricane Belle	520	No
1976	7 / 21	Severe Storms / Flooding	515	No
1976	6 / 29	Flash Flooding	512	No
1976	3 / 19	Ice Storm, Severe Storms, Flooding	494	No
1975	10 / 2	Hurricane Eloise	487	No
1974	7 / 23	Severe Storms / Flooding	447	No
1973	7 / 20	Severe Storms / Flooding	401	No
1973	3 / 21	High Winds, Wave Action and Flooding	367	No

**Town of Warwick, Village of Florida, Village of Greenwood Lake and Village of Warwick
MULTI – JURISDICTIONAL, MULTI – HAZARD MITIGATION PLAN – DRAFT**

1972	6 / 23	Tropical Storm Agnes	338	Yes: IA, PA
1971	9 / 13	Severe Storms / Flooding	311	Yes: PA
1970	7 / 22	Heavy Rains, Flooding	290	No
1969	8 / 26	Heavy Rains, Flooding	275	No
1967	10 / 30	Severe Storms / Flooding	233	No
1965	8 / 18	Water Shortage	204	Yes: IA, PA
1963	8 / 23	Heavy Rains, Flooding	158	No
1962	3 / 16	Severe Storm, High Tides, Flooding	129	No
1956	3 / 29	Flood	52	N / A
1955	8 / 22	Hurricanes Connie and Diane	45	N / A
1954	10 / 7	Hurricanes Carol and Hazel	26	N / A

Table 1.4: NEW YORK STATE EMERGENCY DECLARATIONS 1954 - 2012

Year	Date	Disaster Type	Disaster Number	Was Orange County Designated
2012	10 / 28	Hurricane Sandy	3351	Yes: PA
2011	9 / 8	Remnants of Tropical Storm Lee	3341	No
2011	8 / 26	Hurricane Irene	3328	Yes: PA
2008	12 / 18	Severe Winter Storm	3299	No
2007	2 / 23	Snow	3273	No
2006	10 / 15	Snowstorm	3268	No
2005	9 / 30	Hurricane Katrina Evacuation	3262	Yes: PA
2004	3 / 3	Snow	3195	No
2003	8 / 23	Power Outage	3186	Yes: PA
2003	3 / 27	Snowstorm	3184	Yes: PA
2003	2 / 26	Snowstorm	3173	No
2002	1 / 1	Snowstorm	3170	No
2000	12 / 4	Snowstorm	3157	No
1999	9 / 18	Hurricane Floyd	3149	No

1999	3 / 10	Winter Storm	3138	No
1999	1 / 15	Snow Emergency	3136	No
1993	3 / 17	Severe Blizzard	3107	N / A
1977	1 / 29	Snowstorms	3027	No
1974	11 / 2	Flooding (NYS Barge Canal)	3004	N / A

1.7 Key Terms

Actions / Projects – specific projects or actions that help achieve goals and objectives.

Asset – Any natural or human – caused feature that has value, including, but not limited to people; buildings; infrastructure such as bridges, roads, sewer and water systems; lifelines like electricity and communication resources; or environmental, cultural, or recreational features like parks, dunes, wetlands or landmarks.

Building – A structure that is walled and roofed principally above ground and permanently affixed to a site. The term also includes a manufactured home on a permanent foundation on which the wheels and axles carry no weight.

Disaster Mitigation Act of 2000 (DMA2K) – A law signed by the President on October 30, 2000 that encourages and rewards local and state pre – disaster planning, promotes sustainability as a strategy for disaster resistance, and is intended to integrate state and local planning with the aim of strengthening statewide mitigation planning.

Federal Emergency Management Agency (FEMA) – Formerly an independent agency created in 1978 to provide a single point of accountability for all Federal activities related to disaster mitigation and emergency preparedness, response and recovery. As of March 2003, FEMA is part of the Department of Homeland Security’s Emergency Preparedness and Response (EPR) Directorate.

Flood Insurance Rate Map (FIRM) – A map of a community, prepared by FEMA that shows the special flood hazard areas and the risk premium zones applicable to the community.

Geographic Information Systems (GIS) – A computer software application that relates physical features on the earth to a database to be used for mapping and analysis.

Goals – General guidelines that explain what you want to achieve that are usually broad statements with long – term perspective.

Hazard – Includes a source of potential danger or an adverse condition. Hazards include both natural and human-caused events. A natural event is a hazard when it has the potential to harm people or property and may include events such as floods, earthquakes, tornadoes, tsunami, coastal storms, landslides and wildfires that strike populated areas. Human-caused hazard events originate from human activity and may include technological hazards and terrorism. Technological hazards arise from human activities and are assumed to be accidental and/or have unintended consequences (e.g., manufacture, storage and use of hazardous materials). While no single definition of terrorism exists, the Code of Federal Regulations defines terrorism as “...unlawful use of force and violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives.”

Hazard Mitigation – Any approach that alters, eliminates, bypass and / or reduce natural hazards that aids in eliminating or decreasing the long – term risks to human life, property and other critical assets.

Hazard Profile – a description of physical characteristics of hazards accompanied with a determination of various descriptors such as frequency, extent, magnitude and probability.

Natural Hazard – any hazards that result from acts of nature. Some examples include winter storms, wildfire, floods and tornados.

Hazard Mitigation Plan – an organized plan that documents and assess natural hazards and the magnitude that certain events will occur.

Hazard Mitigation Planning – the process of administrating actions taken by professional organizations and individual citizens participating in mitigation activities.

Disaster – Any sudden incident, ranging from natural disasters to accidents that contribute damage to property, injuries and loss of life.

Human-Caused Hazards – Conditions that provide a potential risk to life and property that include criminal, intentional acts of terrorism and technological hazards incidents that factor from human tasks dealing with hazardous chemicals, transportation, manufacture and storage.

100 – Hundred Year Floodplain – Also known as the 100 Year Base Flood Elevation (BFE) and Special Flood Hazard Area (SFHA). The Hundred Year Floodplain is areas within a floodplain, having a 1% or greater chance of flood occurrence in any given year.

Q3 Data – a digital representation of certain features of FEMA’s Flood Insurance Rate Map (FIRM) product, intended for use with desktop mapping and Geographic Information Systems technology. The digital Q3 Flood Data are created by scanning the effective FIRM paper maps and digitizing selected features and lines. The digital Q3 Flood Data are designed to serve FEMA’s needs for disaster response activities, National Flood Insurance Program activities, risk assessment and floodplain management.

Repetitive Loss Property – property that is currently insured by which two or more National Flood Insurance Program losses – occurring more than ten days apart, of at least \$1,000 each have been paid within any 10 year period since 1978.

Risk – an estimated impact that a hazard would have on people, services facilities and structures in a community; the likelihood of a hazard event resulting in an adverse condition that causes damage or injury.

Vulnerability – describes how exposed or susceptible to damage an asset is. Vulnerability depends on an asset’s construction, contents, and the economic value of its functions.

Vulnerability Analyses – the extent of damage and injury that may result from a hazard event of a given intensity in a given area. It also addresses the impacts of hazard events on the existing and future built environment.

SECTION 2: PLAN DEVELOPMENT PROCESS

2.1 Planning Process Description

The Town of Warwick applied for and was approved for Hazard Mitigation Grant Program (HMGP) funding. Upon receiving the grant, the Town initiated a Request For Proposal process and selected Tectonic to work with the participating jurisdictions and guide the planning process. Four jurisdictions actively participated in the plan update effort and will officially adopt the Plan. An initial project kick-off meeting between the Town of Warwick and Tectonic was held December 10, 2012 to begin the planning process, outline plan objectives, and outline the anticipated meeting agendas for the planning efforts and to discuss the proposed plan format and other administrative tasks. Initial points of contact were established between the Town of Warwick and Tectonic. Four Planning Team meetings were conducted within a four month period, starting with the first meeting on December 10, 2012 and the final meeting being held on April 4, 2013. Throughout that period and for several months afterward, all work necessary to collect, process and document data and prepare the draft of the Plan was performed. Details relevant to key contact information and promulgation authorities, Planning Team selection, participation, activities and public involvement are discussed in the following sections.

2.1.1 Previous Planning Process Assessment

There have been no previous Hazard Mitigation Plans specifically for the Town of Warwick and Villages of Warwick, Florida and Greenwood Lake.

2.2 Planning Team

The process used to create the 2013 Plan included a multi-jurisdictional Planning Team. The Planning Team comprised of one or more representatives from each participating jurisdiction in addition to other invited and interested agencies and organizations. There were also local teams made up of specific individuals involved in assisting their Planning Team representatives in the completion of task assignments and worksheets.

The role of the Planning Team was to work with the Tectonic to perform the coordination, research and planning element activities required for the 2013 Plan. Attendance to every Planning Team meeting was required by each participating jurisdiction because each meeting

was structured to progress step by step through the planning process. Procedures and steps for the 2013 Plan were discussed and addressed at each meeting, and task assignments and corresponding worksheets were normally assigned. Each of the meeting’s content and discussions were built on information received and discussed at previous meetings, creating a stepwise and systematic process for preparing the 2013 Plan. The Planning Team was tasked with:

- Ensuring 100 % attendance / Representation at Planning Team meetings.
- Convey information and assignments received at the Planning Team meetings to the Local Planning Team for discussion and completion.
- Ensure timely assignment completion.
- Arrange for review and official plan adoption of the Plan.

The function and role of the Local teams were to:

- Provide support and data.
- Assist representative(s) in completing each assignment and the associated worksheets.
- Make planning decisions regarding Plan components.
- Review the Plan draft documents.

2.2.1 Primary and Jurisdictional Point of Contacts

A primary point of contact (PPOC) was established for the Town and jurisdictional points of contact (JPOC) were established for each participating village. Table 2.1 summarizes the PPOC and JPOCs for the Town and Villages.

Table 2.1: LIST OF PRIMARY POINT OF CONTACT AND JURISDICTIONAL POINTS OF CONTACT

Jurisdiction	Name	Department / Position	Phone	Email
Town of Warwick	Michael Sweeton (PPOC)	Supervisor	845-986-1120	supervi@warwick.net
Village of Warwick	Michael Newhard	Mayor	845-986-2031	mayor@villageofwarwick.org
Village of Florida	James Pawliczek	Mayor	845-651-7815	vofmayor@warwick.net
Village of Greenwood Lake	Barbra Moore	Mayor	845-705-2114	Barbara@tiffund.com

2.2.2 Planning Team Assembly

At the beginning of the planning process, the Town of Warwick identified members of the Planning Team by initiating contact with, and extending invitations to incorporated municipalities intended as Plan participants. Other key local, state and federal agencies and entities were also invited, as well as the Tectonic consultant team. The participating members of the Planning Team are displayed in Table 2.2.

Table 2.2: PLANNING TEAM PARTICIPANTS		
Name	Jurisdiction / Organization	Department / Position
Daniel Gibson	Town of Warwick	Building Inspector
Michael Newhard	Village of Warwick	Mayor
Barry Cheney	Village of Warwick	Deputy Mayor
Laura Baraca	Town of Warwick	HDR
Tom Fulller	Village of Florida	Emergency Manager
Adrian Mateosian	Village of Florida	Building Inspector
Brian Slattery	Village of Florida	Trustee
Dody Nicholas	Village of Greenwood Lake	Building Inspector
Ann Lierow	Town of Warwick	Asst. Supt. of Business
Daniel Kelly	Village of Warwick	Building Inspector

2.2.3 Planning Team Activities

The Planning Team met for the first time on December 12, 2012 to begin the planning process. Three more meetings were assembled on a four week basis to step through the plan development process. Table 2.3 summarizes the Planning Team meetings along with a brief list of the agenda items discussed. Detailed meeting notes for all of the Planning Team meetings are provided in Appendix A. Action item status reports are also included with meeting notes as well as final status report. Sign-in sheets, that document meeting attendance, are also located in Appendix A.

Following each Planning Team meeting, JPOCs coordinated with their Local Planning Team, as needed, to work through the assignments and generate the necessary Plan elements pertinent to that jurisdiction.

**Table 2.3: SUMMARY OF PLANNING MEETING DATES, PLACES AND AGENDAS
 CONVENED**

Meeting Type, Date and Location	Meeting Agenda
<p>Kickoff Meeting</p> <p>December 10, 2012 9:00AM-12:00PM</p> <p>Town of Warwick Town Hall</p> <p>132 Kings Highway, Warwick, NY</p>	<ol style="list-style-type: none"> 1. TEAM MEMBER INTRODUCTIONS WITH ROLES AND RESPONSIBILITIES 2. PROJECT AND SCHEDULE 3. DMA 2000 OVERVIEW AND UPDATE REQUIREMENTS <ol style="list-style-type: none"> a. General Planning Elements b. Plan Requirements c. Proposed Outline for Plan d. Plan Review Requirements 4. PLANNING PROCESS TOPICS <ol style="list-style-type: none"> a. Planning Team Roles and Responsibilities b. Additional Invitations c. Public Involvement Strategy 5. RISK ASSESSMENT TOPICS <ol style="list-style-type: none"> a. Critical Facilities and Infrastructure b. Initial Hazard List Identification 6. DATA NEEDS <ol style="list-style-type: none"> a. Base GIS Data b. Hazard Specific Data c. Critical Facilities and Infrastructure 7. CLOSING ITEMS <ol style="list-style-type: none"> a. Summarize Action Items / Task Assignments / Questions b. Schedule Next Meetings
<p>Meeting No. 2</p> <p>January 24, 2013 AM-PM</p> <p>Town of Warwick Town Hall</p> <p>132 Kings Highway, Warwick, NY</p>	<ol style="list-style-type: none"> 1. TEAM MEMBER INTRODUCTIONS 2. TASK ASSIGNMENT STATUS REVIEW 3. RISK ASSESSMENT <ol style="list-style-type: none"> a. Review Hazard Profile Mapping and Data for each hazard b. Critical Priority Risk Index Analysis c. Critical Facilities and Infrastructure d. Changes in Development (Past / Future) 4. MITIGATION STRATEGY <ol style="list-style-type: none"> a. Review Current Mitigation Actions / Projects b. Identify New Mitigation Action / Projects 5. CLOSING ITEMS <ol style="list-style-type: none"> a. Schedule Next Meetings b. Summarize Action Items / Task Assignments / Questions

Table 2.3: SUMMARY OF PLANNING MEETING DATES, PLACES AND AGENDAS CONVENED	
Meeting Type, Date and Location	Meeting Agenda
Meeting No. 3 February 27, 2013 AM-PM Town of Warwick Town Hall 132 Kings Highway, Warwick, NY	1. TASK ASSIGNMENT STATUS REVIEW 2. MITIGATION STRATEGY TOPICS <ul style="list-style-type: none"> a. NFIP Statistics and Compliance b. Repetitive Loss Properties c. Capability Assessment 3. PLANNING PROCESS TOPICS 4. PLAN MAINTENANCE STRATEGY <ul style="list-style-type: none"> a. Develop New Monitoring Schedule b. Plan Update Schedule c. Continued Public Involvement 5. PROMULGATION PROCESS 6. CLOSING ITEMS <ul style="list-style-type: none"> a. Summarize Action Items / Task Assignments / Questions b. Schedule Next Meetings
Meeting No. 4 March 28, 2012 AM-PM Town of Warwick Town Hall 132 Kings Highway, Warwick, NY	1. TASK ASSIGNMENT STATUS REVIEW 2. MITIGATION STRATEGY TOPICS <ul style="list-style-type: none"> a. Goals and Objectives for New Plan 3. MITIGATION STRATEGY TOPICS (REVIEW) <ul style="list-style-type: none"> a. Action / Project Identification 4. PROMULGATION PROCESS (REVIEW) 5. CLOSING ITEMS <ul style="list-style-type: none"> a. Summarize Action Items / Task Assignments / Questions

2.2.4 Agency / Organizational Participation

In order to fulfill Federal requirements, the Plan development process was made open and available to other stakeholders and the public. At the beginning of the planning process, a list of known and / or potential stakeholders was assembled. Invitations to attend meetings and provide input were extended to these stakeholders through emails, facsimile and copies. Documentation of these invitations is provided in Appendix C. After the first Planning Meeting, the Planning Team also chose to extend an invitation to all citizens within the participating jurisdictions via website postings and

newspaper articles. This approach was considered the best way to reach interested non-profits and businesses within the Town and provide them an opportunity to participate in the planning process. The following list includes entities that were either directly invited or responded to the public invitations and attended at least one Planning Team meeting:

- Town & Village Public Works Departments
- Warwick Fire Department
- Town of Warwick Police Department
- Warwick Valley Central School District
- Greenwood Lake Union Free School District
- Orange and Rockland Utilities

An essential aspect of the planning process included coordination with agencies and organizations outside of the participating jurisdiction's governance to obtain information and data for inclusion into the Plan or to provide more public exposure to the planning process. With guidance and assistance from Tectonic, the Town of Warwick Supervisor Michael Sweeton took the initiative to lead in pursuing a range of activities to: (1) make other stakeholders aware of the development of the Hazard Mitigation Plan, and (2) provide other stakeholders with a forum to ask questions, submit suggestions, bring forth comments on the process and/or directly participate. Stakeholders were invited to key meetings and presented with the opportunity to actively contribute to the plan by participating in questionnaires and reviewing sections of the draft plan.

2.3 Public Involvement

Public involvement and input during the Plan development process was encouraged by all participating jurisdictions through the use several different venues. Press releases, newspaper articles and website announcements were all used to communicate jurisdictional news and activities. Post agendas for Council / Committee / Board actions were used to make the public aware of the planning effort and to provide the opportunity for public input and participation.

Public Input notices were first posted in The Warwick Valley Dispatch on January 16, 2013 and subsequently on January 30, February 6 and February 13 (See Appendix C). A posting was also made on the Village of Greenwood Lake website as well. The Public Input notices explained the

overall purpose of the Hazard Mitigation Planning process, when meeting locations and times were, and provided email and phone contact information of JPOCs. No responses to the pre-draft public notices or website postings were received by the Town of Warwick or Tectonic.

The post-draft public involvement strategy included the following actions:

- (PENDING INFORMATION)

Copies of the pre – draft and post – draft public notices, web pages and newspaper notices are provided in Appendix C.

2.4 Reference Documents and Technical Resources

Over the course of the planning process, numerous other plans, studies, reports and technical information were obtained and reviewed for incorporation or reference purposes. Table 2.4 provides a reference listing of the primary documents or technical resources reviewed and used in the Plan. Other bibliographic references are provided as footnotes throughout the Plan.

Table 2.4: LIST OF RESOURCE DOCUMENTS AND REFERENCES REVIEWED AND INCORPORATED IN THE PLAN PROCESS		
Referenced Document or Technical Source	Resource Type	Description of Reference and Its Use
Federal Emergency Management Agency	Technical and Planning Resource	Resource for HMP guidance (How – To – Series). Used in the risk assessment and mitigation strategy.
National Weather Service	Technical Resource	Resource for some hazard information, data sets, and historic
National Climate Data Center	Technical Resource	Online resource for weather related data and historic hazard event data. Used in the risk assessment.
New York OEM Hazard Mitigation Planning Standard		
New York State Hazard Mitigation Plan (2011)	Hazard Mitigation Plan	Source for some hazard data compiled with this plan.
Orange County Hazard Mitigation Plan (2011)	Hazard Mitigation Plan	Source for some hazard data compiled with this plan and population estimates.
Town of Warwick Comprehensive Plan (2008)	Town Comprehensive Plan	Source of information about the Town Overview: past and future development, growth descriptions, geography and transportation.
Town of Warwick Website	Website Reference	Source of information about various communities: Town History

Table 2.4: LIST OF RESOURCE DOCUMENTS AND REFERENCES REVIEWED AND INCORPORATED IN THE PLAN PROCESS

Referenced Document or Technical Source	Resource Type	Description of Reference and Its Use
U.S Army Corps of Engineers	Dam Inventory	Source for dam locations and characteristics.
U.S Census Bureau	Technical Data	Source used to obtain population estimates.
U.S. Geological Survey	Technical Data	Source for geological hazard data and incident data. Used in the risk assessment.
Village of Florida Comprehensive Plan (2002)	Village Comprehensive Plan	Source of information about the community: past and future growth descriptions and geography.
Village of Greenwood Lake Flood Mitigation Plan (2008)	Flood Mitigation Plan	Source of information about the community and some specific flood hazard information for the area (NFIP data and statistics).
Village of Warwick Comprehensive Plan (2004)	Village Comprehensive Plan	Source of information about the community: past and future growth descriptions and geography.
Wikipedia (2013)	Website Reference	Source of information about various communities.

2.5 Plan Integration into Other Planning Mechanisms

Incorporation and / or integration of the Plan into other municipal planning mechanisms, either by content or reference, enhances a community’s ability to perform hazard mitigation by expanding the scope of the Plan’s influence. It also helps a community to capitalize on all available mechanisms at their disposal in order to accomplish hazard mitigation and to reduce risk.

2.5.1 Five Year Plan Integration / Incorporation Strategy

The Planning Team identified typical ways to use and incorporate the Plan over the next five-year planning cycle as follows:

- Use of, or reference to, Plan elements in updates/revisions to codes, ordinances, general and/or comprehensive planning documents and other long term – strategic plans.

- Ñ Integration of defined Mitigation A/Ps into capital improvement plans and programming.
- Ñ Reference to Plan risk assessments during updates or revisions to land use planning and zoning maps.
- Ñ Resource for developing and/or updating emergency operations plans, community wildfire protection plans, emergency response plans, etc.
- Ñ Reference during grant application processes.

Specific opportunities for integrating and/or referencing the Plan into other planning mechanisms over the next five years are summarized below for each participating jurisdiction. The jurisdiction’s Planning Team representative will take responsibility to ensure that the Plan, Risk Assessment, Goals and Mitigation A/Ps are integrated and/or incorporated into the listed planning mechanism by participating in those efforts as they occur.

Town of Warwick:

- Comprehensive Plan (11/20/08) (Land use planning guidelines)
- Stormwater Code / Ordinance (Town Code)
- Emergency Action Plan (Emergency Guidelines)
- Capital Improvement Plan (Infrastructure Evaluation)
- Zoning Code

Village of Florida:

- Master Plan
- Emergency Management Plan

Village of Greenwood Lake:

- Comprehensive Plan

Village of Warwick:

- Village of Warwick Planning Board
- Watershed Protection Plan
- Forest Management Plan
- Emergency Operations Plan

2.5.2 *Plan Incorporation Process*

Each jurisdiction has particular processes that are followed for officially incorporating and adopting planning documents and tools. Many of the process and procedures are similar for jurisdictions with comparable government structures.

In general, planning documents prepared by various departments/divisions of a particular jurisdiction are developed using an appropriate planning process that is overseen and carried out by staff, with the occasional aide of consultants. Each planning process is unique to the plan being developed, but all usually involves the formation of a planning team, and has some level of interagency coordination within the plan's effective area. Public involvement may also be incorporated depending on the type of plan when appropriate. New or updated plans are usually developed to a draft stage wherein they are presented to the respective governing body for initial review and comment. Upon addressing all comments, which may take several iterations, the plans are then presented to the governing body for final approval and official adoption.

Referencing or integration to the Town of Warwick, Village of Florida, Village of Greenwood Lake and Village of Warwick Multi – Jurisdictional, Multi – Hazard Mitigation Plan into these various processes will be accomplished by the active participation of the Planning Team representative(s) from each jurisdiction to ensure the Plan risk assessment, mitigation A/Ps and goals are incorporated into the planning mechanism as appropriate.

Table 2.5 displays a summary of standard operating procedures that each of the participating jurisdictions follow when considering and incorporating official planning mechanisms, and how they apply to integration of the Plan.

Table 2.5 JURISDICTIONAL STANDARD OPERATING PROCEDURES FOR INTEGRATION OF PLANNING MECHANISMS

Jurisdiction	Description of Plan Integration Standard Operating Procedures
Town of Warwick	General planning documents prepared by all departments for the Town of Warwick are developed by staff to a final draft stage and presented to the Warwick Town Board in a study work session for review and comment. Final approval and official adoption of any planning document or mechanism is normally done using a formal resolution process through the Warwick Town Board.
Village of Florida, Greenwood Lake and Warwick	General planning documents prepared by all departments for the Village of Florida, Greenwood Lake and Warwick are developed by staff to a final draft stage and presented to each of the Villages respective Village Board Meetings in a study work session for review and comment. Final approval and official adoption of any planning document or mechanism is normally done using a local law process through each of the Villages respective Village Board members and Board of Trustees.

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SECTION 3: HAZARD IDENTIFICATION

Hazard identification is the process of answering the question; “What hazards can and do occur in my community or jurisdiction?” FEMA encourages an evaluation of all potential hazards, both natural and manmade. However, the DMA 2000 does not require the evaluation of manmade hazards in order to obtain plan approval. Therefore, the Town of Warwick and Villages of Florida, Greenwood Lake and Warwick agreed to focus exclusively on natural hazards in this Plan.

The review included an initial screening process to evaluate each of potential hazards based on the following considerations:

- Experiential knowledge on behalf of the Planning Team with regard to the relative risk associated with the hazard.
- Documented historic context for damages and losses associated with past events with a focus on events that have occurred.
- The ability / desire of jurisdictions represented by the Planning Team to develop effective mitigation actions / projects for the hazard under current DMA 2000 criteria.
- Consideration of and compatibility with the 2011 State Plan hazards.
- Duplication of effects attributed to each hazard.
- Focus on natural hazards.

Following the initial review, several hazards were identified and addressed. These hazards are as follows:

- Dam Failure
- Drought
- Earthquake
- Extreme Temperatures
- Extreme Winds
- Floods
- Hurricanes
- Landslide
- Lightning
- Tornado
- Winter Storm

A comprehensive evaluation of each of these hazards was conducted using information obtained from State and Federal agency online websites as well as through a review of the New York State Hazard Mitigation Plan (2011) and other sources.

Table 3.1 lists all potential natural hazards considered, along with a brief description of their characteristics. Table 3.2 then provides an evaluation of each hazard and outlines whether they can be identified as a significant hazard to the Jurisdictions and why. Table 3-3 summarizes the compilation of historic events for each identified significant hazard that will be covered by this Plan.

Table 3.1: LIST OF ALL POTENTIAL NATURAL HAZARDS	
<i>Hazard</i>	<i>Description</i>
Avalanche	A rapid flow, slide or fall of packed snow down a slope and / or mountainside.
Coastal Erosion	Landward displacement of a shoreline caused by the forces of waves and currents.
Dam Failure	A collapse, breach or other failure of a dam structure resulting in downstream flooding.
Drought	A prolonged period when an area is in a deficiency in its water supply regarding surface and / or underground water, usually as a result from a lack of normal precipitation.
Earthquake	A sudden, rapid release of energy from the Earth crust caused by the breaking and shifting of rock beneath the surface that creates seismic waves.
Expansive Soils	Soils that will exhibit some degree of volume change with variation in moisture conditions
Extreme Temperatures	Extreme heat and extreme cold conditions vary regarding different parts of the country (i.e. heat / cold waves). Heat waves are extended periods of abnormally high temperatures with excessive heat often along with high levels of humidity. Cold waves, according to the U.S National Weather Service, is a rapid fall in temperature within a 24 hour period requiring substantially increased protection to agriculture, industry, commerce and social activities.
Extreme Wind	An event that can occur randomly at any part of the country, any time and are often without warning. These events are most commonly the result of nor'easters, severe thunderstorms, tropical storms and hurricanes; however "windstorms" can also occur during absence of these events. For example, a "downburst", a type of windstorm, can cause damage capable of comparing to a strong tornado.
Flood	Partial or complete inundation of normally dry land.
Hailstorm	A storm that produces solid precipitation such as balls of ice (hailstones). Hail occurs when a strong, upward motion of air in thunderstorms carry raindrops in to parts of the atmosphere where the temperatures are below freezing.
Hurricane and Tropical Storm	Hurricanes and tropical storms are classified as cyclones and defined as any closed circulation developing around a low – pressure center in which the winds rotate counter – clockwise in the Northern Hemisphere (or clockwise in the Southern Hemisphere) and with a diameter averaging 10 – 30 miles across. Determining factors regarding the

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	classification between a hurricane and tropical storm depends on the strength and location. When maximum sustained winds meet or exceed 39 miles per hour, the storm system is designated a tropical storm. When winds meet or exceed 74 miles per hour the system is classified as a hurricane.
Ice Jams	Ice that is formed over a body of water that limits the flow of water due to freezing. Ice jam flooding occurs when warm temperatures and heavy rain cause the snow to melt rapidly, causing frozen rivers or lakes to overflow.
Landslide	An event that includes a wide array of movements of debris, earth or rock down a slope when the force of gravity pulling down the slope exceeds the strength of the earth materials that comprise to hold it in place.
Land Subsidence	The gradual settling or sudden sinking of the Earth’s surface due to the subsurface movement of earth materials.
Lightning	An electrical energy discharge caused by an unbalanced positive and negative charge buildup within a thunderstorm, producing a “bolt” when the charges building up become strong enough. The sound of thunder is the result of rapid cooling (air) and heating (lightning).
Nor’easter	Closely resembling hurricanes, these storms are capable of causing damage to coastal areas in the Eastern United States due to their associated winds and heavy surf. These are caused by the interaction of the jet stream with horizontal temperature gradients and generally occur during the fall and winter months when moisture and cold air are plentiful.
Storm Surge	An offshore rise of water associated with a low pressure system, often 50 to 100 miles wide and rising anywhere from four to five feet in a Category 1 hurricane up to more than 30 feet in a Category 5 storm.
Tornado	A forceful, rotating column of air that is often in the form of a visible funnel and has contact to the ground. Tornadoes are most often generated by thunderstorm activity when cool, dry air intersects and overrides a layer of warm, moist air forcing the warm air to rise rapidly.
Wildfire	An uncontrollable, outdoor fire burning in an area of vegetative fuels such as grasslands, brush or woodlands.
Winter Storm	An event which includes a variety of precipitation that only forms at low temperatures that may include freezing rain, sleet, snow or a mix of these wintry forms (i.e. Blizzards and Ice Storms).

