Albany County

Multi-Jurisdictional Multi-Hazard Mitigation Plan

July 2018

Albany County
Multi-Jurisdictional Multi-Hazard Mitigation Plan

Prepared for:
Albany County

Prepared by:
Barton & Loguidice, D.P.C.
10 Airline Drive, Suite 200
Albany, New York 12205

Table of Contents

1.0 Introduction 1
1.1 Background 1
1.2 Plan Purpose 2
1.3 Planning Participants 3
1.4 Hazard Mitigation Planning Process 6
2.0 Albany County Profile 7
2.1 Geographic Location 7
2.2 Climate 8
2.3 Historical Overview 11
2.4 Demographics 11
2.5 Land Use 13
2.6 Economic Characteristics and Employment 19
2.7 Transportation 20
2.8 Critical Community Facilities 23
2.9 Office of the Albany County Executive 32
3.0 Planning Process 34
3.1 Resources and Information Collection 34
3.2 Planning Team and Key Stakeholders 34
3.3 Jurisdiction Participation 35
3.4 Public Participation 37
3.5 Coordination with Agencies 37

Table of Contents

4.0 Risk Assessment 40
4.1 Risk Assessment Tools 41
4.2 Hazard Identification 47
4.3 Presidential Disaster Declaration 53
4.4 Crude Oil Transportation 59
5.0 Hazard Data and Profiles 60
5.1 Extreme Temperatures 60
5.2 Severe Thunderstorm/Wind/Tornado 66
5.3 Hurricanes and Tropical Storms 86
5.4 Floods 92
5.5 Drought 104
5.6 Landslides 111
5.7 Earthquakes 117
5.8 Winter Storm/Ice Storm 130
5.9 Wildfires 144
5.10 Ice Jams 148
6.0 Hazard Vulnerability 154
6.1 Identify Assets 156
6.2 Damage Potential 156
6.3 Development Trends 158

Table of Contents

7.0 Hazard Mitigation 162
7.1 Background and Past Mitigation Accomplishments 162
7.2 Mitigation Strategy 162
7.3 Mitigation Goals 164
7.4 Capability Assessment 169
7.5 Mitigation Strategy Prioritization 180
8.0 National Flood Insurance Program 183
8.1 Albany County Flood Mapping 183
8.2 Albany County NFIP Policy and Loss Statistics 184
8.3 NFIP Mitigation Actions 189
9.0 Plan Maintenance Process 189
9.1 Plan Monitoring and Evaluation 192
9.2 Plan Updating 193
9.3 Local Planning Considerations 193
9.4 Public Involvement 195
9.5 Plan Integration 195
10.0 Background 197
10.1 Hazard Vulnerabilities and Ranking 198
10.2 Capability Assessment 198
10.3 Mitigation Strategy and Prioritization 199

Table of Contents

Tables:

Table 2.1a – Areas for Jurisdiction within Albany County

Table 2.2a – Annual Temperature, Precipitation, and Snowfall Data Recorded Between 1950 and 2015 and Displayed as Decade Averages

Table 2.4a – Population Change in Albany County Jurisdictions – 1990 to 2010

Table 2.5a – Percentage of Acreage per Jurisdiction by Land Use Categories

Table 2.5b – Agricultural Land Inventory by Type

Table 2.6a – Change in Observed Total Jobs in Industries between January 2015 and January 2016 – Albany-Schenectady-Troy MSA

Table 2.6b – Top 10 Private Employers (by number of employees)

Table 2.8a – Essential Facilities within the 500-Year Floodplain

Table 2.8b – High Hazard Dams in Albany County

Table 3.3a – Jurisdictional Capability Assessment and Resource Availability

Table 4.3a – Presidential Disaster Declarations for New York State, 1954-2015 Major Disaster Declarations

Table 4.3b – NYS Emergency Declarations

Table 4.3c – Fire Management Assistance Declarations

Table 5.0a – Probability of Future Hazard Occurrence

Table 5.2a – Severity and Typical Effects of Various Speed Winds

Table 5.3a – Saffir-Simpson Hurricane Scale

Table 5.4a – Summary of Land Areas in Flood Hazard Areas

Table 5.4b – Summary of Total Values in Flood Hazard Areas

Table 5.4c – Flood Related Disaster Declarations Affecting Albany County 2000-2017

Table 5.4d – Flood Occurrences in Albany County 2007-2017

Table 5.5a – Distribution of Agricultural Land in Albany County

Table 5.7a – Modified Mercalli Scale vs. Richter Scale

Table 5.7b – Modified Mercalli Intensity (MMI) and PGA Equivalents

Table 5.7c – Earthquake History throughout New York State (1737-2005)

Table of Contents

Tables (cont'd):

Table 5.7d – Earthquake History in Albany County (2007-2014)

Table 5.8a – Northeast Snowfall Impact Scale (NESIS) Ranking Categories

Table 5.8b – Occurrence of Winter Storms/Ice Storms, Albany County (2000-2019)

Table 5.10a – Ice Jam Occurrences in Albany County

Table 6.0a – Detailed Hazards per Jurisdiction

Table 6.2a – Housing Types

Table 6.2b – Age of Structures

Table 6.2c – Housing Values

Table 7.5a – Benefit and Cost Prioritization Rankings

Table 8.1a – Total Parcels Mapped in 100- and 500-Year Floodplains by Jurisdiction

Table 8.2a – NFIP Policy Statistics, Snapshot as of March 31, 2016

Table 8.2b – NFIP Loss Statistics, as of March 31, 2016 for Losses Incurred Since January 1, 1978

Table 8.2c – NFIP Repetitive Loss Properties, as of November 30, 2014 for Losses Incurred Since January 1, 1978

Table 8.2d – Repetitive Loss/Severe Repetitive Loss by Structure Type

Table 8.3a – Acreage of Vacant Land Availability per Municipality

Table 9.3a – Planning Mechanism Incorporation

Table 10.0a – Participating Jurisdictions in Albany County

Table of Contents

Figures:

Figure 1.1a – The Phases of Emergency Management

Figure 1.3a – Participating Jurisdictions Map

Figure 2.5a – Land Use Map

Figure 2.5b – Agricultural Districts in Albany County

Figure 2.5c – Publically Owned Lands

Figure 2.7a – Transportation Facilities in Albany County

Figure 2.8a – Large Scale Critical Infrastructure Facilities

Figure 2.8b – Emergency Facilities Map

Figure 4.0a – Three Phases of Risk Assessment

Figure 4.0b – The Risk Assessment Process

Figure 4.1a – 2014 Albany County CEPA Participants

Figure 4.1b – Albany County Hazard Assessment Bar Chart

Figure 4.1c – Albany County Hazard Likelihood, Consequence, and Relative Risk Score Chart

Figure 4.3a – Presidential Disaster Declarations for New York State, 1954-2013

Figure 5.1a – Heat Index

Figure 5.1b – Windchill Chart

Figure 5.2a – Number of High Wind Events Reported For New York State between 1960 and 2012

Figure 5.2b – Number of Hail Wind Events Reported For New York State between 1960 and 2012

Figure 5.2c – Hail Property Damage in New York State, 1960-2012

Figure 5.2d – Wind Zones in the United States

Figure 5.2e – New York State Historical Tornado Paths, 1960-2012

Figure 5.2f – Storm Prediction Center's Tornado and Severe Thunderstorm Watch Frequency Maps – 2013, 2014, & 2015

Figure 5.3a – Historical Storm Tracks 1960-2011

Figure 5.4a – Albany County Watersheds and Subwatersheds

Table of Contents

Figures (cont'd):

Figure 5.4b – Albany County Floodplain Map

Figure 5.4c – Albany County, NY Residential Property Exposure in 100-year Flooplains

Figure 5.4d – The Odds of Being Flooded

Figure 5.5a – Palmer Drought Severity Index, August 2014

Figure 5.5b – U.S. Drought Monitor, October 6 2015

Figure 5.5c – Palmer Drought Severity Index (PDSI) Summary Map for the United States

Figure 5.5d – Albany County Agricultural Lands

Figures Cont'd:

Figure 5.6a – Landslide Incidence and Susceptibility in NYS

Figure 5.6b – NYS Landslide Events by County 1960-2012

Figure 5.6c – NYS Landslide Property Damage by County 1960-2012

Figure 5.7a – US Earthquake Hazard Map (PGA, 2% in 50 years)

Figure 5.7b – NYS 2002 Earthquake Hazard Map (SA 2% in 50 years)

Figure 5.7c – PGA % Seismic Hazard Map

Figure 5.7d – NEHRP Soil Classification in NYS

Figure 5.7e – Albany County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50 years

Figure 5.7f – New York State Historical Earthquakes 1972-2012

Figure 5.7g – New York State Earthquake Annualized Losses by County

Figure 5.8a – New York State Annual Average Snowfalls 1960-2012

Figure 5.8b – Freezing Rain Zones Nationwide

Figure 5.8c – The Sperry Ice Accumulation Index

Figure 5.9a – Fire Danger Rating Area Risk Map

Figure 5.9b – New York State Wildfire Occurrences 1988-2012

Figure 5.10a – NYS Ice Jams Incidents 1875-2007

Figure 6.3a – Low to Moderate Income Map

Table of Contents

Figures (cont'd):

Figure 6.3b – Population Ages 65+

Figure 8.3a – Vacant Parcels within Albany County

Table of Contents

Appendices:

Appendix A – Meetings and Public Participation Documents

Appendix B – Sample and Plan Adoption Resolutions

Appendix C – Hazard Mitigation Plan Checklist

Appendix D – Albany County 2014 County Emergency Preparedness Assessment (CEPA)

Appendix E – Works Cited

Appendix F – FEMA Worksheets

Appendix G – Parcels within Floodplain

Appendix H – Mitigation Funding Sources

Appendix I – Potential Sites for Temporary Housing

Appendix J – Demonstrating Good Practices within Local Hazard Mitigation Plans

1.0 Introduction

1.1 Background

What is a Hazard?
A hazard is defined as a situation which poses a level of threat to life, health, property, and/or the environment. A hazard can be natural, technological or human-caused.

What is Hazard Mitigation?
Hazard mitigation is broadly defined as a method for reducing or alleviating property loss, reducing damage to the environment, and reducing the number and severity of injuries that occur from hazard events through long and short-term strategies. Responsibility for implementing mitigation measures runs community wide from individuals to industries, private business and all levels of government.

Hazard Mitigation and the Other Phases of Emergency Management
Hazard mitigation is often considered just one (1) of four (4) phases of emergency management. The other phases include preparedness, response and recovery. Each of these phases relate to and rely upon each other, as illustrated by Figure 1.1a.

Figure 1.1a – The Phases of Emergency Management

The overarching goal of all of these emergency management activities is the prevention or minimizing of loss of life and property in disaster situations. The Office of the Albany County Executive serves as the local lead agency in promoting this goal. Local supporting agencies include the County Department of Public Works; County Sheriff's Department; Albany County Emergency Management; County Department of Economic Development, Conservation, and Planning; and the Albany County Health Department.

FEMA and Hazard Mitigation

The Federal Emergency Management Agency (FEMA) provides assistance through the Robert T. Stafford Disaster Relief and Emergency Assistance Act to local governments that are recovering from a hazard event. The Federal Disaster Mitigation Act of 2000 (DMA 2000) recognized the importance and cost-effectiveness of mitigation in specifying that local governments must have a FEMA approved natural hazard mitigation plan to be eligible for mitigation project funding.

DMA 2000 encourages and rewards local and state pre-disaster planning, promotes conservation and sustainability, and seeks to integrate state and local planning with an overall goal of strengthening statewide hazard mitigation planning. As of November 1st, 2004, all local governments were required to have a FEMA approved hazard mitigation plan to receive funding through the Hazard Mitigation Grant Program (HMGP) for specified mitigation projects.

1.2 Plan Purpose

Why Develop a Hazard Mitigation Plan?

The purpose of this Multi-Jurisdictional Multi-Hazard Mitigation Plan (HMP) is to effectively reduce future disaster damages, public expenditure, private losses, and community hazard vulnerability. This plan update provides an opportunity for Albany County and its municipalities to develop a comprehensive risk assessment and to outline proposed mitigation actions to minimize the costs and impacts of future disaster events.

The intention of this plan update is to meet the New York State and federal hazard mitigation planning requirements established and managed by the New York State Department of Homeland Security and Emergency Services' (DHSES) and FEMA. Jurisdictions that are participating in this plan update will benefit from the planning and implementation of the mitigation actions proposed and included within. The Pre-Disaster Mitigation Program (PDM), HMGP, and the Flood Mitigation Assistance (FMA) Program continue to require communities to have an active FEMA-approved multi-hazard mitigation plan in-place prior to requesting project implementation funds. Participating jurisdictions that are granted funds are able to implement and complete beneficial mitigation actions to minimize impacts to their communities and constituents from hazard events. The following resources and regulatory programs are key documents which provided guidance for the preparation of this HMP update:

- Section 404 of Robert T. Stafford Disaster Relief and Emergency Assistance Act, Public Law 93-288, as amended, 42 U.S.C. 5121 et seq. (April 2013);
- Federal Disaster Mitigation Act of 2000;
- Hazard Mitigation Grant Program (HMGP), Pre-disaster Mitigation Program, Flood Mitigation Assistance Program, Repetitive Floodplain Claims Program (RFC), Severe Repetitive Loss Program (SRL);
- Code of Federal Regulations (CFR) – 44 Part 201 – Mitigation Planning;
- Hazard Mitigation and Relocation Assistance Act of 1993;
- FEMA – 44 CFR Part 9 – Floodplain Management and Protection of Wetlands and 44 CFR Part 10 – Environmental Considerations;

- New York State Executive Law, Article 2-B, Sections 23 and 28-a;
- New York State Hazard Mitigation Plan (2014);
- Hazard Mitigation Planning Standards (NYS DHSES, June 2014)

The development of a HMP update for Albany County provides the following benefits:

- Maintains eligibility for federal funds to complete pre-disaster mitigation actions;
- Allows for the development of more sustainable and disaster-resistant communities;
- Emphasizes the formation of partnerships that support planning and mitigation efforts;
- Reduces long-term impacts to structures and human-health associated with extreme hazard events, which are in some cases are exacerbated by changing climatic conditions; and
- Increases the understanding of the hazards that could potentially impact the County and its municipalities, and the specific locations within the County that are more vulnerable to damages and impacts as a result of natural hazard events.

Comments or questions about this plan should be addresses to the Office of the County Executive, 112 State Street, Room 900, Albany, NY 12207. This office can be reached by phone at (518) 447-7040 and online at Albany County's website: http://www.albanycounty.com/Government/Departments/CountyExecutive.aspx.

1.3 Planning Participants

The 2017 HMP for Albany County includes participation from seventeen (17) jurisdictions located within, and including, Albany County. Participants include Albany County, the Cities of Albany, Cohoes, and Watervliet; Towns of Berne, Bethlehem, Colonie, Coeymans, Guilderland, Knox, New Scotland, and Westerlo; the Town/Village of Green Island; and the Villages of Altamont, Menands, Ravena, and Voorheesville.

Figure 1.3a (page 5) shows the locations of the sixteen (16) jurisdictions within the County limits and the position of Albany County within New York State.

The participation of nearly all jurisdictions within Albany County in the HMP process fulfills one of the main goals that Albany County had for this effort, and greatly improves the quality and completeness of this planning document. The Hazard Mitigation Planning Committee that was in charge of putting together the 2007 HMP was predominately composed of County officials. There were provisions to open the planning process up to the jurisdictions within Albany County as well as the public. Ultimately the 2007 HMP was not adopted and did not receive any feedback from the public or the jurisdictions within the County.

Municipalities within Albany County were contacted by the County Executive's Office to participate in the plan update and were invited to attend a variety of meetings held throughout the planning process. Each participating jurisdiction provided updated information about the hazards that have historically occurred within their boundaries, with a focus on post-2007 events. Repair costs and damage estimates associated with such hazard events were also provided. Participating

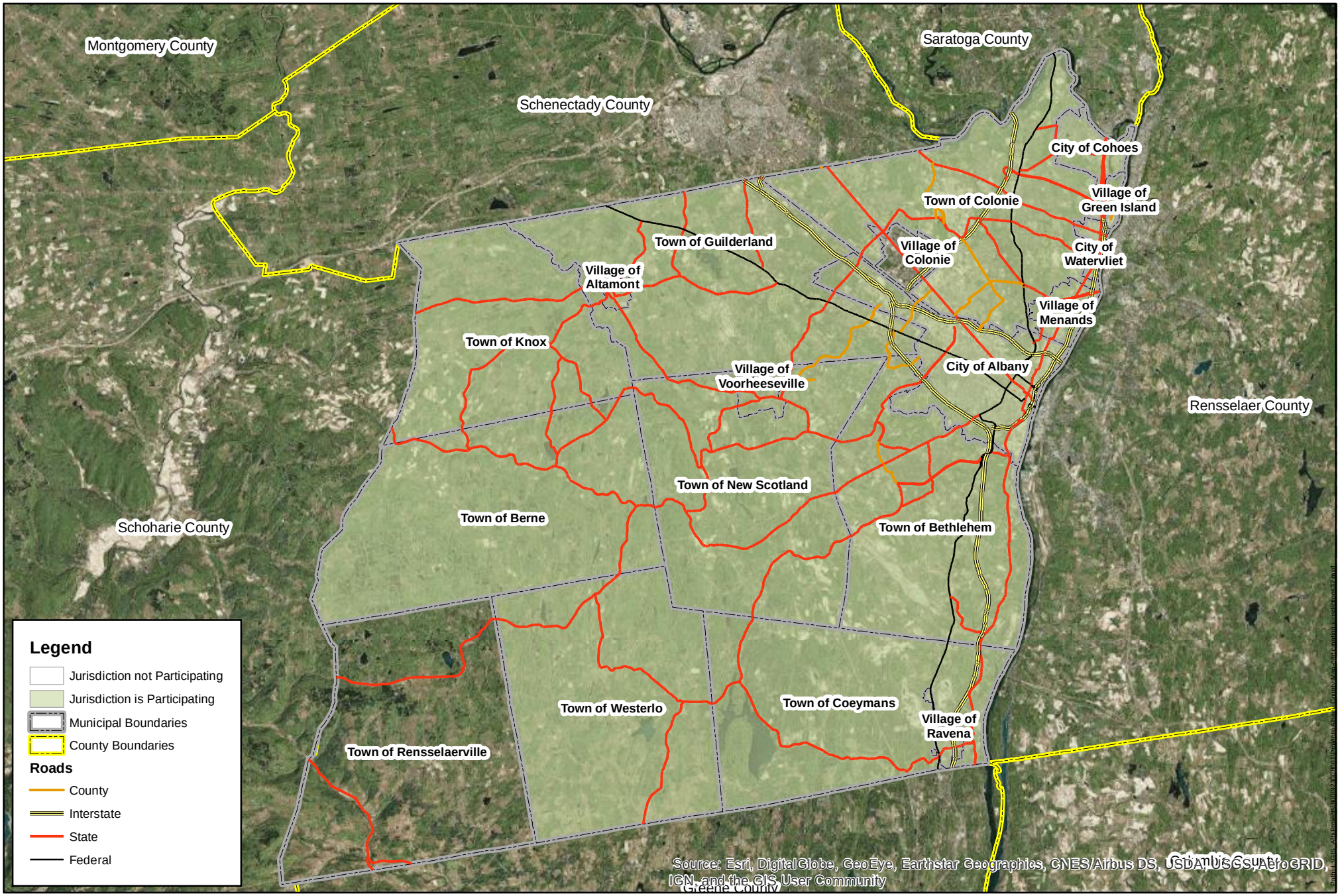
jurisdictions reviewed the critical facilities within their boundaries and the risk assessment and vulnerability information provided within this Plan Update. The County Executive's Office coordinated data collection and information review with jurisdictions and agencies unable to attend scheduled meetings.

A wide variety of additional resources were utilized to gather information concerning historic and recent occurrences of hazard events within Albany County, vulnerabilities within the County related to future hazard events, and costs and damages likely to occur as a result of a hazard event. The goals and objectives included in the County's 2007 HMP were reviewed and updated, as appropriate. Goals are created to assist in the formulation of potential mitigation actions and strategies that could be implemented to minimize the loss of life, frequency of injuries, damage to property, and/or impacts to the environment as a result of hazard events that affect Albany County.

Representatives from the participating jurisdictions made up the Project Team. A Steering Committee was also assembled by the County Executive's Office. This committee consisted of representatives from the following agencies, groups, and entities: Barton & Loguidice (project consultant), Albany County Office of Emergency Management, Albany County Office of Natural Resources, Albany County Department of Public Works, Albany County Department of Parks and Recreation, Albany County Department of Information Technology, Albany County Planning Department, and Albany County Real Property Services. Steering Committee members were selected and invited to participate in this update process based upon their specialties and fields of interest. Further detail about the Project Team and the Steering Committee is provided in Section 3.0.

Figure 1.3a on the following page depicts a map of the participating jurisdictions in this multi-jurisdictional plan update. Sixteen (16) municipalities within Albany County, including the County itself, are participating in this plan.

Figure 1.3a - Participating Jurisdictions Map



1 inch = 23,333 feet

Hazard Mitigation Plan

Participating Jurisdictions Map

Albany County July 2018 New York

Figure 1.3a

Project No. 923.008.001

1.4 Hazard Mitigation Planning Process

In completing the 2017 HMP update, participating jurisdictions accomplished the following objectives to support the plan update process:

- Established a knowledgeable planning group to represent all participating jurisdictions;
- Assessed numerous natural, technological, and human-caused hazards to determine those that have the greatest possibility of impacting their community;
- Analyzed and profiled selected hazards;
- Incorporated recent planning efforts and new updated scientific information into hazard profiles and mitigation activities;
- Updated critical facility listings for their community;
- Estimated damages and impacts that could occur as a result of various hazard events;
- Developed pre-disaster mitigation strategies and actions for the various types of hazards to which each jurisdiction determined it was vulnerable; and
- Reviewed and revised the plan maintenance procedures associated with this Plan.

DMA 2000 only requires that communities evaluate the impact of natural hazards. Though ten (10) natural hazards are the primary focus of this Plan Update, Albany County and other participants could have also chosen to assess the County's vulnerability to technological hazards and human-caused hazards. However, the County chose to focus on natural hazards. Some of the participating jurisdictions followed this lead and only chose to address natural hazards for their communities. The ten (10) natural hazards identified by Albany County are further described and profiled in Section 5.0 of this Plan Update.

2.0 Albany County Profile

This section details the existing environmental features, transportation networks, demographics, history, available facilities and a profile of Albany County and its existing features and facilities. Section 2.0 will detail and identify the existing conditions, capabilities, and vulnerabilities of Albany County itself and the sixteen (16) participating jurisdictions within the County.

2.1 Geographic Location

Albany County is located in Upstate New York, northwest of New York City. Albany County is geographically bounded to the east by the Hudson River with Rensselaer County bordering the Hudson River, and the Mohawk River to the north creating the border between Albany County and Saratoga County. Schenectady County lies to the northwest, Schoharie County to the west, and Greene County to the south. Albany County is a part of the region known as the "Capital District". The Capital District is made up of four (4) counties, Albany County, Saratoga County, Rensselaer County, and Schenectady County.

The City of Albany serves as both the Capital of New York State as well as the county seat for Albany County. The County includes three (3) cities, nine (9) towns, five (5) villages, and the Town/Village of Green Island. Albany County consists of a total area of five hundred thirty-three (533) square miles, of which five hundred twenty-three (523) square miles are land area and ten (10) square miles are water area. In terms of total area, the Town of Berne is the largest jurisdiction within Albany County, totaling 64.8 square miles. This equates to 12.16% of the total area of the County. The Town/Village of Green Island is the smallest town in Albany County, totaling 0.9 square miles in area, which represents only 0.17% of the total area of Albany County (U.S. Census Bureau). Table 2.1a provides the total areas (in square miles) for cities and towns included within Albany County. The various villages located within Albany County are included within the total areas of their encompassing towns in Table 2.1a

Table 2.1a –Areas for Jurisdictions Within Albany County
(U.S. Census Bureau, 2016)

Jurisdiction	Total Area (sq. miles)	Total Land (sq. miles)	Total Water (sq. miles)	% of Total Area in County
Albany County	533	523	10	100%
Albany (C)	21.8	21.4	0.4	4.09%
Berne (T)	64.8	64.1	0.6	12.16%
Bethlehem (T)	49.6	48.8	0.8	9.31%
Colonie (T) (Includes the Village of Colonie and Menands)	57.9	56.1	1.8	10.81%
Cohoes (C)	4.2	3.7	0.5	0.79%
Coeymans (T) (Includes the Village of Ravena)	53.1	50.2	2.9	9.96%
Green Island (T) (Co-terminus with the Village of Green Island)	0.9	0.7	0.2	0.17%
Guilderland (T) (Includes the Village of Altamont)	58.7	57.9	0.8	11.01%
Knox (T)	41.9	41.8	0.1	7.86%
New Scotland (T) (Includes the Village of Voorheesville)	58.4	58.1	0.3	10.96%
Rensselaerville (T)	61.9	61.5	0.4	11.91%
Watervliet (C)	3.8	3.5	0.3	0.71%
Westerlo (T)	58.6	57.9	0.7	10.99%

The areas surrounding the Hudson and Mohawk River are relatively flat, whereas other areas are high and hilly in the southwest of the Helderberg Escarpment and the Helderberg Mountains. The escarpment is located about eleven (11) miles west of the City of Albany (NYS DEC, 2015) The highest summit in the County is located near Henry Hill, and reaches 2,160 feet (658 meters) above sea level; some portions along the Hudson River reach as low as sea level. The Hudson River shoreline in Albany County is subject to ocean tides as part of the Hudson River Estuary.

2.2 Climate

The climate of Albany County is of the humid continental type, typical of the interior northeastern United States (NYS Climate Office, 2010). Humid continental climates are known for their variable weather conditions, due to their location between the polar and tropic air masses. Polar air masses collide with tropical air masses, causing uplift of the moist tropical air and resulting in precipitation.

The location of Albany County is far enough from Lake Ontario that lake-effect weather patterns do not often affect the county. However, the County is located close enough to the coast that heavy snows from Nor'easters affect the area.

The Albany Weather Forecast Office, in the Town of Colonie, high temperatures average over January in 32ºF with average lows just above 14ºF. In July, the average high temperature is 83ºF with lows averaging 60ºF. The year-round average temperature is about 48.0. Rainfall averages 38.43 inches annually, while annual snowfall averages 62.35 inches (National Weather Service 2016).

Table 2.2a depicts the fluctuating average temperatures, average precipitation, and seasonal snowfall totals in Albany County from 1950 to 2015.

Table 2.2a – Annual Temperature, Precipitation, and Snowfall Data Recorded Between 1950 and 2015 and Displayed as Decade Averages *(NWS, 2016)*

Years	Average Temperature (ºF)	Average Precipitation (inches)	Seasonal Snowfall Totals (inches)
2010-2015	49.7	41.78	62.26
2000-2009	48.6	43.17	60.61
1990-1999	48.4	38.08	58.42
1980-1989	47.4	36.09	59.02
1970-1979	46.9	39.90	69.37
1960-1969	46.9	31.75	67.06
1950-1959	47.8	36.15	59.69
Overall Average	48.0	38.43	62.35

The best, most recent, climate science indicates a future of increased temperatures and shifting precipitation patterns for Albany County and New York State. Rates are projected to increase much faster than historic natural rates over the coming century, and as a result extreme hazard events may increase in frequency and intensity. The New York State Energy Research and Development Authority (NYSERDA) commissioned report, *ClimAID: the Integrated Assessment for Effective Climate Change Adaptation Strategies in New York State*, released in November 2011, was written by scientists from Cornell University, Columbia University, and the City University of New York. The report and adaptation guidance focus exclusively on climate change adaptation strategies specific to New York State, and is geared to assist local decision-makers in developing and adopting adaptation strategies. Climate change projections were updated in September 2014 through the release of the Supplement to NYSERDA Report 11-18. The 2011 ClimAID report and 2014 Supplement highlight the need for Albany County to prepare for the following climate change projections and predications:

- **Heat waves** will become more frequent and intense, increasing heat-related illness and death and posing new challenges to the energy system, air quality, and agriculture.

- **Summer drought** is projected to increase, affecting water supply, agriculture, ecosystems, and energy production.
- **Rate of occurrence** for heating and cooling days (days over 90°F and days below 32°F) will change. The frequency of heating days is projected to increase, while the frequency of cooling days is projected to decrease.
- **Heavy downpours** are increasing and are projected to increase further. These can lead to flooding and related impacts on water quality, infrastructure, and agriculture.
- **Major changes** to ecosystems including species range shifts, population crashes, and other sudden transformations could have wide-ranging impacts, not only for natural systems but also for health, agriculture, and other sectors.
- **Coastal flooding** is predicted to increase as a result of sea level rise. Rising sea levels have the potential to impact the Hudson River and adjacent communities.

The 2014 ClimAID Supplement breaks New York State into seven regions to better analyze specific trends and customize climate change predictions to specific areas. Albany County is included in Region 5, whose observed weather station is located in the City of Albany. Region 5 predictions included in the 2014 ClimAID Supplement indicate that temperatures will rise by 1.7 to 3.7°F by the 2020s, 3.5 to 7.1°F by the 2050s, and 4.1 to 11.4°F by the 2080s, with the lower ends of these ranges expected under lower greenhouse gas emissions and the higher ends for higher emissions scenarios.

The ClimAID Report and 2014 Supplement note that these are not the best and worst cases, just the most likely; sharp cuts in global emissions could result in temperature increases lower than the bottom ends of these ranges, while a continuation of business-as-usual could result in increases higher than the high ends. Observed climate trends specific to the Albany County area (Region 5) show that the annual temperature trend from 1901-2012 has increased 0.22°F per decade (NYSERDA, 2014).

The 2014 ClimAID Supplement also projects that annual average precipitation for Region 5 will increase by 1% to 10% by the 2020s, 2% to 15% by the 2050s, and 3% to 17% by the 2080s. This will not be distributed evenly over the course of the year. Much of this additional precipitation is likely to occur during the winter months as rain, with the possibility of slightly reduced precipitation projected for the late summer and early fall. Continuing the observed trend, more precipitation is expected to fall in heavy downpours and less in light rains. Observed climate trends specific to the Albany County area (Region 5) show that the annual precipitation trend from 1901-2012 has increased 0.90 inches per decade (NYSERDA, 2014). Of the seven (7) regions included in the 2014 ClimAID Supplement, Region 5 displays the largest increases in precipitation for this time period.

In addition, the 2014 ClimAID Report highlights that some areas, including Albany County, are vulnerable in other ways: regions that depend on agriculture and tourism (such as fishing, hiking, and wineries) may be especially in need of adaptation assistance; and low-income urban neighborhoods, especially those within flood zones, are less able to cope with climate impacts such as heat waves and flooding.

Specific groups of people that are identified in the 2014 ClimAID Report as being particularly vulnerable include elderly, disabled, and health compromised individuals who are more vulnerable to climate hazards, including floods and heat waves; low-income groups that have limited ability to meet higher energy costs; farm workers who may be exposed to more chemicals if pesticide use increases in response to climate change; asthma sufferers who will be more vulnerable to the decline in air quality during heat waves; and people who depend on public transportation and lack private cars for evacuating during emergencies. Small businesses are also identified as being particularly vulnerable, as they are typically less able to cope with costly climate related interruptions and stresses, such as power and communication service disruptions, than larger businesses.

2.3 Historical Overview

The region that would become Albany County was settled by French and then Dutch fur traders in the early 17th century after Henry Hudson voyaged up "La Grande Riviere" (later named the Hudson River) in his ship the Half Moon, searching for a trade route to the Far East (Albany County, No Date (2)).

The County was created on November 1st, 1683. Albany County was among the original twelve (12) counties of New York State. By 1774, Albany County was the most populated county in colonial New York with over 42,000 settlers. County boundaries were later redefined in 1809 to reflect what they are today; bounded on the east by the Hudson River and on the north by the Mohawk River (Albany County (2)). The City of Albany, located in Albany County was established as the State Capital in 1797, and was chosen over the City of Kingston and New York City as the government center (City of Albany, 2013). In 1825, the Erie Canal brought commerce to the County's waterfront, and in 1831 travel by rail brought even more activity to the area.

Much of Albany County was developed from the City of Albany outward into the surrounding municipalities. Since the mid-20th century, the County has experienced continued suburban development as City populations' level off.

2.4 Demographics

According to the U.S. Census (2010), the population of Albany County totaled 304,204 in 2010, reflecting a growth of 9,639 people when compared to the 2000 U.S. Census data (294,565 people). Population projections estimate the population of Albany County in 2020 will rise to 309,730, growing an estimated 1.78% in the next ten (10) years.

This increase in population over the past decade reflects steady growth within the County. Table 2.4a provides population data for the County and its jurisdictions for the previous three census counts (1990, 2000, and 2010) and the most recent population projection data available (2020) (U.S. Census Bureau, 2016). Between 2000 and 2010, Albany County has grown by 3.17% overall. Between the 2000 and 2010 Census eight (8) of the seventeen (17) municipalities have experienced a decline in population. The largest population reduction observed within Albany County was the Town of Coeymans, with 9.88% of the population lost between 2000 and 2010 (US Census Bureau, 2016). Of the ten (10) municipalities that have seen increase in population,

only one (1) had significant growth. The Town/Village of Green Island saw 13.05% growth between 2000 and 2010.