Source: FEMA Appendix B Mitigation Ideas Guide 2012 & Orange County Hazard Mitigation Plan 2011

Table 3.2: HAZARD EVALUATION PROCESS

Natural Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
Avalanche	No	<ul style="list-style-type: none"> • Review of US Forest Service National Avalanche Center web site • Review of NY State Hazard Mitigation Plan 	<ul style="list-style-type: none"> • Avalanches are not included in the NY State Hazard Mitigation Plan, and are not discussed for NY on the US Forest Service Avalanche Center web site • The topography and climate around the Town of Warwick does not support conditions required for the occurrence of significant avalanches
Coastal Erosion	No	<ul style="list-style-type: none"> • Review of NY State Hazard Mitigation Plan • Orange County HAZNY • Orange County Mitigation Plan 	<ul style="list-style-type: none"> • The State Plan does not identify any mapped coastal erosion areas for the Town of Warwick • Orange County HAZNY did not include coastal erosion
Dam Failure	Yes	<ul style="list-style-type: none"> • Review of NY State Hazard Mitigation Plan • Review of New York State Department of Environmental Conservation • Orange County HAZNY • Orange County Mitigation Plan 	<ul style="list-style-type: none"> • The State Plan designates 22 dams in Orange County as “High” hazard risks and another 48 as “Moderate” hazard risks • The Orange County HAZNY ranked dam failure as a Moderately Low hazard
Drought	Yes	<ul style="list-style-type: none"> • Review of NY State Hazard Mitigation Plan • Review of NOAA NCDC Database • NOAA National Drought Mitigation Center • Orange County HAZNY • Orange County Mitigation Plan 	<ul style="list-style-type: none"> • The State Plan references three significant drought events since 1993 that affected the Town of Warwick • NCDC reports that Orange County has been affected by two drought events since 1993 • Orange County HZNY ranked drought as a moderately low hazard

Table 3.2: HAZARD EVALUATION PROCESS (cont'd)

Natural Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
Earthquake	No	<ul style="list-style-type: none"> • Review of NY State Hazard Mitigation Plan • Review of USGS Earthquake Hazards Program website • Orange County HAZNY • Orange County Mitigation Plan 	<ul style="list-style-type: none"> • The State Plan identifies earthquakes as a significant hazard and ranks Orange County 12th out of 62 counties for potential annualized earthquake losses • Orange County HAZNY ranked earthquakes as Moderately Low
Expansive Soils	No	<ul style="list-style-type: none"> • Review of NY State Hazard Mitigation Plan • Orange County HAZNY • Orange County Mitigation Plan 	<ul style="list-style-type: none"> • The State Plan does not identify expansive soil as a significant hazard • Orange County HAZNY did not include expansive soil as a significant hazard
Extreme Temperatures	Yes	<ul style="list-style-type: none"> • Review of NY State Hazard Mitigation Plan • Review of National Oceanic and Atmospheric (NOAA) National Data Climate Data Center (NCDC) Database • Orange County HAZNY • Orange County Hazard Mitigation Plan 	<ul style="list-style-type: none"> • Extreme heat events are mentioned in the NY State Plan as a discrete hazard. Extreme cold is mentioned in the context of winter storms • The State Plan records three significant extreme heat events affecting Orange County since 1994 • NCDC reports 11 significant extreme events effecting Orange County between 1993 and 2009 which included five extreme heat events, five extreme cold events and one unseasonably warm event • Orange County HAZNY study of 2009 ranked extreme temperatures as a Moderately Low Hazard

Table 3.2: HAZARD EVALUATION PROCESS (cont'd)

Natural Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
Extreme Wind	Yes	<ul style="list-style-type: none"> • Review of NY State Hazard Mitigation Plan • Review of NOAA NCDC Storm Events Database • Review of Wind Zones in the United States as per FEMA Publication 320 - • Orange County HAZNY • Orange County Hazard Mitigation Plan 	<ul style="list-style-type: none"> • Extreme wind events are included in the NY State Plan in the context of hurricanes and tornadoes • The State Plan ranks Orange County as 6th out of 62 counties in the state for the threat of extreme winds • According to FEMA-320, the Town of Warwick is located in a wind zone where extreme wind speeds of 160mph is possible • NCDC reports more than 235 high wind events affecting Orange County since 1955, mostly associated with thunderstorms
Flood	Yes	<ul style="list-style-type: none"> • Review of NY State Hazard Mitigation Plan • Review of NOAA NCDC Storm Event Database • Review of FEMA's National Flood Insurance Program (NFIP) • Review of FEMA DFIRM flood Data • Orange County HAZNY • Orange County Mitigation Plan 	<ul style="list-style-type: none"> • The State Plan designates flooding as the primary natural hazard in New York and reports that more than half of all Federal disaster declarations that affected Orange County from 1953 to 2007 involved flooding • Orange County ranks as the 5th most vulnerable to flood loss out of 62 counties State wide • Orange County HAZNY ranked flooding as a High Hazard

Table 3.2: HAZARD EVALUATION PROCESS (cont'd)

Natural Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
Hailstorm	No	<ul style="list-style-type: none"> • Review of NY State Hazard Mitigation Plan • Review of NOAA NCDC Storm Event Database and NOAA National Severe Storms Laboratory (NSSL) website • Orange County HAZNY • Orange County Hazard Mitigation Plan 	<ul style="list-style-type: none"> • The State Plan includes hailstorms as a discrete hazard • The NCDC reports 49 “significant” hailstorm events for Orange County and one “damaging” hailstorm but only 2 injuries and \$1,000 in crop damage occurred • According to the NSSL, Orange County is located in a part of the country with the lowest annual number of days with hailstorms • The Orange County HAZNY did not include hailstorms
Hurricane and Tropical Storm	Yes	<ul style="list-style-type: none"> • Review of NY State Hazard Mitigation Plan • Analysis of NOAA historical tropical cyclone tracks • Review of NOAA National Hurricane Center website (NHC) • Review of NOAA NCDC Storm Events Database • Orange County HAZNY • Orange County Hazard Mitigation Plan 	<ul style="list-style-type: none"> • The State Plan discusses hurricanes and tropical storm and provides a map showing Town of Warwick located in a hurricane-susceptible area • State and Federal records show that Orange County has been covered by major disaster declarations due to hurricanes and tropical storms • According to the NHC, the estimated return period for a Category 1 hurricane in the New York City area is 17 years. The return time for a Category 5 is 370 years • Orange County HAZNY (2009) ranked hurricanes as a Moderately Low Hazard

Table 3.2: HAZARD EVALUATION PROCESS (cont'd)

Natural Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
Ice Jams	No	<ul style="list-style-type: none"> • Review of NY State Hazard Mitigation Plan • USACE CRREL “Ice Jam Database” • Orange County HAZNY • Orange County Mitigation Plan 	<ul style="list-style-type: none"> • Although the State Plan and the Orange County Plans consider ice jams a significant hazard, the USACE CRREL Ice Jam Database shows that the Town of Warwick has not experienced significant ice jams in the past
Landslide	No	<ul style="list-style-type: none"> • Review of NY State Hazard Mitigation Plan • Review of USGS Landslide Susceptibility Map • Orange County HAZNY • Orange County Mitigation Plan 	<ul style="list-style-type: none"> • The State Plan ranks Orange County as 28th out of 62 counties state wide for susceptibility to landslides • USGS landslide map shows that portions of Orange County are identified as “High landslide incidence, however the Town of Warwick only fell under “Low incidence” • Orange County HAZNY did not include landslides in its study
Land Subsidence	No	<ul style="list-style-type: none"> • Review of NY State Hazard Mitigation Plan • Review of USGS Fact Sheet 165-00 Land Subsidence in the U.S. • Orange County HAZNY • Orange County Mitigation Plan 	<ul style="list-style-type: none"> • The State Plan notes that 20% of Orange County is underlain by carbonate karst rock such as limestone but explains that new sinkholes in karst areas are rare • The County HAZNY study and Mitigation Plan does not include subsidence as a significant hazard • There are no know historical occurrences in the Warwick

Table 3.2: HAZARD EVALUATION PROCESS (cont'd)

Natural Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
Lightning	Yes	<ul style="list-style-type: none"> • Review of NY State Hazard Mitigation Plan • Review of NOAA NCDC Storm Events Database, NOAA lightning statistics, and NSSL website • Orange County HAZNY • Orange County Mitigation Plan 	<ul style="list-style-type: none"> • Lightning is not considered as a discrete hazard in the NY State Hazard Mitigation Plan • NOAA data shows that the Town of Warwick is located in an area of the Country that experiences 20 to 30 thunder days annually, and two to four lightning flashes per square kilometer per year. By comparison, other locations of the Country experience 120 events per year with more than 10 flashes per square kilometer • The Orange County HAZNY study did not include lightning as a discrete hazard
Nor'easter	No	<ul style="list-style-type: none"> • Review of NY State Hazard Mitigation Plan • Review of NOAA NCDC Storm Events Database • Orange County HAZNY • Orange County Mitigation Plan 	<ul style="list-style-type: none"> • Nor'easters are discussed in the State Plan as common cause of flooding and snowstorms • NYSEMO has classified nor'easters as a moderate hazard for areas including the Town of Warwick • The Orange County HAZNY 2009 ranked severe storms as a moderately high hazard
Storm Surge	No	<ul style="list-style-type: none"> • Review of NY State Hazard Mitigation Plan • USACE See, Lake, and Overland Surges from Hurricanes (SLOSH) • Orange County HAZNY • Orange County Mitigation Plan 	<ul style="list-style-type: none"> • The State Plan includes storm surges under the flood and hurricane hazards • SLOSH modeling shows storm surge traveling up the Hudson River but no affecting the Town of Warwick • The County HAZNY study and Mitigation Plan did not include storm surges as a significant hazard

Table 3.2: HAZARD EVALUATION PROCESS (cont'd)

Natural Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
Tornado	Yes	<ul style="list-style-type: none"> • Review of NY State Hazard Mitigation Plan • Review of NOAA NCDC Storm Events Database • Orange County HAZNY • Orange County Mitigation Plan 	<ul style="list-style-type: none"> • The State Plan identifies tornadoes as a moderate hazard for the area within which the Town of Warwick lays • The NSSL tornado probability data indicates that Orange County is in an area that experiences 0.4 to 0.6 tornado events per year • Orange County HAZNY ranked tornados as a moderately high Hazard
Wildfire	Yes	<ul style="list-style-type: none"> • Review of NY State Hazard Mitigation Plan • NYSEMO and NYSDEC websites • NOAA NCDC Storm Events Database • Orange County HAZNY • Orange County Mitigation Plan 	<ul style="list-style-type: none"> • The State Plan identifies wildfires as a moderate risk for the area covering the Town of Warwick • A significant portion of the area the Town of Warwick covers has long urban-wildland interfaces • The Orange County HAZNY ranked wildfires as a “Moderately High” hazard
Winter Storm	Yes	<ul style="list-style-type: none"> • Review of NY State Hazard Mitigation Plan • Review of NOAA NCDC Storm Events Database • Orange County HAZNY • Orange County Mitigation Plan 	<ul style="list-style-type: none"> • The NY State Plan ranks winter/ice storms as a moderate risk for the area covering the Town of Warwick • According to NOAA, the Town of Warwick is located in an area where snow depths of 50-75 inches or greater have a 5% chance of occurring in any given year • NCDC mapping shows the Town of Warwick is located in an area with an average of 8-12 hrs. of freezing rain per year • Orange County HAZNY ranked ice storms as a moderately high

TABLE 3.3: MAJOR HAZARD EVENTS IN WARWICK (1980 – 2012)

HAZARD	NO. OF RECORDS	RECORDED LOSSES		
		FATALITIES	INJURIES	DAMAGE COSTS
DAM FAILURE	1	0	0	\$788,300
DROUGHT	4	0	0	0
EARTHQUAKE	0	0	0	0
EXTREME TEMPERATURES	13	1	0	\$50,000
EXTREME WINDS	33	1	2	\$357,750
FLOODS	7	0	0	\$18 MILLION+
HURRICANES (1970 – 2012)	6	0	0	\$4.1 MILLION+
LANDSLIDE	2	0	0	\$1 MILLION+
LIGHTNING	2	0	0	0
TORNADO	0	0	0	0
WILDFIRE	151+	0	0	(UNKNOWN)
WINTER STORM	56	0	0	\$199,851

NOTES:

- SOURCES: FEMA, NOAA NATIONAL CLIMATE DATA CENTER STORM EVENTS DATABASE, UNITED STATES GEOLOGICAL SURVEY, NEW YORK HAZARD MITIGATION PLAN (2011), ORANGE COUNTY HAZARD MITIGATION PLAN (FINAL 2011), TOWN OF WARWICK HISTORICAL HAZARDS NEWS ARTICLES.
- DATES FOR HURRICANES EXTEND OUT LONGER THAN THE 12 YEAR SPAN DUE TO HISTORICAL DATA THAT THE TOWN AND VILLAGES SUBMITTED AND ARE DOCUMENTED IN PARENTHESIS ABOVE.
- HAZARDS SUCH AS EXTREME WINDS, WINTER STORMS AND EXTREME TEMPERATURE NO. OF RECORDS INCLUDE EVENTS THAT HAPPENED BOTH IN THE ZONE OF ORANGE COUNTY AND THE TOWN AND VILLAGES THEMSELVES, DUE TO THESE HAZARDS BEING ASSUMED TO BE EQUALLY EXPOSED THROUGHOUT THE WHOLE AREA.
- DAMAGE COSTS ARE APPROXIMATE ESTIMATES, WITH SOME VARIABILITY DEPENDING ON AVAILABLE DATA THAT WAS FOUND DURING THIS TIME.
- THE PLANNING TEAM CHOSE TO DROP EARTHQUAKES AND LANDSLIDES FROM FURTHER CONSIDERATION DUE TO THE LACK OF HISTORIC DAMAGES AND PERCEIVED RISK.

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SECTION 4: RISK ASSESSMENT

One of the key elements to the Hazard Mitigation planning process is the Risk Assessment. In performing a Risk Assessment, a community not only determines “what” can occur, but also “when” (how often) it is likely to occur and “how bad” the effects could be¹⁵.

This Risk Assessment for the Participating Jurisdictions was performed using a multi-jurisdictional perspective, with much of the information gathering and development being accomplished by the Planning Team. This integrated approach was employed because many hazard events are likely to affect numerous jurisdictions within the Town and Villages, and are not often relegated to a single jurisdictional boundary. The vulnerability analysis was performed in a way such that the results reflect vulnerability at an individual jurisdictional level.

4.1 Vulnerability Analysis Methodology

4.1.1 General

The following sections summarize the various methodologies used to perform the vulnerability analysis portion of the Risk Assessment. For the purposes of this vulnerability analysis, hazard profile maps were developed, as appropriate, to map the geographic variability of the risk posed by the Plan hazards selected by the Planning Team.

For the following hazards in Section 4.2, profile categories of HIGH, MODERATE, and / or LOW located within the *Jurisdictional Summary* sections were used and were subjectively assigned based on the Calculated Priority Risk Index values on probability and severity.

4.1.2 Calculated Priority Risk Index (CPRI) Evaluation

Assessing the perceived risk for each hazard in the Plan is one of the initial steps of vulnerability analysis. For this plan, a Calculated Priority Risk Index (CPRI) formula was used to assign an overall numerical risk value to each hazard. The CPRI value is obtained

¹⁵ National Fire Protection Association, 2000, *Standard on Disaster/Emergency Management and Business Continuity Programs*, NFPA 1600

by assigning varying degrees of risk to four (4) categories for each hazard, and then calculating an index value based on a weighting scheme. Table 4.1 summarizes the CPRI risk categories and provides guidance regarding the assignment of values and weighting factors for each category.

Table 4.1: CALCULATED PRIORITY RISK INDEX (CPRI) CATEGORIES AND RISK LEVELS				
CPRI Category	Degree of Risk			Assigned Weighting Factor
	Level ID	Description	Index Value	
Probability	Unlikely	<ul style="list-style-type: none"> ■ Extremely rare with no documented history of occurrences or events. ■ Annual probability of less than 0.001. 	1	45%
	Possible	<ul style="list-style-type: none"> ■ Rare occurrences with at least one documented or anecdotal historic event. ■ Annual probability that is between 0.01 and 0.001. 	2	
	Likely	<ul style="list-style-type: none"> ■ Occasional occurrences with at least two or more documented historic events. ■ Annual probability that is between 0.1 and 0.01. 	3	
	Highly Likely	<ul style="list-style-type: none"> ■ Frequent events with a well-documented history of occurrence. ■ Annual probability that is greater than 0.1. 	4	
Magnitude/ Severity	Negligible	<ul style="list-style-type: none"> ■ Negligible property damages (less than 5% of critical and non-critical facilities and infrastructure). ■ Injuries or illnesses are treatable with first aid and there are no deaths. ■ Negligible quality of life lost. ■ Shut down of critical facilities for less than 24 hours. 	1	30%
	Limited	<ul style="list-style-type: none"> ■ Slight property damages (greater than 5% and less than 25% of critical and non-critical facilities and infrastructure). ■ Injuries or illnesses do not result in permanent disability and there are no deaths. ■ Moderate quality of life lost. ■ Shut down of critical facilities for more than 1 day and less than 1 week. 	2	
	Critical	<ul style="list-style-type: none"> ■ Moderate property damages (greater than 25% and less than 50% of critical and non-critical facilities and infrastructure). ■ Injuries or illnesses result in permanent disability and at least one death. ■ Shut down of critical facilities for more than 1 week and less than 1 month. 	3	

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	Catastrophic	<ul style="list-style-type: none"> ■ Severe property damages (greater than 50% of critical and non-critical facilities and infrastructure). ■ Injuries or illnesses result in permanent disability and multiple deaths. ■ Shut down of critical facilities for more than 1 month. 	4	
Warning Time	Less than 6 hours	Self-explanatory.	4	15%
	6 to 12 hours	Self-explanatory.	3	
	12 to 24 hours	Self-explanatory.	2	
	More than 24 hours	Self-explanatory.	1	
Duration	Less than 6 hours	Self-explanatory.	1	10%
	Less than 24 hours	Self-explanatory.	2	
	Less than one week	Self-explanatory.	3	
	More than one week	Self-explanatory.	4	

As an example, when a jurisdiction was assessing the hazard of flooding, it decided that the following assignments best describe the flooding hazard for their community:

- Probability = Likely
- Magnitude / Severity = Critical
- Warning Time = 12 to 24 hours
- Duration = Less than 6 hours

The CPRI for the flooding hazard is then:

$$\text{CPRI} = [(3*0.45) + (3*0.30) + (2*0.15) + (1*0.10)]$$

$$\text{CPRI} = 2.65$$

4.1.3 Critical Facilities and Infrastructure (CFI)

A detailed inventory of local critical facilities and infrastructure (CFI) data was created for the mitigation planning process and vulnerability assessment. For the purpose of this Plan, the Planning Team used the following to establish a working definition for what qualifies as a critical facility or critical infrastructure:

“Any structure(s) and/or infrastructure within a community whose incapacity or destruction would:

- *Have a debilitating impact on the defense or economic security of that community.*
- *Significantly hinder a community's ability to recover following a disaster."*

Following the criteria set forth by the Federal Critical Infrastructure Assurance Office (CIAO), the Primary Planning Team outlined eight general categories¹⁶ they used to classify CFI:

- 1. Communications Infrastructure:** Telephone, cell phone, data services, radio towers and internet communications, which have become essential to continuity of business, industry, government and military operations.
- 2. Electrical Power Systems:** Generation stations and transmission and distribution networks that create and supply electricity to end-users.
- 3. Gas and Oil Facilities:** Production and holding facilities for natural gas, crude and refined petroleum, and petroleum-derived fuels, as well as the refining and processing facilities for these fuels.
- 4. Banking and Finance Institutions:** Banks, financial service companies, payment systems, investment companies and securities / commodities exchanges.
- 5. Transportation Networks:** Highways, railroads, ports and inland waterways, pipelines and airports and airways that facilitate the efficient movement of goods and people.
- 6. Water Supply Systems:** Sources of water; reservoirs and holding facilities; aqueducts and other transport systems; filtration, cleaning, and treatment systems; pipelines; cooling systems; and other delivery mechanisms that provide for domestic and industrial applications, including systems for dealing with water runoff, wastewater and firefighting.
- 7. Government Services:** Capabilities at the federal, state and local levels of government required to meet the needs for essential services to the public.
- 8. Emergency Services:** Medical, police, fire and rescue systems.

Other CFI such as public libraries, schools, businesses, museums, parks, recreational facilities, historic buildings or sites, churches, residential and / or commercial structures and so forth, are typically not classified as CFI unless they serve a secondary function to the community during a disaster emergency (e.g. - emergency housing or evacuation

¹⁶ Instituted via Executive Order 13010, which was signed by President Clinton in 1996.

centers). Ultimately, complete discretion was given to each community to determine what qualified as CFI in their community using the working definition as a basis for their decision. For example, a local business that employs a major segment of the community’s workforce might be considered as a CFI to that community. Accordingly, each community made the final decision regarding what is, or is not a CFI for their jurisdiction.

Most of the CFI identified by the Planning Team’s jurisdictions are adequately represented by a point on a map. Each facility is attributed with a descriptive name, facility description, physical address, geospatial position (longitude and latitude), and an estimated replacement cost for the building / structure and contents. Tools used to compile the CFI database and attributes included: GIS data sets, on-line mapping utilities, county planning mapping, and county assessor data. Table 4.2 summarizes the CFI counts for facilities within the Town and Villages. The Planning Team chose to not include the detailed CFI data with this Plan. Instead they are secured and on file with the participating Planning Team members (Town and Villages) for their respective hazard mitigation planning efforts.

Table 4.2: CRITICAL FACILITY AND INFRASTRUCTURE COUNTS BY CATEGORY AND JURISDICTION

Jurisdiction	Communications Infrastructure	Electrical Power Systems	Gas and Oil Facilities	Banking and Finance Institution	Transportation Network	Water Supply Systems	Government Services	Emergency Services	Educational ^a	Shelter and Evacuation Facilities ^a	Business ^a	Nursing Home / Senior Care
Florida, Village of	2		1		3	12	3	3	2			1
Greenwood Lake, Village of	3			1		1 ^b	4	3	1		4	1
Warwick, Town of								9	13			
Warwick, Village of	4		4	7	1	27 ^c	2	4	1		2	2

NOTES:

- (a) CFI listed under these categories have been determined to be critical per the definition of this Plan by the corresponding jurisdiction.
- (b) Awosting Dam (controls Greenwood Lake levels) not included because the physical address is located within the state of New Jersey.
- (c) Total consists of village pump stations and storage tanks

It should be noted that the facility counts summarized in Table 4.2 do not represent a comprehensive inventory of all the category facilities that exist within the Town of Warwick and Villages of Florida, Greenwood Lake and Warwick. They do, however, represent the facilities inventoried to-date by each jurisdiction and are considered to be a work-in-progress that is anticipated to be expanded and augmented with each Plan cycle.

Figures 4.1 through 4.4 on the following pages are maps that detail the location of the identified critical facilities for each of the Participating Jurisdictions.

4.1.4 Loss Estimations

Loss estimates procedures for this Plan were derived using information, such as human and residential structure impacts, from 2013 HAZUS – MH (Multi – Hazards) software data (FEMA’s loss estimation software package). Estimates are documented as either dollar loses or were evaluated using improved values only for exposure on assets such as general residential, commercial, industrial structures and population. Improved property, as stated in later sections, refers to any structural developments for industrial, municipal, recreational, residential, commercial and/or utility uses.

According to HAZUS – MH (2013) software there is an estimated of 13,214 total buildings within the region (Town and Villages) at an estimated total replacement value of \$3,147,404 (not including contents within structures). Table 4.3 below shows the general building stock value in regards to exposure and percent of total by building type.

Table 4.3: BUILDING EXPOSURE BY OCCUPANCY TYPE (Source: HAZUS 2013 Software – MH: Flood Event Report)		
Occupancy (Building Type)	Exposure (\$1000)	Percent of Total
Residential	2,283,613	72.6%
Commercial	640,767	20.4%
Industrial	71,520	2.3%
Agricultural	30,464	1.0%
Religious	47,663	1.5%
Government	16,826	0.5%
Education	56,551	1.8%
TOTAL	3,147,404	100.0%

It should also be noted that some uncertainties regarding parts the loss estimation may be due to:

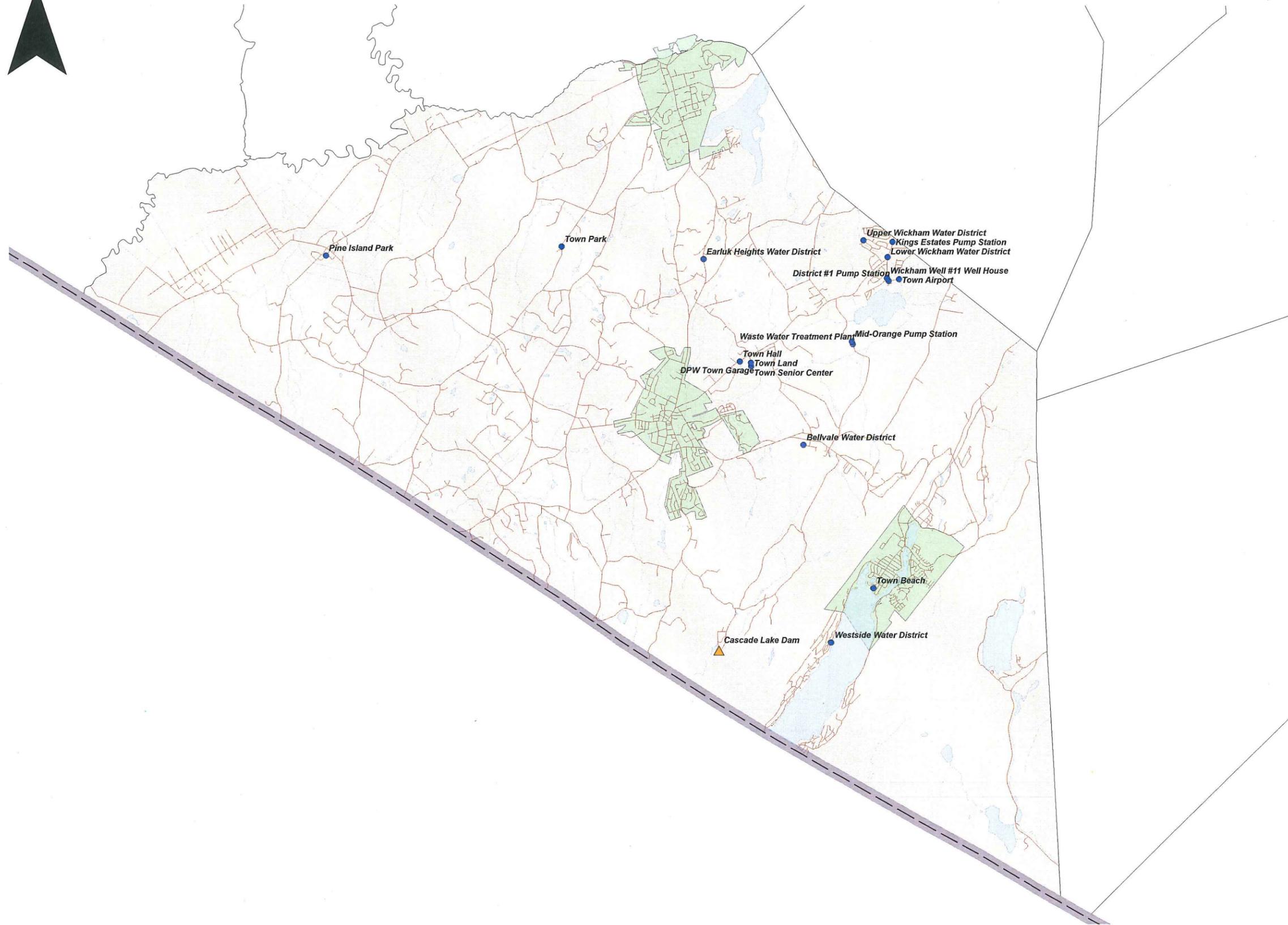


Figure 4.1 TOWN OF WARWICK CRITICAL FACILITY AND INFRASTRUCTURE LOCATIONS

**WARWICK HMP
ORANGE COUNTY
NEW YORK**

APRIL 2013

Legend

- Critical Structure Locations
- ▲ Significant Dam Hazard
- Roads
- Watercourses
- Villages
- ▭ New York State Boundary
- ▭ Cities/Towns
- ▭ Warwick Town Boundary

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Geodatabase Location:
G:GIS/PROJECTS/5532/5532-6001



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Source: Orange County GIS (2009), Municipalities (2013)



N

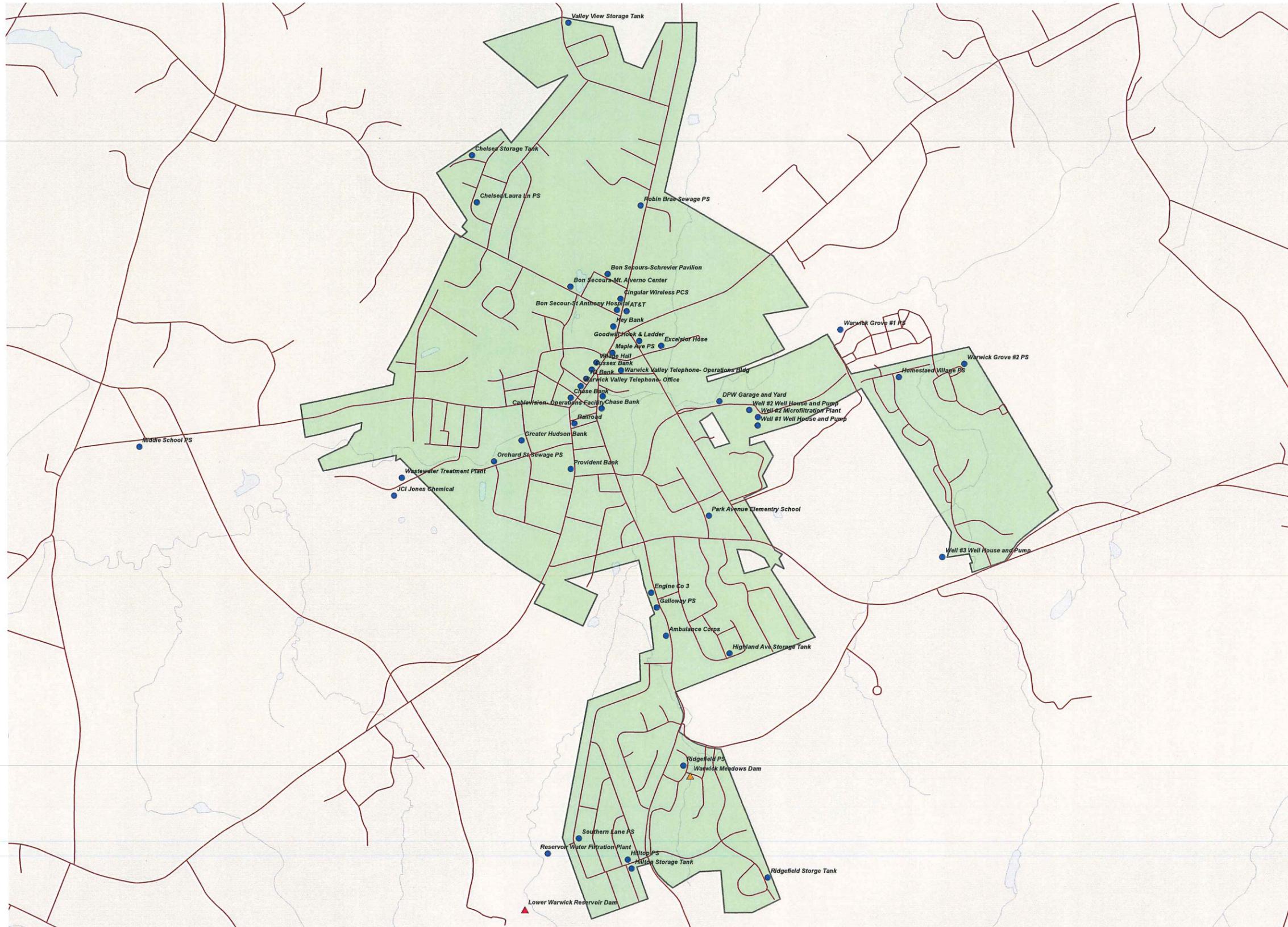


Figure 4.2 VILLAGE OF WARWICK CRITICAL FACILITY AND INFRASTRUCTURE LOCATIONS

WARWICK HMP ORANGE COUNTY NEW YORK

APRIL 2013

Legend

- Critical Structure Locations
- ▲ High Dam Hazard
- ▲ Significant Dam Hazard
- Roads
- Watercourses
- Village of Warwick
- Cities/Towns
- Warwick Town Boundary

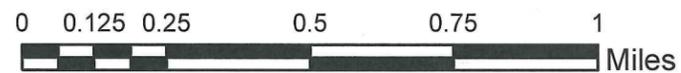
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Geodatabase Location:
G:GIS/PROJECTS/5532/5532-6001



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Source: Orange County GIS (2009), Municipalities (2013)

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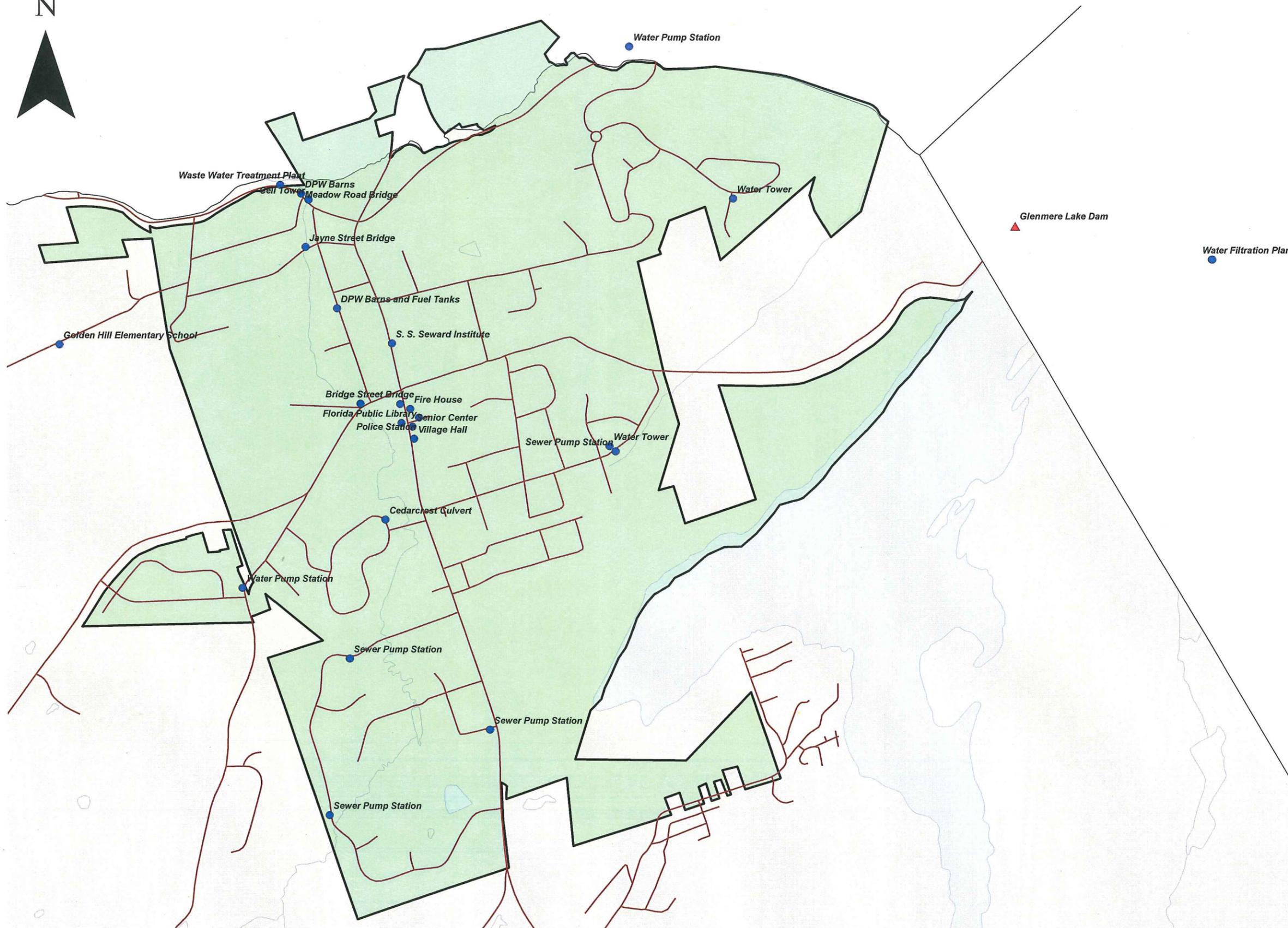


Figure 4.3 VILLAGE OF FLORIDA CRITICAL FACILITY AND INFRASTRUCTURE LOCATIONS

**WARWICK HMP
ORANGE COUNTY
NEW YORK**

APRIL 2013

Legend

- Critical Structure Locations
- ▲ High Dam Hazard
- Roads
- Watercourses
- Village of Florida
- Cities/Towns
- Warwick Town Boundary

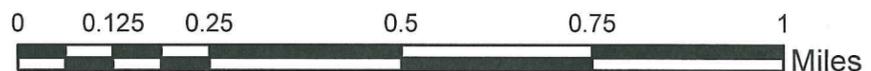
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Geodatabase Location:
G:GIS/PROJECTS/5532/5532-6001



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Source: Orange County GIS (2009), Municipalities (2013)



Figure 4.4 VILLAGE OF GREENWOOD LAKE CRITICAL FACILITY AND INFRASTRUCTURE LOCATIONS

**WARWICK HMP
ORANGE COUNTY
NEW YORK**

APRIL 2013

Legend

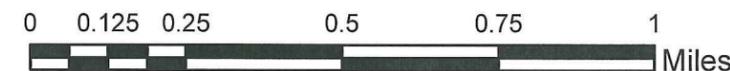
- Critical Structure Locations
- Roads
- Watercourses
- Cities/Towns
- Warwick Town Boundary

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Source: Orange County GIS (2009), Municipalities (2013)

- Incomplete knowledge (scientific) concerning hazards and the ability to predict effects on built environment.
- Approximation and simplifications that are vital to perform a sufficient comprehensive analysis; and,
- Temporary lack of detailed data necessary to implement a feasible statistical approach to loss estimations.

Several of the hazards profiled in this Plan may not include a comprehensive data collection of quantitative exposure and loss estimates. People and asset vulnerability associated with some hazards are nearly impossible to assess due to uncertainties associated with attempting to specify a geospatial correlation of the hazard event and loss potential without sufficient data to justify the estimation of geographically varied damages. In such instances, a qualitative review of vulnerability would be addressed to provide nature of losses that are associated with each hazard. Data, such as (charts) and estimated damages using information such as improved values, were gathered from the New York State HMP (2011) and Orange County HMP (2011). During subsequent updates of this Plan, the data and/or missing information that is needed to evaluate those specific hazards may become further clarified so that a more comprehensive vulnerability statement along with thorough loss estimations can be adjusted and made.

4.1.5 Development Trend Analysis

Development trends reflect the growth (i.e. population, residential and commercial) and changes in the Participating Jurisdictions over the last planning cycle (5 Years) along with anticipated future development within the course of the next five years. Refer to back Section 1.6 for general growth and development trend discussions for each jurisdiction.

The development patterns for each of the communities may be subject to a whole array of regulatory factors. Many hazards may affect the Town and Villages uniformly, while other hazards may affect only delineable portions of the area. Regarding development trends analysis, the following information may be relatively conservative and lacking of qualitative and quantitative value due to unavailable development trend maps for each jurisdiction necessary for estimating and evaluating the extent of risk for hazards in potentially developable areas. More detail and analysis would be incorporated in future Plan updates. Tables 4.4 and 4.5 display existing development/land uses in acres and percentages for the Town and each Village.

Town of Warwick, Village of Florida, Village of Greenwood Lake and Village of Warwick
 MULTI – JURISDICTIONAL, MULTI – HAZARD MITIGATION PLAN – DRAFT

Table 4.4: SUMMARY OF LAND USE (ACRES)
 (Source: Orange County HMP 2011)

Community	Residential	Community Services	Offices / General / Business / Commercial	Industrial	Utilities	Agriculture	Transportation	Recreation	Vacant	Under Water	Not Yet Classified	Total (Acres)
Town of Warwick	18,542	1,614	585	165	436	14,534	1,654	13,230	11,118	796	684	63,358
Village of Greenwood Lake	469	30	39	4	10	0	102	221	195	316	8	1,394
Village of Florida	559	30	45	18	4	0	93	97	514	0	46	1,405
Village of Warwick	722	58	56	13	14	3	141	107	340	0	28	1,482

**Town of Warwick, Village of Florida, Village of Greenwood Lake and Village of Warwick
MULTI – JURISDICTIONAL, MULTI – HAZARD MITIGATION PLAN – DRAFT**

Table 4.5: SUMMARY OF LAND USE (PERCENTAGE)
(Source: Orange County HMP 2011)

Community	Residential	Community Services	Offices / General / Business / Commercial	Industrial	Utilities	Agriculture	Transportation	Recreation	Vacant	Under Water	Not Yet Classified	Total (Acres)
Town of Warwick	29.3%	2.5%	0.9%	0.3%	0.7%	22.9%	2.6%	20.9%	17.5%	1.3%	1.1%	100.0%
Village of Greenwood Lake	33.6%	2.2%	2.8%	0.3%	0.7%	0%	7.3%	15.8%	14.0%	22.7%	0.6%	100.0%
Village of Florida	39.8%	2.1%	3.2%	1.2%	0.3%	0%	6.6%	6.9%	36.6%	0%	3.3%	100.0%
Village of Warwick	48.7%	3.9%	3.8%	0.8%	1.0%	0.2%	9.5%	7.2%	22.9%	0%	1.9%	100.0%

4.2 Hazard Profiles

The following sections summarize the risk profiles for each of the Plan hazards identified in Section 3. For each hazard profile, the following elements are addressed:

- Description
- Location and Extent of Area
- Historical Occurrences
- Probability of Future Occurrences
- Vulnerability (includes: CPRI Results, Loss Estimations, Development Trends and Jurisdictional Summary)
- Sources
- Profile Maps (if applicable)

Specific information contributed by Planning Team members and other stakeholders are also included.

Figure 4.5 displays a number of weather – related hazards by County between 2006 and 2011.

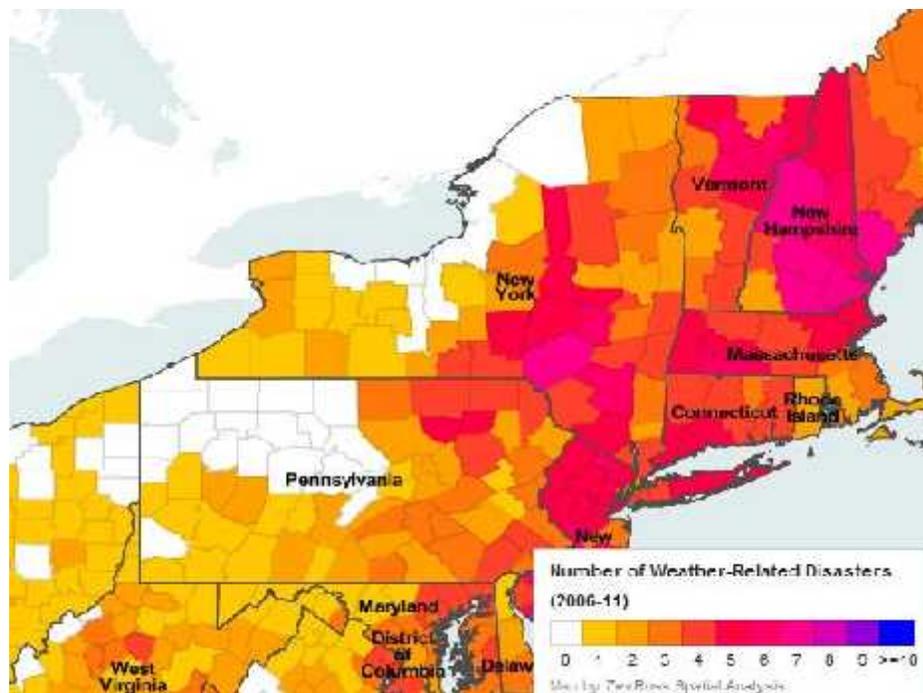


Figure 4.5 - Weather Related Hazards - 2006-2011

4.2.1 *Flood*

Description

For the purpose of this Plan, the flooding hazard addressed in this section will pertain to floods that result from precipitation or runoff related events. Flooding due to dam or levee failures is addressed separately. FEMA’s National Flood Insurance Program (NFIP) defines flooding as “a general temporary condition of partial or complete inundation...from overflow of inland or tidal waters, unusual and rapid accumulation or runoff of surface waters from any source, or a mudflow.”

Floods are considered hazards when lives and property are affected and generally fall into three categories:

Coastal Flooding – Flooding that occurs from sea water along large lakes and coasts by several paths, such as an overflowing a barrier, direct inundation and / or breaching of a barrier. Most coastal flooding is caused by severe storms, tsunamis, storm surges and hurricanes.

Riverine Flooding – Flooding that occurs along established watercourses as in when the bank full capacity of a watercourse is exceeded by storm runoff or snowmelt and the overbank areas become inundated (i.e. overbank flooding from debris and/or ice jams and flash floods).

Shallow Flooding – Flooding that occurs in flat areas where there is a lack of channels that prevents adequate water flow drainage (examples include ponding, sheet flow and urban drainage).

Location

Despite being influenced by the Hudson River, the Town of Warwick and Villages are unaffected by coastal flooding due their distance from the open ocean. Flooding events for the Participating Jurisdictions are typically caused by urban drainage issues (shallow flooding) and riverine flooding.

Extent

Federal, state and local departments use the “base flood / 100 – year flood” to determine flood zones. This reference means that a specific area has a 1 percent

chance of being flooded at a depth of one-foot or greater in any given year. This term is also known as a “special flood hazard area” and is a beneficial instrument for assessing the risk and vulnerability in flood prone areas.

For the purposes of this Plan, the probability and magnitude of flood hazards in the Participating Jurisdictions are primarily based on the 1% (100 – year) and 0.2% (500 – year) probability floodplains delineated on FEMA Flood Insurance Rate Maps (FIRMs), plus any provisional floodplain delineations used for in-house purposes by the Participating Jurisdictions or Planning Team delineated areas.

FEMA flood risk zone designations are categorized into three areas which are described as follows:

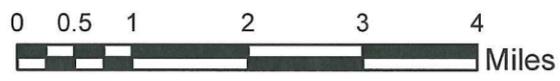
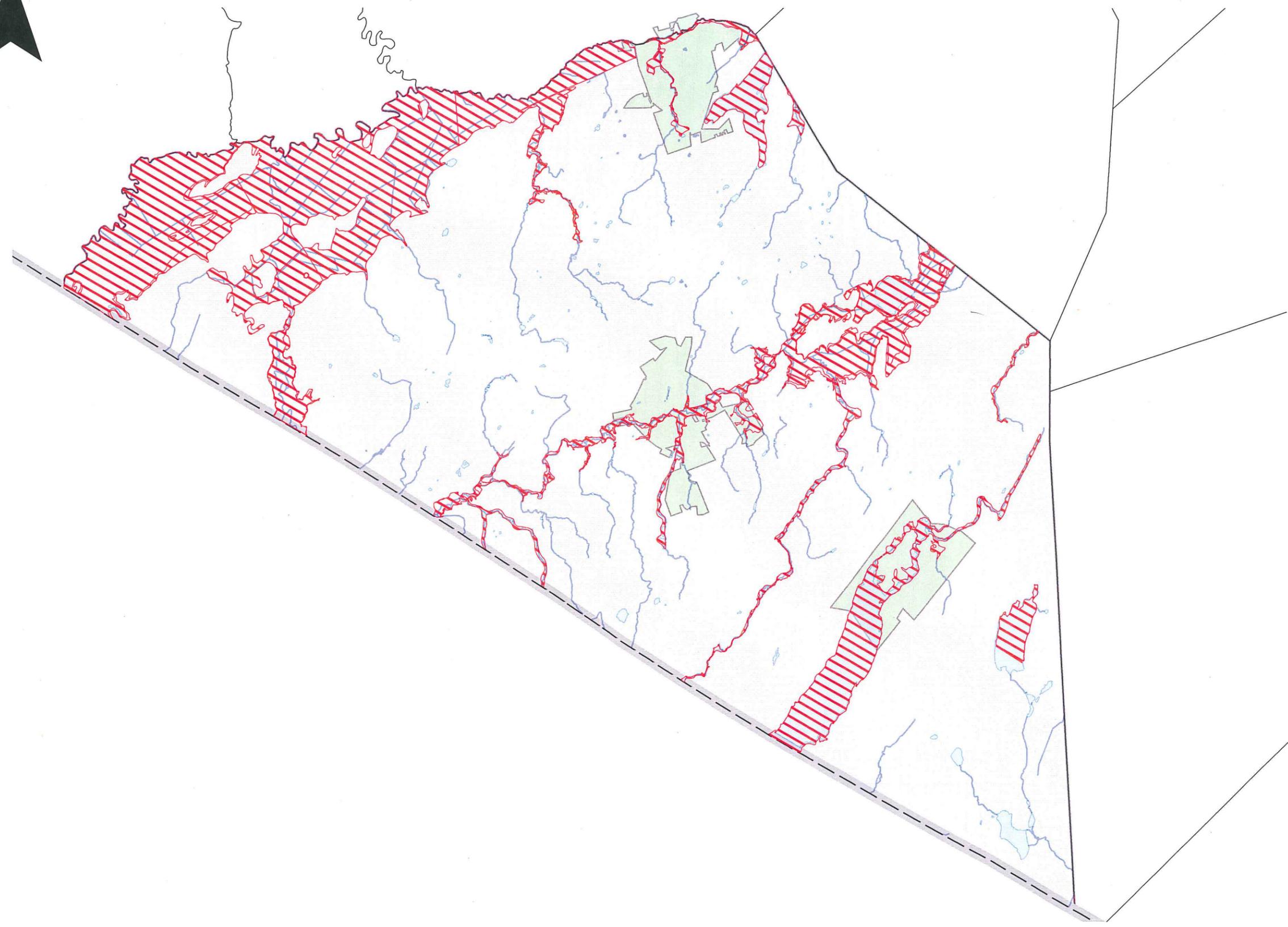
HIGH Hazard Areas (also known as Special Flood Hazard Area / SFHA; e.g. – A, A1-99, AE, AH, AO, V and VE) – are the areas with a 1% chance of being flooded in any given year (the “100 – year” floodplain).

MODERATE Hazard Areas (e.g. – Zone X500) – are areas lying between the “100 – year” and “500 – year” mark (0.2 % chance) floodplain limits.

LOW Hazard Areas (e.g. – Zone X) – are areas outside the 500 – year floodplain, where flooding is minimal.

Tables 4.6 and 4.7 use information derived from FEMA’s DFIRM to show the summary of flood risk areas for the Town of Warwick and Villages of Florida, Greenwood Lake and Warwick.

According to information from *Orange County’s Hazard Mitigation Plan of 2011* and DFIRM data, only 11% of the County area lies within moderate and / or high flood risk zones. The Village of Greenwood Lake has the highest proportion of its area within a “high” flood risk zone. The GIS analysis in Table 4.7 shows that the Town of Warwick has one of the greatest dollar amounts of improved property within high flood risk zones. Figure 4.6 displays the general flood zone areas located throughout the Town and Villages.



Source: Orange County GIS (2009)

Figure 4.6 MULTI- JURISDICTIONAL FLOODING LOCATIONS

WARWICK HMP ORANGE COUNTY NEW YORK

APRIL 2013

- Legend**
-  Flood Zone
 -  Watercourses
 -  Ponds/Lakes
 -  Villages
 -  New York State Boundary
 -  Cities/Towns
 -  Warwick Town Boundary

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Table 4.6: SUMMARY OF LAND AREAS IN FLOOD HAZARD AREAS

(Source: FEMA DFIRM Data 2011)

Municipality	Total Land Area (Acres)	High Flood Risk (Acres)	Moderate Flood Risk (Acres)	Low Flood Risk (Acres)	Land in High Flood Risk %	Land in Moderate Flood Risk %
		A, AE, AH, AO	X500	X	A, AE, AH, AO	X500
Florida, Village of	1,405	141	16	1,248	10%	1%
Greenwood Lake, Village of	1,394	414	0	980	30%	0%
Warwick, Town of	63,358	10,0777	446	52,783	16%	1%
Warwick, Village of	1,482	211	20	1,251	14%	1%

Table 4.7 SUMMARY OF IMPROVED VALUES IN FLOOD HAZARD AREAS

(Source: FEMA DFIRM Data, Orange County HMP 2011)

Municipality	Total Improved Value	Improved Value in High Flood Risk Areas		Improved Value in Moderate Flood Risk Areas		Improved Value in Low Flood Risk Areas	
		Zones A, AE, AH, AO		Zone X500		Zone X	
		\$	%	\$	%	\$	%
Florida, Village of	\$252,670,165	\$10,850,142	4.3%	\$1,970,065	0.8%	\$239,849,944	94.9%
Greenwood Lake, Village of	\$261,917,040	\$22,681,470	8.7%	\$0	0%	\$239,235,571	91.3%
Warwick, Town of	\$2,266,424,291	\$142,251,361	6.3%	\$12,963,021	0.6%	\$2,110,114,858	93.1%
Warwick, Village of	\$666,185,886	\$41,270,470	6.2%	3,929,103	0.6%	620,986,256	93.2%

Historical Occurrence

Descriptions of significant flood events that have occurred within the Town of Warwick and Villages over the last twenty years are summarized below:

- March 1980 – 5 to 8 inches of rain flooded areas in the Village of Warwick and washed away gravel and an earthen berm into Reservoir No. 3¹⁷.
- April 1983 – The Wallkill River flooded over 4,200 acres of farmland in the Pine Island area.
- April 1984 – Heavy rain / snowmelt caused the Wawayanda Creek to flood the Village of Warwick area.
- April 2005 – The Wawayanda Creek flooded in the Town of Warwick and surrounding areas causing damage to culverts located on Southwyke Drive and Wawayanda Road.
- August 2008 – A low pressure system produced thunderstorms with rainfall that contributed to flash flooding in the area (Lower Hudson Valley). Streets such as Railroad Avenue and Main Street within the Town of Warwick were inoperable due to these flash floods.
- March 2010 – Flooding caused by heavy rain and snow melt took place in the Village of Greenwood Lake.
- August 2011 – Nearly \$81 million damage was recorded for the County of Orange excluding private insurance claims. Orange County became eligible for both Public and Individual Assistance under Disaster Declarations DR – 1420 and DR – 1431. Widespread flooding in the southeastern State of New York region (New York City, Albany, Orange, Long Island and Ulster) contributed to multiple raw – sewage spills to local waters, dam failure, destruction of some homes (trailer homes), infrastructure / utility damage (ruptured water tanks, village buildings, damaged transformers and drowned wires) and agricultural damage that accounted for nearly half of the region’s estimated damage (farms). An estimated \$50 million of produce was damaged.

¹⁷ Warwick Advertiser Photo News, March 26, 1980.

Probability of Occurrence

For the purposes of this Plan, the probability of occurrences of flood hazards in the Town of Warwick and Villages are primarily based on the 1% (100 year) and 0.2% (500 year) probability floodplain information as previously seen in the Extent section and Tables located in Section 4.2.1 respectively.

Vulnerability – CPRI Results

Flooding CPRI results for each jurisdiction are summarized in Table 4.8.

Table 4.8: CPRI RESULTS BY JURISDICTION FOR FLOODING					
Participating Jurisdiction	Probability	Magnitude / Severity	Warning Time	Duration	CPRI Score
Town of Warwick	Highly Likely	Critical	12 -24 hours	>1 week	3.25
Village of Greenwood Lake	Likely	Limited	<6 hours	<24 hours	2.75
Village of Florida	Highly Likely	Critical	>24 hours	<1 week	3.15
Village of Warwick	Highly Likely	Critical	<6 hours	<1 week	3.60
Town – wide average CPRI =					3.20

Vulnerability – Loss Estimations

Table 4.9 shows the general building stock in relation to a flooding scenario.

Table 4.9: BUILDING EXPOSURE BY OCCUPANCY TYPE FOR FLOODING		
<i>(Source: HAZUS – MH 2013: Flood Event Report)</i>		
Occupancy (Building Type)	Exposure (\$1000)	Percent of Total
Residential	1,026,488	74.3%
Commercial	218,442	15.8%
Industrial	41,681	3.0%
Agricultural	17,150	1.2%
Religious	26,365	1.9%
Government	7,273	0.5%
Education	43,400	3.1%
TOTAL	1,380,799	100.0%

According to HAZUS – MH 2013, approximately 95 buildings would be moderately damaged during a flooding scenario with an estimated count of one building being destroyed. Tables 4.10 and 4.11 on the following page shows expected damage by general occupancy and building types. Table 4.12 depicts estimated damage to essential facilities.

In a simulated major flooding event that would occur throughout the Town of Warwick, HAZUS – MH 2013 estimates up to 2,447 tons of debris from buildings could be generated. Approximately 98 truckloads would be needed to remove this amount of debris.

HAZUS – MH 2013 also estimates that 839 households will be displaced due to such a major flood event. Based upon the Town of Warwick’s population of 30,764,¹⁸ 1,421 people living near an inundated area will need to seek public shelters. Economic loss, including residential property (capital stock) damage and business interruptions (income), is estimated to be at \$73 million.

Table 4.10: EXPECTED BUILDING DAMAGE BY OCCUPANCY

(Source: HAZUS 2013 – MH: Flood Event Report)

Occupancy	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	9	52.94	7	41.18	1	5.88	0	0.00	0	0.00	0	0.00
Education	1	100.0	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	2	100.0	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	1	33.33	0	0.00	2	66.67	0	0.00	0	0.00	0	0.00
Religion	1	100.0	0	0.00	0	0.00	0	0.00	0	0.0	0	0.00
Residential	1	1.16	50	58.14	16	18.60	17	19.77	1	1.16	1	1.16
TOTAL	15		57		19		27		1		1	

¹⁸ Note – 30,764 represents Town of Warwick’s population in the year 2000, due to the current data used and available on the 2013 HAZUS software.

Table 4.11: EXPECTED BUILDING DAMAGE BY TYPE

(Source: HAZUS 2013 – MH: Flood Event Report)

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Manufacture Housing	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Masonry	4	36.36	5	45.45	0	0.00	2	18.18	0	0.00	0	0.00
Steel	6	66.67	1	11.11	2	22.22	0	0.00	0	0.00	0	0.00
Wood	3	3.66	46	56.10	16	19.51	15	18.29	1	1.22	1	1.22

Table 4.12: EXPECTED DAMAGE TO ESSENTIAL FACILITIES

(Source: HAZUS 2013 – MH: Flood Event Report)

Classification	# of Facilities			
	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	5	1	0	1
Hospitals	1	0	0	0
Police Stations	3	0	0	0
Schools	13	2	0	2

**Zeroes represent: (1) no flooded facilities or (2) an analysis was not run.*

According to a disclaimer within Warwick’s HAZUS – MH (2013), the above totals only reflect data census tracts / blocks included in the user’s study region. The estimates of social and economic impacts were produced using HAZUS loss estimation methodology software which is based on current scientific and engineering knowledge. In any loss estimation technique there are uncertainties; therefore there may be significant differences between the results shown above and actual losses following a specific

flood. These results can be further improved by using enhanced inventory data and flood hazard information.

In addition, recent historical flooding data sources from 1980’s to the present contributed by Town / Villages news articles and Tectonic indicate damage estimates for the area during this time period totaled well over \$18 million.

Vulnerability – Repetitive Loss Properties

Repetitive Loss (RL) properties are those NFIP – insured properties that since 1978 have experienced multiple flood losses. FEMA tracks RL property statistics and in particular to identify Severe RL (SRL) properties. RL and SRL properties demonstrate a track record of repeated flooding for a certain location and are one element of the vulnerability analysis. RL properties are also important to the NFIP since structures that flood frequently put a strain on the National Flood Insurance Fund. According to FEMA’s criteria, there are no SRL properties located within the Town of Warwick or Villages of Florida, Greenwood Lake and Warwick. Table 4.13 displays the most current FEMA records for Town of Warwick and other Participating Jurisdictions.

Table 4.13: COMMUNITY NFIP REPETITIVE LOSS PROPERTIES							
Community	# of RL Properties	Total Number of Paid Losses	Total Payments	Average Individual Payment	Located in Mapped Floodplains		
					A (1 % Annual Chance)	X500 (.2% Annual Chance)	X (Low Risk)
Town of Warwick	1	2	\$4,557	\$2,279		0	1
Village of Greenwood Lake	3	7	\$20,773	\$2,968		0	1
Village of Florida	2	4	\$91,076	\$22,769		0	1
Village of Warwick	4	9	\$78,783	\$8,754	3	0	1

Vulnerability – Development Trends

Discussed briefly, below, is a brief synopsis of existing Orange County assets, critical facilities, commercial, and residential infrastructure located in the Town and Villages that lie within a flood risk zone area.

General – Town of Warwick, Villages of Florida, Greenwood Lake and Warwick

The Town of Warwick has one of the greatest amounts of vacant land (<1000 acres) in the “100 year” floodplain among the various Towns within Orange County. The Town of Warwick has 6.3% of improved property in high flood risk area (A zone) with .6 % in moderate are (X500 zone), the Village of Warwick has 6.2% of improved property in high flood risk area (A zone) with .6 % in moderate (X500 zone), the Village of Florida has 4.3% of improved property in high flood risk area (A zone) with .8% in moderate (X500 zone) and the Village of Greenwood Lake has 8.7% of improved property in high flood risk are (A zone) with no improved property located in the moderate flood risk area, below contains more detailed information on the Village of Greenwood Lake below.¹⁹

Currently, there are no available development trend maps to visually display and emphasize the areas of development (population, commercial, residential and industrial) for any of the Participating Jurisdictions.

Village of Greenwood Lake

Residential homes that are located within the floodplain were built during the 1920’s and 30’s as seasonal dwellings. More houses were built on the hillsides surrounding the lake with very steep roads lacking proper storm water drainage. According to a FEMA Flood Insurance Study, Preliminary Report June 2007, the rise in development along the lake’s shoreline as well as along the steep slopes that surround the Village has resulted in an increase of impervious areas adjacent to the lake. Flooding of shoreline properties, and the wetland areas west and northeast of the Village are a result of high lake levels.²⁰ It was also noted that there have been land use regulations that Village officials enacted restricting developments on steep slope areas and improving storm water management. Parkland was developed from converted vulnerable lakefront property.

The following table details the number of properties affected by the Floodplain.

Table 4.14: PROPERTIES AFFECTED BY FLOODPLAIN	
Type of Property	# of properties
Commercial	19
Residential (single / two family and multiple dwellings)	310
Municipal (beach & DPW complex)	3
Religious	1
Private Beach (<i>usually owned by homeowners association</i>)	3
Vacant (<i>Orange County, NY Department of Real Property</i>)	42

¹⁹ Orange County Hazard Mitigation Plan 2011

²⁰ Village of Greenwood Lake Flood Mitigation Plan 2008

Total Number of Properties affected by 100 – Year Floodplain	378
<p><i>Source: Village of Greenwood Lake Flood Mitigation Plan 2008.</i></p> <p><i>Note: Although these properties fall within the 100 – year floodplain, the structure on these properties may be outside the actual floodplain as defined in FEMA report of Dec. 1978</i></p>	

There are ten (10) flood hazard areas in the Village of Greenwood Lake that have been identified based on their location to the 100 floodplain as listed below:

- NYS Route 210/ Jersey Avenue
- Edgemere Avenue/Sterling Road to the Waterstone Road Bridge
- Sterling Road / Ten Eyck Avenue / Starlight Lane
- North of the NYS Route 17A bridge, eastern arm of the lake & inland along NYS Route 17A
- NYS Route 17A / Linden Avenue / Waterstone Road between the NYS Route 17A bridge and the Waterstone Avenue bridge
- Grove Avenue / Maple Street / Poplar Street
- Murray Road / Lakewood Road
- Southern portion of the Village along Windemere Avenue / Myrtle Avenue / Woodbine Avenue to Laurel Avenue
- Village Department of Public Works Complex on Elm Street
- Village Drive / Random Road

Critical facilities within the Village of Greenwood Lake such as the Village School District’s bus garage, DPW, Village Hall, emergency service buildings (fire / police) and the municipal water treatment plant are situated in areas that are not prone to flood flooding and / or outside the floodplain. As documented from a Village flood mitigation committee meeting, emergency personnel stated that they had little to no difficulty responding to flood – prone areas throughout the Village during flood events.

Future development within flood areas that are mapped is regulated for jurisdictions participating in FEMA’s National Flood Insurance Program (NFIP). A floodplain management ordinance must exist to help aid in coordinating activities and enforce various ordinances by a designated manager (floodplain) / coordinator (NFIP) within the floodplain.

Vulnerability – Jurisdictional Summary

The following Table 4.15 presents an overall summary of each jurisdiction’s vulnerability to Flooding.

Table 4.15: FLOOD VULNERABILITY BY JURISDICTION			
Jurisdiction	Vulnerability	Mitigation Priority?	Notes
Town of Warwick	High	Yes	The Town and Villages have moderate to high levels of vulnerability to flood hazards and all have designated flooding as a mitigation priority.
Village of Greenwood Lake	Moderate	Yes	
Village of Florida	High	Yes	
Village of Warwick	High	Yes	

Sources

- New York State Hazard Mitigation Plan (NYSHMP) 2011
- NOAA National Weather Service
- Orange County Hazard Mitigation Plan 2011

4.2.2 Dam Failure

Description

A dam is defined as a barrier constructed across a watercourse for the purpose of control, diversion or storage of water. Dams may be constructed of concrete, earth, mine tailings or rock. A dam impounds water in the upstream area, or reservoir, and the volume of storage is usually measured in acre-feet (the volume of water that covers an acre of land to a depth of 1 foot). Dam failures are breakdowns or collapses of the structure of a dam characterized by an uncontrolled discharge of enclosed water that causes flooding downstream. Most dams are equipped with an emergency spillway, which provides a designed and protected outlet to convey runoff volumes exceeding the dam’s storage capacity during back-to-back or extreme storm events.

Natural hazards and human induced events can cause dam failures. Natural hazards include earthquakes, landslides, extreme wave action, floods and hurricanes. Additionally, human negligence such as poor maintenance and design errors could also be contributing factors.

The department responsible for the regulation and dam safety for the State is the New York State Department of Environmental Conservation (NYSDEC), classifies the hazard potential of dams using four categories as shown in Table 4.16.

Table 4.16: DAM HAZARD POTENTIAL CLASSIFICATION	
NYSDEC Classification	Description
Class “C” or “High Hazard”	A dam failure may result in widespread or serious damage to home (s); damage to main highways, industrial or commercial buildings, railroads, and / or important utilities, including water supply, sewage treatment, fuel, power, cable or telephone infrastructure; or substantial environmental damage; such as the loss of human life or widespread substantial economic loss is likely.
Class “B” or “Moderate Hazard”	A dam failure may result in damage to isolated homes, main highways, and minor railroads; may result in the interruption of important utilities, including water supply, sewage treatment, fuel, power, cable or telephone infrastructure; and / or is otherwise likely to pose the threat of personal injury and / or substantial economic loss or substantial environmental damage. Loss of human life is not expected.
Class “A” or “Low Hazard”	A dam failure is unlikely to result in damage to anything more than isolated or unoccupied buildings, undeveloped lands, minor roads such as town or country roads; is unlikely to result in the interruption of important utilities, including water supply, sewage treatment, fuel, power, cable or telephone infrastructure; and / or is otherwise unlikely to pose the threat of personal injuring, substantial economic loss or substantial environmental damage.
Class “D” or “Negligible or No Hazard”	A dam that has been breached or removed, or has failed or otherwise no longer materially impounds waters, or a dam that was planned but never constructed. Class “D” dams are considered to be defunct dams posing negligible or no hazard. The department may retain pertinent records regarding such dams.

It should be noted that the Hazard Potential Classification is an assessment of the *Consequences* of dam failure, but not an evaluation of the *probability* of the failure or improper operation.

Location and Extent

The NYSDEC records 297 dams in the County of Orange, with 22 classified as High Hazard Potential (C), 48 classified as Moderate Hazard Potential (B), 198 are classified as Low Hazard Potential (A), and the remaining being negligible, or have no hazard potential (D). Currently, then Lower Warwick Reservoir Dam is the only Class “C” Dam located within the Town of Warwick. The Glenmere Lake Dam, which is also a Class C, is actually located across the border within the Town of Chester; however, it would have a significant effect on the Town of Warwick should it fail. Table 4.17 provides information on the two Class C dams. Figure 4.7 on the following page shows the locations of all major dams within the Town of Warwick and Figure 4.8 shows dam failure inundation areas.

Table 4.17: HIGH HAZARD DAMS IN WARWICK, NY <i>(Source: Orange County HMP 2011)</i>					
Dam Name	Community	River / Stream	Maximum Storage (Acre – Feet)	Dam Height (Feet)	Hazard Potential USACE / NYSDEC
Lower Warwick Reservoir Dam	Warwick (Town)	Mistucky Creek	48	33	C
Glenmere Lake Dam	Warwick (Town) Chester (Town)	Browns Creek	3,327	24	C

Historical Occurrence

There is no record of a major dam failure within the Town of Warwick’s jurisdiction. However, in 1984 and during Hurricane Irene in 2011, it was reported that there were over-topping incidents at the Upper Reservoir Dam.