Table 2.4a – Population Change in Albany County Jurisdictions – 1990 to 2010
(U.S. Census Bureau, 2016)

Jurisdiction	Census Population 1990	Census Population 2000	Census Population 2010	*Population Change 2000-2010 (%)*	Projected Population 2020
Albany County	292,793	294,565	304,204	*3.17%*	309,730
Albany, City of	100,031	94,301	97,856	*3.63%*	98,187
Altamont, Village of	1,519	1,737	1,720	*-0.98%*	1,756
Berne, Town of	3,053	2,846	2,794	*-1.86%*	2,863
Bethlehem, Town of	27,552	31,304	33,656	*6.99%*	34,861
Coeymans, Town of	8,158	8,151	7,418	*-9.88%*	7,483
Cohoes, City of	16,825	15,521	16,168	*4.00%*	16,549
Colonie, Town of	76,497	79,528	81,591	*2.53%*	83,438
Colonie, Village of	8,019	7,916	7,793	*-1.58%*	7,760
Green Island, Town/Village of	2,490	2,278	2,620	*13.05%*	2,608
Guilderland, Town of	30,011	34,045	35,303	*3.56%*	36,536
Knox, Town of	2,661	2,647	2,629	*-0.68%*	2,772
Menands, Village of	4,333	3,910	3,990	*2.01%*	4,088
New Scotland, Town of	9,139	8,626	8,648	*0.25%*	8,797
Rensselaerville, Town of	1,990	1,915	1,843	*-3.91%*	1,882
Ravena, Village of	3,547	3,369	3,268	*-3.09%*	3,295
Voorheesville, Village of	3,225	2,775	2,789	*0.50%*	2,833
Watervliet, City of	11,061	10,207	10,254	*0.46%*	10,315
Westerlo, Town of	3,325	3,466	3,361	*-3.12%*	3,439

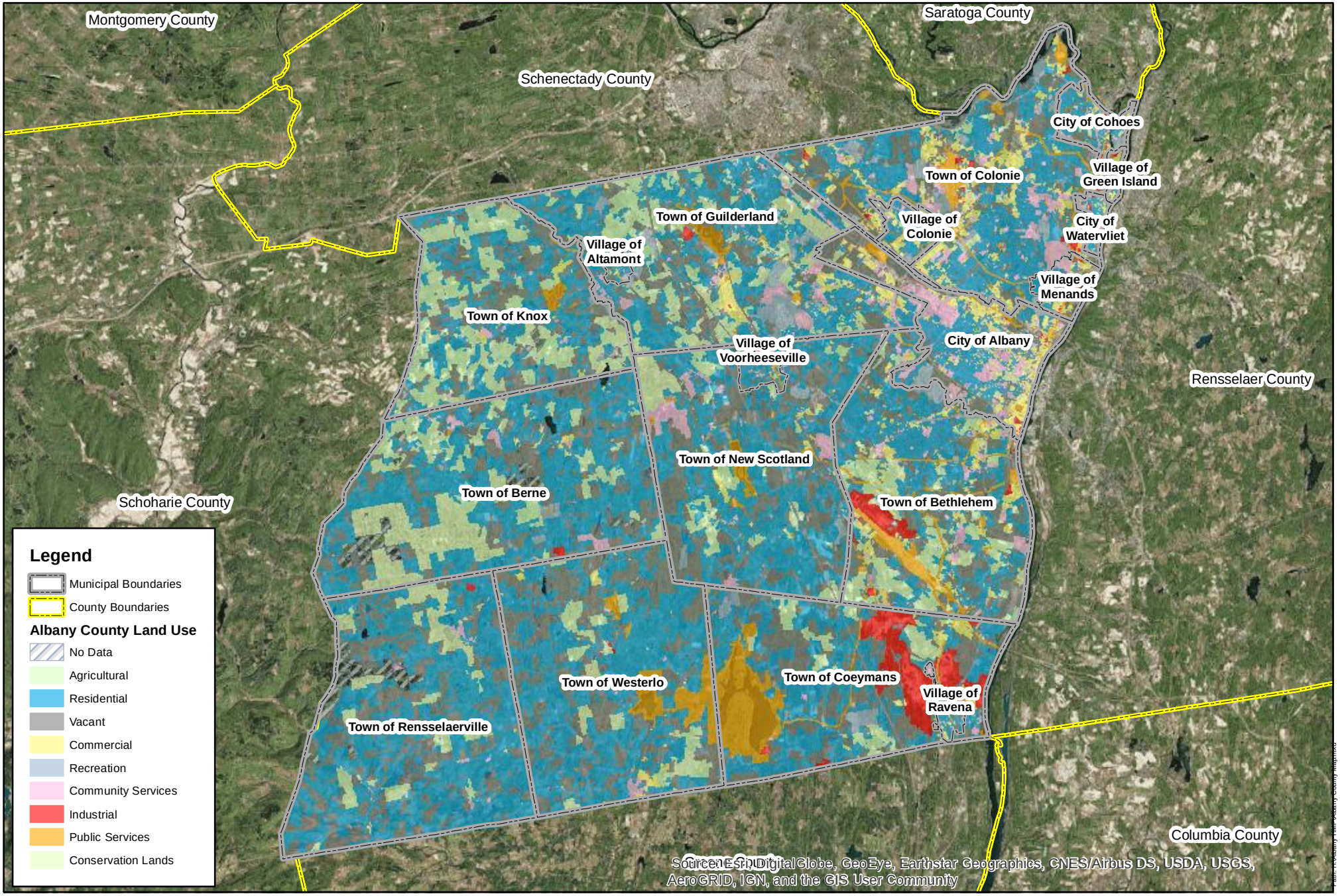
2.5 Land Use

Land use within Albany County is mixed, with the majority of tax parcel use reflected in the following land use categories: agriculture, residential, commercial, and vacant land. Table 2.5a displays the percent acreage for each jurisdiction in Albany County by land use category.

Table 2.5a – Percentage of Acreage per Jurisdiction by Land Use Categories

Jurisdiction	Agriculture	Residential	Vacant	Commercial	Recreation & Entertainment	Community Services	Industrial	Public Services	Wild, Forested & Conservation Lands	No Data
Albany (County)	9.7%	41.9%	2.6%	4.1%	2.1%	3.3%	2.0%	4.4%	27.9%	2.0%
Albany (C)	0.0%	24.8%	24.4%	18.7%	6.0%	18.5%	1.0%	4.3%	2.3%	0.0%
Altamont (V)	0.0%	63.8%	12.8%	3.6%	12.7%	3.0%	0.0%	3.3%	0.5%	0.3%
Berne (T)	9.7%	49.3%	22.7%	0.4%	0.6%	0.1%	0.3%	1.6%	14.8%	0.5%
Bethlehem (T)	17.1%	32.9%	23.3%	6.9%	2.3%	3.8%	3.5%	8.6%	1.6%	0.0%
Coeymans (T)	6.3%	33.2%	26.8%	2.3%	2.3%	0.4%	13.9%	14.3%	0.6%	0.0%
Cohoes (C)	4.4%	36.6%	22.8%	11.7%	4.1%	8.6%	2.2%	4.5%	5.2%	0.0%
Colonie (T) (includes Village of Colonie)	1.4%	37.1%	24.1%	15.0%	5.6%	9.0%	1.2%	5.0%	1.6%	0.0%
Green Island (T/V)	0.0%	12.3%	29.6%	31.6%	1.4%	1.2%	9.5%	10.9%	3.4%	0.0%
Guilderland (T)	15.2%	38.5%	19.1%	4.5%	5.6%	4.8%	0.2%	2.5%	9.7%	0.0%
Knox (T)	32.7%	33.8%	21.7%	1.1%	0.6%	0.4%	2.8%	1.5%	4.3%	1.1%
Menands (V)	0.0%	29.2%	16.5%	23.5%	1.0%	16.4%	2.6%	10.8%	0.0%	0.0%
New Scotland (T)	7.0%	47.1%	29.2%	1.0%	1.6%	4.7%	2.1%	2.2%	4.4%	0.9%
Rensselaerville (T)	4.9%	52.0%	36.4%	0.1%	0.0%	0.6%	0.3%	0.0%	5.7%	0.0%
Ravena (V)	0.0%	39.9%	29.7%	12.1%	2.5%	10.8%	0.5%	4.6%	0.0%	0.0%
Voorheesville (V)	0.0%	53.7%	30.7%	2.9%	0.9%	1.4%	7.3%	2.6%	0.5%	0.0%
Watervliet (C)	0.0%	47.4%	8.2%	13.6%	4.0%	22.3%	3.5%	1.1%	0.0%	0.0%
Westerlo (T)	5.5%	51.6%	30.8%	1.3%	1.6%	0.6%	0.1%	6.8%	1.6%	0.0%

Figure 2.5a - Land Use Map



1 inch = 23,333 feet

Hazard Mitigation Plan

Land Use Map

Albany County July 2018 New York

Figure 2.5a

Project No. 923.008.001

Residential

Residential uses make up for the largest proportion of land use within the County, at 41.89%. There are four (4) municipalities within the County with more than 50% of their land being used for residential purposes. Those municipalities are the Villages of Altamont and Voorheesville and the Towns of Rensselaerville and Westerlo. Residential use in the City of Albany only makes up 24.77% of land uses, making it the jurisdiction with the least amount of land being used for residential purposes.

Vacant

A high proportion of vacant properties within a County can put them at higher risk for property damage in case of an extreme weather event. Properties that are not vacant tend to see less damage because they are better maintained than those without owners. In terms of acres, 2.6% of the land area in Albany County is classified as vacant. The Village of Voorheesville and the Town of Westerlo have the highest percent of vacant land, at 30.7% and 30.8% respectively. The Town of New Scotland and the Town/Village of Green Island have similar numbers with vacancies at 29.2% and 29.6% respectively.

Industrial

Industrial uses are relatively low within Albany County, only 2.01% of land is being used for industrial purposes. The Town of Coeymans and the Town/Village of Green Island have 13.86% and 9.52% of their land being used for industrial purposes. It is important for municipalities with high concentrations of industrial uses to plan for potential hazards that would exist if some industrial facilities were to be affected by a hazard event. Often special plans need to be made when planning to mitigate certain hazards.

Table 2.5b - Agricultural Land Inventory by Type
(Albany County)

Jurisdiction	Agricultural Classification							
	Livestock/ Poultry (acres)	Equine (acres)	Dairy (acres)	Orchard/ Vineyard (acres)	Truck Crops (acres)	Nursery/ Greenhouse (acres)	Gen Ag Land (acres)	Total Acres
Albany (C)	0	0	0	0	0	0	0	0
Berne (T)	861.64	1,117.00	0	0	112.43	1,618.20	0	3,709.27
Bethlehem (T)	991.63	1,967.93	0	17.33	56.05	1,711.16	56.31	4,800.41
Coeymans (T) (includes Village of Ravena)	368.93	366.54	0	0	0	1207.81	0	1,943.28
Cohoes (C)	0	0	0	0	0	41.96	0	41.96
Colonie (T) (includes Village of Colonie & Menands)	161.14	7.97	60.55	13.41	142.42	108.61	0	494.1
Green Island (T/V)	0	0	0	0	0	0	0	0
Guilderland (T) (includes Village of Altamont)	1,031.86	1,722.13	244.79	106.29	58.58	2,153.43	0	5,317.08
Knox (T)	2,931.82	1,099.14	0	0	0	4,410.32	0	8,441.28
New Scotland (T) (includes Village of Voorheesville)	654.4	1,117.05	300.47	11.5	23.63	278.07	0	2,385.12
Rensselaerville (T)	260.62	1,110.58	0	0	0	439.62	0	1,810.85
Watervliet (C)	0	0	0	0	0	0	0	0
Westerlo (T)	400.35	1,610.66	0	0	0	0	0	2,011.08
Total Ag Land (acres)	7,662.44	10,118.99	605.8	148.53	393.12	11,969.20	56.31	30,954.39

Note: Agricultural classifications are based on Office of Real Property land use codes. Codes have been aggregated.

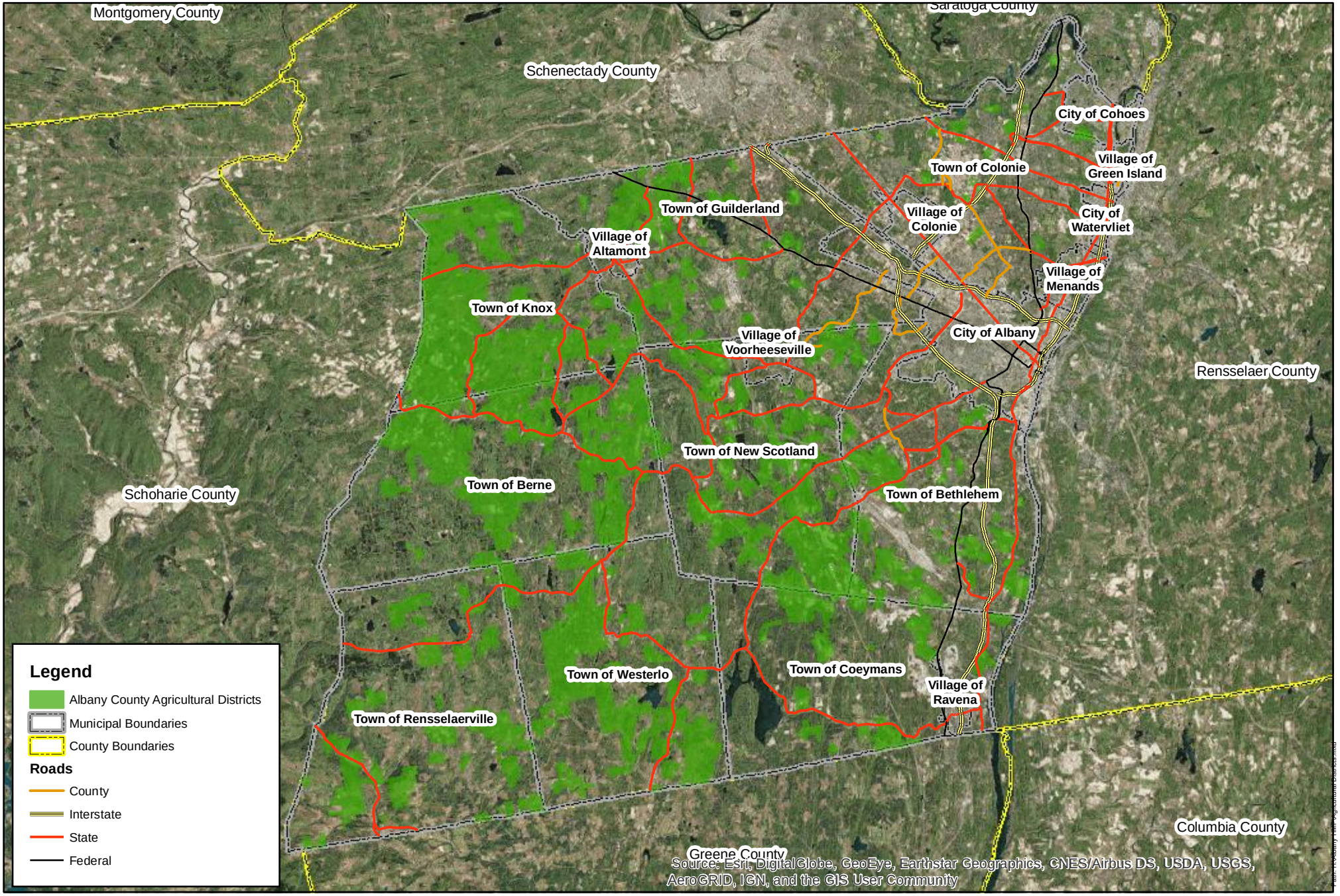
Agriculture

9.66% of Albany County is being used for agricultural purposes. Most of the municipalities in Albany County have less than 10% of their land used for agricultural. Three (3) towns in Albany County rely on agriculture more heavily than the other municipalities. Those towns are the Town of Knox with 32.66%, the Town of Bethlehem with 17.14%, and the Town of Guilderland 15.19%. Areas heavily reliant on agriculture are prone to more extensive devastation from severe drought or flooding. Figure 2.5b (below) shows the land used for agricultural enterprises operating in each municipality within Albany County.

Publically Owned Land

Publically owned land in Albany County encompasses several different land use categories, including government buildings or facilities, public utilities and associated facilities, parks and recreational facilities and conserved or protected land. 10.37% of total land in Albany County is owned publically, by either local, county, or state governments. A majority of this land is located within the City of Albany, specifically Harriman Campus and Empire State Plaza. The presence of publically owned land significantly reduces tax revenues and can make it challenging for municipalities to adopt balanced budgets. This is especially the case for the City of Albany, where 68% of land is untaxable. Although many of the tax exempt properties are religious institutions, hospitals, and universities, publically owned land contributes significantly to the City's tax burden.

Figure 2.5b - Agricultural Districts in Albany County



1 inch = 23,333 feet

Hazard Mitigation Plan

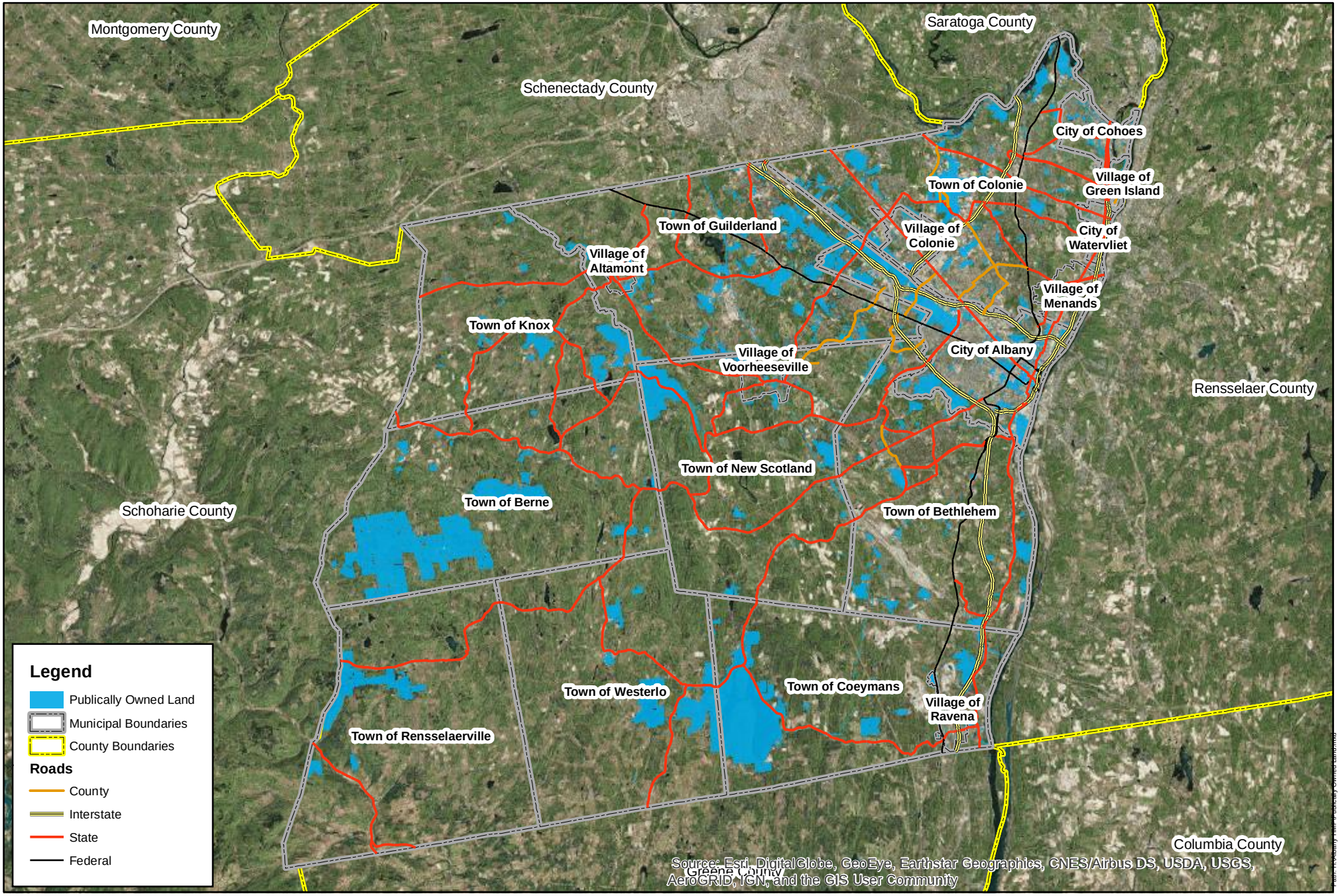
Agricultural Districts in Albany County

Albany County July 2018 New York

Figure 2.5b

Project No. 923.008.001

Figure 2.5c - Publically Owned Lands



1 inch = 23,333 feet

Hazard Mitigation Plan

Publically Owned Land

Albany County July 2018 New York

Figure 2.5c

Project No. 923.008.001

2.6 Economic Characteristics and Employment

To understand how Albany County's economy fits into a regional context data was collected for the Albany-Schenectady-Troy MSA (Metropolitan Statistical Area) and the Capital District which encompasses the counties of Albany, Rensselaer, Saratoga, and Schenectady. The unemployment rate in Albany-Schenectady-Troy MSA has decreased over the past year from 5.1% in 2014 to approximately 4.5% in 2015 (NYS Department of Labor, 2016); though it remains lower than the New York State unemployment rate of 5.36% (all based on preliminary data). The increase or decrease in numbers of jobs within different industries between January 2015 and January 2016 is shown in Table 2.6a. Overall, employment in the Albany-Schenectady-Troy MSA grew from 423,600 employees in January 2015 to 429,600 employees in January 2016.

Table 2.6a - Change in Observed Total Jobs in Industries between January 2015 and January 2016 - Albany-Schenectady-Troy MSA
(NYS Department of Labor, 2016)

Industrial Sector	Employment (No. of jobs)		
	Jan. 2015	Jan. 2016	*% Change*
Mining Quarrying and Oil and Gas Extraction	18.1	17.1	*-5.5%*
Trade, Transport, and Utilities	73.9	75.7	*2.4%*
Manufacturing	24.5	25.5	*4.1%*
Wholesale Trade	13.9	13.8	*-0.7%*
Retail Trade	47.1	49.1	*4.2%*
Transportation and Warehousing	12.9	12.8	*-0.8%*
Information	8.3	8.2	*-1.2%*
Finance and Insurance	25.5	26.2	*2.7%*
Professional Scientific and Technical Services	30.9	29.9	*-3.2%*
Management of Companies and Enterprises	6.5	6.4	*-1.5%*
Administrative and Support and Waste Management and Remediation Services	15.9	15.0	*-5.7%*
Educational Services	28.2	26.9	*-4.6%*
Health Care and Social Assistance	62.2	63.3	*1.8%*
Leisure and Hospitality	35.3	36.9	*4.5%*
Accommodation and Food Services	30.3	31.1	*2.6%*
Other Services (except Public Administration)	18.3	18.1	*-1.1%*
Total All Government	100.2	99.5	*-0.7%*

The largest employment sectors in Albany County are the Trade, Transport, and Utilities industry and the Total Government industry. The State Capital is located in the City of Albany making Albany County home to many offices and other state functions. Both sectors combined account for 175,200 of total employees within the Albany-Schenectady-Troy MSA. Between January 2015 and January 2016, Manufacturing and Leisure and Hospitality experienced the most employment growth, an increase of 2,060 employees. Educational Services and Professional Scientific and Technical Services experienced the largest job decrease, 2,300 job losses, or over 7.8%, of the MSA's 2016 workforce (NYS Department of Labor, 2016).

Table 2.6b Top 10 Private Employers (by number of employees)
(Capital District Chamber of Commerce)

Employer	Jurisdiction	Employment Category/ Specialization	Employee Estimate
St. Peter's Heath Partners	City of Albany	Educational and Health Services	12,334
Albany Medical Center	City of Albany	Educational and Health Services	8,740
Hannaford	Throughout County	Other Services	3,000
Center for Disability Services	City of Albany	Education and Health Services	2,556
National Grid	City of Albany	Trade, Transportation, and Utilities	2,000
Empire BlueCross	City of Albany	Educational and Health Services	1,600
Northern Rivers Family Services	City of Albany	Educational and Health Services	1,215
Capital District Physicians' Health Plan	City of Albany	Educational and Health Services	1,105
First Niagara Bank	Throughout County	Financial Activities	1,027
KeyCorp	Throughout County	Financial Activities	1,000

According to the data gathered by the Capital District Chamber of Commerce there are ten (10) employers with 1,000 employees or greater. Of these ten (10) largest employers, six (6) are categorized in the educational and health services sector, two (2) are categorized as financial activities, one (1) is categorized as trade, transportation, and utilities, and one (1) is categorized as other services. Of these top ten (10) private employers, seven (7) are located within the City of Albany and three (3) have several locations throughout the County.

2.7 Transportation

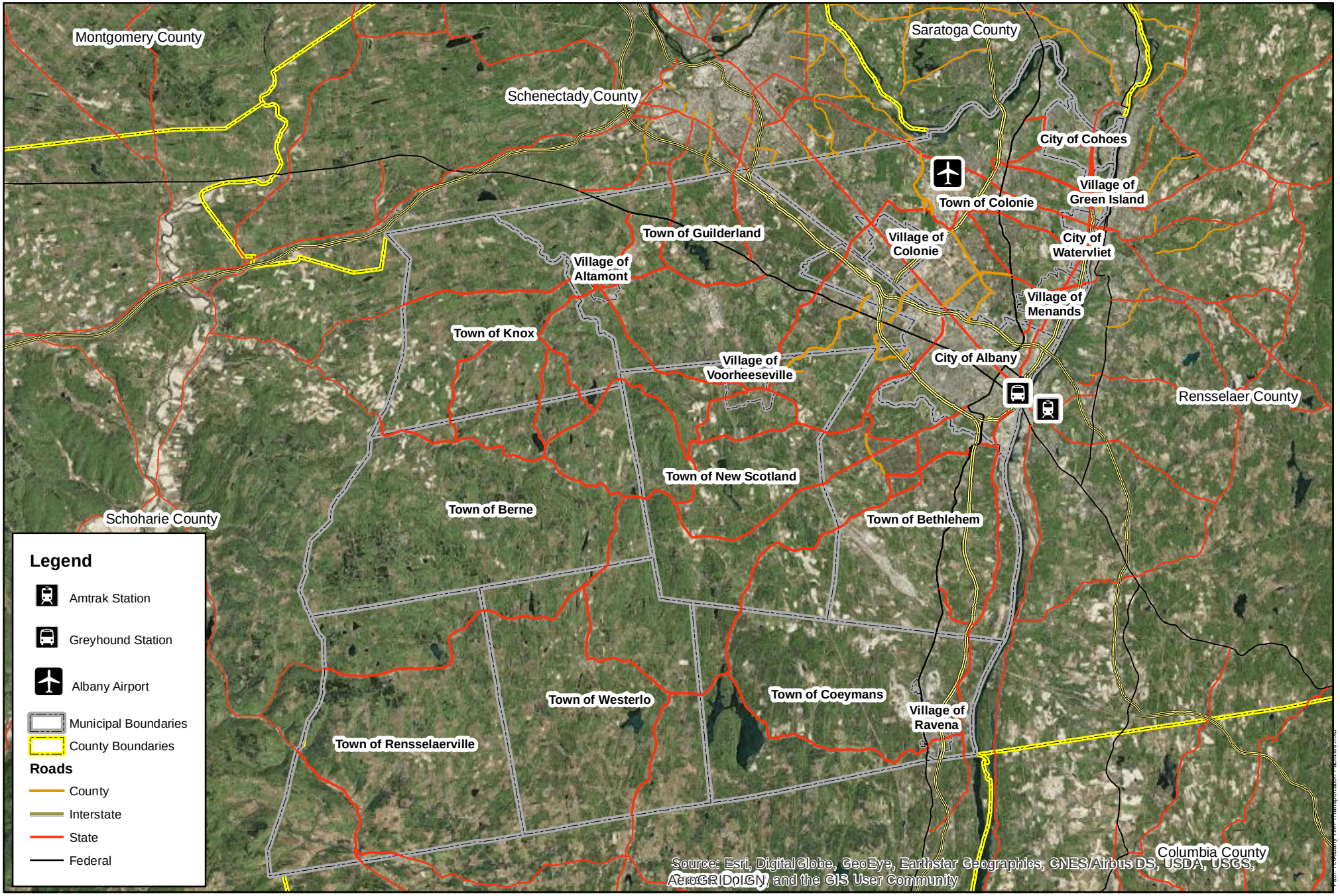
In Albany County, roadway, rail, and air transportation options are available. Albany County is serviced by Albany-Rensselaer Amtrak Station located across the Hudson River in the City of Rensselaer. The Albany-Rensselaer Station is the ninth busiest Amtrak Station in the nation (Amtrak, 2015). The station provides connections to New York City, Syracuse, Buffalo, Niagara Falls, Montreal, Toronto, Rutland, Boston, as well as minor destinations throughout the Amtrak network.

There is a Greyhound Bus Station located in the City of Albany. This bus terminal provides access to a number of nearby cities such as New York City, Boston, and more. Albany County has three (3) major roadways: Interstate 87, Interstate 90 and New York State Route/Interstate 787. Figure 2.7a (page 22) shows the locations of the major roadways in Albany County. Albany County is also serviced by an extensive regional bus transit system called the Capital District Transportation Authority (CDTA).

In terms of air transportation, Albany International Airport is the primary airport for domestic and international flights in the Capital Region. The airport facilitates commercial passengers, air freight, and private aviation. Located in the Town of Colonie, Albany International Airport is

centrally located between the four (4) counties of the Capital District (Albany, Rensselaer, Saratoga, and Schenectady) and services the outlying rural areas as well.

Figure 2.7a - Transportation Facilities in Albany County



1 inch = 23,333 feet

Hazard Mitigation Plan

Transportation Facilities

Albany County July 2018 New York

Figure 2.7a

Project No. 923.008.001

2.8 Critical Community Facilities

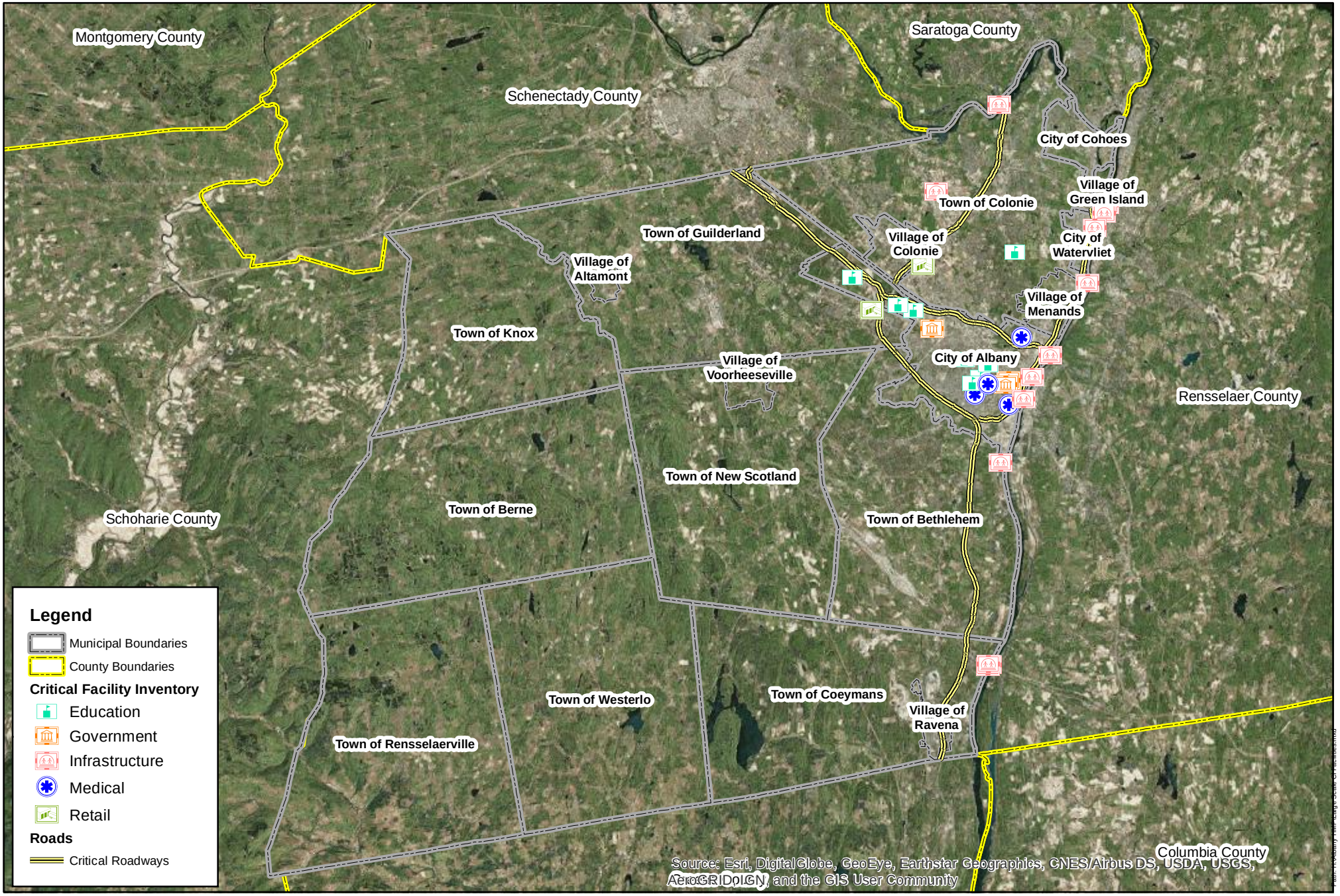
Many of the critical facilities, including hospitals, medical facilities, and educational facilities, identified for each participating jurisdiction are clustered around in the City of Albany.