Probability of Occurrence

The probability of occurrences for dam failures is difficult to quantify due to numerous factors that may cause a dam to fail. The magnitude of a dam failure is normally an estimate of discharge and can vary greatly with each dam. Factors impacting the

Figure 4.7 MULTI- JURISDICTIONAL DAM LOCATIONS

WARWICK HMP ORANGE COUNTY NEW YORK

APRIL 2013

Legend

- ▲ Low Dam Hazard
- ▲ Significant Dam Hazard
- ▲ High Dam Hazard
- Watercourses
- Ponds/Lakes
- Villages
- New York State Boundary
- Cities/Towns
- Warwick Town Boundary

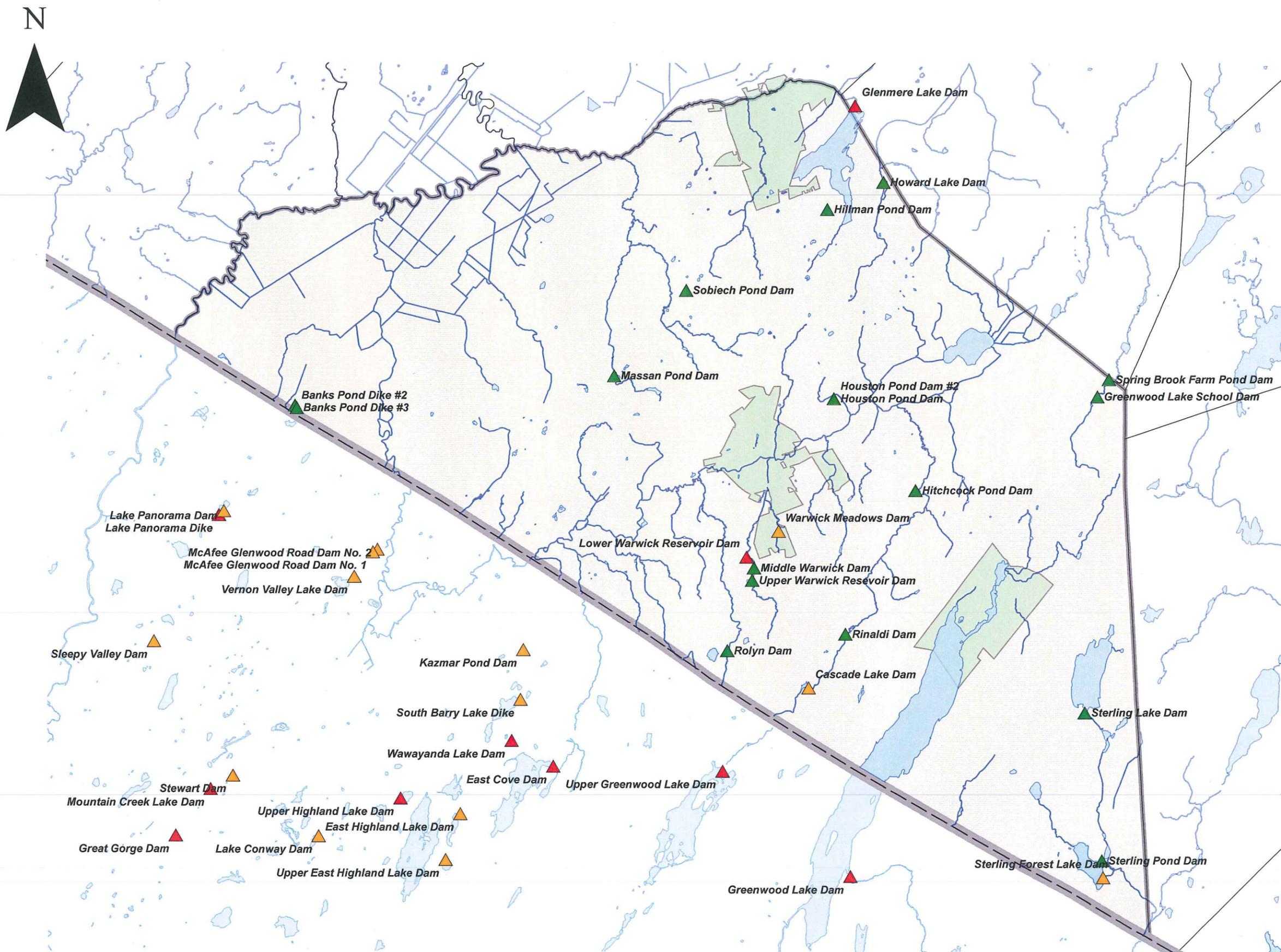
W.O. 5532.6001
COPYRIGHT TECTONIC 2013

This map is computer generated using data acquired by Tectonic from various sources and is intended only for reference, conceptual planning and presentation purposes. This map is not intended for and should not be used to establish boundaries, property lines, location of objects or to provide any other information typically needed for construction or any other purpose when engineered plans or land surveys are required.

Geodatabase Location:
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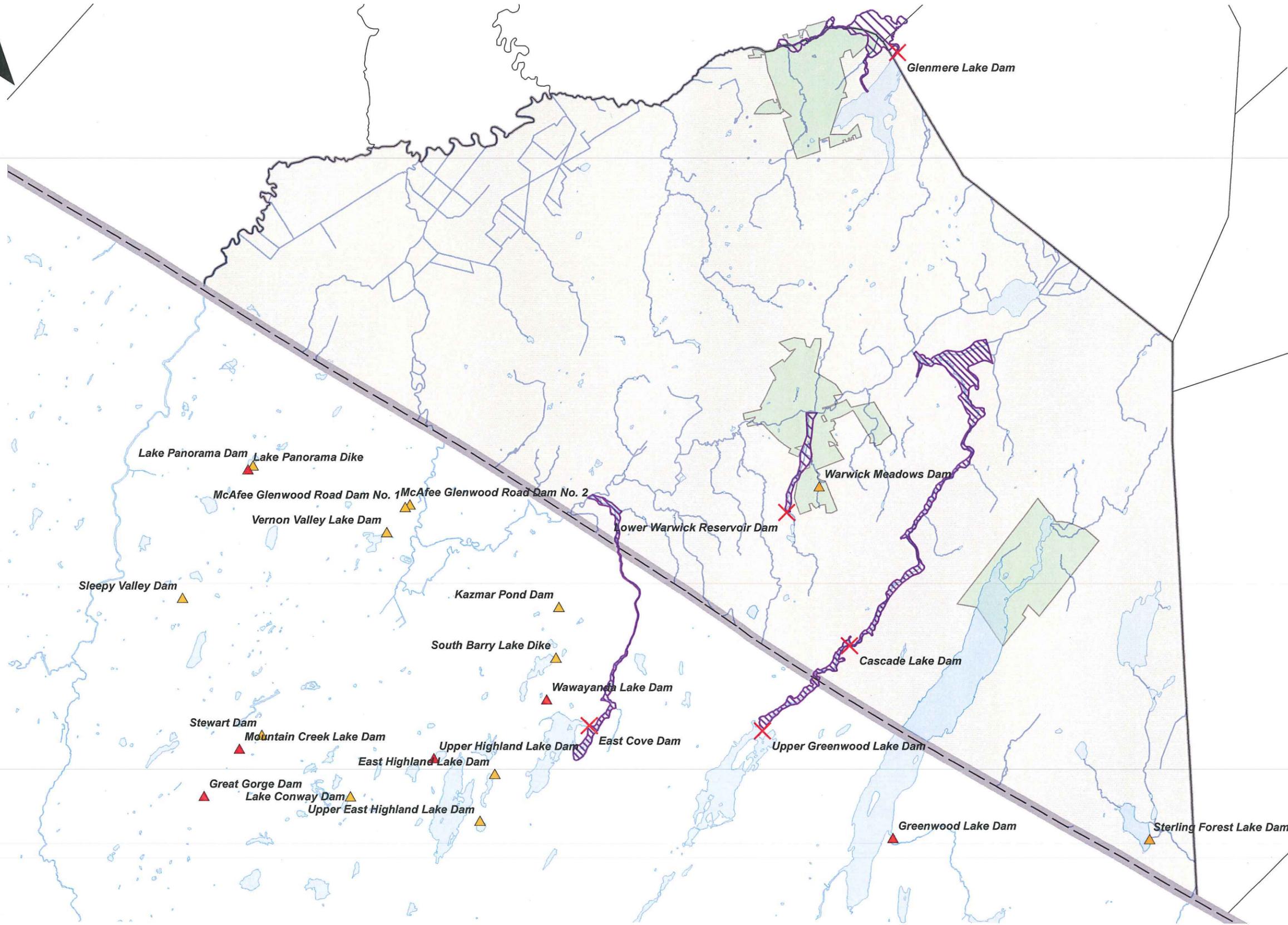
Practical Solutions, Exceptional Service



0 0.5 1 2 3 4
Miles

Source: Orange County GIS (2009), NYS GIS (2011), NJ DEP (2012)

N



**Figure 4.8
MULTI-
JURISDICTIONAL
DAM FAILURE
INUNDATION AREAS**

**WARWICK HMP
ORANGE COUNTY
NEW YORK**

APRIL 2013

Legend

- Assumed Dam Failure Locations
- High Dam Hazard
- Significant Dam Hazard
- Inundation Area
- Villages
- New York State Boundary
- Cities/Towns
- Warwick Town Boundary

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This map is computer generated using data acquired by Tectonic from various sources and is intended only for reference, conceptual planning and presentation purposes. This map is not intended for and should not be used to establish boundaries, property lines, location of objects or to provide any other information typically needed for construction or any other purpose when engineered plans or land surveys are required.

Geodatabase Location:
G:GIS/PROJECTS/5532/5532-6001



Practical Solutions, Exceptional Service



Source: Orange County GIS (2009), Town of Warwick (2012), NJ DEP (2012)

probability and magnitude of dam failure are directly influenced by the type and age of the dam, storage capacity and height, downstream conditions, operational purpose, hydrologic conditions at the time of failure and many other factors.

Vulnerability – CPRI Results

Dam Failure CPRI results for each jurisdiction are summarized in Table 4.18.

Table 4.18: CPRI RESULTS BY JURISDICTION FOR DAM FAILURE

Participating Jurisdiction	Probability	Magnitude / Severity	Warning Time	Duration	CPRI Score
Town of Warwick	Unlikely	Critical	12 – 24 hours	>1 week	2.05
Village of Greenwood Lake	Possible	Critical	<6 hours	<24 hours	2.80
Village of Florida	Possible	Critical	12 – 24 hours	<1 week	2.40
Village of Warwick	Possible	Catastrophic	<6 hours	>1 week	3.10
Town – wide average CPRI =					2.60

Vulnerability – Loss Estimations

There is a lack of significant detailed (quantitative / qualitative) findings at this time for loss estimations.

Vulnerability – Development Trends

Generally, a careful evaluation of new development occurring within dam failure inundation zones should be conducted by each community to ensure that overland pathways are maintained through developments for emergency spillway releases and potential breach flows.

Currently, there are no available development trend maps to visually display and emphasize the areas of development (population, commercial, residential and industrial) for the Town or Villages. However, the Village of Greenwood Lake has no improved property that lays within dam failure risk areas.

Vulnerability – Jurisdictional Summary

The following table 4.19 presents an overall summary of each jurisdiction’s vulnerability to Dam Failures.

Table 4.19: DAM FAILURE VULNERABILITY BY JURISDICTION			
Jurisdiction	Vulnerability	Mitigation Priority?	Notes
Town of Warwick	Moderate	Yes	The Town and Villages have moderate to high levels of vulnerability to dam failure. Portions of the Town and Villages of Warwick and Florida all have some areas that are located within dam failure inundation limits as seen in Figure 4.8. All have designated dam failure as a mitigation priority.
Village of Greenwood Lake	High	Yes	
Village of Florida	Moderate	Yes	
Village of Warwick	High	Yes	

Sources

- New York State Hazard Mitigation Plan (NYSHMP) 2011
- Orange County HMP 2011
- Town and Village Historical News Articles

4.2.3 Hurricane

Description

Characteristics of tropical storm systems include a body of thunderstorms that contribute severe rains and strong winds that surrounds a warm low pressure center (20 – 30 mile “eye”). A tropical storm, in the northern hemisphere, is considered a “hurricane” when wind speeds have reached or exceed 74 miles per hour with a counterclockwise wind rotation. Systems in the northern hemisphere that have speeds between 74 miles per hour through 39 are referred to as tropical storms.

Several other natural hazards can occur before, during and after a hurricane and tropical storm event. These hazards include: land erosion, flooding, wave actions and high winds.

Because they develop over large bodies of warm water, hurricanes lose their strength as they travel over land due to the lack of warm water and the addition of surface friction.

Hurricanes and tropical storms located in the Atlantic Basin region typically occur between June 1st and November 30th, with the peak period among mid-August and late October.

Location

Due to the distance from the coast, the Town of Warwick, and the Villages of Florida, Greenwood Lake and Warwick are more likely to experience tropical storms. However, depending on the size of the storm, areas within each jurisdiction are still prone to be affected by hurricanes.

Extent

The Saffir – Simpson Hurricane Scale (SSHS) is used to categorize the magnitude and severity of hurricanes in the Atlantic Ocean and northern Pacific Ocean region. The SSHS provides an estimate on potential damage to property and flooding when a storm system arrives on land. Five categories are used with a range of values ranked by wind speeds as shown in Table 4.20. Storm surge values may vary on the in the landfall region’s continental shelf slope.

Table 4.20: THE SAFFIR-SIMPSON HURRICANE SCALE			
Category	Wind Speed (miles per hour)	Storm Surge (feet above normal sea level)	Potential Damage from Winds
1	74 – 95 mph	4 – 5 ft.	<u>Minimal:</u> well – constructed frame homes could have damage to roof, shingles, vinyl siding and gutters, unanchored mobile homes are damaged. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
2	96 – 110 mph	6 – 8 ft.	<u>Moderate:</u> well – constructed frame homes could sustain major roof and siding damage, major damage to mobile homes. Many shallowly rooted

**Town of Warwick, Village of Florida, Village of Greenwood Lake and Village of Warwick
MULTI – JURISDICTIONAL, MULTI – HAZARD MITIGATION PLAN – DRAFT**

			trees will be snapped or uprooted and block numerous roads. Near – total power loss is expected with outages that could last from several days to weeks.
3	111 – 129 mph	9 – 12 ft.	<u>Extensive:</u> well – built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm.
4	130 – 156 mph	13 – 18 ft.	<u>Extreme:</u> well – built framed homes can sustain severe damage with loss of most of the roof structure and / or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months.
5	Greater than 157 mph	Greater than 18 ft.	<u>Catastrophic:</u> a high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months.

* Source: National Weather Service, National Hurricane Center website <http://www.nhc.noaa.gov/aboutsshws.ph>

Even though tropical storms (winds below 73 miles per hour) are not listed in the SSHS above, typical potential effects from these storms involve minimal damage to signs, windows, and the dislodging of tree branches and twigs.

Historical Occurrence

Descriptions of significant hurricane events that have occurred within the County, Town of Warwick and Villages over the last twenty years are summarized below:

- June 1972 - Tropical Storm / Hurricane Agnes produced up to 12 inches of rain in southeastern New York State.
- 1979 - Hurricane David caused flooding in low lying areas with winds up to 60 mph that uprooted trees and knocked out power to 115,000 customers.
- July 1996 - Hurricane Bertha made landfall and dumped 4.5 inches of rain on Greenwood Lake.

- September 1999 - Hurricane Floyd dropped up to 13 inches of rain with wind gusts up to 60 mph on southeastern New York State with widespread severe flooding in low lying areas. Orange County issued a Presidential Disaster Declaration.
- September 2008 - Hurricane / Tropical Storm Hanna landed in southeast New York and dropped a range of 1 – 6 inches of rainfall within the Port Jervis – New York City area which later caused flooding.
- August/September 2011 – Hurricane Irene / Tropical Storm Lee caused flooding that damaged as well as collapsed roads, embankments, culverts and a bridge throughout the Town of Warwick and the Village of Warwick areas.
- In October 2012 - Late season, Hurricane Sandy made landfall with over 85 miles per hour winds and produced widespread flooding that was unprecedented. There was also massive power outages and disruption for services dealing with mass transit for the New York City Metro Area and southeastern New York State. Sandy was ranked as the second most costly Hurricane in U.S history.

Probability of Occurrence

According to the Orange County Hazard Mitigation Plan, resources such as NOAA's Atlantic Oceanographic and Meteorological Laboratory (AOML), data indicates that Orange County and its jurisdictions have roughly a 12 percent chance of being impacted by a named storm on any given year.²¹

Vulnerability – CPRI Results

Hurricane CPRI results for each jurisdiction is summarized in Table 4.21.

²¹ *Orange County Hazard Mitigation Plan 2011*

Table 4.21: CPRI RESULTS BY JURISDICITON FOR HURRICANE					
Participating Jurisdiction	Probability	Magnitude / Severity	Warning Time	Duration	CPRI Score
Town of Warwick	Highly Likely	Critical	>24 hours	<24 hours	3.05
Village of Greenwood Lake	Likely	Limited	12 – 24 hours	<1 week	2.55
Village of Florida	Possible	Critical	>24 hours	<1 week	2.25
Village of Warwick	Possible	Catastrophic	6 – 12 hours	<6 hours	2.65
Town – wide average CPRI =					2.63

Vulnerability – Loss Estimations

According to HAZUS – MH 2013 scenario results, hurricanes are divided into seven category “return periods” ranging from 10 to 1000 years. Tables 4.22 through 4.25 displays probable building damages, shelter requirements and economic losses for each “return year event period”.

It is important to note that induced hurricane damages for this HAZUS estimate model breaks debris down into four general categories: 1) reinforced concrete steel, 2) brick / wood, 3) eligible tree debris and 4) other tree debris. Even though these details are not specifically displayed on any tables within the Plan, the models indicate a steady increase in debris generation as the return periods rise from 10 to 1000 years.

Table 4.22: NUMBER OF RESIDENTIAL BUILDINGS DAMAGED					
<i>(Source: HAZUS – MH 2013: Quick Assessment Report)</i>					
Return Period	Minor	Moderate	Severe	Destruction	Total
10	0	0	0	0	0
20	0	0	0	0	0
50	4	0	0	0	4
100	28	0	0	0	28
200	163	5	0	0	168
500	848	60	0	1	909
1000	1,438	148	3	4	1,592

Table 4.23: NUMBER OF NON-RESIDENTIAL BUILDINGS DAMAGED
 (Source: HAZUS – MH 2013: Quick Assessment Report)

Return Period	Minor	Moderate	Severe	Destruction	Total
10	0	0	0	0	0
20	0	0	0	0	0
50	7	0	0	0	7
100	34	1	0	0	35
200	180	6	0	0	186
500	903	66	1	1	972
1000	1,547	169	6	4	1,726

Table 4.24: SHELTER REQUIREMENTS
 (Source: HAZUS – MH 2013: Quick Assessment Report)

Return Period	Displaced Households (# of)	Short Term Shelter (# of People)
10	0	0
20	0	0
50	0	0
100	0	0
200	0	0
5000	5	0
1000	16	2

Table 4.25: PROPERTY DAMAGE (CAPITAL STOCK LOSSES)
 (Source: HAZUS – MH 2013: Quick Assessment Report)

Return Period	Residential	Total	Business Interruption (Income) Losses
10	0	0	0
20	0	0	0
50	755	755	0
100	3,384	3,470	2
200	9,595	9,792	127
500	23,153	24,097	656
1000	35,798	38,344	1,731
Annualized	242	263	16

As a comparison, data for Hurricane Irene’s aftermath in August 2011 indicates that damage estimates were totaled at well over \$2.5 million. Below is a non – comprehensive list that includes the various infrastructures that were damage during Irene for each jurisdiction:

Town of Warwick

- Black Rock Road – Culvert and road collapse
- Cascade & Birdsall Road – Culvert damage
- 83 Distillery Road – Culvert and road collapse
- 21 Ketchum Road – Culvert and road collapse
- Ryerson Road Bridge – Severe scour beneath wingwall and bridge abutment
- Brady Road
- Taylor Road
- Bowen – Culvert and road Collapse
- Jessup – Culvert and road collapse

Village of Warwick

- Parkway Bridge – Replace bridge culvert
- Colonial Avenue Culvert
- Upper Reservoir Dam

Village of Florida

- *No detailed findings at this time, but can be inputted during future planning updates.*

Village of Greenwood Lake

- Lakeland Culvert / Bridge Collapse
- Aeration damage
- Catch Basin Damage

Vulnerability – Development Trends

Currently, there are no available development trend maps to visually display and emphasize the areas of development (population, commercial, residential and industrial) for the Town or Villages. Hazards that are associated with hurricane events such as flooding and severe wind would be assumed to cause uniform damages to future developments within the area. State Building Codes along with local adopted building code changes should have existing guidelines that require newly constructed infrastructure be built with a degree of protection against frequent high wind hazards and flooding hazards.

Vulnerability – Jurisdictional Summary

The following Table 4.26 presents an overall summary of each jurisdiction’s vulnerability to Hurricanes.

Table 4.26: HURRICANE VULNERABILITY BY JURISDICTION			
Jurisdiction	Vulnerability	Mitigation Priority	Notes
Town of Warwick, Village of Greenwood Lake, Florida and Warwick	Moderate to High	Yes	There is no significant geographic variability in the severity or probability of hurricane events, all jurisdictions within the area are considered to be equally exposed to hurricanes.

Sources

National Weather Service, National Hurricane Center,
<http://www.nhc.noaa.gov/aboutsshws.php>

4.2.4 Tornadoes

Description

A tornado is a forceful, rotating column of air that is often in the form of a visible funnel and has contact to the ground. Tornadoes are most often generated by thunderstorm activity when cool, dry air intersects and overrides a layer of warm, moist air forcing the warm air to rise rapidly. Additionally, tornadoes can form from two types of

thunderstorms: supercell and non-supercell. According to the National Oceanic & Atmospheric Administration (NOAA), tornadoes that derive from supercell thunderstorms are the most common and dangerous. The main distinguishing factor from supercell and non-supercell produced tornadoes relies on supercell thunderstorms having a rotating updraft, thus producing a tornado. In contrast, non-supercell produced storms do not form from organized storm-scale rotation. Wind speeds for a tornado can range between 40 to more than 300 miles per hour. Tornadoes have the capability of developing any time during a year, but are more prone during months of spring through summer depending on the region in the U.S.

Location

Since 1952, over 350 tornadoes have occurred in the State of New York. The Town of Warwick and the Villages of Florida, Greenwood Lake and Warwick are all equally likely to have a tornado event occur within the borders. Figure 4.9 below shows the Town of Warwick situated within a high tornado activity risk area.

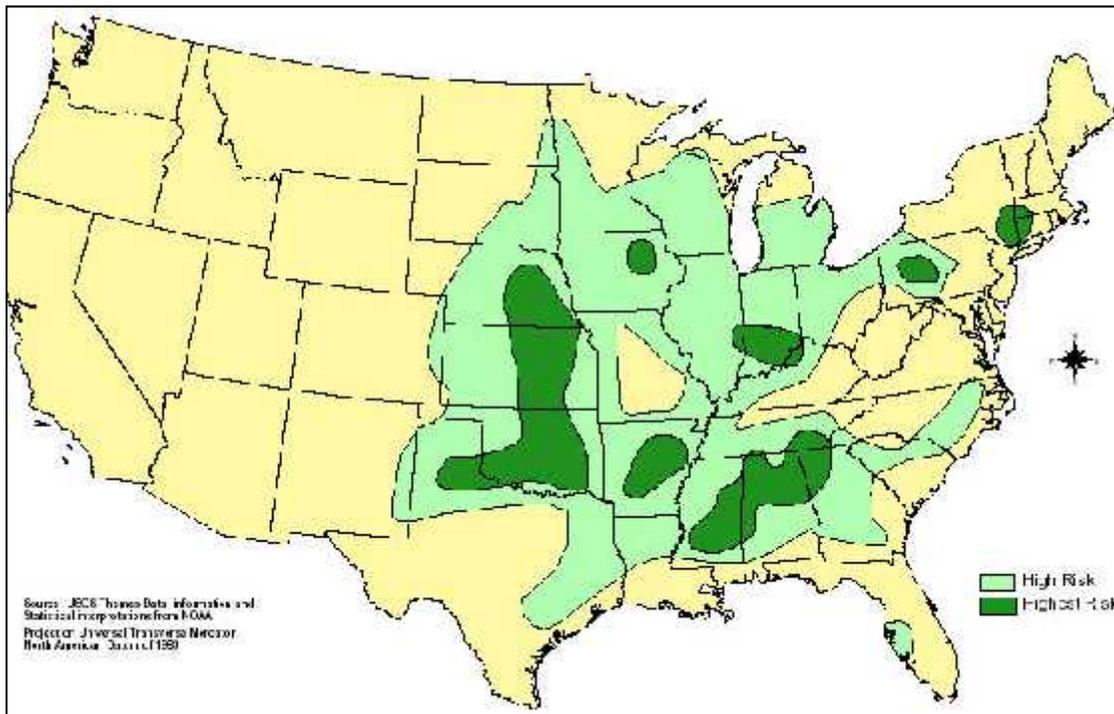


Figure 4.9 Tornado Risk Areas in Continental USA

Extent

Wind speed determines the magnitude and severity of a tornado. The Enhanced Fujita Scale (EF scale) as shown in Table 4.27 is used to categorize descriptions of tornado damage and strength. EF2 – EF3 scaled tornadoes are normally determined to be “significant”, whereas EF4 – EF5 tornadoes are considered “violent / intense” events.

Table 4.27: ENHANCED FUJITA SCALE			
Scale	Intensity Phrase	3 Second Gust / Wind Estimate (MPH)	Damage Description
EF0	Gale	65 – 85	Some damage to chimneys; broken tree branches, shallow – rotted trees toppled over, damages to sign boards
EF1	Moderate	86 – 110	Roof surfaces peeled off, overturned or pushed off mobile homes, automobiles pushed off roads
EF2	Significant	111-135	Roof torn off well – constructed homes, mobile homes destroyed, uprooted or snapped trees (large), light object missiles generated.
EF3	Severe	136 – 165	Walls and roof torn off well – constructed homes, heavy cars lifted off ground, trains overturned and most trees in forest setting uprooted.
EF4	Devastating	166 – 200	Well – constructed homes leveled, weak structured foundations blown away, large missiles (debris) generated with tossed cars.
EF5	Incredible	Over 200	Well – constructed houses lifted of foundations and carried considerable distances, automobile – sized missiles fly through the air in excess of 100 meters (109 yards), all trees debarked, steel reinforced concrete structures badly damaged.

Historical Occurrence

There is no historical activity of tornadoes for the Town of Warwick and Villages of Florida, Greenwood Lake and Warwick. However, it was noted that in November 1989 an EF1 magnitude scale tornado hit the nearby Towns of Monroe, Villages of South Blooming Grove, Newburgh, New Windsor and Washingtonville within the County. Damages caused by this tornado were recorded at \$25 million, 18 injuries and nine fatalities occurred when a cafeteria wall at East Coldenham Elementary School collapsed.²²

²² Orange County Hazard Mitigation Plan 2011

Probability of Occurrence

Statistics from NOAA’s National Climatic Data Center (NCDC) for 1991 -2010 suggests that New York State experiences an average of ten (10) tornadoes per year with the majority occurring during the months of May and June. Most Likely magnitudes range EF-0 from EF-3²³. Based upon mapping data released by the National Severe Storms Laboratory (NSSL) spanning from 1990 to 2009, the Town of Warwick lies within an area of the country that can expect to experience an average of .25 to .50 tornado days per year (all magnitudes)²⁴.

Vulnerability – CPRI Results

Tornado CPRI results for each jurisdiction is summarized in Table 4.28.

Table 4.28: CPRI RESULTS BY JURISDICTION FOR TORNADO					
Participating Jurisdiction	Probability	Magnitude / Severity	Warning Time	Duration	CPRI Score
Town of Warwick	Possible	Critical	< 6 hours	< 6 hours	2.50
Village of Greenwood Lake	Unlikely	Limited	< 6 hours	< 6 hours	1.75
Village of Florida	Unlikely	Limited	< 6 hours	< 6 hours	1.75
Village of Warwick	Possible	Catastrophic	< 6 hours	< 6 hours	2.80
Town – wide average CPRI =					2.20

Vulnerability – Loss Estimations

Table 4.29 displays estimated annual tornado damages for the Town of Warwick, Village of Florida, Greenwood Lake and Warwick.

²³ NOAA National Climate Data Center; <http://www.ncdc.noaa.gov/oa/climate/severeweather/tornadoes.html>

²⁴ Oklahoma Climatological Survey; <http://www.climate.ok.gov>

Table 4.29: ANNUAL LOSS ESTIMATES – TORNADO (1969 -2009) (Source: NCDC Records on Orange County Hazard Mitigation Plan 2011)		
Municipality	Total Value of Improvements	Distributed Annual Loss Estimate, Tornado
Town of Warwick	\$2,266,424,291	\$50,187
Village of Greenwood Lake	\$261,917,040	\$5,800
Village of Florida	\$252,670,165	\$5,595
Village of Warwick	\$666,185,886	\$14,752

Vulnerability – Development Trends

Currently, there are no available development trend maps to visually display and emphasize the areas of development (population, commercial, residential and industrial) for the Town or Villages. However like extreme wind, tornadoes pose a uniform risk for the whole area within the Town of Warwick which would hold the same precedent for any future residential or commercial development exposed to this hazard. State Building Codes along with local adopted building code changes should have existing guidelines that reflect that newly constructed infrastructure be built with a degree of protection against frequent high wind hazards.

Vulnerability – Jurisdictional Summary

The following table 4.30 presents an overall summary of each jurisdiction’s vulnerability to Tornadoes.

Table 4.30: TORNADO VULNERABILITY BY JURISDICTION			
Jurisdiction	Vulnerability	Mitigation Priority?	Notes
Town of Warwick	Moderate	No	There is no significant geographic variability in the severity or probability of tornado events, all jurisdictions within the area are considered to be equally exposed to tornado events. Tornado is not considered a mitigation priority due to its unlikely probability of occurring within the area.
Village of Greenwood Lake	Low	No	
Village of Florida	Low	No	
Village of Warwick	Moderate	No	

Sources

- New York State Hazard Mitigation Plan (NYSHMP) 2011
- Orange County Hazard Mitigation Plan 2011

4.2.5 *Winter Storms*

Description

Winter storms occur during low temperatures and include events such as blizzards, ice storms, extreme cold (Section 4.2.8) and extreme wind (Section 4.2.11). Coastal erosion and flooding are also sometimes characterized with winter storms. Winter storms are regular annual occurrences for the area and are only considered hazards when they significantly affect certain building structures and disrupt communications and electrical power.

Another other type of winter storm that is common for the New York is nor'easters. These storms are typically known for contributing heavy amounts of precipitation along with high winds which sometimes produces storm surges. During winter months these storms can produce accumulations of snow of more than nine inches, causing outages and damage to property are common. It is also important to note that a main distinction between nor'easter's and hurricanes is that nor'easter's require cold-core low pressure systems with cold air, while the latter relies on warm-core low pressure systems.

According to NOAA, precipitation falls as snow when the temperature remains at or below 0° Celsius from the cloud base to the ground, other types of winter precipitation include:

Snow Flurries – occurs when light snow falls for short durations with light dusting and no accumulation.

Snow Showers – occurs when snow falls for short durations at varying intensities with some possible accumulation.

Snow Squalls – occurs when there are brief, intense snow showers with strong gusty winds with significant accumulation.

Blowing Snow – occurs when wind – driven snow reduces visibility and causes significant drifting. This may include loose snow on the ground being picked up by the wind or falling snow.

Blizzards – occurs when winds over 35 mph with snow and blowing snow, reducing visibility to 1 / 4 miles or less for at least 3 hours.

Sleet – occurs when snowflakes only partially melt when they fall through a shallow layer of warm air.

Freezing Rain – occurs when snowflakes descend into a warmer layer of air and melt completely.

Statewide, according to NOAA data the average annual snowfall for Orange County ranges from 30 to 50 inches per year as seen in Figure 4.10.

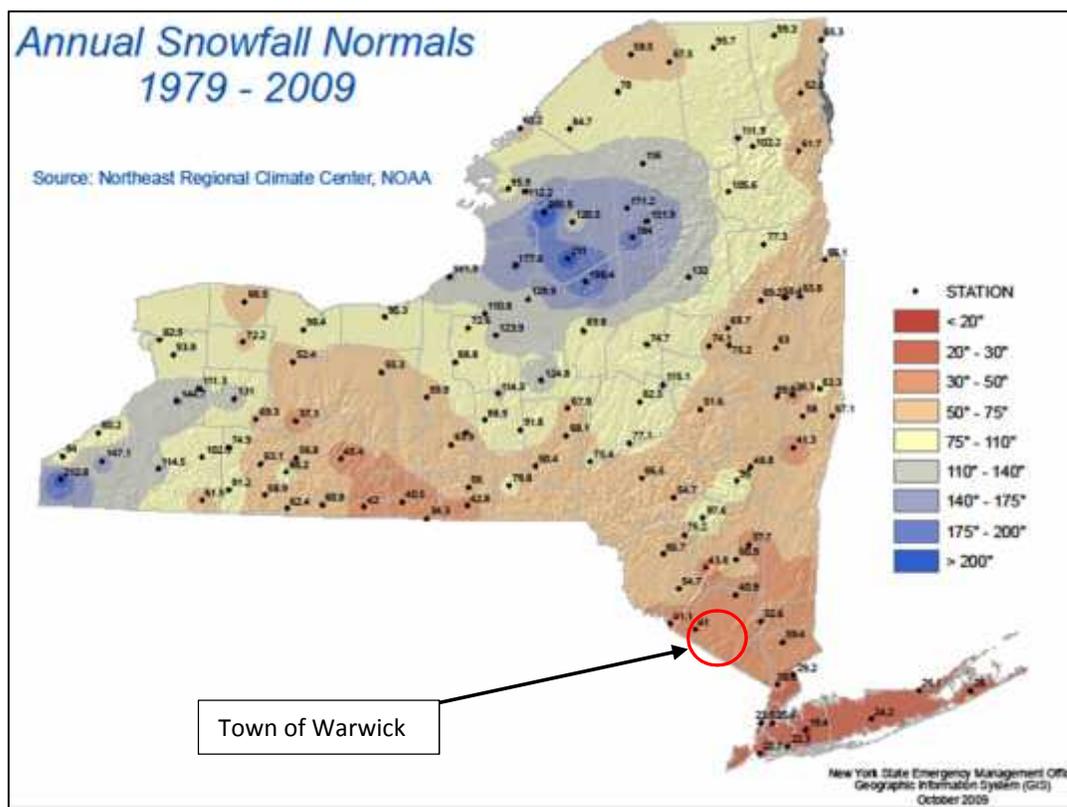


Figure 4.10 NOAA Annual Snowfall

Historical Occurrence

Descriptions of major winter storm events that have affected areas of the Town of Warwick and Participating Villages over the last decade are summarized below:

- March 1997 – An intense low pressure system developed off the Delmarva Coast and moved northeast, passing south of Long Island. During the afternoon hours, rain developed into heavy wet snow accumulating at least six inches of snow. Power lines and trees fell due from 40 mph winds and snow that resulted in the closing of many roads. A State of Emergency was declared by Towns. Snowfall amounts for Warwick and Cornwall were recorded at 17 inches.²⁵
- March 1999 – Low pressure system, with cold air in place developed over the Gulf Coast States on March 13th. As it moved northeast toward the Mid – Atlantic Coast, precipitation was spread across the region. In the afternoon of March 14th the light rain transformed in wet snow then becoming heavy as the low pressure system hit the Mid – Atlantic States. Heavy snow caused power line damage along with tree limbs across the area. Nine inches of snowfall was measured at Chester and Warwick.²⁶
- December 2000 – Gusty winds and subfreezing temperatures lingered behind a low pressure storm system accompanied by thunder and lightning. Snowfalls totals were recorded to be 21 inches at Warwick and Rock Tavern.²⁷
- January 2009 – A combination of deepening low pressure over the Great Lakes and a weak high retreating over the northeast produced a significant accumulation of ice across the northern portions of the Lower Hudson Valley. Power lines and trees were down, with the amount of ice averaging around one – half inch. Orange County ice accumulation ranged from Warwick having .3 inches to .8 inches in Monroe and Middletown.²⁸
- March 2010 – A winter storm caused culvert and road collapse in the Town of Warwick on Ryerson Road.