Large scale critical facilities include: Albany International Airport, Port of Albany, Albany County School District includes over seventy (70) public schools within the county, St. Peters Hospital, Albany Medical Center, Albany Memorial Hospital, Albany VA Medical Center, the New York State Capitol Building, Empire State Plaza, Harriman Campus, Crossgates Mall, Colonie Center, University at Albany, SUNY (uptown and downtown campus), SUNY Polytech Institute, College of St. Rose, Excelsior College, Siena College, Albany Law School, Albany Medical College, Albany College of Pharmacy, Sage College of Albany, Interstate 87, Interstate 90, New York State Route/Interstate 787, Dunn Memorial Bridge, Patroon Island Bridge, Alfred H. Smith Bridge, Castleton Bridge, Collar City Bridge, Congress Street Bridge, Green Island Bridge, Livingston Avenue Bridge, Thaddeus Kosciuszko Bridge, and the Troy-Menands Bridge.

Other, more ubiquitous yet still critical, facilities include utility infrastructure (water tanks, electric substations, cell towers, etc.), banks, senior housing, bus terminals, municipal buildings, community centers, correctional facilities, courthouses, dams, day care centers, schools, emergency operations, fire and police departments, highway facilities, human services, major industrial locations, medical facilities and hospitals, post offices, sports complexes and facilities, and locations of other public facilities.

Figure 2.8a, on the following page, shows the locations of the large scale critical facilities mentioned above. The locations of critical facilities were considered during the risk assessment and hazard vulnerability components of this HMP process. Critical facilities identified on the local level are detailed in each participating jurisdiction’s municipal section, included in Appendix F of this document.

Figure 2.8a - Large Scale Critical Infrastructure Facilities



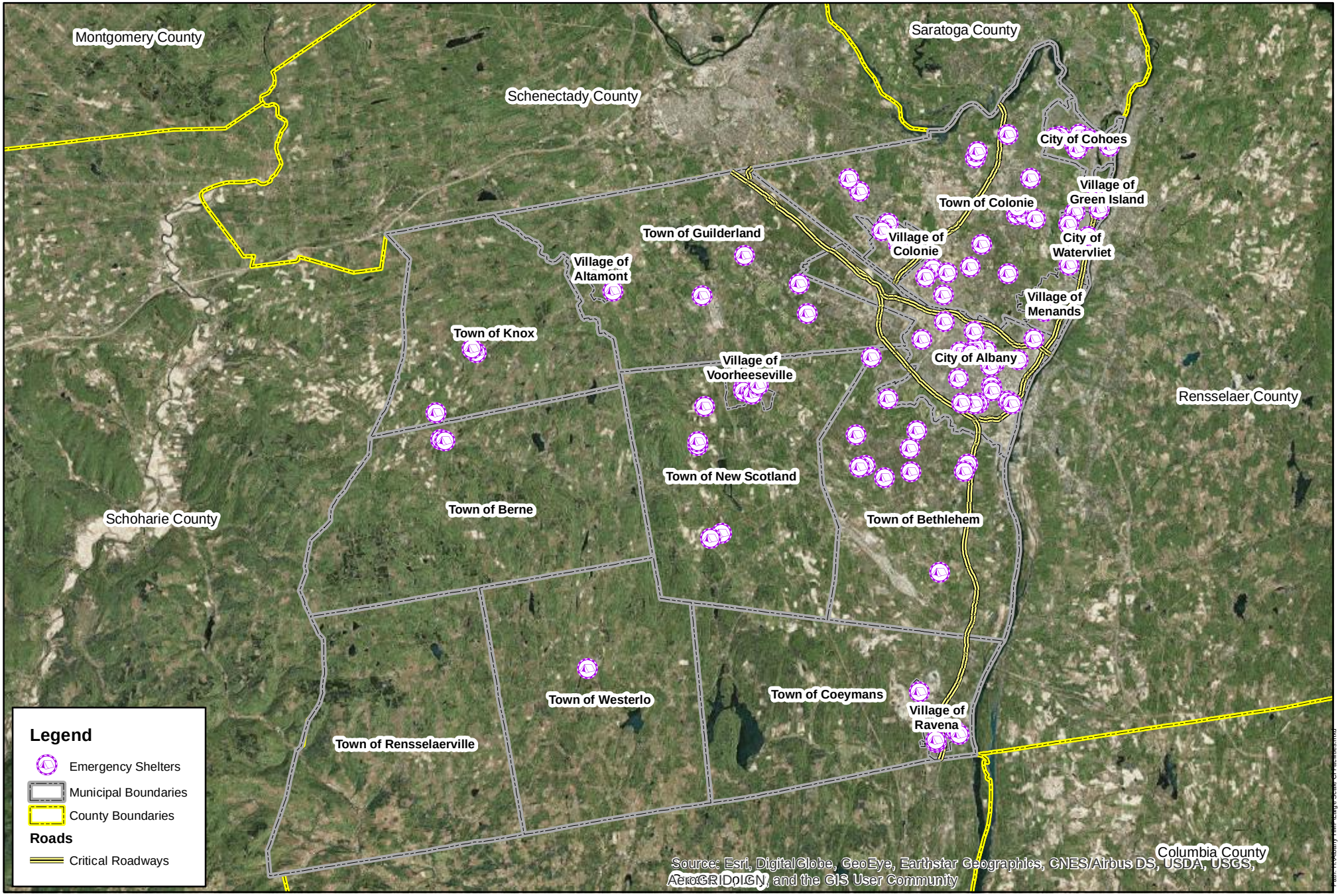
1 inch = 23,333 feet

Hazard Mitigation Plan
Large Scale Critical Infrastructure Facilities
Albany County — July 2018 — New York

Figure 2.8a

Project No. 923.008.001

Figure 2.8b - Emergency Facilities Map



1 inch = 23,333 feet

Hazard Mitigation Plan

Emergency Facilities Map

Albany County July 2018 New York

Figure 2.8b

Project No. 923.008.001

Essential Facilitates

For the purposes of this Plan, "essential facilities" were considered to be emergency facilitates (including police, fire, ambulatory, and emergency operations facilities), hospitals and medical centers, schools, elderly care facilities, child care facilities, and religious service facilities.

Table 2.8a lists the essential facilities located within the 500-year floodplain.

Table 2.8a – Essential Facilities within the 500-Year Floodplain

Critical Facility	Facility Type	Municipality
Mount Zion Baptist Church	Church	Albany - City
New Church of Christ	Church	Albany - City
St Johns Church of God	Church	Albany - City
St John's-St Ann's Church	Church	Albany - City
St Matthews Lutheran	Church	Albany - City
Third Reformed Church	Church	Albany - City
St. Ann's Church	Church	Albany - City
St. John's Cogic	Church	Albany - City
Capital City Rescue Mission	Church	Albany - City
Victory Christian Church,	Church	Albany - City
Saint Peter's Hospital	Government	Albany - City
Mental Health Department	Government	Albany - City
Health Department	Government	Albany - City
Sewer Plant - South	Government	Albany - City
Sewer Plant - North	Government	Albany - City
Center for Disability Services,	Government	Albany - City
County of Albany Sewer District	Government	Albany - City
Albany County District Attorney	Government	Albany - City
Albany Medical Center	Government	Albany - City
St. Matthew Lutheran School	School	Albany - City
DIGI Academy of Learners, LLC	School	Albany - City
Pebbles To Steps Registered Child Care	School	Albany - City
National Grid	Utility	Albany - City
St Lucy's Church of Altamont	Church	Altamont - Village
Evangel Church,	Church	Berne - Town
Berne-Knox Central School	School	Berne - Town
First Reformed Church Of,	Church	Bethlehem - Town
Sister's of the Holy Name	Church	Bethlehem - Town
Albany Waterboard	Government	Bethlehem - Town
RCS Central School	School	Bethlehem - Town
Niagara Mohawk Power Corp.	Utility	Bethlehem - Town

Table 2.8a – Essential Facilities within the 500-Year Floodplain		
Critical Facility	Facility Type	Municipality
Riverview Baptist Church	Church	Coeymans - Town
Little Red School House	School	Coeymans - Town
St Peter & Paul Church,	Church	Cohoes - City
Center For The Disabled	Government	Cohoes - City
Pentecost USA Inc, Church of,	Church	Colonie - Town
Pilgrim Holiness Church of New York	Church	Colonie - Town
Albany International Airport	Commercial	Colonie - Town
Colonie Department of Public Works	Government	Colonie - Town
Lisha Kill Middle School	School	Colonie - Town
Niagara Mohawk Power Corp.	Utility	Colonie - Town
Church of the Good Shepherd	Church	Green Island – Town/Village
Green Island Fire Department	Government	Green Island - Town/Village
Paine Street Park	Park	Green Island - Town/Village
Union Free School Dist #1,	School	Green Island - Town/Village
Berean Baptist Church	Church	Guilderland - Town
Helderberg Reformed Church	Church	Guilderland - Town
The Board of Education	Government	Guilderland - Town
Altamont Fire Department	Government	Guilderland - Town
Little Butterflies Family Daycare	School	Guilderland - Town
Clarksville Community Church	Church	New Scotland - Town
Niagara Mohawk dba Nat'l Grid	Utility	New Scotland - Town
Potter Hollow Unionchurch,	Church	Rensselaerville - Town
Baptist Church,	Church	Rensselaerville - Town
First Methodist Church	Church	Voorheesville - Village
St Matthews Catholic Church	Church	Voorheesville - Village
Voorheesville Elementary School	School	Voorheesville - Village
Trinity Church,	Church	Watervliet - City
St Ann's Maronite Church	Church	Watervliet - City
Kyles Kidz Korner Daycare	School	Watervliet - City
National Grid	Utility	Watervliet - City

Emergency Facilities

As described in Section 2.9, the Emergency Management Office operates through the Office of the Albany County Sheriff, the office is responsible for the organized analysis, planning, decision making, and assignment of available resources to mitigate, prepare for, respond to, and recover from the effects of all hazards (Albany County).

The Office of Emergency Management has the day-to-day responsibility for:

- Developing and implementing emergency management programs and activities;
- Coordinating all aspects of the counties mitigation, preparedness, response, and recovery capabilities;
- Assisting the County Executive and County Legislature relative to these matters as authorized or required pursuant to the provisions of the Executive Law or other statute, or as may be delegated to said office by the Office of the Sheriff, County Legislature, or the County Executive.

All of the participating jurisdictions in the 2017 HMP Update are covered by local fire departments, police enforcement, and emergency medical services. There are forty-eight (48) firehouses, thirty-four (34) police barracks, and thirteen (13) EMS facilities located across Albany County.

Hospitals and Medical Centers

Hospitals and medical centers are scattered across Albany County. Most facilities are concentrated in areas of greater population density in the City of Albany. These facilities range in size and specialty with smaller medical establishments offer niche diagnoses, evaluations, and treatments. There are four (4) hospitals clustered in the City of Albany – these medical centers provide care for a majority of Albany County and the surrounding counties. In total, there are five (5) hospitals (Albany Medical Center Hospital, Albany Medical Center – South Clinical Campus, St. Peter's Hospital, Albany Memorial Hospital, and St. Peter's Addiction Recovery Center) and forty-three (43) medical centers in Albany County.

Schools, Colleges, and Universities

Primary educational facilities (elementary, middle, and high school) are scattered across Albany County and, much like medical centers, are most concentrated in areas of higher population in the Town of Colonie and the City of Albany. Secondary educational facilities (colleges, universities, technical training institutions) are located primarily in the City of Albany (University at Albany – State University of New York, College of Saint Rose, Sage College of Albany, Albany Law, and Albany College of Pharmacy) and the Town of Colonie (Siena College). Both types of facilities can function as emergency shelters during major outages or disasters, due to their abilities to accommodate large numbers of people with basic services.

There are one hundred nine (109) primary educational facilities and seventy-four (74) secondary educational in Albany County.

Elder Care and Child Care

Vulnerable populations merit enhanced cognizance in the preparation of hazard mitigation plans and are discussed further in Section 6.3. As such, facilities that provide services to vulnerable populations such as the elderly and children are included in this inventory of critical facilities. While more vulnerable to hazards than other facilities, elder care and child care centers can be important management sites for disaster preparation and response. There are thirty-one (31) elder care facilities in Albany County and seventeen (17) child care facilities.

Religious Services Facilities

Churches, synagogues, mosques, and other religious services facilities are important considerations for hazard mitigation efforts because of their propensities to hold significant amounts of people at a given time. Just as with educational institutions and elder and child care facilities, religious services facilities also offer the potential to serve as local shelters and disaster preparation and response local management centers. There are three hundred sixty-two (362) religious services facilities in Albany County.

Lifeline Utility Systems

Lifeline utility systems include drinking water, wastewater, energy resources, and communications infrastructure. Albany County relies heavily on these systems, all of which are vulnerable to natural hazards to varying degrees.

Potable Water

Albany County relies on water from both surface and groundwater sources within the six (6) watersheds that run through the County. The majority of the County's water supply is provided by twelve (12) community water supply systems which draw fresh water from the four (4) reservoirs located throughout the County. There are six (6) water districts that serve the County, some of which cross municipal boundaries. There are water plants in eleven (11) municipalities in Albany County; these water plants are concentrated along the Hudson River.

Wastewater Facilities

The Albany County Sewer District has two (2) wastewater facilities; the district owns two (2) wastewater treatment facilities, designated North and South. These facilitates provide secondary treatment to the wastewater of eight communities in Albany County. The North Plant in located in Menands and treats wastewater from the cities of Cohoes, Watervliet, and parts of Albany, the villages of Menands and Colonie, parts of the towns of Guilderland and Colonie, and the Town/Village of Green Island. The South Plant is located in the Port of Albany-Rensselaer and services the City of Albany exclusively (Lyons, 2010). The North Plant has created an innovative waste recycling and energy producing system that allows for fewer emissions and lower costs. NYSERDA has identified this project as being the first of its kind (Benjamin, 2013).

Energy and Electricity

Gas utilities in Albany County are primarily provided by the Niagara Mohawk Power Corporation, while electric is provided through National Grid. The Town/Village of Green Island uses energy produced locally at the Green Island Power Authority which uses hydroelectric power (Green Island, No Date). Power is also generated at the North Wastewater Treatment Plant located in the Village of Menands. The Bethlehem Energy Center uses combination of gas and coal to produce energy and is located in the Town of Bethlehem.

Communications

Albany County is served by a variety of communications systems, including traditional land line, fiber optic, and cellular provided by multiple companies such as Verizon, Direct TV, Time Warner Cable, AT&T, Dish Network, T-Mobile, and Sprint. Each carrier has individual plans for emergency situations during hazard events and post disaster recovery efforts. In addition to land line, fiber optic, and cellular communications systems, Albany County has an extensive radio

communications network that is utilized by emergency services agencies, hospitals, law enforcement, public works, transportation and other supporting organizations.

Emergency and disaster information is broadcast to local radio stations through the Emergency Alert System (EAS). This service is activated by the National Weather Service. Albany County also utilizes the CodeRED system for emergency communications. The City of Albany has its own Emergency Management Sirens that are used for city residents.

High Impact Facilities

High Impact Facilities are properties or infrastructure that can impact a significant proportion of the population and other property if they are to incur natural hazard damages. These include dams, hazards materials facilities (HAZMAT), and military installations. This section will discuss dams in Albany County as well as Empire State Plaza, the State Capital Building, the Port of Albany-Rensselaer, and other government facilities.

Dams

A number of sources were used to identify the quantities and conditions of dams in Albany County. According to the U.S. Army Corps of Engineers National Inventory of Dams (NID), there are thirty-six (36) dams located within Albany County. These numbers differ from the National Performance of Dam Program (NPDP) which indicates that there are thirty-nine (39) dams in Albany County (eleven [11] high hazards, eighteen [18] significant hazards, eight [8] low hazards, and two [2] unknown). NYSDEC data from the New York State GIS Clearinghouse indicates that there are forty-two classified dams located in Albany County (eleven [11] Class A, fourteen [14] Class B, twelve [12] Class C, and five [5] unclassified). There are sixty-three (63) additional dams in the county that have no classification.

In reference to the one hundred five (105) dams identified in GIS data, dams in New York State are classified in terms of potential for downstream damage in the case of failure. These classifications come from the NYSDEC's draft "Guidance for Dam Hazard Classification" and are as follows:

> **"(1) Class "A" or "Low Hazard" dam:** 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 county 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 injury, substantial economic loss or substantial environmental damage.
>
> **(2) Class "B" or "Intermediate Hazard" dam:** 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.
>
> **(3) Class "C" or "High Hazard" dam:** 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 that the loss of human life or widespread substantial economic loss is likely. (NYSDEC, No Date (2).)"