²⁵ Orange County Hazard Mitigation Plan 2011

²⁶ Ibid

²⁷ Ibid

²⁸ Ibid

Probability of Occurrence

Based upon historical events, winter storms continue to be one of the certain probable and frequent hazards for the area around the Town of Warwick.

Vulnerability – CPRI Results

Winter Storm CPRI results for each jurisdiction are summarized in Table 4.31.

Table 4.31: CPRI RESULTS BY JURISDICTION FOR WINTER STORM					
Participating Jurisdiction	Probability	Magnitude / Severity	Warning Time	Duration	CPRI Score
Town of Warwick	Highly Likely	Limited	6 – 12 hours	< 24 hours	3.05
Village of Greenwood Lake	Likely	Limited	12 – 24 hours	< 1 week	2.55
Village of Florida	Highly Likely	Critical	> 24 hours	< 1 week	3.15
Village of Warwick	Highly Likely	Critical	6 – 12 hours	< 1 week	3.45
Town – wide average CPRI =					3.05

Vulnerability – Loss Estimations

There is a lack of significant detailed (quantitative / qualitative) findings at this time for the Town and Villages’ loss estimations. Records from the National Climatic Data Center (NCDC) indicate an estimate of \$25 million in property / structural damages that have been caused by wintery storm events for Orange County from 1993-2000. Storm data Information provided by the Town and Villages on the past 57 winter storm incidents that occurred within the jurisdictions indicates that damage estimates totaled approximately \$199,851.

Vulnerability – Development Trends

Currently, there are no available development trend maps to visually display and emphasize the areas of development (population, commercial, residential and industrial) for the Town or Villages. Winter storms pose a uniform risk for the whole area within the Town of Warwick which would also hold the same precedent for any future residential or commercial development exposed to this hazard. State Building Codes along with local adopted building codes should have existing guidelines that

reflect newly constructed infrastructure be built with a minimal degree of protection against attributes that accompany winter storms such as the collection of snow, wind and precipitation.

Vulnerability – Jurisdictional Summary

The following table presents an overall summary of each jurisdiction’s vulnerability to Winter Storms.

Table 4.32: WINTER STORM VULNERABILITY BY JURISDICTION			
Jurisdiction	Vulnerability	Mitigation Priority?	Notes
Town of Warwick	High	Yes	The Town and Villages have moderate to high levels of vulnerability to winter storms. All have designated winter storm as a mitigation priority.
Village of Greenwood Lake	Moderate	Yes	
Village of Florida	High	Yes	
Village of Warwick	High	Yes	

4.2.6 Wildfires

Description

A wildfire is an uncontrolled fire spreading through vegetative fuels, exposing and possibly consuming structures. They often begin unnoticed, spread quickly, and are usually signaled by dense smoke. Wildfires can be human – caused through acts such as arson, unattended campfires or the improper burning of debris. Another common cause of wildfires is lightning. Furthermore, wildfires can be categorized into four types:

Wild land fires occur mainly in areas under federal control, such as national forests and parks, and are fueled primarily by natural vegetation. Generally, development in these areas is nonexistent, except for roads, railroads, power lines and similar features.

Interface or intermix fires, occur in areas where both vegetation and structure provide fuel. These are also referred to as “urban – wild land interface” fires.

Firestorms occur during extreme weather (e.g. high temperatures, low humidity and high winds) with such intensity that fire suppression is virtually impossible. These events typically burn until the conditions change or the fuel is exhausted.

Prescribed fires and prescribed natural fires, are intentionally set or natural fires that are allowed to burn for beneficial purposes.

Topography, fuel and weather contribute to wildfire behavior. These details are briefly discussed below:

- **Topography:** As slope increases, the rate of wildfire spread increases.
- **Fuel:** Wildfires spread based on the type and quantity of available flammable material, referred to as the fuel load.
- **Weather:** The most variable factor affecting wildfire that includes temperature, humidity, wind and lightning.

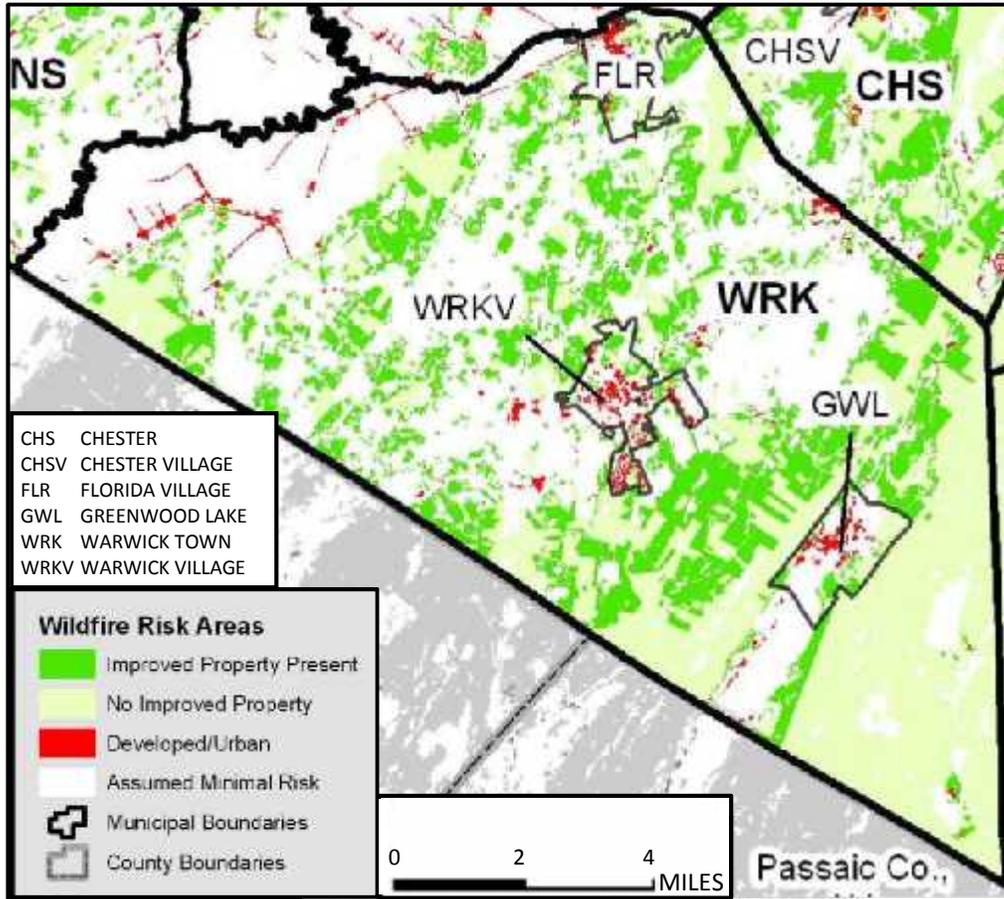
Location and Extent

According to the County’s Hazard Mitigation Plan, areas in Orange County where the severity of wildfire hazards are the greatest tend to show the lowest population densities in the County resulting in the exposure and risk to the majority of people living and working in the Town as relatively low. Figure 4.11 displays the developed and undeveloped areas in the Town of Warwick which can provide a basis for determining risk from wildfire.

Historical Occurrence

Descriptions of a series of wildfire events that have occurred within the Town of Warwick over the last twenty years are summarized below:

- February 1980 – A couple winter months with no snow or rain led to a string of brush fires (7+) that burned several acres of grass within the Town of Warwick, with one of the events reported to be near grassland areas of Sutton Road.



Source: Orange County GIS, Municipalities, Parcels; USGS, NLCD Zone 65 Land Cover Layer, 2003 2005; Lamont-Doherty Earth Observatory, Columbia University, Hudson River Estuary Shoreline, 2004

Figure 4.11 Wildfire Risk Areas in the Town of Warwick

Probability of Occurrence

According to the County’s Hazard Mitigation Plan, wildfires are an occasional occurrence within the County. Future probability is moderate, but the risk may increase or decrease depending upon the severity of drought conditions in the area. Increased development (residential area projects) may result in an increase of urban – wildland interface risk as well.²⁹

²⁹ Orange County Hazard Mitigation Plan 2011

Vulnerability – CPRI Results

Wildfire CPRI results for each jurisdiction is summarized in Table 4.33.

Table 4.33: CPRI RESULTS BY JURISDICTION FOR WILDFIRE					
Participating Jurisdiction	Probability	Magnitude / Severity	Warning Time	Duration	CPRI Score
Town of Warwick	Likely	Limited	12 – 24 hours	> 1 week	2.65
Village of Greenwood Lake	Possible	Critical	< 6 hours	< 24 hours	2.30
Village of Florida	Possible	Limited	< 6 hours	> 1 week	2.50
Village of Warwick	Likely	Limited	< 6 hours	< 6 hours	2.65
Town – wide average CPRI =					2.53

Vulnerability – Loss Estimations

Table 4.34 below expresses vulnerability as the value of improvements exposed to wildfire incidents within the Town and Villages.

Table 4.34: EXPOSURE TO WILDFIRE RISK								
<i>(Source: NCDC Records on Orange County Hazard Mitigation Plan 2011)</i>								
Community	Urban Wildland Interface (feet)	Wildfire Risk Area – No Improved Property (acres)	Wildfire Risk Area – With Improved Property (acres)	Total Municipal Area (acres)	Total Area Within Wildfire Risk Zones (%)	Total Value of Improvements in Municipal Areas	Improve Value Within Wildfire Risk Zones	Improved Value Within Wildfire Risk Zones (%)
Town of Warwick	33,524	18,816	12,369	63,358	49%	\$2,266,424,291	\$715,388,587	32%
Village of Greenwood Lake	4,875	286	189	1,394	34%	\$261,917,040	\$33,826,265	13%
Village of Florida	10,724	271	212	1,405	34%	\$252,670,165	\$32,217,499	13%
Village of Warwick	18,912	144	172	1,482	21%	\$666,185,886	\$132,281,389	20%

Vulnerability – Development Trends

The Wildland Urban Interface (WUI) represents the border of urban development as it intersects with the natural development. Future development that occurs at the WUI (seen in Figure 4.11) will increase WUI areas and expand the potential exposure of new structures to wildfire hazards.

Discussed briefly below are specific critical assets located in the Town and Villages that lie within a delineated wildfire area.

Town of Warwick

- Department of Public Works Maintenance Garage
- Warwick County Park / Hickory Hill Golf Course
- Glenmere Lake/ Black Meadow Reservoir

Village of Florida

- Glenmere Lake / Black Meadow Reservoir

Vulnerability – Jurisdictional Summary

The following table presents an overall summary of each jurisdiction’s vulnerability to Wildfires.

Table 4.35: WILDFIRE VULNERABILITY BY JURISDICTION			
Jurisdiction	Vulnerability	Mitigation Priority?	Notes
Town of Warwick	Moderate	No	The vulnerability for wildfire for the Town and Villages is moderate. The Town of Warwick as seen in Table 4.34 has the highest improved value percent within wildfire risk zones. Heavy forested areas with large wild lands are more prone to wildfires, while highly urbanized developed areas within these jurisdictions are lower due to lack of connective vegetation and fuel.
Village of Greenwood Lake	Moderate	No	
Village of Florida	Moderate	No	
Village of Warwick	Moderate	No	

Sources

Orange County HMP 2011

New York State Department of Environmental Conservation website:

<http://www.dec.ny.gov/lands/4975.html>

4.2.7 *Drought*

Description

Drought is the result of a natural decline in the expected precipitation over an extended period of time, typically for one or more seasons in length. The severity of drought can be aggravated by other climatic factors, such as prolonged high winds and low relative humidity (FEMA, 1997). The severity of droughts depends on numerous factors including intensity, duration and geographic extent as well as regional watery supply demands by humans and vegetation.

The following are four commonly used definitions of droughts:

Meteorological – A Drought defined by a period of substantially diminished precipitation duration and/or intensity. The commonly used definition of meteorological drought is an interval of time, generally on the order of months or years, during which the actual moisture supply at a given place consistently falls below the climatically appropriate moisture supply.

Agricultural – Occurs when there is inadequate soil moisture to meet the needs of a particular crop at a particular time. Agricultural drought usually occurs after or during meteorological drought, but before hydrological drought and can affect livestock and other dry – land agricultural operations.

Hydrological – Refers to deficiencies in surface and subsurface water supplies. It is measured as stream flow, snow pack, and as a lake, reservoir and groundwater levels. There is usually a delay between lack of rain or snow and less measurable water in streams, lakes and reservoirs. Therefore, hydrological measurements tend to lag behind other drought indicators.

Socio-economic – When physical water shortages start to affect the health, well – being and quality of life of the people, or when the drought starts to affect the supply and demand of an economic product.

A drought differs from other natural hazard in three ways. First, the onset and end of a drought are difficult to determine due to the slow accumulation and lingering effects of an event after its apparent end. Second, the lack of an exact and universally accepted

definition adds to the confusion of its severity and existence. Third, the impact of drought is less obvious and may be spread over a large geographic area.

Droughts may cause a shortage of water for human consumption, industrial uses, hydroelectric power, recreation, navigation and aquatic habitat. The number and severity of wildfires may also affect water supply and water quality. Severe droughts may result in the loss of forest products, agricultural crops, undernourished wildlife and livestock.

Location and Extent

Droughts can happen in all parts of the U.S and at any time of the year, depending on the precipitation and temperature over time. Town of Warwick and Participating Villages are all more susceptible to less severe, short-term droughts as opposed to more extreme, long – term drought conditions. According to the Orange County Hazard Mitigation Plan, some of the most immediate effects of the drought in the County are likely to be experienced by farmers. Table 4.36 provides a breakdown of agricultural land distribution based upon County GIS data. Figure 4.12 on the following page shows the delineations of agricultural districts throughout the Town of Warwick.

Table 4.36: DISTRIBUTION OF AGRICULTURAL LAND						
<i>(Source: Orange County GIS / HMP 2011)</i>						
Municipality	Total Area (Acres)	Cultivated Cropland (Acres)	Pasture Land (Acres)	Other Agricultural Land (Acres)	Total Agricultural Land (Acres)	Total Agricultural Land %
Warwick, Town of	63,358	8,613	5,587	335	14,534	22.9%
Warwick, Village of	1,482	0	3	0	3	0.2%

Historical Occurrence

The following paragraphs are descriptions of drought events that have affected the Town of Warwick and Participating Villages over the last twenty years are summarized:

- July – September 1980 – A dry trend occurred due to a dry spring and snowless winter. Record show that the last rainfall that occurred during this period was on

July 23, when .92 inches fell. Examples of the extent of the drought during this period included crop failures such as dried up corn fields and crumbling tomato plants, as well as an eight-inch drop of water level at Greenwood Lake. This drought period also forced water pumps to directly pump water from the lake instead of its usual mix of lake and ground water. Local news articles at this period stated that the drought periods were responsible for nearly drying up a small pond located in Pond Hill Avenue (Warwick).

- August – December 1993 – Period of drought contributed to agricultural damage to the southeastern region of the state. Crops such as corn, vegetables and fruits were the harshest hit. During August 1993 the New York State Drought Management Task Force issued an alert advisory for the neighboring counties in the area.
- November 2001 – October 2002 – Drought conditions worsened due to extremely dry weather in the area. Records indicate that in November December 2001 the New York State Department of Environmental Conservation issued drought warnings for Orange Counties and the surrounding areas as a consequence of groundwater conditions being consistently below adequate ranges. These warnings remained in place through October 2002.

Probability of Occurrence

Unlike floods (100 year / 1% annual chance) there is no commonly accepted probability or return period for defining the risk of drought. The magnitude of drought is usually measured by a hydrologic deficit's time and severity.

NOAA records indicated that within a 16 year span from 1993 to 2009, the Town of Warwick had experienced 2 significant drought incidents. This suggests that the area can expect an average of .125 droughts per year. However, there were no accounts of any prolonged drought periods within the last five years and according to the County's Plan the area is less likely than other parts of the region to experience drought conditions.

Vulnerability – CPRI Results

Drought CPRI results for each jurisdiction is summarized in Table 4.37.

Table 4.37: CPRI RESULTS BY JURISDICTION FOR DROUGHT					
Participating Jurisdiction	Probability	Magnitude / Severity	Warning Time	Duration	CPRI Score
Town of Warwick	Unlikely	Limited	> 24 hours	> 1 week	1.60
Village of Greenwood Lake	Possible	Critical	12 – 24 hours	> 1 week	2.50
Village of Florida	Possible	Catastrophic	> 24 hours	> 1 week	2.65
Village of Warwick	Possible	Critical	> 24 hours	> 1 week	2.35
Town – wide average CPRI =					2.28

Vulnerability – Loss Estimations

The most current loss estimations for drought incidents were not available at this time; however, Table 4.38 provides sufficient estimated annual loss figures from drought conditions for the Town of Warwick.

Table 4.38: ANNUAL LOSS ESTIMATES – DROUGHT (1993 – 2009)			
<i>(Source: Orange County HMP 2011)</i>			
Community	Total Acres Non – Pasture Agricultural Land (Acres)	Percent of Total Non – Pasture Agricultural Land	Distributed Annual Loss Estimate Drought
Town of Warwick	8,947	20.3%	\$356,923

Vulnerability – Development Trends

Currently, there are no available development trend maps to visually display and emphasize the areas of development (population, commercial, residential and industrial) for the Town or Villages. Droughts pose a uniform risk for the whole area within the Town of Warwick which would also hold the same precedent for any future residential or commercial development exposed to this hazard. However, it is important to realize that droughts are assumed not to pose any physical damage or threat to infrastructure and/or critical facilities.

Vulnerability – Jurisdictional Summary

The following Table presents an overall summary of each jurisdiction’s vulnerability to Droughts.

Table 4.39: DROUGHT VULNERABILITY BY JURISDICTION			
Jurisdiction	Vulnerability	Mitigation Priority?	Notes
Town of Warwick	Low	No	The Town and Villages have low to moderate levels of vulnerability to drought. Drought impact on portions of the Town and Villages rely on availability of agricultural land in within the Town and Village communities as seen in Figure 4.12.
Village of Greenwood Lake	Moderate	No	
Village of Florida	Moderate	No	
Village of Warwick	Moderate	No	

Sources

- Orange County HMP 2011
- New York State Hazard Mitigation Plan (NYSHMP) 2011
- NOAA National Weather Service
- U.S Drought Portal (www.drought.gov)

4.2.8 *Extreme Temperatures*

Descriptions

Extreme Cold

What constitutes as extreme cold is relative to what is considered normal average cold temperatures for the region. According, to the New York State Hazard Mitigation Plan (2011), characteristics of extreme cold for northern states include temperatures at or below zero degrees for an extended period of time. Frigid temperatures can freeze rivers, causing ice jams which ultimately lead to flooding. Freezing temperatures can also destroy crops and vegetation.

Terms such as frostbite (body tissue damage caused by extreme cold), wind chill (how the wind/cold feels on exposed skin) and hypothermia (when human body temperatures are recorded less than 95 degrees Fahrenheit) are some of the negative impacts extreme cold can have on both human beings and animals, especially when

utility service providers go offline. Infants and the elderly are more susceptible to such conditions. Figure 4.13 shows the National Weather Service Wind Chill Chart.

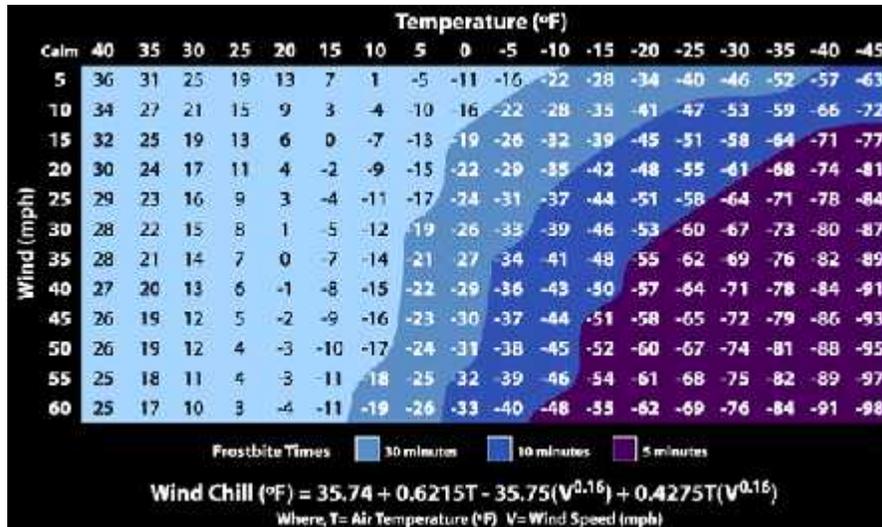


Figure 4.13: NWS Wind Chill Chart

Extreme Heat

According to the New York State Hazard Mitigation Plan (2011), temperatures that hover 10 degrees or more above the average high temperature for the region and last for several weeks are defined as extreme heat. When high atmospheric pressure traps hazy, damp air near the ground level, humid conditions can occur.

Figure 4.14 displays the National Weather Service (NWS) heat index chart that measures actual air temperature when factored with the relative humidity. Additionally, Table 4.40 shows the effects that prolonged exposure to heat can have on a human being. The Heat Index (HI) values, once the temperature and relative humidity are known, describes how it actually feels.

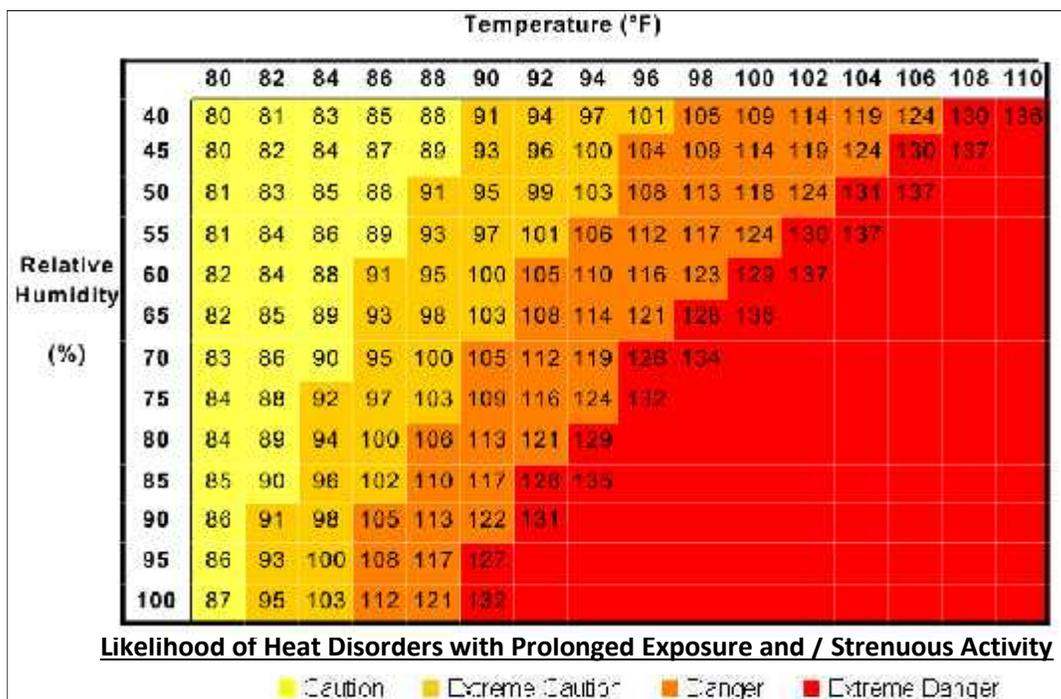


Figure 4.14: National Weather Service Heat Index Chart

Table 4.40: ADVERSE EFFECTS OF PROLONGED HEAT EXPOSURE		
Category	Heat Index	Health Hazards
Extreme Danger	130° F - Higher	Heat Stroke / Sunstroke is likely with continued exposure.
Danger	105° - 129° F	Sunstroke, muscle cramps, and / or heat exhaustion possible with prolonged exposure and / or physical activity.
Extreme Caution	90° - 105° F	Sunstroke, muscle cramps, and / or heat exhaustion possible with prolonged exposure and / or physical activity.
Caution	80° - 90° F	Fatigue possible with prolonged exposure and / or physical activity

* It is important to note, that full, open exposure to sunshine can increase values up to 14° F

Location and Extent

The Town of Warwick and Participating Villages are equally exposed to extreme temperatures. As mentioned in the County Hazard Mitigation Plan (2011) extreme heat events are common between May and mid – September.

Historical Occurrence

There were a total of 7 extreme heat events and 4 extreme cold events between 1993 – 2012 that have affected the Town of Warwick and the surrounding areas which are summarized below:

- February 1993 – Extreme cold temperatures ranged below five below zero with a reading of 40 below zero wind chill within the area.
- July 1999 – Extreme heat temperatures peaked in the high 90's with moderate humidity that resulted in heat indexes ranging from 110 to 115°F in the area.
- January 2000 – There were two extreme cold events within the area with temperatures at 10°F with the wind chill recorded at 35° below zero.
- August 2001 – Extreme heat temperatures rose as high as 94°F with a heat index of 110.
- July 2002 – Two extreme heat events that took place within Orange County.
- Jan 2004 – Extreme cold temperatures ranging 1 degree above 0 with a 26 below zero wind chill.
- August 2006 – Extreme heat temperatures reached around 100°F with a heat index of 115.
- July 2011 and July 2012 – Extreme heat incidence took place during these months within Orange County.

Probability of Occurrence

According, to Orange County HMP and NCDC records, extreme temperatures are a frequent occurrence and based on the past decade events of extreme temperatures can occur at an estimate of 0.8 – 1.6 times per year.

Vulnerability – CPRI Results

Extreme Temperatures CPRI results for each jurisdiction are summarized in Table 4.41.

Table 4.41: CPRI RESULTS BY JURISDICTION FOR EXTREME TEMPERATURES					
Participating Jurisdiction	Probability	Magnitude / Severity	Warning Time	Duration	CPRI Score
Town of Warwick	Likely	Limited	> 24 hours	> 1 week	2.50
Village of Greenwood Lake	Possible	Critical	12 – 24 hours	< 1 week	2.40
Village of Florida	Likely	Limited	> 24 hours	> 1 week	2.50
Village of Warwick	Highly Likely	Limited	6 – 12 hours	< 24 hours	3.05
Town – wide average CPRI =					2.61

Vulnerability – Loss Estimations

Sufficient historical data was not obtained for structural dollar loses and damages estimates. Critical infrastructures are not considered highly vulnerable to extreme temperatures and are assumed to yield minimum losses. It is important to note that extreme heat / cold events can cause serious effects on human populations within communities, especially vulnerable ones. The population affected by these heat / cold incidents would vary by age and income.

Vulnerability – Development Trends

Currently, there are no available development trend maps to visually display and emphasize the areas of development (population, commercial, residential and industrial) for the Town or Villages. Extreme temperatures pose a uniform risk for the whole area within the Town of Warwick. Increase in population numbers may increase vulnerability to extreme temperatures depending up demographic changes. Future infrastructure development may incorporate mitigation techniques for extreme temperature events such as enforcement of local adopted building codes for critical facilities to include backup power generation equipment and/or surplus of gas storage tanks.

Vulnerability – Jurisdictional Summary

The following table presents an overall summary of each jurisdiction’s vulnerability to Extreme Temperatures.

Table 4.42: EXTREME TEMPERATURES VULNERABILITY BY JURISDICTION

Jurisdiction	Vulnerability	Mitigation Priority?	Notes
Town of Warwick	Moderate	Yes	The Town and Villages have moderate to levels of vulnerability to extreme temperatures. All have designated extreme temperatures as a mitigation priority due to historical records. There is little to no significant deviation in expected high and low temperature extremes for the Town and Villages with all equally exposed to extreme temperature hazards.
Village of Greenwood Lake	Moderate	Yes	
Village of Florida	Moderate	Yes	
Village of Warwick	Moderate	Yes	

4.2.9 **Earthquake**

Description

According to the New York State Hazard Mitigation Plan (2011), an earthquake is both the sudden slip on a fault, the resulting ground shaking and radiated seismic energy caused by a slip, volcanic activity or other stress changes in the earth. “Main shocks”, are the largest earthquake movements occurring sometimes after the fore shocks. However, main shocks usually always have aftershocks (smaller earthquakes) in the same region as the main shock. Though smaller than the main shock, aftershocks have the capability of continuing during a period of weeks, months and / or even years. Earthquakes can trigger another natural hazard such as landslides and contribute to the occurrence of soil liquefaction. Liquefaction occurs due to the shaking and vibrations of an earthquake causing unconsolidated, saturated soil to take the form of a substance that acts like a liquid. Thus, adding to the validation on how soil type can considerably increase earthquake risk.

Location

Most of New York State is susceptible to some level of risk from earthquakes. Figure 4-15 displays a hazard map for earthquakes created by the United States Geological Survey (USGS) Earthquake Hazards program. The map shows that the Town of Warwick lies within an area that has a moderate level of seismic risk compared to the State.

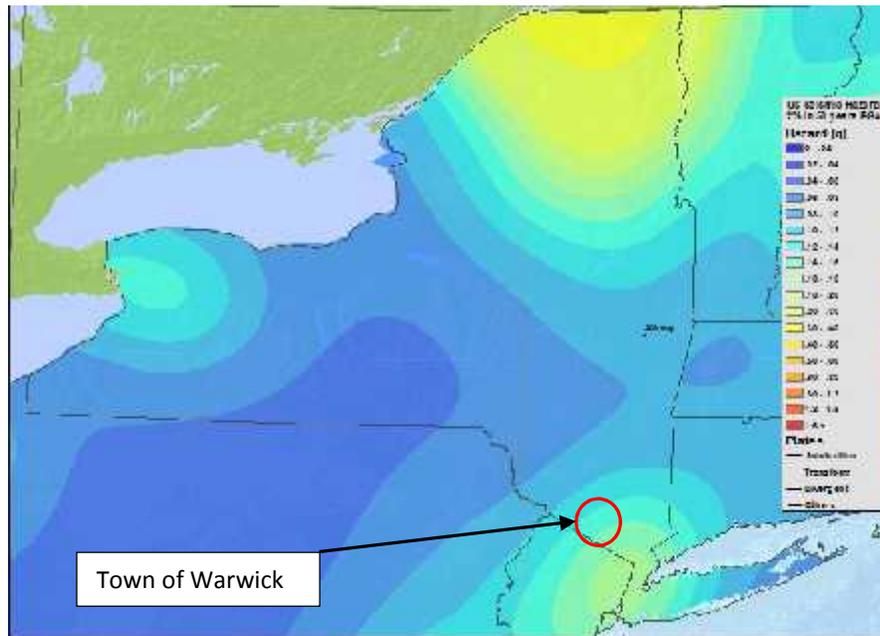


Figure 4.15: Earthquake Hazard Map (Source: US Geological Survey)

Extent

The amount of energy released at the epicenter (the point above where the fault ruptures) and the location's distance from the epicenter determines the severity of an earthquake. The magnitude is the measurement of the total amount of energy released. The intensity takes into account the effects of an earthquake at a specific spot. Using Peak Ground Acceleration (PGA) is another method expressing the severity of an earthquake comparing its acceleration to the normal acceleration due to gravity (g). PGA measures the rate of in motion of the earth's surface and expresses it as a percent of the established rate of acceleration due to gravity ($9.8\text{m} / \text{sec}^2$). Figure 4.15 above shows that the Town of Warwick lies within an area that has a PGA between .14 (g) to .18 (g). Table 4.43 displays an approximate relationship between intensity; magnitude and PGA while Table 4.44. contains definitions for the scale rating.

Table 4.43: EARTHQUAKE MAGNITUDE / INTENSITY COMPARISON

PGA (%g)	Magnitude (Richter Scale)	Intensity	Perceived Shaking	Potential Damage
<.17	1.0 – 3.0	I	Not Felt	None
0.17 – 1.4	3.0 – 3.9	II – III	Weak	None
1.4 – 9.2	4.0 – 4.9	IV – V	IV. Light V. Moderate	IV. None V. Very Light
9.2 – 34	5.0 – 5.9	VI – VII	VI. Strong VII. Very Strong	VI. Light VII. Moderate
34 – 124	6.0 – 6.9	VIII – IX	VIII. Severe IX. Violent	VIII. Moderate / Heavy IX. Heavy
>124	7.0 and higher	X and higher	Extreme	Very Heavy

*Source: (2) Wald, D., et al., 1999, *Relationship between Peak Ground Acceleration, Peak Ground Motion, and Modified Mercalli Intensity in California*, *Earthquake Spectra*, V. 15, p. 557-564; (3) *Community Internet Intensity, USGS Modified Mercalli Intensity, and Instrumental Intensity*. 1999. <http://www-social.wr.usgs.gov/ciim/pubs/ciim/node5.html> (July 27, 2003)

Table 4.44: DEFINED MODIFIED MERCALLI INTENSITY SCALE RATING

I (<i>INSTRUMENTAL</i>)	Not felt except by a very few under especially favorable conditions.
II (<i>WEAK</i>)	Felt only by a few people at rest, especially on upper floors of buildings.
III (<i>SLIGHT</i>)	Felt quite noticeable by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing automobiles may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV (<i>MODERATE</i>)	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors, disturbed; walls will make cracking sound. Sensation like heavy truck striking building. Standing automobiles rocked noticeably.
V (<i>RATHER STRONG</i>)	Felt by nearly everyone; many awakened. Broken dishes and windows. Unstable objects may be overturned.
VI (<i>STRONG</i>)	Felt by all. Some furniture moved; Slight damage.
VII (<i>VERY STRONG</i>)	Damage negligible in buildings of good design and construction; slight to moderate in well - built ordinary structures; considerable damage in poorly built or badly designed structures. Some broken chimneys.
VIII (<i>DESTRUCTIVE</i>)	Slight damage ins specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Great damage in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.

**Town of Warwick, Village of Florida, Village of Greenwood Lake and Village of Warwick
MULTI – JURISDICTIONAL, MULTI – HAZARD MITIGATION PLAN – DRAFT**

IX (<i>VIOLENT</i>)	Considerable damage in specially designed structures; well – designed frame structures are thrown out of plumb. Great damage in substantial buildings with partial collapse. Buildings shifted off foundations.
X (<i>INTENSE</i>)	Some well – built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
XI (<i>EXTREME</i>)	Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.
XII (<i>CATASTROPHIC</i>)	Total damage. Lines of sight and level are distorted. Objects thrown into the air.

*Source: USGS

Historical Occurrence

According to records, there have not been any significant earthquakes occurring in the area of the Town of Warwick in recent history. Figure 4.16 is a USGS map detailing seismic activity in and around the State of New York since 1973

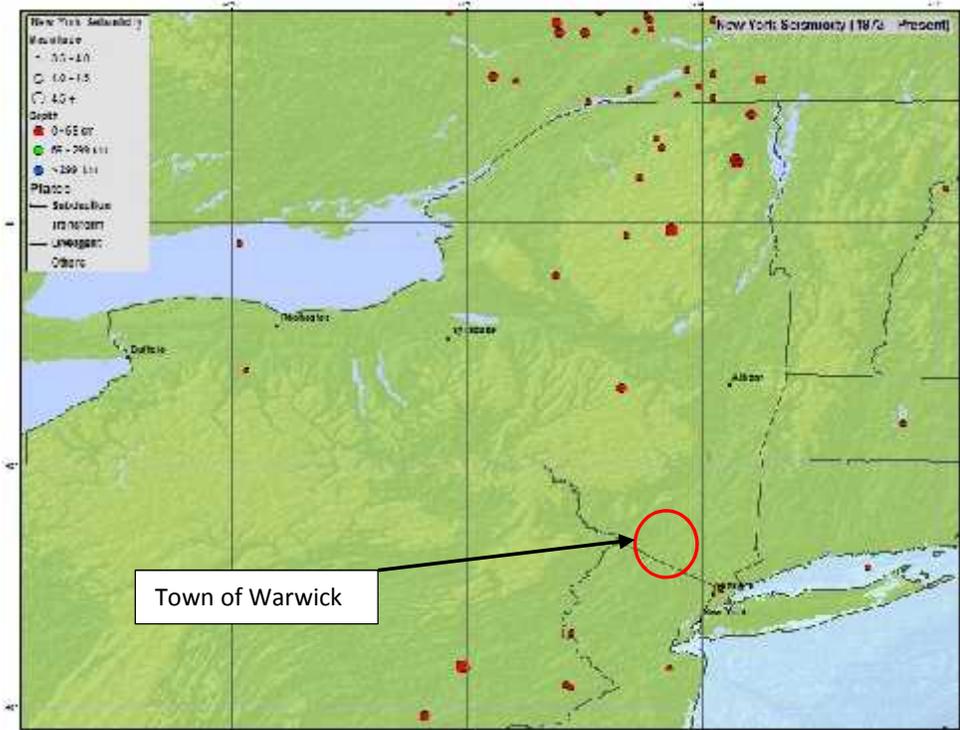


Figure 4.16: Seismic Activity Map (Source: US Geological Survey)

Probability of Occurrence

Predicting earthquakes is difficult due to them occurring at any time with little to no warning. Hazard peak ground acceleration (PGA) maps for earthquakes show the probability of different intensity earthquakes being exceeded at a specific place over a period of time. According the USGS map in Figure 4.17 high intensity earthquakes are a relatively low hazard for t the Town of Warwick and Villages.

Vulnerability – CPRI Results

Earthquake CPRI results for each jurisdiction is summarized in Table 4.45.

Table 4.45: CPRI RESULTS BY JURISDICTION FOR EARTHQUAKE					
Participating Jurisdiction	Probability	Magnitude / Severity	Warning Time	Duration	CPRI Score
Town of Warwick	Unlikely	Negligible	< 6 hours	< 6 hours	1.45
Village of Greenwood Lake	Unlikely	Negligible	< 6 hours	< 24 hours	1.55
Village of Florida	Unlikely	Negligible	< 6 hours	< 6 hours	1.45
Village of Warwick	Possible	Limited	< 6 hours	< 6 hours	2.20
Town – wide average CPRI =					1.67

Vulnerability – Loss Estimations

Even though the Towns and Villages did not have any specific values or estimates for earthquake damages, Table 4.46 from Orange County HMP displays total exposure (dollar value of all building stock with potential losses) for four return periods below.

Table 4.46: TOTAL EARTHQUAKE LOSSES – ORANGE COUNTY FOR FOUR RETURN PERIODS OF 2500, 1000, 500, 250 (Source: New York State Hazard Mitigation Plan 2011)	
Return Periods	Distributed Annual Loss Estimates
2,500	\$1,097,619
1,000	\$317,536

**Town of Warwick, Village of Florida, Village of Greenwood Lake and Village of Warwick
MULTI – JURISDICTIONAL, MULTI – HAZARD MITIGATION PLAN – DRAFT**

500	\$93,951
250	\$21,925

Below is a brief list of some existing assets, critical facilities, commercial and residential infrastructure located in the Town and Villages that lie within an earthquake risk zone area.

Town of Warwick

- Calvary Christian Academy
- Golden Hill Elementary School
- Pine Island Ambulance
- Pine Island Elementary School
- Pine Island Fire Department
- Waste Water Treatment Facility (Warwick Town SD#1)
- Warwick Municipal Airport
- Communications Facility WTBQ 1110

Village of Warwick

- Mount Alverno Center (Bon Secours)
- Park Avenue Elementary School
- Schervier Pavilion (Bon Secours)
- St. Anthony Hospital (Bon Secours)
- Warwick Village Wastewater Treatment Plant / Water Treatment Plants
- Village of Warwick Fire Dept. Stations
- Village of Warwick Ambulance Corps
- Dams located within the Village

Village of Greenwood Lake

- Greenwood Lake Ambulance
- Greenwood Lake Elementary School
- Greenwood Lake Fire Department
- Greenwood Lake Police Department
- Greenwood Lake Religious Education

Vulnerability – Development Trends

Currently, there are no available development trend maps to visually display and emphasize the areas of development (population, commercial, residential and industrial) for the Town or Villages. Earthquakes pose a uniform risk for the whole area within the Town of Warwick which would also hold the same precedent for any future residential or commercial development exposed to this hazard. Even though earthquake effects may vary from one community to another due to varying soil types; State Building Codes along with local adopted building codes should have existing guidelines that reflect newly constructed infrastructure be built with a minimal degree of protection against seismic activity.

Vulnerability – Jurisdictional Summary

The following table presents an overall summary of each jurisdiction’s vulnerability to Earthquakes. Due to these results along with data and records detailed in the previous sections, the Town of Warwick and Participating Villages have deemed earthquake as a negligible hazard for their jurisdictions.

Table 4.47: EARTHQUAKE VULNERABILITY BY JURISDICITON			
Jurisdiction	Vulnerability	Mitigation Priority?	Notes
Town of Warwick	Low	No	The Town and Villages did not consider Earthquake to be a mitigation priority and its vulnerability is at a low to nuisance level only.
Village of Greenwood Lake	Low	No	
Village of Florida	Low	No	
Village of Warwick	Low	No	

Source

New York State Hazard Mitigation Plan (NYSHMP) 2011
 United State Geological Survey (USGS) www.usgs.gov – Earthquake Hazard Program
 Orange County HMP 2011

4.2.10 *Landslide*

Description

According to the New York State Hazard Mitigation Plan (2011), a landslide (sometimes referred to as an earth flow) is defined as a downward movement of a slope and materials under the force of gravity. When the stability of a slope changes from a stable to an unstable condition, a landslide can occur. Although gravity is seen as one of the main causes of landslides, other factors that can contribute to the cause of landslides include erosion, earthquakes, groundwater changes, rapid snowmelt and human activities (i.e., blasting and deforestation).

Slope susceptibility to landslides decreases as slope stability increases. Factors that determine slope stability include the following:

Soil Type: Certain types of soil provide more stability than others. Glacial till is one type of soil that New York State has that tends to stand up well to landslide tendency. However there are other certain types of soils, such as glacial lake clay soils, which are also abundant throughout the State and have a higher risk for landslides.

Terrain: The steeper and higher a slope is the higher the risk for landslide occurrence. Landslides susceptibility becomes significant when slopes are equal to or greater than 10 degrees and when the height of a hill or slope is greater than 40 ft.

Vegetative Cover: Slopes with little or no vegetative cover are more prone to landslides than vegetated type slopes.

Soil Water Content: Slope stability decreases as the water content in the soil increases. Periods of snow melt, above average precipitation and even short duration rainfall incidents with significant precipitation can all contribute to soil water content and increase the susceptibility for landslides.

Location and Extent

The potential for landslides exists throughout the State of New York. However, according to NYGS and USGS, 80 % of the State has a low susceptibility to landslides including all of the Town of Warwick and The Villages as seen in Figure 4.17. Landslide severity is also dependent upon the degree of development in the area. Devastating consequence mainly result when landslides occur in localized areas that are heavily

populated. For example, underdeveloped areas would be less severe because not much property and lives would be affected. Developed areas, in contrast, would have more infrastructure and structural damage with possible injury and / or loss of life. Table 4.48 provides a breakdown of the percentage of improved land that is locate within the high and moderate landslide risk zones.

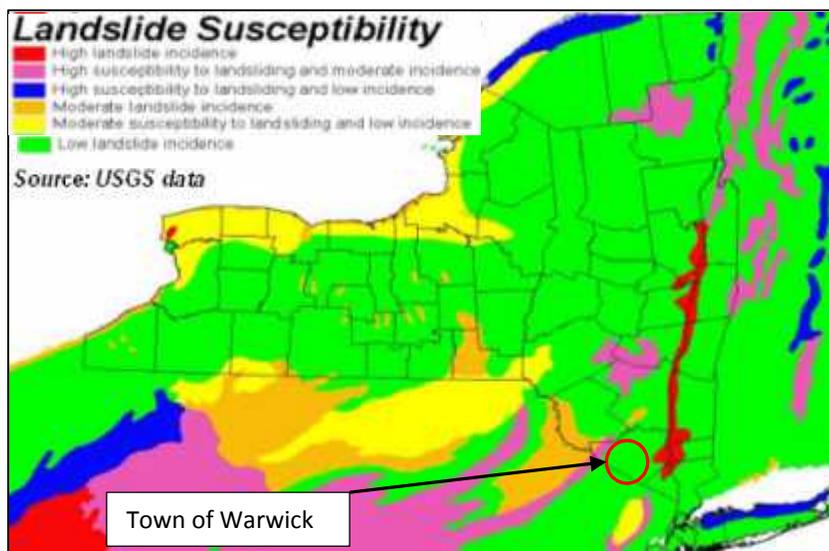


Figure 4.17 Landslide Risk in the Town of Warwick

Table 4.48: LANDSLIDE RISK BY MUNICIPALITY
(Source: Orange County HMP 2011)

Municipality	Total Area (Acres)	Total Improved Value	High Incidence				Moderate Incidence and High Susceptibility / Moderate Incidence			
			Area (Acres)	%	Improved Values	%	Area (Acres)	%	Improved Value	%
Florida, Village of	1,405	\$252,670,165	0	0	0	0	0	0	0	0
Greenwood Lake, Village of	1,394	\$261,917,040	0	0	0	0	0	0	0	0
Warwick, Town of	63,358	\$2,266,424,291	0	0	0	0	0	0	0	0
Warwick, Village of	1,482	\$666,185,886	0	0	0	0	0	0	0	0

Historical Occurrence

According to records obtained by the Planning Team, there has not been any significant landslide activity occurring in the area within recent history. However, the Town of Warwick did document two landslide events that are worth noting. The first occurred in 1984 when there was a landslide at the Upper Reservoir that resulted in \$1 million having to be spent on debris and sediment removal. The other landslide event occurred in 2006 which caused water and debris damage to an adjacent home that resulted in an estimated \$50,000 in repairs.

Probability of Occurrence

Sufficient data could not be acquired at this time to estimate the frequency of future occurrences. However, based upon the USGS risk map shown in figure 4.17 and the lack of historical incidents, it can be assumed that the Town of Warwick and Participating Villages can expect a low probability of landslide occurrences.

Vulnerability – CPRI Results

Landslide CPRI results for each jurisdiction is summarized in Table 4.49.

Participating Jurisdiction	Probability	Magnitude / Severity	Warning Time	Duration	CPRI Score
Town of Warwick	Possible	Limited	< 6 hours	< 6 hours	2.20
Village of Greenwood Lake	Possible	Limited	< 6 hours	< 24 hours	2.30
Village of Florida	Unlikely	Limited	< 6 hours	< 6 hours	1.75
Village of Warwick	Possible	Critical	< 6 hours	< 6 hours	2.50
Town – wide average CPRI =					2.19

Vulnerability – Loss Estimations

Despite two landslide incidents occurring within the Town and Village of Warwick reservoirs, loss estimations for landslides are unable to be determined at this time because of the lack of sufficient historical data to help compose frequencies of land slide events for annual loss estimates. Additionally, according to NYS HMP (2011), there are no standard loss estimation models or methodologies for landslides.

Vulnerability – Development Trends

Currently, there are no available development trend maps to visually display and emphasize the areas of development (population, commercial, residential and industrial) for the Town or Villages. State Building Codes along with local adopted building codes should have existing guidelines that regulate future development of newly constructed infrastructure in areas with steep slopes.

Vulnerability – Jurisdictional Summary

The following table presents an overall summary of each jurisdiction’s vulnerability to Landslides. Based upon the findings detailed in this table and in the above sections, the Participating Jurisdictions determined that landslide is a negligible hazard for their communities.

Table 4.50: LANDSLIDE VULNERABILITY BY JURISDICTION			
Jurisdiction	Vulnerability	Mitigation Priority?	Notes
Town of Warwick	Low	No	The Town and Villages did not consider landslide to be a mitigation priority and its vulnerability is at a nuisance level only.
Village of Greenwood Lake	Low	No	
Village of Florida	Low	No	
Village of Warwick	Moderate	No	

Sources

- Orange County Hazard Mitigation Plan 2011
- New York State Hazard Mitigation Plan (NYSHMP) 2011

4.2.11 *Extreme Wind*

Description

Extreme wind is defined as air that is in constant motion relative to the surface of the earth which may encompass all climatic events that produce damaging winds and. Extreme winds can be the result of tornadoes, hurricanes and nor’easters. The other primary sources of damaging winds are those that accompany thunderstorms. Thunderstorms can occur year-round and are usually associated with cold fronts in the winter and tropical storms in the late summer or early fall. Three types of damaging

wind related features typically accompany are thunderstorm; 1) downbursts, 2) straight line winds and infrequently 3) tornadoes.

Downbursts are columns of air moving rapidly downward through a thunderstorm. When the air reaches the ground, it spreads out in all directions, creating horizontal wind gusts of 80 mph or higher. Downburst winds have been measured as high as 140 mph. Some of the air curls back upward with the potential to generate a new thunderstorm cell. Downbursts are called macro bursts when the diameter is greater than 2.5 miles, and microbursts when the diameter is 2.5 miles or less. They can be either dry or wet downbursts. Wet downburst contains precipitation that continues to the ground, while the precipitation in a dry downburst evaporates before falling to the ground, decreasing the air temperature and increasing the air speed. In a microburst, the wind speeds are highest near the location where the downdraft reached the surface, and are reduced as they move outward due to the friction of objects at the surface. Typical damage from downbursts includes uprooted trees; downed power lines; mobile homes knocked off their foundations; block walls and fences felled, and porches and roofs blown off of homes.

Straight line winds are developed similar to downbursts, but are usually sustained for greater periods as a thunderstorm reaches the mature stage, traveling parallel to the ground surface at speeds of 75 mph or higher. These winds are frequently responsible for generating dust storms and sand storms, reducing visibility and creating hazardous driving conditions.

A tornado (as referenced in Section 4.2.4) is a rapidly rotating funnel (or vortex) of air that extends toward the ground from a cumulonimbus cloud. Most funnel clouds do not touch the ground. When the lower tip of the funnel cloud does touch the earth, it becomes a tornado and can cause extensive damage.

Extreme wind events can pose a significant threat to utilities, lives and property due to objects being propelled by forces of wind.

Location

Every region in the United States experiences factors of extreme wind to some degree. Figure 4.18 is used to determine the expected level of extreme wind hazard in specific areas. As shown, a single wind zone covers the Town of Warwick and its jurisdictions

which are identified as Zone II (160 mph). Additionally, this map shows that the area is also susceptible to hurricane winds.

Extent

Wind severity is dependent on maximum sustained winds experienced. Table 4.51 shows the severity and typical effects of various wind speeds, as obtained from the NOAA NCDC web site.

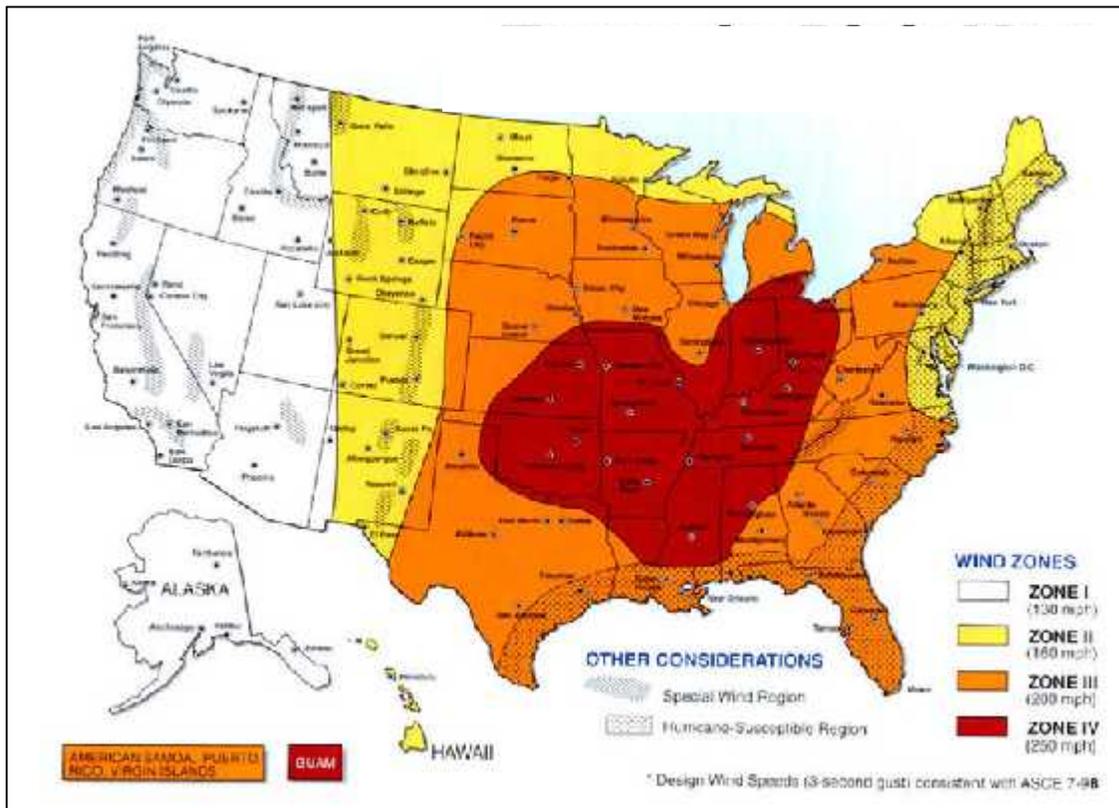


Figure 4.18: Wind Zones in the United States

Table 4.51: SEVERITY AND TYPICAL EFFECTS OF VARIOUS WIND SPEED

Maximum Wind Speeds	Saffir – Simpson Equivalent Scale (Hurricanes)	Fujita Scale (Tornadoes)	Severity	Typical Effects
40 – 72 mph	Tropical Storm 39 – 73 mph	F0	Minimal	Some damage to chimneys; broken tree branches, shallow – rotted trees toppled over, damages to sign boards; hurricane wind speed begins at 73 mph.
73 – 112 mph	Category 1 = 74-95 mph Category 2 = 96 – 110 mph Category 3 = 111 – 130 mph	F1	Moderate	Roof surfaces peeled off, overturned or pushed off mobile homes, automobiles pushed off roads
113 – 157 mph	Category 3 = 111 – 130 mph Category 4 = 131 – 155 mph Category 5 > 155 mph	F2	Considerable	Roof torn off well – constructed homes, mobile homes destroyed, uprooted or snapped trees (large), light object missiles generated.
158 – 206 mph	Category 5 > 155 mph	F3	Severe	Walls and roof torn off well – constructed homes, heavy cars lifted off ground, trains overturned and most trees in forest setting uprooted.
207 – 260 mph	*Category 5 > 155 mph	F4	Devastating	Well – constructed homes leveled, weak structured foundations blown away, large missiles (debris) generated with tossed cars.
261 – 318 mph	N / A	F5	Incredible	Well – constructed houses lifted of foundations and carried considerable distances, automobile – sized missiles fly through the air in excess of 100 meters (109 yards), all trees debarked, steel reinforced

				concrete structures badly damaged.
Greater than 319 mph	N / A	F6	N / A	Maximum wind speeds of tornadoes are not expected to reach this level. The maximum wind speeds of hurricanes are not expected to reach this level.

**The Saffir-Simpson Scale is a five-category wind speed / storm surge classification scale used to classify Atlantic hurricane intensities. The Saffir-Simpson values range from Category 1 to Category 5. The strongest SUSTAINED hurricane wind speeds correspond to a strong F3 (Severe Tornado) or possibly a weak F4 (Devastating Tornado) value. Whereas the highest wind gusts in Category 5 hurricanes correspond to moderate F4 tornado values, F5 tornado wind speeds are not reached in hurricanes.*

Historical Occurrence

According to the Town, Villages and NOAA National Climate Data Center (NCDC) Storm Event database between January 2000 and December 2012, there were a total of 33 extreme wind events categorized as wind chills, high winds, strong winds and thunderstorm winds.

Probability of Occurrence

According to the County HMP (2011), extreme wind incidents have a probability of very frequent occurrences. It is also noted that the entire planning area is susceptible to a variety of recurring events that contribute to extreme wind conditions including severe thunderstorms, tropical storms and hurricanes.³⁰ It is very difficult to predict when and how severe winds incidents will occur. However, wind recurrence intervals (frequencies) can be express with speeds using the FEMA Benefit-Cost Analysis Software (Version 4.5.5, June 2009)³¹ in the Table 4.51 below.

³⁰ Orange County HMP 2011

³¹ Ibid

Table 4.52: WIND SPEEDS AND PROBABILITIES FOR CENTRAL ORANGE COUNTY (Source: FEMA BCA Software v4.5.5 / Orange County HMP 2011)		
Recurrence Interval (Years)	Annual Probability	Wind Speed (mph)
10	10%	32
20	5%	45
50	2%	58
100	1%	68
200	.5%	78
500	.2%	89
1,000	.1%	95

Vulnerability – CPRI Results

Extreme Wind CPRI results for each jurisdiction are summarized in Table 4.52.

Table 4.53: CPRI RESULTS BY JURISDICTION FOR EXTREME WIND					
Participating Jurisdiction	Probability	Magnitude / Severity	Warning Time	Duration	CPRI Score
Town of Warwick	Likely	Limited	< 6 hours	< 6 hours	2.65
Village of Greenwood Lake	Likely	Limited	12 – 24 hours	< 1 week	2.55
Village of Florida	Likely	Limited	> 24 hours	< 1 week	2.40
Village of Warwick	Possible	Critical	< 6 hours	< 6 hours	2.50
Town – wide average CPRI =					2.53

Vulnerability – Loss Estimations

Sufficient data for loss estimation was not available at this time for extreme wind hazard regarding structures and population affected. Furthermore it is assumed that all critical infrastructures within the County are exposed and could possibly be affected. Historical loss estimation data recorded by NOAA documents dollar losses over \$300,000 for high wind and thunderstorm wind occurrences between 2000 – 2012.

Vulnerability – Development Trends

Currently, there are no available development trend maps to visually display and emphasize the areas of development (population, commercial, residential and industrial) for the Town or Villages. However like tornadoes, extreme winds pose a

uniform risk for the whole area within the Town of Warwick which would hold the same precedent for any future residential or commercial development exposed to this hazard. State.

Vulnerability – Jurisdictional Summary

The following table presents an overall summary of each jurisdiction’s vulnerability to Extreme Winds.

Table 4.54: EXTREME WIND VULNERABILITY BY JURISDICTION			
Jurisdiction	Vulnerability	Mitigation Priority?	Notes
Town of Warwick	Moderate	No	The Town and Villages have moderate vulnerability to extreme winds. There is no significant geographic variability in severity or probability of severe wind events. Since severe wind events primarily impact infrastructure above ground all of the Town and Villages are considered equally vulnerable.
Village of Greenwood Lake	Moderate	No	
Village of Florida	Moderate	No	
Village of Warwick	Moderate	No	

Sources

- Orange County Hazard Mitigation Plan 2011
- New York State Hazard Mitigation Plan (NYSHMP) 2011

4.2.12 *Lightning*

Description

Lightning is an electrostatic discharge caused by an unbalanced positive and negative charge buildup within a thunderstorm, producing a “bolt” when the charges building up become strong enough and then discharges. A lightning bolt, which can occur between clouds or between a cloud and the ground, reaches temperatures approaching 50, 000

degrees Fahrenheit. Such tremendous heat can spark fires, especially during dry conditions. Individuals struck by lightning can be seriously injured or killed. Electronics that are not protected from surges can be damaged or destroyed beyond repair.

Location and Extent

According to the County’s Hazard Mitigation Plan (2011), the Town of Warwick and Participating Villages are located in a region of the country that is susceptible to lightning, though not to the same intensity as other regions of the country (southeastern states). Figure 4.19 displays a lightning flash density map and indicates that the area can expect approximately 2 – 3 lightning flashers per square kilometer per year. Lightning injuries and fatalities often occur in open areas such as golf courses, parks and recreational areas.

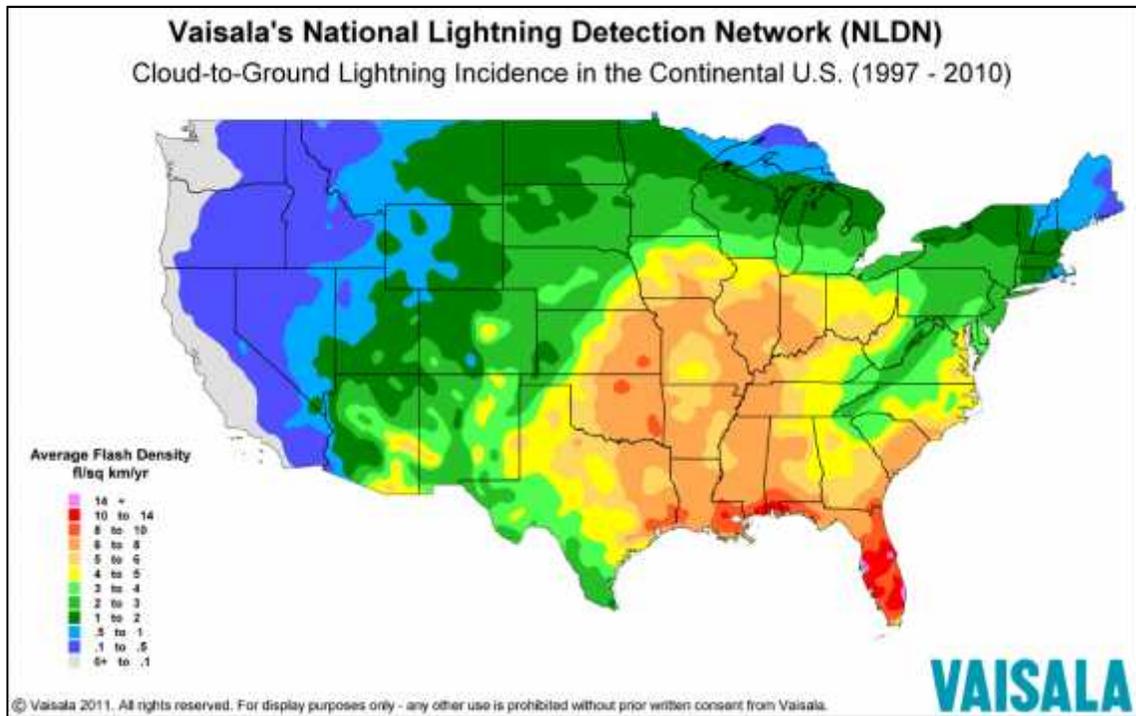


Figure 4.19: Lightning Flash Density - Contiguous United States

Historical Occurrence

According to NCDC, Orange County has experienced 19 significant lightning events between 1995 – 2012 that resulted in 12 injuries and 1 death; with two lightning incidents occurring within the Town of Warwick on August 2004 and June 2006.

Probability of Occurrence

According to NOAA, the Town and Villages are situated in an area that on average experiences 3-5 lightning flashes per square mile per year. The probability of future occurrences for the area is high.

Vulnerability – CPRI Results

Lightning CPRI results for each jurisdiction are summarized in Table 4.54.

Table 4.55: CPRI RESULTS BY JURISDICTION FOR LIGHTNING					
Participating Jurisdiction	Probability	Magnitude / Severity	Warning Time	Duration	CPRI Score
Town of Warwick	Likely	Limited	< 6 hours	< 6 hours	2.65
Village of Greenwood Lake	Likely	Limited	< 6 hours	< 6 hours	2.65
Village of Florida	Likely	Limited	< 6 hours	< 6 hours	2.65
Village of Warwick	Highly Likely	Limited	< 6 hours	< 6 hours	3.10
Town – wide average CPRI =					2.76

Vulnerability – Loss Estimations

Sufficient data was not available to provide accurate loss estimations. However, it is assumed that every location within the Town is equally vulnerable to lightning strikes.

Vulnerability – Development Trends

Currently, there are no available development trend maps to visually display and emphasize the areas of development (population, commercial, residential and industrial) for none of the Town or Villages. Lightning poses a uniform risk for the whole area within the Town of Warwick which would hold the same precedent for any future

residential or commercial development exposed to this hazard. State Building Codes along with local adopted building code changes should have existing guidelines that reflect that newly constructed infrastructure be built with a degree of protection against lightning hazards.

Vulnerability – Jurisdictional Summary

The following table presents an overall summary of each jurisdiction’s vulnerability to Lightning.

Table 4.56: LIGHTNING VULNERABILITY BY JURISDICTION			
Jurisdiction	Vulnerability	Mitigation Priority?	Notes
Town of Warwick	Moderate	No	The Town and Villages have moderate to high levels of vulnerability to lightning strikes due to various CFI and population disparities.
Village of Greenwood Lake	Moderate	No	
Village of Florida	Moderate	No	
Village of Warwick	High	No	

Sources

- Orange County Hazard Mitigation Plan 2011
- New York State Hazard Mitigation Plan (NYSHMP) 2011

SECTION 5: MITIGATION STRATEGY

The Mitigation Strategy provides the “what, when and how” of actions that can possibly remove or reduce the communities’ exposure to hazard risks. According to the DMA 2000, the primary components of the mitigation strategy are generally categorized into the following:

- **Capability Assessment**
- **Goals and Objectives**
- **Mitigation Actions / Projects and Implementation Strategy**

5.1 Capability Assessment

An important component of Mitigation Strategy is a review of each participating jurisdiction’s capabilities in order to identify, evaluate and enhance the capacity of local resources to mitigate the effects of hazards. The capability assessment is comprised of several components:

- Ñ Legal and Regulatory Review – A review of the legal and regulatory capabilities, including ordinances, codes, plans, manuals, guidelines and technical reports that address hazard mitigation activities.
- Ñ Technical Staff and Personnel – Assesses and describes the administrative and technical capacity of the jurisdiction’s staff and personnel resources.
- Ñ Fiscal Capability – Summarizes each jurisdiction’s fiscal capability to provide the financial resources to implement the mitigation strategy.
- Ñ National Flood Insurance Program (NFIP) Participation – The NFIP contains specific regulatory measures that enable government officials to determine where and how growth occurs relative to flood hazards. Participation in the NFIP is voluntary for local governments, but the program is promoted by FEMA as a basic first step for implementing and sustaining an effective flood hazard mitigation program, and is a key indicator for measuring local capability as part of this assessment.

5.1.1 *Jurisdictional Capabilities*

Tables 5.1 through 5.12 are grouped by jurisdiction and summarizes each jurisdiction’s capability in three main areas: 1). Legal and regulatory mitigation including a brief listing of current codes, ordinances, plans, studies, and / or reports that are relevant to the jurisdictions capacity for mitigation, 2). Staff and personnel resources employed by

each jurisdiction that serve as a resource for hazard mitigation, and 3). Fiscal capability and budgetary tools available to each participating jurisdiction.