The table below, Table 2.8b, identifies the locations of Class "C" or "High Hazard" dams within Albany County

Table 2.8b - High Hazard Dams in Albany County
(Source, NYSDEC)

Dam Name	Municipality	River/Stream	Dam Height *(Feet)*	Maximum Storage *(Acre-Feet)*	Hazard Potential *(USACE/* NYSDEC)	EAP on File
Alcove Dam	Coeymans (T)	Hannacrios Creek	77	47,600	C	On File
Altamont Main Reservoir Dam	Knox (T)	Bozen Kill (Tr.)	35	127	C	On File
Basic Creek Dam	Westerlo (T)	Basic Creek	21	3,922	C	On File
Cohoes Reservoir #3 Dam	Cohoes (C)	Mohawk River (Tr.)	20	230	C	On File
Helderberg Lake Dam	Berne (T)	Onesquethaw Creek (Tr)	35	330	C	On File
Loudonville Reservoir Dam	Colonie (T)	Unknown	40	0	C	On File
Myosotis Lake Dam	Rensselaerville (T)	Ten Mile Creek	22	1,975	C	On File
Vly Creek Dam	New Scotland (T)	Onesquethaw Creek (Tr)	25	4,500	C	On File
Vly Creek Reservoir Dike	New Scotland (T)	Vly Creek	40	4,500	C	On File
Watervliet Lower Dam	Watervliet (C)	Dry River	27	53	C	On File
Watervliet Reservoir Dam	Guilderland (T)	Normans Kill	36	8,990	C	On File
Watervliet Upper Dam	Colonie (T)	Dry River	72	1,217	C	On File

Governor Nelson A. Rockefeller Empire State Plaza

Empire State Plaza is a massive complex of several state government buildings. The Plaza is located in the City of Albany's downtown region, occupying ninety-eight (98) acres of land. The Plaza houses approximately 11,000 New York State employees throughout ten (10) buildings. Other uses of the Plaza include a modern art collection, the New York State Museum, Library and Archives, various memorials, an observation deck, a performing arts center, and a convention center (NYS Office of General Services, no date).

Empire State Plaza has been identified as a critical community facility because of the facility has become a substantial local employer as well as a significant visitor attraction. The area is also somewhat prone to natural hazards such as extreme temperatures, severe thunderstorm events, and earthquakes.

New York State Capitol Building
The New York State Capitol Building is located in the heart of the City of Albany next to the Empire State Plaza. The building was built by hand using solid masonry and was completed in 1899. The building has experienced a fire that destroyed much of the western side of the Capitol. Since its restoration it has been declared a National Historic Landmark. The building's importance to State Government and status as a historic landmark means that special attention should be paid to this location when determining mitigation strategies for the City of Albany specifically (University Art Museum, no date).

Port of Albany-Rensselaer
The Port of Albany-Rensselaer is a transportation hub located on the Upper Hudson River and lies within the City of Albany. This port was established over three hundred (300) years ago, since the city was founded. The port facilitates access from the Hudson River to the canal system, as well as major interstate highways, cargo rail line, and Albany International Airport (Albany Port District Commission, no date).

The Port plays a major role in bringing clean energy products to the rest of the region. Since the port received its first windmill blade they have had more than 1,600 more blades pas through. The port has several large scale facilities including 4,200 feet of wharf length (space along the coast that allows boats to dock at the port), a 10-acre open storage yard, a 12-acre road salt depot, and a 12-acre scrap yard (Albany Port District Commission, no date).

The Port has been identified as a critical community facility because the facilities and products passing through can be seen as a potential risk to the waterfront area. The area is also somewhat prone to natural hazards such as flooding, landslides, extreme temperatures, severe thunderstorm events, and earthquakes.

Government Facilities
Albany County also identified numerous government facilities as critical including municipal offices, department of public works (DPW) properties, post offices, and courthouses. According to GIS data collected by Albany County, there are ninety-seven (97) municipal buildings, fifty-four (54) post offices, forty (40) courthouses, thirty-three (33) DPW facilities, and two (2) NYS Department of Transportation facilities in Albany County.

2.9 Office of the Albany County Executive

The Office of the Albany County Executive in conjunction with the Local Emergency Planning Committee and the Emergency Management Office serves as the local lead agency in promoting this goal. These offices all operate through the Office of the Albany County Sheriff. Local supporting agencies include the Department of Public Works, Albany County Sheriff's Department, and the Albany County Health Department.

The County Executive is the chief executive officer of County government, elected by the voters of Albany County to a four-year term of office. Responsibilities of the Office include directing, coordinating and monitoring the activities of all County administrative units under the County Executive's control; appointing administrative heads of departments; approving and executing contracts and agreements for the County as authorized; directing the creation of the Tentative

Annual Budget; maintaining communications with federal, state and local governments; and directing special projects requiring coordination among County departments. The Office of the Albany County Executive works to ensure the efficient operation and delivery of high-quality services to Albany County residents (Albany County, 2012).

The Local Emergency Planning Committee (LEPC) is made up of state and local officials, law enforcement, fire, HazMat EMS, public health, environmental, hospital, transportation, media, community groups and facility owners. The committee does not respond to emergency situations, but they attempt to identify and catalogue potential hazards, identify available resources, mitigate hazards when feasible, and write emergency plans. According to the National Response Plan (NRP) the initial response to an emergency incident or disaster is by local officials. The role of the LEPC is to anticipate and plan the initial response for foreseeable disasters in their jurisdiction. The emergency response plan and all LEPC files are maintained by the Albany County Sheriff's Critical Incident / Emergency Management Unit. This unit interfaces with local emergency managers in Albany County (Albany County, no date).

The Emergency Management Office also operates through the Office of the Albany County Sheriff, the office is responsible for the organized analysis, planning, decision making, and assignment of available resources to mitigate, prepare for, respond to, and recover from the effects of all hazards (Albany County, no date).

Albany County communicates emergency of disaster related information with residents through the Albany County Sheriff Mass Notification System. The County has had this system in place since 2006. The system is a self-registration system allowing residents to choose how emergency or disaster information in relayed to them. Information is also broadcast from many local radio stations: WAMC-FM 90.3, WFLY-FM 92.3, WRCZ-FM 94.5, WYJB-FM 95.5, WAJZ-FM 96.3, WTRY-FM 98.3, WRVE-FM 99.5, WQBK-FM 103.5, WBZZ-FM 105.7, WPYX-FM 106, WZMR-FM 104.9, WROW-AM 590, WGY-AM 810, and WGNA-AM 1460 (Albany County, no date). Residents in Albany County can also participates in NY-Alert (NYS's All-Hazards Alert and Notification System) by signing up through the State's emergency and disasters information dissemination program.

Currently most smartphones (iPhone, Android, etc.) and wireless providers participate in the Wireless Emergency Alerts system (WEA). This service is provided at no cost to the consumer, nor does the consumer need to sign up to receive the alerts. Wireless providers who do not participate in WEA, are required by the FCC to notify all customers that they do not participate. WEA is set up to inform the public of any public safety emergencies (severe weather, terrorist threat involving imminent threats to safety or life across the county. Meaning, if an alert is sent to an area in Albany County, someone visiting from Florida would receive the alert Albany County.

3.0 Planning Process

This planning process section of the plan describes who was involved in the development of this document, what steps were taken to complete all phases of the process, and how public involvement was considered throughout plan development. Throughout the plan development process, information was gathered from participating jurisdictions, as well as state, federal and local agencies and groups, citizens and business owners in the community, and other stakeholders. Project Team representatives were also tasked with collecting data and information from their respective jurisdictions or areas of expertise. The information included in this plan represents the results of an extensive planning process that involved the input of many jurisdictions and community members.

3.1 Resources and Information Collection

The planning process followed for the development of the Albany County Multi-Jurisdiction Multi-Hazard Mitigation Plan Update is consistent with the guidelines provided in the State and Local Mitigation Planning, how-to guides (FEMA Report 386-2) and the Local Multi-Hazard Mitigation Planning Guidance (FEMA, 2008) and Planning Standards (NYS DHSES, 2014).

Much of the event-specific information and details came from the members of the Planning Team. The public and other interested parties were provided numerous opportunities throughout the planning process to provide input and comments.

Planning Mechanisms and Capabilities

Another important objective of updating the HMP is to incorporate the document into existing and future planning efforts and initiatives throughout the County. Elements of the plan will be considered during municipal and county development and comprehensive planning efforts. The approved HMP will also serve as an important resource for developing and updating emergency operations plans and procedures throughout Albany County. This updated HMP will be incorporated into, considered during, and referenced by future updates and efforts at the County and municipal levels concerning the plans, policies, ordinances, programs, studies, reports, and staff.

3.2 Planning Team and Key Stakeholders

Three (3) groups were created to assist in various facets of information collection and document preparation and review: Executive Steering Committee, Project Team and Key Stakeholders. The Executive Steering Committee is represented by key staff from various County Departments including the County Executive's Office, County Department of Public Works (DPW), County Emergency Services (EMS) and the County Sherriff's Department. The Executive Steering Committee is responsible for overseeing the project, reviewing all consultant data and information, setting of agendas and meeting dates, and review of and approval of hazard identification/mitigation information. This level of involvement was documented through meeting agendas and meeting summaries provided in Appendix A. The Project Team is represented by at least one (1) municipal representative from each participating jurisdiction, and is responsible for assisting in data collection, document review, and coordination efforts. The Key Stakeholders group includes various members of the community and adjacent governments,

such as local elected officials, municipal employees, school officials, fire and emergency response personnel, adjacent County representatives, utility contacts, and other interested community members. All of whom were included on a database of contacts and regularly invited to all project-related meetings, workshops and public information sessions.

Meetings with these three (3) groups of selected and interested individuals were held at strategic points throughout the HMP development process beginning in the Spring of 2015. The first meeting of the Executive Steering Committee was held on May 20th, 2015 at the Albany County Office Building in downtown Albany. Subsequent meetings of the Executive Steering Committee were held generally monthly and/or as needed to review data being collected by/from/about the various hazards and municipalities involved in the project.

Meeting agendas, materials, PowerPoint presentations, and meeting summary notes are provided in Appendix A that document various review activities that took place at these meetings over the course of the project. Participants and representatives that attended every meeting were recorded on sign-in sheets and are also listed in Appendix A, along with their affiliation, as it relates to the project. Key stakeholders and organizations they represented along with various members of the community and adjacent municipal government officials attended numerous meetings throughout the planning process. This documentation can be found in Appendix A.

3.3 Jurisdiction Participation

To be included in the 2017 Albany County Multi-Jurisdictional Multi-Hazard Mitigation Plan, all interested jurisdictions needed to express their willingness to be a part of the process and needed to remain an active participant throughout all stages of plan development. Active participation for each jurisdiction was gauged based on the following factors: meeting attendance, information collection and research, plan review and comment, mitigation action submission, public review assistance, and final resolution to adopt the HMP. A jurisdiction did not have to meet all criteria listed to be considered a participating member (for example, meeting attendance), but each jurisdiction did have to show an effort to participate and provide relevant information (for example, email follow-up after a missed meeting to discuss what was missed).

Overall, it was determined that sixteen (16) of the eighteen (18) jurisdictions within Albany County (including the Albany County Government, itself) met the participation requirements and are, therefore, included and considered in this document. The only two (2) jurisdictions that chose to not participate were the Town of Rensselaerville and the Village of Colonie. All participating jurisdictions have agreed to pass a resolution to adopt the HMP after NYS DHSES and FEMA review and approval. These resolutions will be added to Appendix B, as they are adopted. For now, a sample resolutions are provided.

Table 3.3a - Jurisdictional Capability Assessment and Resource Availability

	Albany County	City of Albany	City of Albany – Dept. of Planning and Development	City of Albany – Water Board	Village of Altamont	Town of Berne	Town of Bethlehem	Town of Coeymans	City of Cohoes	Town of Colonie	Town/Village of Green Island	Town of Guilderland	Town of Knox	Village of Menands	Town of New Scotland	Village of Ravena	Village of Voorheesville	City of Watervliet	Town of Westerlo
Comprehensive/Land Use Plan	No	Yes	Yes	No	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Capital Improvement Plan	Yes	Yes	No	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	No	No	No	No	No	No
Economic Development Plan	Yes	Yes	No	No	No	No	Yes	Yes	No	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	No
Local Emergency Operations Plan	No	Yes	No	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes
Continuity of Operations Plan	No	Yes	No	No	Yes	Yes	Yes	No	No	No	No	Yes	Yes	No	No	No	Yes	No	No
Transportation Plan	No	Yes	No	No	No	No	Yes	No	No	No	No	No	Yes	No	No	Yes	No	No	No
Storm water Management Plan	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Community Wildfire Protection Plan	No	Yes	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	No	Yes
Other special plans (e.g., Brownfields redevelopment, disaster recovery, coastal zone management, climate change adaptation	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	No
Building Code	Yes	Yes	-	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Building Code Effectiveness Grading Schedule (BCEGS) Score	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Fire Department ISO Rating	-	Yes	-	No	5	9	3-4	4-6	4	4	Yes	Yes	Yes	Yes	Yes	5	4	-	Yes
Site Plan review requirements	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
Zoning Ordinance	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Subdivision Ordinance	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Floodplain Ordinance	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Natural Hazard specific ordinance (storm water, steep slope, wildfire)	Yes	Yes	No	No	No	No	Yes	No	Yes	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Flood Insurance rate maps	Yes	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Acquisition of land for open space and public recreation uses	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	No	Yes

Table 3.3a - Jurisdictional Capability Assessment and Resource Availability

	Albany County	City of Albany	City of Albany – Dept. of Planning and Development	City of Albany – Water Board	Village of Altamont	Town of Berne	Town of Bethlehem	Town of Coeymans	City of Cohoes	Town of Colonie	Town/Village of Green Island	Town of Guilderland	Town of Knox	Village of Menands	Town of New Scotland	Village of Ravena	Village of Voorheesville	City of Watervliet	Town of Westerlo
Other	-	-	-	-	-	-	Yes	-	-	-	-	-	-	-	-	-	-	-	-
Planning Commission	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes
Mitigation Planning Committee	No	Yes	No	No	No	No	Yes	No	No	No	Yes	No	Yes	No	No	Yes	Yes	No	Yes
Maintenance programs to reduce risk (e.g., tree trimming, clearing drainage systems)	Yes	Yes	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Mutual aid agreements	No	Yes	-	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Chief Building Official	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	PT	Yes	Yes	Yes	Yes	Yes	Yes
Floodplain Administrator	No	Yes	Yes	No	Yes	Yes	Yes	No	Yes	No	Yes	Yes	PT	Yes	Yes	Yes	Yes	No	Yes
Emergency Manager	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	PT	Yes	Yes	Yes	Yes	Yes	Yes
Community Planner	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Contract	Yes	PT	No	No	No	No	No	Yes
Civil Engineer	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Contract	No	PT	No	Yes	Yes	Yes	No	No
GIS Coordinator	Yes	Yes	Yes	No	Yes	No	Yes	No	Yes	Yes	PT	Yes	PT	No	No	Yes	No	Yes	Yes
Warning Systems/services (Reverse 911, Outdoor warning signals)	Yes	No	-	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Hazard data and information	No	No	-	No	No	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	No	Yes	No	Yes
Grant writing	Yes	Yes	-	Yes	No	No	Yes	No	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	No
Hazus analysis	No	No	-	No	No	No	Yes	No	Yes	Yes	No	No	Yes	No	No	No	Yes	No	No
Capital improvements project funding	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Authority to levy taxes for specific purposes	No	Yes	No	No	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No

Table 3.3a - Jurisdictional Capability Assessment and Resource Availability

	Albany County	City of Albany	City of Albany – Dept. of Planning and Development	City of Albany – Water Board	Village of Altamont	Town of Berne	Town of Bethlehem	Town of Coeymans	City of Cohoes	Town of Colonie	Town/Village of Green Island	Town of Guilderland	Town of Knox	Village of Menands	Town of New Scotland	Village of Ravena	Village of Voorheesville	City of Watervliet	Town of Westerlo
Fees for water, sewer, gas or electric services	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Impact fees for new development	No	Yes	No	No	Yes	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	No	Yes	No	No
Storm water utility fee	No	Yes	-	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Incur debt through general obligation bonds and or special tax bonds	Yes	Yes	Yes	No	Yes	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes
Incur debt through private activities	No	Yes	-	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No
Community Development Block Grant	No	Yes	Yes	No	No	No	Yes	No	No	Yes	Yes	No	Yes	Yes	No	No	No	Yes	No
Other federal funding programs	Yes	Yes	Yes	No	No	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	No	No	Yes	Yes
State funding programs	Yes	Yes	Yes	No	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	No	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes
Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Natural disaster or safety related school programs	No	Yes	-	No	No	No	Yes	No	Yes	Yes	Yes	Yes	No	Yes	No	No	No	No	No
StormReady Certification	No	No	No	No	No	No	Yes	No	Yes	No	No	No	No	No	No	No	No	No	No
Firewise Communities certification	No	No	-	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Public-private partnership initiatives addressing disaster-related issues	No	Yes	-	No	No	No	Yes	No	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	No
Other	-	-	-	-	-	-	Yes	-	-	-	Yes	-	-	-	-	-	-	Yes	-

3.4 Public Participation

During the 2017 Albany County Multi-Jurisdictional Multi-Hazard Mitigation Plan Update process, public involvement was included at two (2) levels. At the local level, community input was sought during the hazard vulnerability and assessment phase of the project. Each participating jurisdiction was responsible for making sure their hazard history and vulnerabilities were accurately portrayed in the draft HMP. The collection of this information often times involved individuals aside from those on the Project Team. Additionally, the Project Team set up meetings with local hazard mitigation and emergency management officials to facilitate discussion on the draft HMP and associated information collection.

The second level of public involvement for the County HMP was provided through public meetings. A stakeholders meeting was held at the Cornell Cooperative Extension in Voorheesville on Thursday, April 27th, 2017. Key elected officials, municipal representatives, and others were invited to attend the meeting. All attendees were updated on the draft status of the plan and directed how to raise concerns and issues or to suggest potential hazard mitigation projects. Stakeholders were invited to provide comments afterwards. See Appendix A for details.

Next, the completed draft HMP was posted to the Albany County Department of Public Works (DPW) website on June 19th, 2017. This was intended to provide the public time to review the draft and to provide feedback on the plan. The public was allotted a 20-day comment period and all comments received were considered for incorporation into the HMP, as appropriate.

A Public Information Meeting regarding the plan was held at the Cornell Cooperative Extension in Voorheesville on Wednesday July 26th, 2017. The purpose of this meeting was to present the draft HMP to the general public and to solicit comments and feedback. Chuck Voss, AICP hosted the informational meeting and presented a detailed Power Point Presentation of the draft HMP (See Appendix A). Attendees were asked to review the online draft HMP and submit any comments or additional questions directly to Michael Lalli at the County Executive's Office.

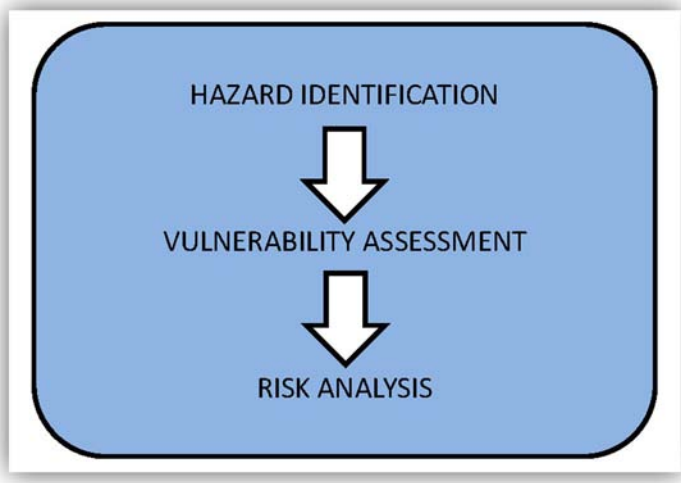
3.5 Coordination with Agencies

County, regional, state, and federal agencies were consulted for relevant information and recommendations with regard to the Hazard Mitigation Plan Update effort. The contributions from agencies and organizations that supported the update planning process include participation in the CEPA risk assessment, review and comment on portions of the draft HMP, and the collection and/or dissemination of information or data to be used in the planning process. In addition to assistance from the participating municipalities the following agencies also provided guidance throughout the planning process: Albany County Office of the County Executive, Albany County Sheriff's Dept., City of Albany Police, City of Albany Fire Dept., City of Watervliet Fire Dept., City of Cohoes Fire Dept., Town of Colonie Emergency Management Services, Town of Colonie Police Dept., Town of Guilderland Police Dept., New York State Division of Homeland Security Emergency Services (DHSES), New York State Office of Emergency Management, New York State Office of Fire Prevention and Control, New York State Police – Troop G, Village of Ravena Fire Dept., Village of Menands Police Dept., and Village of Altamont Police Dept.

4.0 Risk Assessment

Risk Assessments consist of three (3) phases of analysis: hazard identification, vulnerability assessment and risk analysis.

Figure 4.0a – Three Phases of Risk Assessment



Risk Assessments should generally be conducted in the order identified in Figure 4.0a as each phase utilizes information from previous phases.

The first phase, *hazard identification*, calls on the community to identify all potential hazards, document their geographic extent, probability of occurrence and anticipated intensity. This phase will also incorporate the best available data on anticipated climate projections and states the intended impacts as they relate to each hazard.

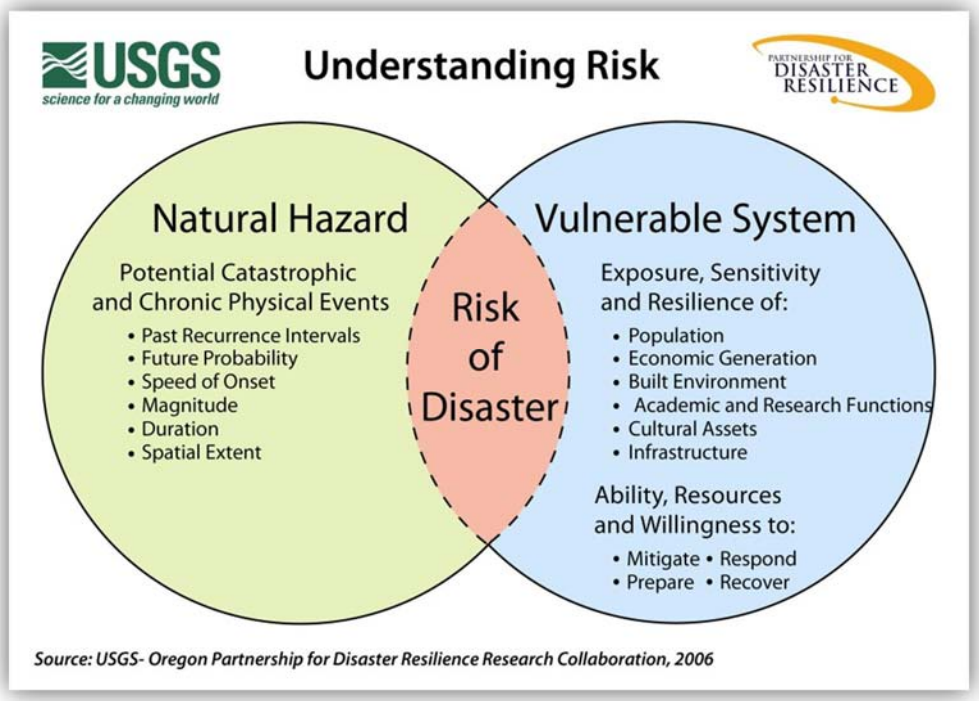
The next phase, *vulnerability assessment*, utilizes the information obtained through the first phase and analyzes it with local information of properties and populations exposed to that hazard. As a part of this phase both current and future development potentials will be analyzed.

The last phase, *risk analysis*, estimates the damage, injuries, and costs likely to occur as a result of that hazard in the community. The picture of risk is broken down into both magnitude and probability of harm occurring. For many hazards this phase of risk assessment will not be realized.

Figure 4.0b was established by the Oregon Partners for Disaster Resilience, an applied research firm which works toward the mission of creating a disaster-resilient and sustainable state, and the United States Geological Society (USGS). This figure depicts the risk assessment process and

points out that the goal of hazard mitigation is to "reduce the area where hazards and vulnerable systems overlap."

Figure 4.0b – The Risk Assessment Process



Albany County is vulnerable to numerous natural, technological, and human-caused hazards. The historic documentation associated with past hazard events that was included in the County's 2007 HMP has been expanded as part of the risk assessment to include the most recent data available, as well as analysis of identified potential impacts from a changing climate and crude oil trains and pipelines in the region. Some of the key revisions that are included in this section of the plan update include: results of Albany County's 2014 County Emergency Preparedness Assessment (CEPA) and 2016 HAZUS Assessment, profiles of new hazards, and the establishment of updated hazard rankings and hazard mitigation planning goals.

4.1 Risk Assessment Tools

County Emergency Preparedness Assessment (CEPA)

All applicable hazards were evaluated, reviewed, and ranked during a risk assessment session moderated by the New York State Department of Homeland Security and Emergency Services (NYS DHSES) using the automated County Emergency Preparedness Assessment (CEPA) program. The key component of CEPA is an in-person meeting between State and local Subject Matter Experts (SMEs) to discuss and analyze local hazard and capability information and

potential resource gaps. DHSES provides a facilitator and scribe for each CEPA session. During the session, hazard risks are assessed along with response capabilities within the County.

On September 4th, 2014, local, county, and state stakeholders participated in the CEPA for Albany County. The listing of CEPA participants for the County is listed below in Figure 4.1a:

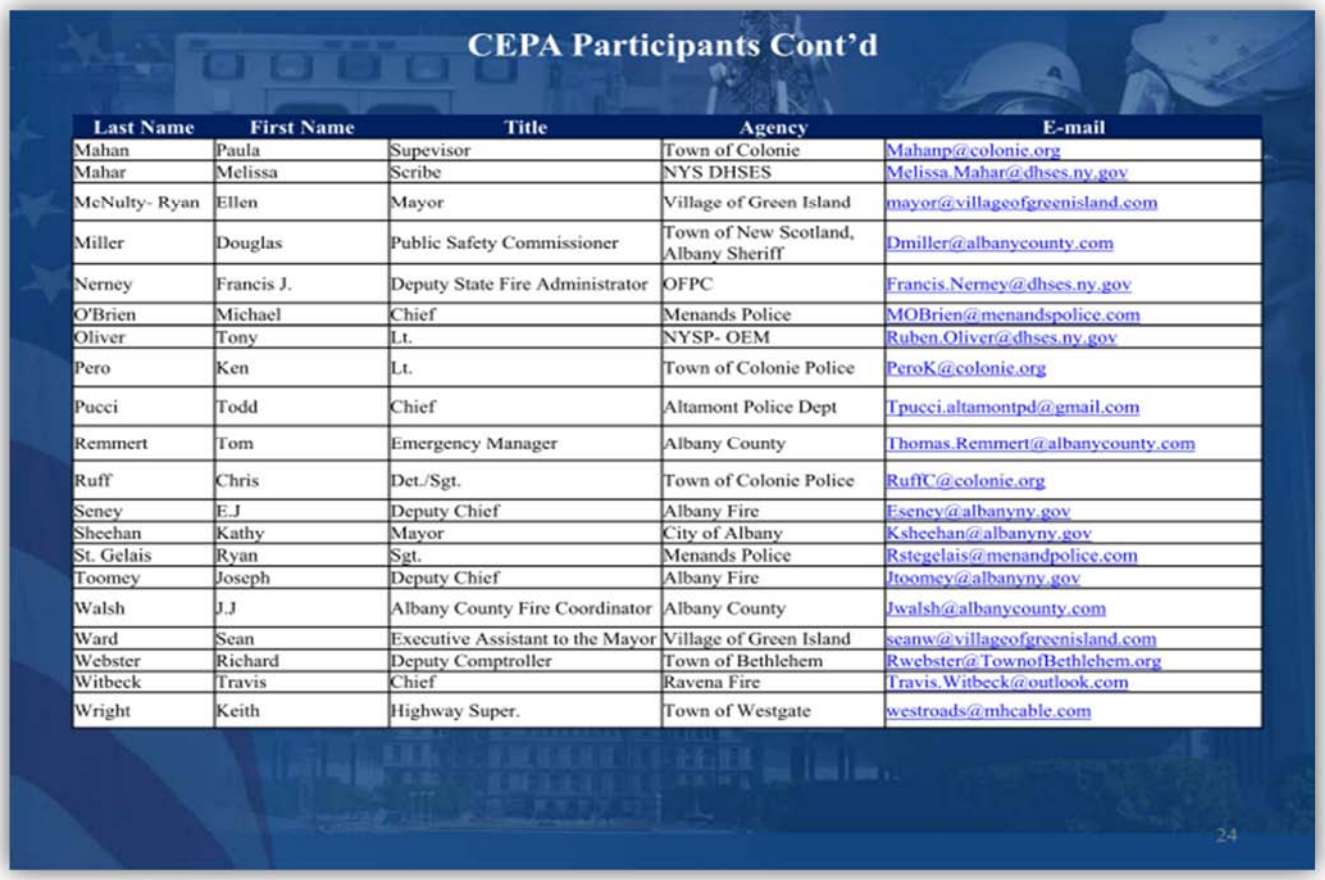
Figure 4.1a – 2014 Albany County CEPA Participants
(Albany County CEPA, 2014) – Part 1

CEPA Participants

Last Name	First Name	Title	Agency	E-mail
Abriel	Warren W.	Fire Chief	City of Albany	Wabriel@albanyny.gov
Altschule	Howard	Deputy Emergency Mgr.	Albany Sheriff	HGA@weatherconsultants.com
Bailey	Bill	Trustee	Village of Ravena	hadlock1@aol.com
Basile	Mike	Commander	Albany Police	Mbasile@albany.ny.org
Berry	Peter D.	Chief of Colonie EMS	Town of Colonie EMS	BerryP@colonie.org
Bertok	Shaun T.	Regional Coord.	NYS OEM	Shaun.Bertok@dhses.ny.gov
Brennan	Jack	Director of EMO	Town of Bethlehem	Jbrennan@TownofBethlehem.org
Brimhall	Shawn	Fire Protection Specialist	OFPC	Shawn.Bruimhall@dhses.ny.gov
Bytner	Richard	Sgt.	NYSP- Troop G	Richard.Bytner@troopers.ny.gov
Clarkson	John	Supervisor	Town of Bethlehem	Jclarkson@townofbethlehem.org
Conlen	Robert	Acting Chief Watervaliet Fire Dept.	Watervaliet Fire	Rconlen@watervaliet.com
Cox	Curtis	Captain	Guilderland Police	CoxC@guilderlandpd.org
Crosier	Kevin G.	Town Supervisor	Town of Berne	Supervisorberneny@gmail.com
Curran	Matt	Intern	NYS DHSES	Matthew.Curran@dhses.ny.gov
Dolin	Tom	Supervisor	Town of New Scotland	Tdolin@townofnewscotland.com
Evers	John T.	Director of Operations	Albany County	John.Evers@albanycounty.com
Fahd	Joseph	Fire Chief	City of Cohoes	Jfahd@ci.cohoes.ny.us
Finegan	Shannon	Regional Director	NYS DHSES- OEM	Shannon.Finegan@dhses.ny.gov
Gibbons	Thomas	Lieutenant	Albany Police	Tgibbons@albany.ny.org
Gregory	Joseph W.	Deputy Chief	Albany Fire	Jgregory@albanyny.gov
Grenier	Megan	Mayor	Village of Menands	MGrenier58@yahoo.com
Guyer	Ken	Highway Super.	Town of New Scotland	Kguyer@townofnewscotland.com
Hammond	Michael	Town Supervisor	Town of Knox	Mhammond@knoxny.org
Hastings	Terry	Facilitator	NYS DHSES	Terry.Hastings@dhses.ny.gov
Heiders	Steve	Chief of Police	Town of Colonie Police	Heiders@colonie.org
Horne	Garry G.	Director of Albany County EMO	Albany County EMO	Ghorne@albanycounty.com
Johnson	Phyllis E.	Emergency Management Committee (Fire Commissioner)	Town of Berne	CWS042@aol.com
Leak	Frank	Mayor	Village of Colonie	villagehall@colonievillage.org

23

Figure 4.1a – 2014 Albany County CEPA Participants
(Albany County CEPA, 2014) – Part 2



CEPA Participants Cont'd

Last Name	First Name	Title	Agency	E-mail
Mahan	Paula	Supevisor	Town of Colonie	Mahanp@colonie.org
Mahar	Melissa	Scribe	NYS DHSES	Melissa.Mahar@dhses.ny.gov
McNulty- Ryan	Ellen	Mayor	Village of Green Island	mayor@villageofgreenisland.com
Miller	Douglas	Public Safety Commissioner	Town of New Scotland, Albany Sheriff	Dmiller@albanycounty.com
Nerney	Francis J.	Deputy State Fire Administrator	OFPC	Francis.Nerney@dhses.ny.gov
O'Brien	Michael	Chief	Menands Police	MOBrien@menandspolice.com
Oliver	Tony	Lt.	NYSP- OEM	Ruben.Oliver@dhses.ny.gov
Pero	Ken	Lt.	Town of Colonie Police	PeroK@colonie.org
Pucci	Todd	Chief	Altamont Police Dept	Tpucci.altamontpd@gmail.com
Remmert	Tom	Emergency Manager	Albany County	Thomas.Remmert@albanycounty.com
Ruff	Chris	Det./Sgt.	Town of Colonie Police	RuffC@colonie.org
Seney	E.J	Deputy Chief	Albany Fire	Eseney@albanyny.gov
Sheehan	Kathy	Mayor	City of Albany	Ksheehan@albanyny.gov
St. Gelais	Ryan	Sgt.	Menands Police	Rstegelais@menandpolice.com
Toomey	Joseph	Deputy Chief	Albany Fire	Jtoomey@albanyny.gov
Walsh	J.J	Albany County Fire Coordinator	Albany County	Jwalsh@albanycounty.com
Ward	Sean	Executive Assistant to the Mayor	Village of Green Island	seanw@villageofgreenisland.com
Webster	Richard	Deputy Comptroller	Town of Bethlehem	Rwebster@TownofBethlehem.org
Witbeck	Travis	Chief	Ravena Fire	Travis.Witbeck@outlook.com
Wright	Keith	Highway Super.	Town of Westgate	westroads@mhcable.com

24

Participants rated natural, technological, and human-caused disasters based upon probability (likelihood) and severity of impact (consequence). The top two rated hazards were rated "High-to-Very High" and were as follows:

- Severe Winter Snowstorms
- Flooding

"Medium-to-High" and were as follows:

- HazMat Release – In Transit
- HazMat Release
- Cyber Attack
- Ice Storms (at least a ½ inch or more)
- Critical Infrastructure Failure (Water System Failure)

- Improvised Explosive Device (IED)/ Vehicle Born IED
- Active Shooter
- Biological Agent Release

The Medium-to-Low rated hazards included:

- Sever Wind/Tornado
- Pandemic
- Major Fires (non-Wildfires)
- Sustained Power Outage (three days or more)
- Major Transportation Accident
- Food contamination
- Wildfire
- Landslide
- Earthquake

Low rated hazards included:

- Radiological Release (Fixed-Site)
- Hurricanes/Tropical Storm (Wind and Surge)
- Drought

Very Low rated hazards included:

- Improvised Nuclear Device (IND)
- Animal Disease/Foreign Animal Disease

A narrative with descriptions of natural hazards only, their past occurrences, and potential impacts of each is included in Section 5.0 – Hazard Profiles.