Table 5.1: LEGAL AND REGULATORY CAPABILITIES FOR TOWN OF WARWICK		
Regulatory Tools for Hazard Mitigation	Description	Responsible Department / Agency
CODES and / or ORDINANCES	Ñ 2010 Residential Code of NYS	Ñ Building Department
	Ñ 2010 Fire Code of NYS	Ñ Building Department
	Ñ 2010 Building Code of NYS	Ñ Building Department
	Ñ 2010 Exiting Building Code of NYS	Ñ Building Department
	Ñ 2010 Energy Conservation Construction Code of NYS	Ñ Building Department
	Ñ 2010 Plumbing Code of NYS	Ñ Building Department
	Ñ 2010 Mechanical Code of NYS	Ñ Building Department
	Ñ 2010 Fuel Gas Code of NYS	Ñ Building Department
	Ñ Town of Warwick Zoning Code of §164	Ñ Planning Board
	Ñ Traditional Neighborhood Overlay District §164 – 47	Ñ Planning Board
	Ñ Ridgeline Overlay District §164 – 47.1	Ñ Planning Board
	Ñ Aquifer Protection Overlay District §164 – 47.2	Ñ Planning Board
	Ñ Agricultural Projection Overlay District §164-47.3	Ñ Planning Board
	Ñ Biodiversity Conservation Overlay District §164-47.9	Ñ Planning Board
	Ñ Lighting §164-43.4	Ñ Planning Board
Ñ Cluster Subdivision §164-41.1	Ñ Planning Board	
Ñ Site Plan and Special Use §164-46	Ñ Planning Board	
PLANS, MANUALS, and/or GUIDELINES	Ñ Stormwater Management §164-47.10	Ñ Planning Board
	Ñ Town of Warwick NY Comprehensive Plan 2008	Ñ Planning Board
	Ñ Architectural Design Standards for Commercial and Mixed Use Development, 2010	Ñ Planning Board
STUDIES	Ñ FIRM Flood Insurance Rate Maps, 2009	Ñ Town Board / Building Department
	Ñ Floodplain Studies completed for portions of Pine Island, est. 2010/2011	

Table 5.2: SUMMARY OF TECHNICAL STAFF AND PERSONNEL CAPABILITIES FOR TOWN OF WARWICK		
Staff / Personnel Resources	<input checked="" type="checkbox"/>	Department / Agency - Position
Planner(s) or engineer(s) with knowledge of land development and land management practices	<input checked="" type="checkbox"/>	Tectonic, HDR and Greenplan
Engineer(s) or professional(s) trained in construction practices related to buildings and / or infrastructure	<input checked="" type="checkbox"/>	Tectonic, HDR and Martin Rogers
Planner(s) or engineer(s) with and understanding of natural and/or human-caused hazards	<input checked="" type="checkbox"/>	Tectonic and HDR
Floodplain Manager	<input checked="" type="checkbox"/>	Building Inspector
Surveyors	<input checked="" type="checkbox"/>	Tectonic, Schmick and Miggin
Staff with education or expertise to assess the community's vulnerability to hazards	<input checked="" type="checkbox"/>	Department of Public Works Commissioner, Tectonic and HDR
Personnel skilled in GIS and/or HAZUS; AutoCad-Civil 3D; ArcViewGIS	<input checked="" type="checkbox"/>	Tectonic and HDR
Scientists familiar with the hazards of the community		N / A
Emergency manager	<input checked="" type="checkbox"/>	Town Supervisor and Department of Public Commissioner
Grant writer(s)		N / A

Table 5.3: FISCAL CAPABILITIES FOR TOWN OF WARWICK

Financial Resources	Accessible or Eligible to Use (Yes, No, Don't Know)	Comments
Community Development Block Grants	Don't Know	Due to income levels only certain areas of the Town are eligible
Capital Improvements Project funding	Yes	We prepare a multi – year plan for infrastructure inventory
Authority to levy taxes for specific purposes	Yes	Wallkill Drainage Districts
Fees for water, sewer, gas, or electric service	Yes	Water and Sewer Districts
Impact fees for homebuyers or new developments / homes	No	Not generally
Incur debt through general obligation bonds	Yes	Not Comment
Incur debt through special tax bonds	Yes	No Comment

Table 5.4: LEGAL AND REGULATORY CAPABILITIES FOR VILLAGE OF FLORIDA

Regulatory Tools for Hazard Mitigation	Description	Responsible Department / Agency
CODES / ORDINANCES	Ñ Chapter 67, “Flood Damage Prevention” of the Code	Ñ Building Department
	Ñ 2010 NYS Building Code, adopted by the Village of Florida	Ñ Building Department
PLANS, MANUALS, and/or GUIDELINES	Ñ Master Plan (adopted in 2003)	Ñ Village and Planning Boards
	Ñ Emergency Management Plan	Ñ Village and Planning Boards
STUDIES	Ñ Glenmere Lake Dam Study	Ñ Village Board

Table 5.5: SUMMARY OF TECHNICAL STAFF AND PERSONNEL FOR VILLAGE OF FLORIDA

Staff / Personnel Resources	<input checked="" type="checkbox"/>	Department / Agency - Position
Planner(s) or engineer(s) with knowledge of land development and land management practices	<input checked="" type="checkbox"/>	Gerald MacDonald, MacDonald Engineering
Engineer(s) or professional(s) trained in construction practices related to buildings and /or infrastructure	<input checked="" type="checkbox"/>	Adrian Mateosian (Building Inspector)
Planner(s) or engineer(s) with and understanding of natural and/or human-caused hazards	<input checked="" type="checkbox"/>	Gerald MacDonald, MacDonald Engineering
Floodplain Manager	<input checked="" type="checkbox"/>	Adrian Mateosian (Building Inspector)
Surveyors		NA
Staff with education or expertise to assess the community's vulnerability to hazards	<input checked="" type="checkbox"/>	Gerald MacDonald, MacDonald Engineering
Personnel skilled in GIS and / or HAZUS; AutoCad-Civil 3D; ArcViewGIS	<input checked="" type="checkbox"/>	Gerald MacDonald, MacDonald Engineering
Scientists familiar with the hazards of the community		NA
Emergency manager	<input checked="" type="checkbox"/>	Thomas Fuller, Trustee
Grant writer(s)		Not Applicable

Table 5.6: FISCAL CAPABILITIES FOR VILLAGE OF FLORIDA

Financial Resources	Accessible or Eligible to Use (Yes, No, Don't Know)	Comments
Community Development Block Grants	Yes	Generally used to improve water and sewer infrastructure
Capital Improvements Project funding	Yes	Not a usual option

Table 5.6: FISCAL CAPABILITIES FOR VILLAGE OF FLORIDA		
Authority to levy taxes for specific purposes	Yes	NA
Fees for water, sewer, gas, or electric service	Yes	NA
Impact fees for homebuyers or new developments / homes	Yes	Capital reserve fees for water and sewer capacity
Incur debt through general obligation bonds	Yes	NA
Incur debt through special tax bonds	Yes	Not a usual option

Table 5.7: LEGAL AND REGULATORY CAPABILITIES FOR VILLAGE OF GREENWOOD LAKE		
Regulatory Tools for Hazard Mitigation	Description	Responsible Department / Agency
CODES / ORDINANCES	Ñ 2010 NYS Building Code, Village of Greenwood Lake Code	Ñ Building Planning Board, Village Zoning Board of Appeals (ZBA)
PLANS, MANUALS, and / or GUIDELINES	Ñ Comprehensive Plan, Flood Maps	Ñ Building Planning Board, Village Zoning Board of Appeals (ZBA)
STUDIES	Ñ Floodplain Studies	Ñ FEMA

Table 5.8: SUMMARY OF TECHNICAL STAFF AND PERSONNEL CAPABILITIES FOR VILLAGE OF GREENWOOD LAKE		
Staff / Personnel Resources	<input checked="" type="checkbox"/>	Department / Agency - Position
Planner(s) or engineer(s) with knowledge of land development and land management practices	<input checked="" type="checkbox"/>	Village Engineer / Department of Public Works Building
Engineer(s) or professional(s) trained in construction practices related to buildings and /or infrastructure	<input checked="" type="checkbox"/>	Building Engineer / Department of Public Works

Table 5.8: SUMMARY OF TECHNICAL STAFF AND PERSONNEL CAPABILITIES FOR VILLAGE OF GREENWOOD LAKE

Staff / Personnel Resources	<input checked="" type="checkbox"/>	Department / Agency - Position
Planner(s) or engineer(s) with and understanding of natural and/or human-caused hazards	<input checked="" type="checkbox"/>	Building Engineer / Department of Public Works
Floodplain Manager	<input checked="" type="checkbox"/>	Building Engineer
Surveyors		
Staff with education or expertise to assess the community's vulnerability to hazards	<input checked="" type="checkbox"/>	Department of Public Works, Building Engineer, Mayor
Personnel skilled in GIS and/or HAZUS; AutoCad-Civil 3D; ArcViewGIS	<input checked="" type="checkbox"/>	Engineer
Scientists familiar with the hazards of the community		NA
Emergency manager	<input checked="" type="checkbox"/>	Mayor
Grant writer(s)	<input checked="" type="checkbox"/>	As needed

Table 5.9: FISCAL CAPABILITIES FOR VILLAGE OF GREENWOOD LAKE

Financial Resources	Accessible or Eligible to Use (Yes, No, Don't Know)	Comments
Community Development Block Grants	Yes	NA
Capital Improvements Project funding	No	NA
Authority to levy taxes for specific purposes	Yes	NA
Fees for water, sewer, gas, or electric service	Yes	NA
Impact fees for homebuyers or new developments / homes	Yes	NA
Incur debt through general obligation bonds	Yes	NA
Incur debt through special tax bonds	No	NA

Table 5.10: LEGAL AND REGULATORY CAPABILITIES FOR VILLAGE OF WARWICK		
Regulatory Tools for Hazard Mitigation	Description	Responsible Department / Agency
CODES	Ñ Village of Warwick Local Law , includes Floodplain Management, Subdivision / Zoning and the regulatory requirement for all building in the floodplain needing Floodplain management approval via Site Plan from the Planning Board.	Ñ Code Enforcement / Planning Board
	Ñ Codes of New York State , includes provisions for flood plain areas in both the Residential and Building Code of New York State.	Ñ Code Enforcement
ORDINANCES	Ñ Zoning Ordinance , a chapter of the Local Law which has provisions for Flood Plain Areas	Ñ Code Enforcement / Planning Board / Zoning Board of Appeals
PLANS, MANUALS, and / or GUIDELINES	Ñ Comprehensive Plan , a planning tool which guided the current Zoning Ordinance.	Ñ Village Board of Trustees
	Ñ Emergency Action Plan	Ñ Mayor / Emergency Manager
	Ñ Dam Emergency Action Plan , an EAP for the three reservoirs.	Ñ Mayor / Emergency Manager
STUDIES	Ñ Flood Insurance Study	Ñ FEMA
	Ñ Dam Safety Study	Ñ Tectonic / Mayor / DPW

Table 5.11: SUMMARY OF TECHNICAL STAFF AND PERSONNEL CAPABILITIES FOR VILLAGE OF WARWICK

Staff / Personnel Resources	<input checked="" type="checkbox"/>	Department / Agency - Position
Planner(s) or engineer(s) with knowledge of land development and land management practices	<input checked="" type="checkbox"/>	Village of Warwick Engineer – appointed yearly by the Village Board
Engineer(s) or professional(s) trained in construction practices related to buildings and / or infrastructure	<input checked="" type="checkbox"/>	Village of Warwick Engineer – appointed yearly by the Village Board and Village of Warwick Code Enforcement Official (village employee)
Planner(s) or engineer(s) with and understanding of natural and/or human-caused hazards	<input checked="" type="checkbox"/>	Village of Warwick Engineer – appointed yearly by the Village Board
Floodplain Manager	<input checked="" type="checkbox"/>	Five member Planning Board serves one of its five members to be annually appointed.
Surveyors		Not Applicable
Staff with education or expertise to assess the community’s vulnerability to hazards	<input checked="" type="checkbox"/>	Emergency Manager and CEO
Personnel skilled in GIS and / or HAZUS; AutoCad-Civil 3D; ArcViewGIS	<input checked="" type="checkbox"/>	Orange County GIS personnel who is part of Orange County Department of Emergency Services.
Scientists familiar with the hazards of the community		NA
Emergency manager	<input checked="" type="checkbox"/>	Village employee that is appointed annually as the emergency manager/ currently Village of Warwick Supervisor of Department of Public Works
Grant writer(s)	<input checked="" type="checkbox"/>	As needed basis, grant writers are chosen for individual grants by the Village Board of Trustees

Table 5.12: FISCAL CAPABILITIES FOR VILLAGE OF WARWICK

Financial Resources	Accessible or Eligible to Use (Yes, No, Don’t Know)	Comments
Community Development Block Grants	Yes	NA

Table 5.12: FISCAL CAPABILITIES FOR VILLAGE OF WARWICK

Capital Improvements Project funding	Yes	NA
Authority to levy taxes for specific purposes	Yes	NA
Fees for water, sewer, gas, or electric service	Yes	Water and Sewer Only
Impact fees for homebuyers or new developments / homes	Yes	New homes and developments only
Incur debt through general obligation bonds	Yes	NA
Incur debt through special tax bonds	Yes	NA

5.1.2 National Flood Insurance Program Participation

Participation in the NFIP is a key element of any community’s local floodplain management and flood mitigation strategy. The Town of Warwick and the Villages of Florida, Warwick and Greenwood Lake all currently participate in the NFIP.

Joining the NFIP requires the adoption of a floodplain management ordinance that requires jurisdictions to follow established minimum standards, set forth by FEMA and the State of New York, when developing in the floodplain. These standards require that all new buildings and substantial improvements to existing buildings be protected from damage by the 100-year flood, and that new floodplain development will not aggravate existing flood problems or increase damage to neighboring properties. As a participant in the NFIP, communities benefit from having Flood Insurance Rate Maps (FIRM) that identify flood hazard areas and can be used to assess flood hazard risk, regulate construction practices and set flood insurance rates. FIRMs are also an important source of information to educate residents, government officials and the private sector about the likelihood of flooding in their community. Table 5.13 summarizes the NFIP status and statistics for each of the Plan’s Participating Jurisdictions.

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Table 5.13: NFIP STATUS AND STATISTICS FOR TOWN OF WARWICK AND PARTICIPATING JURISDICTIONS (As of 2010)

Jurisdiction	Community ID	NFIP Entry Date	Current Effective Map Date	Number of Policies	Amount of Coverage (x \$1,000)	Floodplain Management Role
Warwick, Town of	360636	5 / 31 / 1974	8 / 3 / 2009	67	\$14,102,500	Provided through the Commissioner of Public Works
Florida, Village of	360613	5 / 3 / 1974	8 / 3 / 2009	64	\$3,054,600	Provided through the Building Inspector
Greenwood Lake, Village of	360616	3 / 22 / 1974	8 / 3 / 2009	12	\$14,897,400	Provided through the Building Department / Village Clerk
Warwick, Village of	360637	3 / 29 / 1974	8 / 3 / 2009	64	\$14,576,700	Provided through the Village Planning Board

Sources: Policy Statistics - www.fema.gov / www.bsa.nfipstat.com (9/30/2010)

Each of the incorporated jurisdictions currently participating in the NFIP program performed an overall assessment of their NFIP program by responding to the following questions:

Question 1: Describe your jurisdiction’s current floodplain management / regulation process for construction of new or substantially improved development within your jurisdiction.

Question 2: Describe the status and / or validity of the current floodplain hazard mapping for your jurisdiction.

Question 3: Describe any community assistance activities (e.g. – help with obtaining Elevation Certificates, flood hazard identification assistance, flood insurance acquisition guidance, public involvement activities, etc.)

Question 4: Describe identified needs in your floodplain management program. This could include things like updating the floodplain management code / regulation, establishing written review procedures, modifying or adding flood hazard area mapping, etc.

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Table 5.14: NFIP PROGRAM ASSESSMENT FOR TOWN OF WARWICK AND PARTICIPATING NFIP JURISDICTIONS

Participating Jurisdiction	Responses to Questions 1-4	
Town of Warwick	Q1	According to the Town of Warwick Town Code §89 <i>Flood Damage Prevention</i> , the Town’s appointed local administrator for floodplain management is the Building Inspector. The Building Inspector is in charge of granting or denying floodplain development permits. Applications for a flood permit are furnished by the local administrator. The local administrator reviews the permit application for compliance with standards and provisions of Town Code §89 Flood Damage Prevention.
	Q2	According to the Town of Warwick Town Code §89 – 3.2 <i>Basis for establishing areas of special flood hazard</i> , the Town of Warwick’s Community # is 360636 and has 46 Flood Insurance Rate Map Panel Numbers with the most current effective date being August 3, 2009. There is a Letter of Map Revision, Case Number 10-02-1525P, effective February 4, 2011, amending Panels 36071C0208G, and 36071C0236G of the Flood Insurance Map.
	Q3	
	Q4	
Village of Florida	Q1	Chapter 67 of the Code of the Village of Florida is based upon the model provided by FEMA and is enforced in all activities involving a flood plain.
	Q2	The flood plain hazard mapping in the Village of Florida has been revised and re-mapped in 2009.
	Q3	During the re – mapping process, all property owners who may have been affected were notified. The Building Department explained the process of contesting the newly proposed map to several property owners and brochures on flood insurance were available to anyone interested. There have been recent floodplain work permits issued.
	Q4	A program to remove debris from critical streams and banks areas needs to be devised and implemented.
Village of Greenwood Lake	Q1	The process entails permit review, code compliance and certifier’s compliance.
	Q2	The most recent revisions were reviewed and commented on by the Village.

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Table 5.14: NFIP PROGRAM ASSESSMENT FOR TOWN OF WARWICK AND PARTICIPATING NFIP JURISDICTIONS

Participating Jurisdiction	Responses to Questions 1-4	
	Q3	To provide information and support to residents and developers.
	Q4	None anticipated at this time.
Village of Warwick	Q1	All new constructions and additions must go before the Village of Warwick Planning Board for approvals. The Village of Warwick Planning Board is the Flood Plain Administrator for the Village of Warwick (Local Law Chapter 69 “Flood Damage Prevention”) The Code Enforcement Official is responsible for enforcing the Codes of New York State which include Flood Damage Prevention codes and regulations.
	Q2	The Village of Warwick utilizes the most current FEMA maps. The Current map is dated August 3, 2009.
	Q3	The Village of Warwick has implemented a cumulative damage policy in our Local Law. This program will assist homeowners in the future with several growth programs which would not be available if this law was not in place.
	Q4	The highest priority at this time is to implement a Hazard Mitigation Plan and to identify and prioritize issues that we can correct and prepare for.

5.2 Mitigation Goals

An assessment of mitigation goals was performed by the Planning Team during the 4 / 4 / 13 planning meeting. Following a review of the vulnerability analysis results, the Planning Team developed a list of mitigation goals using the results of the risk assessment and personal experience of hazards impacting the Town and Villages, the Planning Team brainstormed needs and known issues relating to natural hazards and their mitigation. The final list of mitigation goals that were developed by the Planning Team are listed below in no particular order of importance.

Goal 1 – Ensure minimal damage to critical infrastructure from hazards so that the continuity of local government operations will not be significantly disrupted by disasters.

Goal 2 – Develop a resilient community among the Town and Villages that helps eliminate or reduce risk.

Goal 3 – Promote future developments that are less prone to the damaging effects of hazards (disaster resistant)

Goal 4 – Promote widespread Town and Village support and understanding of the importance of hazard mitigation.

Goal 5 – Enhance and improve communication, coordination and collaboration involving hazard mitigation with the local Town, Villages, private sector, government agencies and other stakeholders.

5.3 Mitigation Actions / Projects

Mitigation Actions / Projects (A/P) are those activities identified by a jurisdiction, that when implemented, will have the effect of reducing the community's exposure and risk to the particular hazard or hazards being mitigated. The implementation strategy addresses the "how, when, and by whom?" questions related to utilizing an identified A/P.

The process for defining the list of Mitigation A/Ps for the Plan was accomplished in three steps. First, an assessment of any previous actions and projects in place was performed, wherein each jurisdiction reviewed and evaluated their jurisdiction specific list. Second, a new list of A/Ps for the Plan was developed combining existing A/P's that will be carried forward as a result of the assessment and any new A/P's was formulated. Details of each step and the results of the process are summarized in the following sections.

5.3.1 *Previous Mitigation Actions / Projects*

The Planning Team for each jurisdiction reviewed and assessed the Town’s and Villages’ previous mitigation actions and projects. The assessment included evaluating and classifying each of the previous identified A/Ps based on the following criteria:

STATUS		DISPOSITION	
Classification	Explanation Requirement:	Classification	Explanation Requirement:
“No Action”	Reason for no progress	“Keep”	None required
“In Progress”	What progress has been made	“Revise”	Revised components
“Complete”	Date of completion and final cost of project (if applicable)	“Delete”	Reason(s) for exclusion.

Any A/P with a disposition classification of “Keep” or “Revise” was carried forward to become part of the new A/P list for the Plan. All A/Ps identified for deletion were removed and are not included in this Plan. The results of the assessment for any previous actions and projects are summarized by jurisdiction in Tables 5.16 – 5.19. *If a jurisdiction did not have any previous A/Ps to assess, the table would display N/A.*

Table 5.15: ASSESSMENT OF MITIGATION ACTIONS / PROJECTS IDENTIFIED BY TOWN OF WARWICK FOR PREVIOUS YEARS

Action / Project Title	Ñ Lead Agency Ñ Proposed Cost Ñ Proposed Completion Date	Status	Disposition	Explanation
		N / A		

Table 5.16: ASSESSMENT OF MITIGATION ACTIONS / PROJECTS IDENTIFIED BY VILLAGE OF FLORIDA FOR PREVIOUS YEARS

Action / Project Title	Ñ Lead Agency Ñ Proposed Cost Ñ Proposed Completion Date	Status	Disposition	Explanation
		N / A		

**Table 5.17: ASSESSMENT OF MITIGATION ACTIONS / PROJECTS IDENTIFIED
 BY VILLAGE OF GREENWOOD LAKE FOR PREVIOUS YEARS**

Action / Project Title	Ñ Lead Agency Ñ Proposed Cost Ñ Proposed Completion Date	Status	Disposition	Explanation
		N / A		

Table 5.18: ASSESSMENT OF MITIGATION ACTIONS / PROJECTS IDENTIFIED BY VILLAGE OF WARWICK FOR PREVIOUS YEARS

Action / Project Title	Ñ Lead Agency Ñ Proposed Cost Ñ Proposed Completion Date	Status	Disposition	Explanation
		N / A		

5.3.2 *New Mitigation Actions / Projects and Implementation Strategy*

Upon completion of the assessment summarized in Section 5.2.2, the Planning Team developed new A/P’s using goals and objectives, results of the vulnerability analysis and capability assessment, and the Planning Team’s institutional knowledge of hazard mitigation needs in the Town and Villages. The A/P’s can be generally classified as either structural or non-structural. Structural A/Ps typify a traditional “brick and mortar” approach where physical improvements are provided to affect the mitigation goals. Examples may include bridges, culverts, forest thinning, channels, detention basins, structural augmentations of existing critical infrastructure, emergency structures and dams. Non-structural A/Ps deal more with legislative action, ordinance, regulation and administrative actions or changes, buy-out programs, and policies. For each A/P, the following elements were identified:

- Ñ **Name** – a unique short name for the A/P.
- Ñ **Hazard(s) Mitigated** – a list of the hazard or hazards mitigated by the A/P.
- Ñ **Community Assets Mitigated** – a brief descriptor to qualify the type of assets (existing, future, or both) that the proposed mitigation A/P addresses.
- Ñ **Description** – a brief description of the A/P including a supporting statement that tells the “what” and “why” reason for the A/P.
- Ñ **Estimated Costs** – concept level cost estimates that may be in dollars, staff time, or both.

Benefits and cost for each A/P were identified using a STAPLE + E assessment that aided in prioritizing and evaluating each A/P. Table 5.19 displays in detail the STAPLE + E method. Additional evaluation worksheets are contained in Appendix E.

Table 5.19: STAPLE + E CRITERIA	
S – Social	Is the action unfair to one section of the community over the others? If yes, it is a social cost associated with the action. If the implementation of the action helps achieve a social goal of the community, it is a social benefit associated with the action.
T – Technical	Is the action a good technical solution to the problem? If yes, it is a benefit associated with the action. The better the solution, the higher the benefits.
A – Administrative	Is the action difficult to implement because of the

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	administrative problems associated? If yes it is an administrative <i>cost</i> .
P – Political	Is the action politically favored? If yes it is a benefit. If the action is likely to be politically unacceptable, it is a <i>cost</i> associated with the action.
L – Legal	Are there perceived legal problems in implementing the action? If yes, it is a <i>cost</i> associated with the action.
E – Economic	Does implementing the action make economic sense? Are the costs too prohibitive? If yes, it is a <i>cost</i> associated with the action.
E – Environmental	Does the action have adverse environmental effects? If yes, it is cost associated with the action.

*Source: FEMA guidance document 386-5 (How – To #5) Page 10

Once the full list of A / Ps was completed to the satisfaction of the jurisdiction, the Local Planning Team then performed the STAPLE+E assessment ³² of each A / P using one of three qualifiers for each STAPLE+E category as follows:

- **F** – assigned if the A / P has a favorable disposition for the category.
- **L** – assigned for A / P’s that are less than favorable for the category
- **N** – assigned if the A / P is neutral for the category.

Once the STAPLE+E assessment was completed, each jurisdiction then assigned a numeric ranking to each A / P based on the assessment results and the jurisdiction’s priorities.

Upon completion of the ranking process, each jurisdiction then developed the implementation strategy for the A / P’s. The implementation strategy addresses the “*how, when, and by whom?*” questions related to the execution and completion of an identified A / P. Specific elements identified as a part of the implementation strategy included:

- **Planning Mechanism(s) for Implementation** – where applicable, a list of current planning mechanisms or processes under which the A / P will be implemented. Examples could include CIPs, General Plans, Area Drainage Master Plans, etc.

³² FEMA, 2003, *Developing the Mitigation Plan – Identifying Mitigation Actions and Implementation Strategies*, FEMA 386-3, pp 2-12 through 2-21.

- Ñ **Anticipated Completion Date** – a realistic and general timeframe for completing the A / P. Examples may include a specific target date, a timeframe contingent upon other processes, or recurring timeframes.
- Ñ **Primary Agency and Job Title Responsible for Implementation** –the agency, department, office, or other entity and corresponding job title that will have responsibility for the A/P and its implementation.
- Ñ **Funding Source** – the source or sources of anticipated funding for the A/P.

As a starting point for developing a format to describe the identified projects, each Participating Jurisdiction recorded their new mitigation A/Ps, along with a brief discussion of each element, on FEMA Region II worksheet templates. These additional FEMA worksheet can be found in Appendix G. Tables 5.20 through 5.23 summarize the new mitigation A/Ps and implementation strategies for the Town of Warwick, Villages of Florida, Greenwood Lake and Warwick.

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Table 5.20: MITIGATION ACTIONS / PROJECTS IDENTIFIED BY TOWN OF WARWICK

Name	Hazard(s) Mitigated	Community Assets Mitigated (Existing/Future/Both)	Description	Estimated Cost	STAPLE+E Assessment (F) Favorable; (L) Less Favorable; (N) Neutral							Project Rank
					Social	Technical	Administrative	Political	Legal	Economic	Environmental	
Fuel Depot	Flood, Hurricane	Existing	Relocate fuel supply station to higher elevation for DPW and police vehicles; upgrade existing prison pumps, etc, locate alternative facilities; add propane storage to convert generators to dual fuel	\$1,500,000	F	F	F	F	F	N	F	1
Alternative Power Supply for Town's Six Water & Sewer Districts	Flood, Fire, Winter Storm, Hurricane	Existing	Add emergency generators at water districts and gas pumps to automatically startup in the event of power failure	\$360,000	F	F	F	F	F	N	F	2
Alternative Fuel Source for Generators	Flood, Fire, Winter Storm, Hurricane, Extreme Temp	Existing	Currently run on natural gas; should be orifice to be able to convert to propane	\$100,000	F	F	F	F	F	N	F	3

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Renovate and Stock Temporary Shelters	Flood, Wildfire, Winter Storm, Hurricane	Existing	Add showers, bed/cots, food storage, food, ice machines, freezers, potable water trailer, microwaves	\$50,000	F	F	F	F	N	N	N	4
Repair/Replace town owned culvert in Village of Florida	Flood, Hurricane	Existing	Improve the waterway opening to current design to mitigate overtopping and backwater impacts. Joint project with the V/Warwick	\$400,000	F	F	F	F	F	F	F	5
Town-wide Stream Debris Cleanup	Flood, Winter Storm melt, Hurricane	Both	Removal of natural debris and manmade litter within the Town's streams and stream banks	\$40,000	F	F	F	F	F	N	F	6
Emergency Route Plan	Flood, Winter Storm, Hurricane	Existing	Develop and coordinate an emergency route that will be the first roadways cleaned to maintain traffic and prevent isolation of residents	Municipal Employee Time	F	F	F	F	F	F	N	7
Post Warning Signs at Local Parks	Lightning	Existing	Post warning signs at local parks not to swim during thunder or lightning storms	\$10,000	F	F	F	F	F	F	N	8
Public Education, Awareness and Outreach	All Hazards	Existing	Coordinate public education through websites, social media, village board meetings, news outlets to establish educational opportunities such as "Hazard Awareness Week" and evacuation training	Municipal Employee Time	L	F	F	N	F	N	N	9
Electronic backup of Data	Flood, Fire, Lightning, Hurricane	Both	Provide and maintain electronic backup of all Town of Warwick files in a separate location from Town Hall	Municipal Employee Time	F	F	F	F	F	L	N	10

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Combine DPW and Town Hall electronic storage	Flood, Fire, Lightning, Hurricane	Both	Currently DPW timesheets and files are stored in hard drives or filing cabinets without backup	Municipal Employee Time	F	F	F	F	F	F	N	11
Re-build portions of a Federal Highway (East Shore Rd)	Landslide	Existing	Access condition of natural rock above Federal Highway, propose repairs or replacement or extension (width) of roadway to move further from rock	Municipal Employee Time	F	F	F	F	N	L	F	12
Drought Resistant Landscape Regulation	Drought	Both	Encourage and / or enforce the use of drought resistant landscaping, as appropriate, through ordinance development / enforcement (i.e. xeriscaping incentives)	Staff Time	N	F	F	N	N	F	F	13
Enhance Emergency Communication Capabilities	All Hazards	Both	Improvement in communication networks helps to facilitate better warning and emergency response for extreme weather conditions.	Phasing of costs at \$10,000/ with a minimum of three phases	F	F	F	F	F	F	F	14
Prioritized Electrical Distribution Deenergization during Storm Cleanup	Extreme Wind, Winter Storm, Hurricane	Both	Coordinate with Orange and Rockland Utilities to identify primary/critical access routes for post-storm tree trimming and clearing operations. Future storm response would involve coordinated electrical deenergization, tree removal, and electrical restoration between ORU and community DPWs	Municipal Employee Time	F	F	F	F	F	F	F	15

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Vegetation Management Plan around Above-ground Utility Distribution	Extreme Wind, Winter Storm, Hurricane	Existing	Assist Orange and Rockland utilities with community outreach during distribution line tree trimming and clearing operations.	Municipal Employee Time	F	F	F	N	N	F	N	16
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Table 5.20: MITIGATION ACTIONS / PROJECTS IDENTIFIED BY THE TOWN OF WARWICK (Cont'd)

Name	Planning Mechanism(s) for Implementation	Anticipated Completion Schedule	Primary Agency / Job Title Responsible for Implementation	Funding Source(s)
Fuel Depot	NA	2014	DPW / Engineer	Grants
Alternative Power Supply for Town's Six Water & Sewer Districts	NA	2014	DPW	Grants
Alternative Fuel Source for Generators	NA	2014	DPW	Grants
Renovate and Stock Temporary Shelters	NA	2014	DPW	Grants
Repair/Replace town owned culvert in Village of Florida	NA	2015	DPW / Engineer	Grants
Town-wide Stream Debris Cleanup	Flood Management Plan	2015	DPW / Engineer	Grants
Emergency Route Plan	NA	2015	Supervisor	Grants

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Table 5.20: MITIGATION ACTIONS / PROJECTS IDENTIFIED BY THE TOWN OF WARWICK (Cont'd)

Name	Planning Mechanism(s) for Implementation	Anticipated Completion Schedule	Primary Agency / Job Title Responsible for Implementation	Funding Source(s)
Post Warning Signs at Local Parks	NA	2015	DPW	Grants
Public Education, Awareness and Outreach	NA	2015	Supervisor	Grants
Electronic backup of Data	NA	2015	Records Department	Grants
Combine DPW and Town Hall electronic storage	NA	2015	Records Department	Grants
Re-build portions of a Federal Highway (East Shore Rd)	NA	2016	DPW / Engineer	Grants
Drought Resistant Landscape Regulation	Town Code	2015	Town Board / Supervisor	General Fund
Enhance Emergency Communication Capabilities	NA	Annually	Town with Local Village Gov't Participation	General Fund & Homeland Security Grants
Prioritized Electrical Distribution Deenergization during Storm Cleanup	NA	2015	DPW	General Fund
Vegetation Management Plan around Above-ground Utility Distribution	NA	Annual	DPW	General Fund

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Table 5.21: MITIGATION ACTIONS / PROJECTS IDENTIFIED BY VILLAGE OF FLORIDA

Name	Hazard(s) Mitigated	Community Assets Mitigated (Existing/Future/Both)	Description	Estimated Cost	STAPLE+E Assessment (F) Favorable; (L) Less Favorable; (N) Neutral							Project Rank
					Social	Technical	Administrative	Political	Legal	Economic	Environmental	
					Reserve Municipal Water Supply Feasibility Study	Drought	Both	Perform a hydrogeological investigation to determine potential groundwater supply locations and capabilities to serve as a reserve water supply to the Municipality's current drought-susceptible surface water supply.	\$50,000	F	F	
Glenmere Lake Closure Dike Improvement	Dam Failure, Flooding, Drought	Both	Improve auxiliary spillway to control discharge during significant storm events to mitigate downstream flows to Glenmere Avenue, coordinate elevations with principal spillway and dam top, and stabilize surface against erosion to mitigate potential loss of municipal water supply.	\$200,000	F	F	F	N	F	F	N	8
Add Department of Public Works Building to Sewer Plant Generator	Flooding, Severe Wind, Wildfire, Winter Storm, Extreme Temperature	Existing	Utilize spare capacity in existing natural-gas fired generator at Wastewater Plant to supply DPW building with emergency reserve power to enable response during emergencies.	\$10,000	F	F	F	F	F	F	F	10

**Town of Warwick, Village of Florida, Village of Greenwood Lake and Village of Warwick
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Replace Inoperable Hydrants	Wildfire	Existing	Replace six (6) inoperable hydrants throughout the Municipality to improve availability of fire suppression water.	\$18,000	F	F	F	F	F	F	F	F	5
Water Supply Needs Assessment	Drought	Existing	Perform a study to document the capabilities and capacity of the Municipal water supply, the needs of the rate base, and the improvements necessary to meet the supply requirements.	\$20,000	F	F	F	F	F	F	F	F	17
Generators	Flooding, Severe Wind, Wildfire, Winter Storm, Extreme Temperature	Existing	Provide reserve natural-gas fired power for Police Station, Senior Center, Firehouse and Village Hall to enable response and shelter during emergencies, and provide warming/cooling center capability	\$110,000	F	F	F	F	F	F	F	F	1
Glenmere Lake Dam Spillway Capacity Study	Dam Failure	Existing	Perform an analysis of alternative approaches to increasing spillway capacity to establish capital needs for dam improvements necessary to safely pass the design storm event for a High Hazard dam.	\$50,000	F	F	F	F	F	F	F	F	16
Elevate Sanitary Pump Station	Flooding, Winter Storm, Hurricane	Existing	Reconstruct Warner Avenue Pump Station above base flood elevation to enable performance during high water conditions.	\$150,000	F	F	F	N	N	F	N	N	2
Elevate Sanitary Pump Station	Flooding, Winter Storm, Hurricane	Existing	Reconstruct Village Park Drive Pump Station above base flood elevation to enable performance during high water conditions.	\$150,000	F	F	F	N	N	F	N	N	3
Bridge Street Bridge Replacement	Flooding, Winter Storm, Hurricane	Existing	Improve the waterway opening to current design standards to mitigate overtopping and backwater impacts.	\$400,000	F	F	F	F	F	F	F	F	4

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Jayne Street Bridge Replacement	Flooding, Winter Storm, Hurricane	Existing	Improve the waterway opening to current design standards to mitigate overtopping and backwater impacts. Mitigation will improve access to Golden Hill School (shelter) during emergencies. Joint project with T/Warwick.	\$400,000	F	F	F	F	F	F	F	F	6
Wastewater Treatment Plant Bridge Replacement	Flooding, Winter Storm, Hurricane	Existing	Improve the waterway opening to current design standards to mitigate overtopping and backwater impacts. Mitigation will improve access to Wastewater plant and Public Works building during emergencies.	\$400,000	F	F	F	F	F	F	F	F	7
Vegetation Management Plan around Above-Ground Utility Distribution	Extreme Wind, Winter Storm, Hurricane	Existing	Assist Orange and Rockland utilities with community outreach during distribution line tree trimming and clearing operations.	Municipal Employee Time	F	F	F	N	N	F	N		12
Complete Metering of Village Water Supply	Drought	Existing	Install water meters in remaining unmetered balance of residential user base (approximately 45%) to document consumption and leakage rates. Municipality is under a compliance directive from NYDSEC to document surface water source utilization to refine capability to supply Municipal user base without usage restrictions.	\$115,000	N	F	F	N	N	F	F		13
Lightning Protection for Municipal Water Storage	Lightning	Existing	Lightning arrestors to be installed on Municipal water towers.	\$10,000	F	F	F	F	F	F	F	F	11

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Stream Cleaning (desilt/desnag)	Flooding, Winter Storm, Hurricane	Existing	Periodic vegetation management, sediment removal, and debris removal to alleviate flooding for Brown Creek, Quaker Creek, and associated tributaries.	\$50,000	F	F	F	F	F	F	N	9
Stream Cleaning Access Rights	Flooding, Winter Storm, Hurricane	Existing	Establish legal rights to enter lands adjacent to flood-prone watercourses to perform stream cleaning activities on a periodic basis.	Municipal Employee Time	N	F	F	N	N	F	F	14
Wastewater Treatment Plant Bridge Ownership	Flooding, Winter Storm, Hurricane	Existing	Resolve ownership/rights to maintain and improve bridge providing access to Wastewater plant and Public Works building during emergencies.	Municipal Employee Time	N	F	F	N	N	F	F	15
Enhance Emergency Communication Capabilities	All Hazards (including Tornado and Dam Failure)	Both	Improvement in communication networks helps to facilitate better warning and emergency response for extreme weather conditions.	Phasing of costs at \$10,000/ with a minimum of three phases	F	F	F	F	F	F	F	19
Prioritized Electrical Distribution Deenergization during Storm Cleanup	Extreme Wind, Winter Storm, Hurricane	Both	Coordinate with Orange and Rockland Utilities to identify primary/critical access routes for post-storm tree trimming and clearing operations. Future storm response would involve coordinated electrical deenergization, tree removal, and electrical restoration between ORU and community DPWs	Municipal Employee Time	F	F	F	F	F	F	F	20
Public Education, Awareness and Outreach	All Hazards	Existing	Coordinate public education opportunities through websites, social media, village board meetings and news outlets to establish events such as "Hazard Awareness Week" and classes on evacuating homes.	Municipal Employee Time	L	F	F	N	F	N	N	21

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Glenmere Lake Dam Spillway Capacity Improvement	Dam Failure	Existing	Replacement of principal spillway and dam top improvements to provide capacity to safely pass the design storm event for a High Hazard dam	\$3.25 Million	F	F	F	N	N	F	F	22
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Table 5.21: MITIGATION ACTIONS / PROJECTS IDENTIFIED BY VILLAGE OF FLORIDA (cont'd)

Name	Planning Mechanism(s) for Implementation	Anticipated Completion Schedule	Primary Agency / Job Title Responsible for Implementation	Funding Source(s)
Reserve Municipal Water Supply Feasibility Study	NA	2017	Village	Grant
Glenmere Lake Closure Dike Improvement	5 -yr CIP	2017	DPW & Engineer	HMGP
Add Department of Public Works Building to Sewer Plant Generator	5-yr CIP	2017	DPW	General Fund
Replace Inoperable Hydrants	NA	2014	DPW	General Fund
Water Supply Needs Assessment	NA	2017	Village	Grant
Generators	NA	2013	DPW	Grant
Glenmere Lake Dam Spillway Capacity Study	NA	2014	Village	Grant
Elevate Sanitary Pump Station	5-yr CIP	2014	DPW & Engineer	HMGP

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Table 5.21: MITIGATION ACTIONS / PROJECTS IDENTIFIED BY VILLAGE OF FLORIDA (cont'd)

Name	Planning Mechanism(s) for Implementation	Anticipated Completion Schedule	Primary Agency / Job Title Responsible for Implementation	Funding Source(s)
Bridge Street Bridge Replacement	5-yr CIP	2015	DPW & Engineer	HMPG
Jayne Street Bridge Replacement	5-yr CIP	2015	DPW & Engineer	HMPG
Wastewater Treatment Plant Bridge Replacement	5-yr CIP	2016	DPW & Engineer	HMPG
Vegetation Management Plan around Above-Ground Utility Distribution	NA	Annual	Village	General Fund
Complete Metering of Village Water Supply	NA	2017	DPW	General Fund
Lightning Protection for Municipal Water Storage	NA	2016	DPW	General Fund
Stream Cleaning (desilt/desnag)	NA	2016	DPW	General Fund
Stream Cleaning Access Rights	NA	2017	Village	General Fund
Wastewater Treatment Plant Bridge Ownership	NA	2017	Village	General Fund
Enhance Emergency Communication Capabilities	NA	Annually	Town with Local Village Gov't Participation	General Fund & Homeland Security Grants

Town of Warwick, Village of Florida, Village of Greenwood Lake and Village of Warwick
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Table 5.21: MITIGATION ACTIONS / PROJECTS IDENTIFIED BY VILLAGE OF FLORIDA (cont'd)

Name	Planning Mechanism(s) for Implementation	Anticipated Completion Schedule	Primary Agency / Job Title Responsible for Implementation	Funding Source(s)
Prioritized Electrical Distribution Deenergization during Storm Cleanup	NA	2015	DPW	General Fund
Public Education, Awareness and Outreach	NA	2015	Supervisor	Grants
Glenemere Lake Dam Spillway Capacity Improvement	DEC Plan, upon approval	2017	Village	HMGP

Town of Warwick, Village of Florida, Village of Greenwood Lake and Village of Warwick
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Table 5.22: MITIGATION ACTIONS / PROJECTS IDENTIFIED BY VILLAGE OF GREENWOOD LAKE

Name	Hazard(s) Mitigated	Community Assets Mitigated (Existing/Future/Both)	Description	Estimated Cost	STAPLE+E Assessment (F) Favorable; (L) Less Favorable; (N) Neutral							Project Rank
					Social	Technical	Administrative	Political	Legal	Economic	Environmental	
Steep Slope Best Management Practices	Landslide	Both	Develop municipal guidelines based on State Best Management Practices for local properties on steep slopes to promote soil retention and stability through vegetative measures.	\$10,000	F	F	F	F	F	F	F	9
Storm Sewer Infrastructure Map	Flooding, Winter Storm, Hurricane	Both	Update municipal mapping of catch basin and storm sewer infrastructure to assist in prioritizing response during storm events.	\$20,000	F	F	F	F	F	F	F	10
Public Education, Awareness and Outreach	All	Both	Coordinate public education and execute plan integration opportunities through website, social media, village board meetings, news outlets (mayor's weekly column in Warwick Dispatch))	Municipal Employee Time	F	F	F	F	F	F	F	1
Prioritized Electrical Distribution Deenergization during Storm Cleanup	Extreme Wind, Winter Storm, Hurricane	Both	Coordinate with Orange and Rockland Utilities to identify primary/critical access routes for post-storm tree trimming and clearing operations. Future storm response would involve coordinated electrical deenergization, tree removal, and electrical restoration between ORU and community DPWs.	Municipal Employee Time	F	F	F	F	F	F	F	14

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Gas Pumps Back-up Power	Winds, Hurricane, Extreme Storms	Both	Install generator to run DPW Yard gas pumps during power outage	\$80,000	F	F	F	F	F	F	F	3
Shelter	All	Both	Provide showers and reserve natural-gas fired power for Elks Lodge to enable shelter designation during emergencies and provide warming/cooling center capability	\$30,000	F	F	F	F	F	F	F	2
Salt Barn Replacement	Winter Storm	Both	Replace structurally deficient/functionally obsolete salt storage facility to improve hazard response.	\$70,000	F	F	F	N	F	F	F	14
Single Plow Snow Removal Equipment	Winter Storm	Both	Purchase smaller snow removal equipment to improve response capability in steep/narrow/ remote sections of the municipality	\$30,000	F	F	F	F	F	F	F	7
East Shore Road Mountain Runoff Control	Flooding, Winter Storm, Hurricane	Existing	Study potential locations to install improvements (roadside swales, drainage facilities, and roadway modifications) that intercept mountain runoff and direct discharge to lake to mitigate flooding and icing conditions on critical access route.	\$40,000	F	F	F	F	F	F	F	11
Design & Construct Lakelands Culvert Replacement	Flooding, Winter Storm, Hurricane	Existing	Improve the waterway opening to current design standards to mitigate overtopping and backwater impacts.	\$150,000	F	F	F	F	F	F	F	4
Chronic Flooding and Property Damage Study	Flooding, Winter Storm, Hurricane	Existing	Study to examine drainage patterns, watercourse characteristics, and potential mitigation actions to address chronic flooding and property damage in area between Elm Street, Vine Street, Village Drive, and Crane Road	\$40,000	F	F	F	F	F	F	F	12

**Town of Warwick, Village of Florida, Village of Greenwood Lake and Village of Warwick
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North Arm Flood Study	Flooding, Landslide, Hurricane	Existing	Study to examine potential mitigation of flooding impacts due to continued loss of lake storage in shallow North Arm region from chronic erosion/sedimentation off Sterling Forest lands.	\$40,000	F	F	F	F	F	F	F	13
Random Road Culvert Replacement	Flooding, Winter Storm, Hurricane	Existing	Improve the waterway opening to current design standards to mitigate overtopping and backwater impacts to critical access route.	\$250,000	F	F	F	F	F	F	F	6
Mountain Lakes Bridge Replacement	Flooding, Winter Storm, Hurricane	Existing	Improve the waterway opening to current design standards to mitigate overtopping and backwater impacts to critical access route.	\$400,000	F	F	F	F	F	F	F	5
Vegetation Management Plan around Above-Ground Utility Distribution	Extreme Wind, Winter Storm, Hurricane	Existing	Assist Orange and Rockland utilities with community outreach during distribution line tree trimming and clearing operations.	Municipal Employee Time	F	F	F	N	N	F	N	8
Defensible Space Practices	Wildfire	Both	Implement and recommend defensible space in coordination with possible participation in Firewise Communities Program, to reduce ignitability and protect structures within wildland – urban interface areas.	Staff Time	N	F	F	F	F	F	N	15
Lightning Critical Facility Protection Equipment and Awareness Programs	Lightning	Both	Install grounding and lightning rods on infrastructure dealing with communications and other major critical infrastructure (as needed). Inform public on safety precautions and offer signage at local parks with brochures for distributions in mountainous areas as well.	\$10,000 - \$15,000 / Staff Time	F	F	F	F	F	N	F	16

**Town of Warwick, Village of Florida, Village of Greenwood Lake and Village of Warwick
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Drought Resistant Landscape Regulation	Drought	Both	Encourage and / or enforce the use of drought resistant landscaping, as appropriate, through ordinance development / enforcement (i.e. xeriscaping incentives)	Staff Time	N	F	F	N	N	F	F	17
Enhance Emergency Communication Capabilities	All Hazards (including Tornado and Dam Failure)	Both	Improvement in communication networks helps to facilitate better warning and emergency response for extreme weather conditions.	Phasing of costs at \$10,000/ with a minimum of three phases	F	F	F	F	F	F	F	18

Table 5.22: MITIGATION ACTIONS / PROJECTS IDENTIFIED BY GEENWOOD LAKE (cont'd)

Name	Planning Mechanism(s) for Implementation	Anticipated Completion Schedule	Primary Agency / Job Title Responsible for Implementation	Funding Source(s)
Steep Slope Best Management Practices	NA	2013	Village	General Fund
Storm Sewer Infrastructure Map	NA	2013	DPW	General Fund
Public Education, Awareness, and Outreach	NA	2013	All Municipal employees	General Fund
Prioritized Electrical Distribution Deenergization during Storm Cleanup	NA	2015	DPW	General Fund
Gas Pumps Back-up Power	5 – year CIP	2013	DPW	General Fund
Shelter	NA	2013	DPW/Building & Grounds	General Fund

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Table 5.22: MITIGATION ACTIONS / PROJECTS IDENTIFIED BY GEENWOOD LAKE (cont'd)

Name	Planning Mechanism(s) for Implementation	Anticipated Completion Schedule	Primary Agency / Job Title Responsible for Implementation	Funding Source(s)
Salt Barn Replacement	5 – year CIP	2016	DPW & Engineer	Grant
Single Plow Snow Removal Equipment	NA	2013	DPW	General Fund
East Shore Road Mountain Runoff Control	NA	2014	DPW	Grant
Design & Construct Lakelands Culvert Replacement	5 – year CIP	2014	DPW & Engineer	HMGP
Chronic Flooding and Property Damage Study	NA	2015	DPW	Grant
North Arm Flood Study	NA	2016	DPW	Grant
Random Road Culvert Replacement	5 – year CIP	2015	DPW & Engineer	Grant
Mountain Lakes Bridge Replacement	5 – year CIP	2015	DPW & Engineer	Grant
Vegetation Management Plan around Above-Ground Utility Distribution	NA	Annual	DPW	General Fund
Defensible Space Practices	NA	Ongoing (As needed)	Village & Fire District	General Fund
Lightning Critical Facility Protection Equipment and Awareness Programs	NA	2015	Buildings & Grounds / Engineer	Grant

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Table 5.22: MITIGATION ACTIONS / PROJECTS IDENTIFIED BY GEENWOOD LAKE (cont'd)

Name	Planning Mechanism(s) for Implementation	Anticipated Completion Schedule	Primary Agency / Job Title Responsible for Implementation	Funding Source(s)
Drought Resistant Landscape Regulation	Village Code	2015	Village Board / Mayor	General Fund
Enhance Emergency Communication Capabilities	NA	Annually	Town with Local Village Gov't Participation	General Fund & Homeland Security Grants

Table 5.23: MITIGATION ACTIONS / PROJECTS IDENTIFIED BY VILLAGE OF WARWICK

Name	Hazard(s) Mitigated	Community Assets Mitigated (Existing/ Future/ Both)	Description	Estimated Cost	STAPLE+E Assessment (F) Favorable; (L) Less Favorable; (N) Neutral							Project Rank
					Social	Technical	Administrative	Political	Legal	Economic	Environmental	
Pond Hill Drainage	Flood	Existing	Provide drainage system to prevent floods from road	\$250,000	F	F	N	F	F	N	F	1
Pioneer Farm Area Drainage	Flood	Both	Restore drainage system washed out in 80's	\$500,000	F	F	L	F	N	L	F	2

**Town of Warwick, Village of Florida, Village of Greenwood Lake and Village of Warwick
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Reservios 1,2 &3	Flood	Existing	Clear trees which could block spillways,watershed and settlement ponds	\$500,000	F	F	F	N	F	N	F	3
Carroll Drive Drainage	Flood	Existing	Provide drainage system to prevent floods from road	\$30,000	F	F	F	F	F	F	F	4
7 West St Sewer	Sewage Pollution	Existing	Prevent sewer overflow	\$50,000	F	F	F	F	F	F	F	5
Woodside Drainage	Flood	Existing	Provide drainage system to prevent floods from road	\$100,000	F	F	F	F	F	F	F	6
Forest Management Plan	Deforestation/sedimentation	Existing	Manage reservoir woodlands per Management Plan	\$100,000	F	F	F	F	F	F	F	7
Spring Street tunnel	Flood/erosion	Existing	Repair tunnel and drainage area	\$200,000	F	F	N	F	F	N	F	8
Dredge Reservoir #3	Dam Failure/Flood	Existing	Increase Reservoir capacity to prevent overtopping	\$500,000	F	F	F	F	F	F	F	9
Reservoir#3 Overtopping Protection	Dam Failure/Flood	Existing	Design and construct improvements to reconfigure headworks and reinforce dam face that mitigate dam overtopping and protect against failure.	\$700,000	F	F	F	F	F	F	F	10
DPW second access road	Emergency response	Both	Provide second access/exit road for DPW	\$210,000	N	F	F	N	N	F	N	11
Hydraulic Study of 3 Sequential Reservoirs	Dam Failure/Flood/Hurricane	Both	Study the relationship of impacts of cascading dam failures on 3 sequential dams and recommend cost-effective approach to reinforce the reservoir system to comply with current State Dam Safety Standards	\$40,000	F	F	F	F	F	F	F	12

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Public Education, Awareness and Outreach	All Hazards	Both	Coordinate public education opportunities through websites, social media, village board meetings and news outlets to establish events such as "Hazard Awareness Week" and classes on evacuating homes.	Contributions from local business/ non - profits and Village	F	F	F	F	F	F	F	F	13
Prioritized Electrical Distribution Deenergization during Storm Cleanup	Extreme Wind, Winter Storm, Hurricane	Both	Coordinate with Orange and Rockland Utilities to identify primary/critical access routes for post-storm tree trimming and clearing operations. Future storm response would involve coordinated electrical deenergization, tree removal, and electrical restoration between ORU and community DPWs	Municipal Employee Time	F	F	F	F	F	F	F	F	14
Vegetation Management Plan around Above-ground Utility Distribution	Extreme Wind, Winter Storm, Hurricane	Existing	Assist Orange and Rockland utilities with community outreach during distribution line tree trimming and clearing operations.	Municipal Employee Time	F	F	F	N	N	F	N		15
Reservoir #3 Dam Spillway Capacity Improvement	Dam Failure	Existing	Replacement of principal spillway and dam top improvements to provide capacity to safely pass the design storm event for a High Hazard dam	\$1 Million	F	F	F	F	F	F	F	F	16
Orchard St. Land Acquisitions	Flooding	Existing	Acquire land with repetitive loss structures at 50 Orchard St and 54 Orchard St	\$520,000	N	F	F	N	F	N	N		17
Backup Generators	Flood, Fire, Winter Storm, Hurricane	Existing	Install backup generators at eleven (11) separate critical facilities throughout the Village	\$358,000	F	F	F	F	F	F	N		18

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Protect Sanitary Pump Stations	Flood, Hurricane, Winter Storm	Existing	Reconstruct Robin Brae Pump Station above base flood elevation to enable performance during high water conditions. Includes sound attenuating enclosure for generator. Construct flood protection berm around Orchard Street Pump Station above base flood elevation.	\$250,000	F	F	F	F	F	F	F	F	19
Elevate Sanitary Manholes along Wawayanda	Flood, Hurricane, Winter Storm	Existing	Raise manholes along a 2.5 mile stretch of sewer trunk in flood plain to eliminate inflow during high water events.	\$150,000	F	F	F	F	F	F	F	F	20
Culvert Replacement	Flood, Hurricane, Winter Storm	Existing	Improve the waterway opening to current design standards to mitigate overtopping and backwater impacts. Replace culverts at Wheeler Street and West Street.	\$350,000	F	F	F	F	F	F	F	F	21
Spring Street Storm Sewer Replacement	Flood, Winter Storm, Hurricane	Existing	Replace 1100 linear feet of undersized storm sewer to mitigate street flooding which limits access and emergency response.	\$1.5 Million	F	F	F	F	F	F	F	F	22
Municipal Water Storage Towers	Lightning, Extreme Temp.	Existing	Install lightning arrestors and cathodic protection on Municipal water towers.	\$50,000	F	F	F	F	F	F	F	F	23
Stormwater Infrastructure Access Rights	Flood, Winter Storm, Hurricane	Existing	Establish legal rights to enter lands along existing stormwater piping where easements do not currently exist to perform maintenance and repair activities.	\$100,000	F	F	F	F	F	F	F	F	24
Wastewater Treatment Plant Access Road	Flood, Winter Storm, Hurricane	Existing	Obtain easement for access road in lieu of using load-restricted bridge to permit 40 ton vehicles to access WWTP. Mitigation action will improve access to Wastewater plant during emergencies.	\$50,000	F	F	F	F	F	F	F	F	25

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Stream Cleaning (Desilt/Desnag)	Flood, Hurricane, Winter Storm	Existing	Periodic vegetation management, sediment removal, and debris removal downstream of Cascade road to alleviate flooding upstream from Reservoir #3.	\$40,000	F	F	F	F	F	F	F	F	26
High Maneuverability Snow Removal Equipment	Winter Storm	Existing	Purchase smaller snow removal equipment to improve response capability in high-density/narrow/congested sections of the municipality	\$150,000	F	F	F	F	F	F	F	F	27
Wawayanda Study	Flood, Hurricane, Winter Storm	Both	Study a SFHA with floodway designation to determine mitigation opportunities to reduce impacts to community and infrastructure during flood events	\$200,000	F	F	F	F	F	F	F	F	28
Northwest Village Flood Study	Flood, Winter Storm, Hurricane	Both	Study the northwest village quadrant tributary to Schervier Pond, Spring Street, and West Street to further develop mitigation strategies to address chronic flooding during storm events.	\$50,000	F	F	F	F	F	F	F	F	29

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Table 5.23: MITIGATION ACTIONS / PROJECTS IDENTIFIED BY VILLAGE OF WARWICK (cont'd)

Name	Planning Mechanism(s) for Implementation	Anticipated Completion Schedule	Primary Agency / Job Title Responsible for Implementation	Funding Source(s)
Pond Hill Drainage	Village Engineer designed	2014	Village	Grant
Pioneer Farm Area Drainage	5 yr. CIP	2017	Village/Town/County	Grant
Reservoirs 1,2 &3	Watershed Management Plan	2013	Village	Grant
Carroll Drive Drainage	Village Engineer designed	2014	Village	Grant
7 West St Sewer	Village Engineer designed	2016	Village	General Fund
Woodside Drainage	Village Engineer designed	2013	Village	General Fund
Forest Management Plan	DEC plan,when approved	2013	Village	Grant
Spring Street tunnel	Village Engineer	2015	Village	General Fund
Dredge Reservoir #3	DEC plan,when approved	2017	Village	Grant
Reservoir#3 Overtopping Protection	DEC plan,when approved	2015	Village	HMPG
DPW second access road	Village Engineer	2017	Village	Grant
Hydraulic Study of 3 Sequential Reservoirs	Village Engineer	2013	Village	General Fund
Public Education, Awareness and Outreach	NA	2016	Village	General Fund / Grants

**Town of Warwick, Village of Florida, Village of Greenwood Lake and Village of Warwick
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Table 5.23: MITIGATION ACTIONS / PROJECTS IDENTIFIED BY VILLAGE OF WARWICK (cont'd)

Name	Planning Mechanism(s) for Implementation	Anticipated Completion Schedule	Primary Agency / Job Title Responsible for Implementation	Funding Source(s)
Prioritized Electrical Distribution Deenergization during Storm Cleanup	NA	2015	DPW	General Fund
Vegetation Management Plan around Above-ground Utility Distribution	NA	Annual	DPW	General Fund
Reservoir #3 Dam Spillway Capacity Improvement	DEC Plan, when approved	2017	DPW	HMPG
Orchard St. Land Acquisitions	Comprehensive Plan	End of Plan Cycle	Village Board	HMPG
Backup Generators	NA	2015	DPW	HMPG
Protect Sanitary Pump Stations	HMP	3 years	DPW	Grant
Elevate Sanitary Manholes along Wawayanda	HMP	2 years	DPW	Grant
Culvert Replacement	CDBG/CIP	4 years	DPW	Grant
Spring Street Storm Sewer Replacement	HMP	5 years	DPW	Grant
Municipal Water Storage Towers	CIP	4 years	DPW	General Fund

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Table 5.23: MITIGATION ACTIONS / PROJECTS IDENTIFIED BY VILLAGE OF WARWICK (cont'd)

Name	Planning Mechanism(s) for Implementation	Anticipated Completion Schedule	Primary Agency / Job Title Responsible for Implementation	Funding Source(s)
Stormwater Infrastructure Access Rights	Village Board Action	3 years	DPW	General Fund
Wastewater Treatment Plant Access Road	Village Board Action	5 years	Village Board	General Fund
Stream Cleaning (desilt/desnag)	Annual Budget	2 years	DPW	General fund
High-Maneuverability Snow Removal Equipment	Annual Budget	4 years	Village Board	General Fund
Wawayanda Creek Corridor Flood Study	HMP	5 years	Village Board	Grant
Northwest Village Flood Study	Annual Budget	3 years	Village Board	General Fund

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SECTION 6: PLAN MAINTENANCE PROCEDURES

According to the DMA 2000 requirements, each plan must define and document processes or mechanisms for maintaining, updating and integrating the hazard mitigation plan within the established five – year planning cycle. Elements of this plan maintenance section include:

- **Monitoring and Evaluating the Plan**
- **Updating the Plan**
- **Continued Public Participation**

The following sections document the proposed plan maintenance and update procedures discussed and defined by the Planning Team.

6.1 Monitoring and Evaluation

6.1.1 *Past Plan Cycle*

The Town of Warwick and Villages of Florida, Greenwood Lake and Warwick recognize that this hazard mitigation plan is intended to be a “living” document with regularly scheduled monitoring, evaluation and updating. It is important to note that there was no past Multi – Jurisdictional Hazard Mitigation Plan for the Town and Villages. However, recognizing the need for future improvements, the Planning Team discussed ways to ensure a systematic Plan review and maintenance process over the next five years.

6.1.2 *Proposed Schedule and Scope*

Having a multi-jurisdictional plan can assist in plan monitoring and evaluation through the consolidation of information for all participating jurisdictions in one document. The Planning Team reviewed the current DMA 2000 rules, the October 2011 FEMA guidance document and discussed a strategy for performing the required monitoring and evaluation of the Plan over the next Plan cycle. The monitoring and evaluation procedures resulting from the discussions are as followed.

- **Schedule** – Review once per year; update every five (5) years.

- **Responsibility** – The Town of Warwick Supervisor, will take responsibility for organizing and facilitating the review meetings. Planning Team members or their replacement will be contacted via an invitation email / letter stating the meeting date and agenda. Invitations will be made one month in advance of the meeting date.
- **Review Content** – The content and scope of the above referenced Plan review and evaluation will address the following questions to be addressed by each participating jurisdiction:
 - **Hazard Identification:** *Have the risks and hazards changed?*
 - **Goals and objectives:** *Are the goals and objectives still able to address current and expected conditions?*
 - **Mitigations Projects and Actions:** *Has the project been completed? If not completed but started, what has been done and what percent of the project has been completed? What remains to be done? Are there changes to the scope of work?*
- **Documentation** – Each jurisdiction will review and evaluate the Plan as it relates to their community and document responses to the above questions in the form of an informal memorandum. During the scheduled review meeting, responses to each of the questions will be discussed by the Planning Team to address concerns or successes. Documentation of each review meeting will include a list of attendees, a compilation of the memorandums generated by each jurisdiction, and any notes on discussions and conclusions made during the meeting, all compiled into a brief memorandum or review report. Copies of the review memorandum/report will be distributed to each jurisdiction for inclusion in Appendix F. The memorandums will also be posted to the Jurisdiction’s websites and a public notice article will be published in The Warwick Valley Dispatch announcing the completion of the review and posting of the summary memorandums.

6.2 Plan Update

According to DMA 2000, the Plan requires updating and approval from the New York State Department of Homeland Security and Emergency Management (NYS DHSEM) and FEMA every five years. The plan updates will conform to a set schedule using the following procedure:

- ✓ Approximately two years prior to the plan expiration date, the Planning Team will research sources and secure funding to begin the plan update process.

- ✓ Approximately 18 months prior to the plan expiration date, the Planning Team will be re – convened to begin the update process. The Town of Warwick Supervisor will take responsibility to organize and facilitate the update effort.

- ✓ The revised plan will be submitted to NYSDHSEM and FEMA for review, comment and the issuance of an “Approval Pending Adoption” (APA) letter from FEMA.

- ✓ The APA Plan document will be presented before the respective councils and boards for an official concurrence / adoption of the changes.

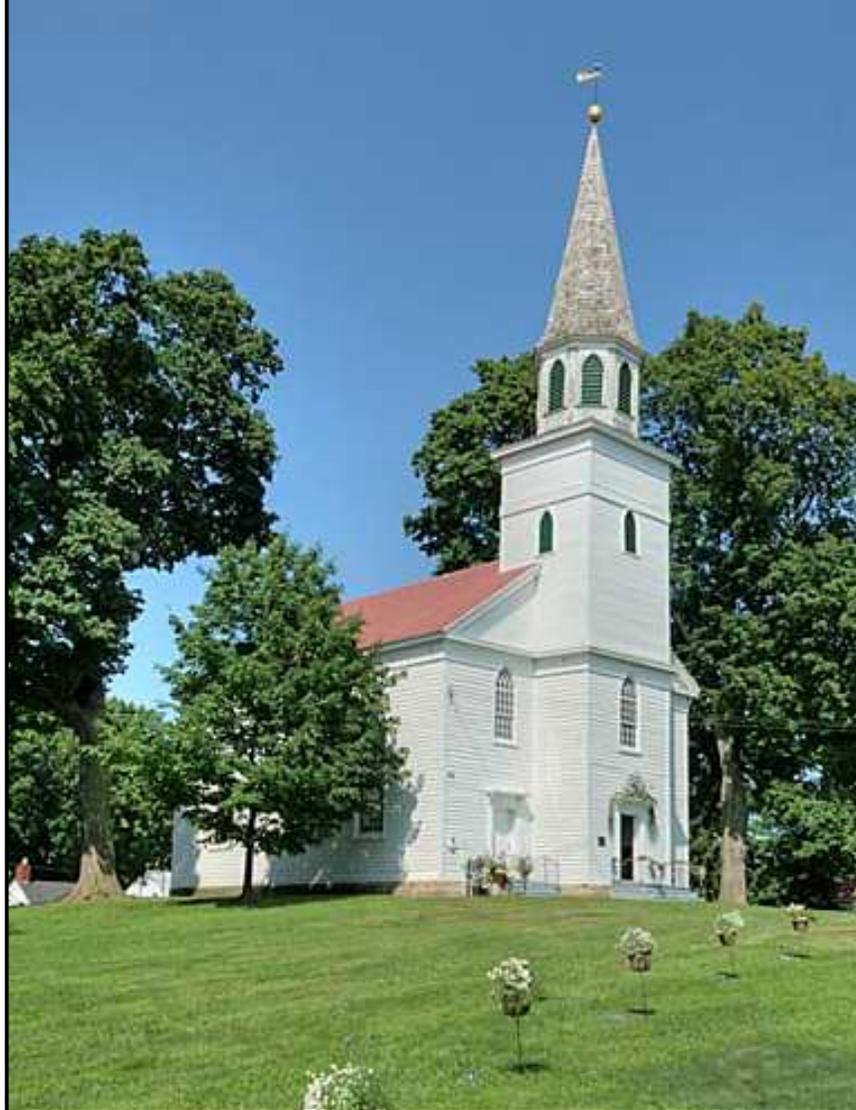
- ✓ Official copies of the resolutions will be sent to NYSDHSEM and FEMA for the final approval.

6.3 Continued Public Involvement

Table 6.1 summarizes proposed activities for continued public involvement and layout of information that shall be pursued whenever possible and appropriate during the next five years. The memorandums generated following the one and three year plan maintenance reviews discussed in Section 6.1.2 will be posted to the Town’s website and a public notice article will be published in a local newspaper alerting citizens to the plan maintenance activity and website. Copies of materials documenting or pertaining to these public involvement efforts will be kept during the next five years and archived in Appendix F for use in the next update process.

Table 6.1: PROPOSED CONTINUED PUBLIC INVOLVEMENT ACTIVITIES OR OPPORTUNITIES IDENTIFIED BY TOWN OF WARWICK AND VILLAGES OF FLORIDA, GREENWOOD LAKE AND WARWICK

Jurisdiction	Proposed Continued Public Involvement Activity or Opportunity
Town of Warwick	<ul style="list-style-type: none"> • Updates periodically posted on Town’s website, social media networks (Facebook, Twitter and etc.) and local weekly newspapers • Quarterly updates at Town Board Meetings • Monthly updates on Municipal Channel 21 • Annual displays in Town Hall lobbies along with presentations within area schools
Village of Florida	<ul style="list-style-type: none"> • Village website posting – with information on mitigation projects with directives on obtaining more information • Mayor’s Column – weekly column where he / she can offer brief updates and solicit input • Monthly Village Board Meetings – solicit public input during the open comment section of the meeting
Village of Greenwood Lake	<ul style="list-style-type: none"> • Updates periodically posted on Village’s website, social media networks (Facebook, Twitter and etc.) local weekly newspapers and Village Board Meetings
Village of Warwick	<ul style="list-style-type: none"> • Updates periodically posted on Village’s website, public hearings, legal notices and press releases.



Corporate Office:
70 Pleasant Hill Road
Mountainville, New York 10953

Regional Offices

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