A bar charts and relative risk score chart depicting the hazard ratings and rankings of each of the natural hazards, along with human-caused or technological hazards, are displayed on the following Figures 4.1b and 4.1c.

Figure 4.1b – Albany County Hazard Assessment Bar Chart

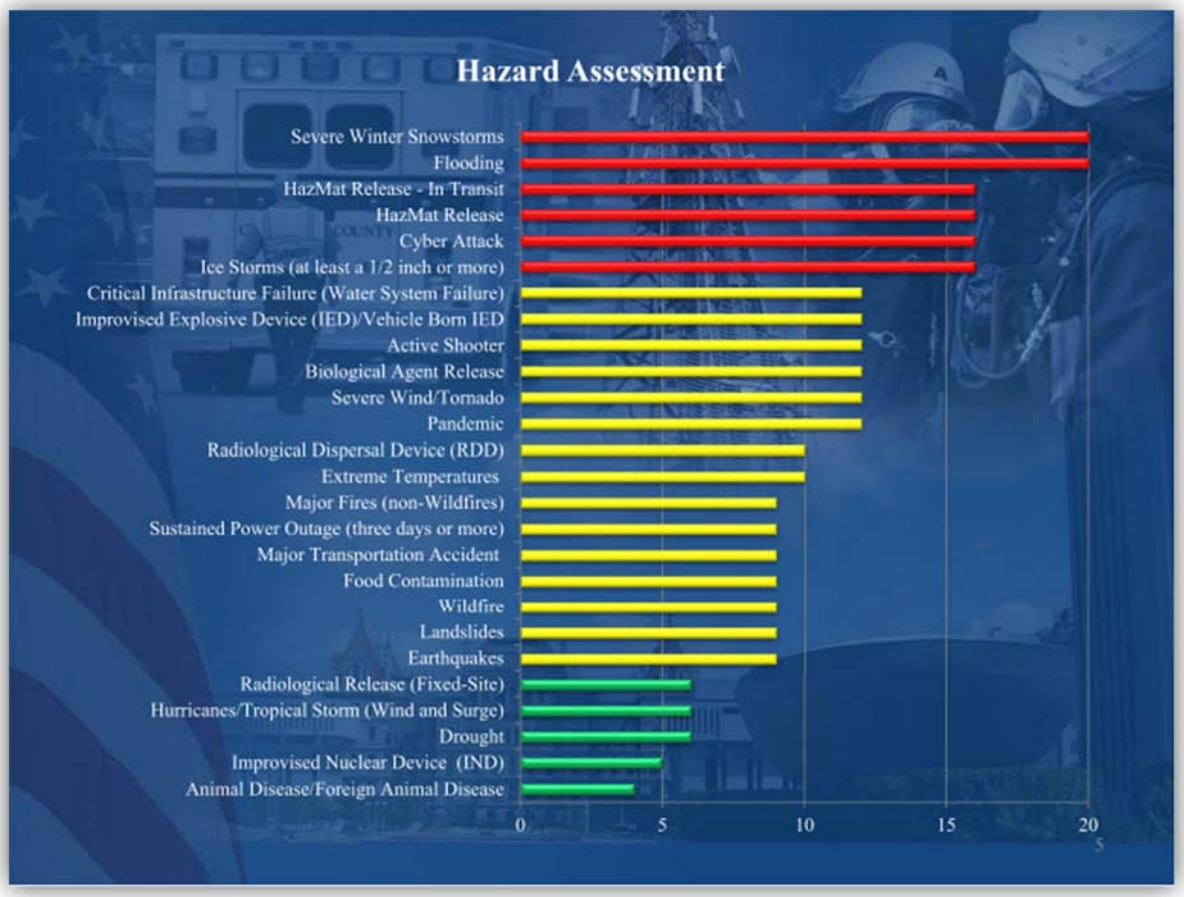
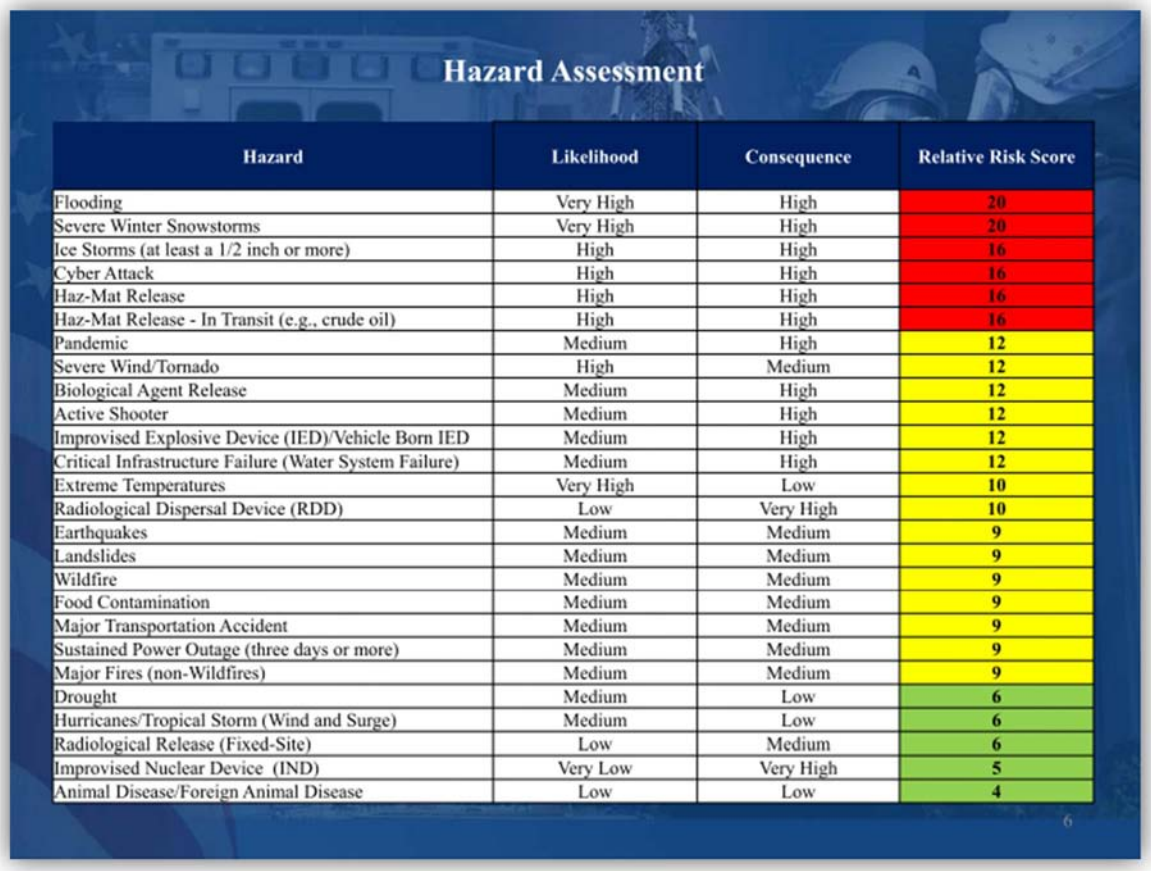


Figure 4.1c – Albany County Hazard Likelihood, Consequence, and Relative Risk Score Chart



Hazard Assessment

Hazard	Likelihood	Consequence	Relative Risk Score
Flooding	Very High	High	20
Severe Winter Snowstorms	Very High	High	20
Ice Storms (at least a 1/2 inch or more)	High	High	16
Cyber Attack	High	High	16
Haz-Mat Release	High	High	16
Haz-Mat Release - In Transit (e.g., crude oil)	High	High	16
Pandemic	Medium	High	12
Severe Wind/Tornado	High	Medium	12
Biological Agent Release	Medium	High	12
Active Shooter	Medium	High	12
Improvised Explosive Device (IED)/Vehicle Born IED	Medium	High	12
Critical Infrastructure Failure (Water System Failure)	Medium	High	12
Extreme Temperatures	Very High	Low	10
Radiological Dispersal Device (RDD)	Low	Very High	10
Earthquakes	Medium	Medium	9
Landslides	Medium	Medium	9
Wildfire	Medium	Medium	9
Food Contamination	Medium	Medium	9
Major Transportation Accident	Medium	Medium	9
Sustained Power Outage (three days or more)	Medium	Medium	9
Major Fires (non-Wildfires)	Medium	Medium	9
Drought	Medium	Low	6
Hurricanes/Tropical Storm (Wind and Surge)	Medium	Low	6
Radiological Release (Fixed-Site)	Low	Medium	6
Improvised Nuclear Device (IND)	Very Low	Very High	5
Animal Disease/Foreign Animal Disease	Low	Low	4

Hazards U.S. – Multi-Hazard (HAZUS-MH)

In 1997, FEMA developed a standardized model for estimating losses caused by earthquakes, known as Hazards U.S. or HAZUS. HAZUS was developed in response to the need for more effective national-, state-, and community-level planning and the need to identify areas that face the highest risk and potential for loss. HAZUS was expanded into a multi-hazard methodology, HAZUS-MH with new models for estimating potential losses from wind (hurricanes) and flood (riverine and coastal) hazards. HAZUS-MH is a Geographic Information System (GIS)-based software tool that applies engineering and scientific risk calculations, which have been developed by hazard and information technology experts, to provide defensible damage and loss estimates. These methodologies are accepted by FEMA and provide a consistent framework for assessing risk across a variety of hazards. The GIS framework also supports the evaluation of hazards and assessment of inventory and loss estimates for these hazards.

HAZUS-MH uses GIS technology to produce detailed maps and analytical reports that estimate a community's direct physical damage to building stock, critical facilities, transportation systems

and utility systems. To generate this information, HAZUS-MH uses default HAZUS-MH provided data for inventory, vulnerability, and hazards; this default data can be supplemented with local data to provide a more refined analysis. Damage reports can include induced damage (inundation, fire, threats posed by hazardous materials and debris) and direct economic and social losses (casualties, shelter requirements, and economic impact) depending on the hazard and available local data. HAZUS-MH's open data architecture can be used to manage community GIS data in a central location. The use of this software also promotes consistency of data output now and in the future and standardization of data collection and storage. The guidance Using HAZUS-MH for Risk Assessment: How-to Guide (FEMA 433) was used to support the application of HAZUS-MH for this risk assessment and plan. More information on HAZUS-MH is available at http://www.fema.gov/plan/prevent/hazus/index.shtm.

- In general, probabilistic analyses were performed to develop expected/estimated distribution of losses (mean return period losses) for the flood and wind hazards. The probabilistic hazard generates estimates of damage and loss for specified return periods (e.g., 100- and 500-year). For annualized losses, HAZUS-MH version 2.1 calculates the maximum potential annual dollar loss resulting from various return periods averaged on a "per year" basis. It is the summation of all HAZUS-supplied return periods (e.g., 10, 50, 100, 200, 500) multiplied by the return period probability (as a weighted calculation). In summary, the estimated cost of a hazard each year is calculated.

4.2 Hazard Identification

In order to ascertain which hazards affect Albany County, several resources were accessed and reviewed. Utilized sources included reviews of available reports or plans, consultation with community experts, accessing available information online, and documenting information provided by the public during public meetings.

On the basis of this review, the most prevalent and potentially the most damaging hazards that could affect the County were included in the 2007 Albany County All-Hazard Mitigation Plan and the County's 2014 CEPA risk assessment. The chosen hazards are mainly caused by various types of storms, especially those that create cascading effects like power outages, flooding, or structural damage. Other hazards appear to occur on a less frequent basis or have an insignificant impact based on the historical data collected. Hazard Event Description Worksheets were provided for each municipality in Albany County (Appendix F). These worksheets were completed by the local jurisdictions and are based on local knowledge of events that occurred within each municipality. They are based on anecdotal information in general as none of the communities kept detailed records over the years of events both large and small that have occurred. To assist in the completion of these worksheets, some assumptions had to be made based on local knowledge, industry standards and common practices within each municipality.

The following hazards are included in the CEPA program, and not limited to the hazard selected for additional analysis during Albany County's recent risk assessment event. These descriptions,

which include natural, technological, and human-caused hazards, summarize the types of hazards and their applicability and ability to affect Albany County. This section of the plan is mirrored after the step-by-step process outlined in FEMA's publication 386-2 entitled "Understanding Your Risks, identifying hazards and estimating losses."

Air Contamination: Air contamination is indicative of pollution caused by atmospheric conditions such as temperature invasion induced smoggy condition sufficiently serious to create some danger to human health. This hazard is not profiled further in this plan update.

Avalanche: An avalanche occurs when a significant amount of snow slides off mountainous terrain. Although Albany County is subject to significant snow storms, no avalanches were found to be an issue at this time. Therefore, this hazard is not profiled further in this mitigation plan update.

Civil Unrest: Civil unrest is when an individual or collective action causes serious interference with the peace, security, and/or functioning of a community. While civil unrest events do occur in Albany County from time to time, it is not profiled in Section 5 of this plan update.

Coastal Storm: Coastal storms cause increases in tidal elevations, wind speed, and erosion, caused both by extra-tropical events and tropical cyclones. Albany County is located in an area of New York State that is not susceptible to coastal storms directly. Because of this they are not specifically identified as a profiled hazard, their impacts are accounted for as hurricanes and tropical storms and severe winter storms in Section 5.

Dam Failure: Dam failures consist of flood damage specifically caused by the structural failure of a man-made water impoundment structure. Albany County has several significant water impoundments that are controlled by dams. This hazard is not evaluated in Section 5 due to its infrequent occurrence and limited impact on communities within the County.

Drought: Drought is the loss of water supply due to the lack of rainfall. The majority of water supply in Albany County is obtained from groundwater wells and reservoirs. Groundwater levels are less susceptible to seasonal and droughty conditions than surface waters. Given the importance of the agriculture in some municipalities within Albany County and the role that climate change may have on future drought events, drought is further detailed as a hazard profile in Section 5.

Earthquake: Earthquakes are described as a shaking or trembling of the earth that is volcanic or tectonic in origin. There is potential for earthquake tremors to be felt within Albany County. Though this hazard is not likely to cause extensive damage within Albany County, because of the historic occurrences of minor damage, it is included in the HMP Update risk assessment.

Epidemic: An epidemic is the spreading of a contagious disease on a mass basis. The frequency of widespread human epidemics within Albany County is not high and it is not profiled in Section 5 of this plan update.

Explosion: Explosions included the rapid burning of material and gases yielding the violent release of energy. There is no known history of explosions within the County. Therefore, this hazard is not analyzed further in regards to its potential impacts on Albany County.

Extreme Temperatures: Extreme temperatures include extended periods of excessive hot or cold weather with a serious impact on human and/or animal populations. Cascade effects can include enhanced fire/wildfire potential and drought. In past years, periods of extreme cold have had a greater impact within Albany County than extreme heat. Vulnerable populations, such as the elderly, reside within the County, elevating the potential risk of an extreme temperature event. The effect that climate change may have on yearly temperatures is a growing concern. Therefore, this hazard was assessed and is documented in the hazard profile section.

Fire: Fire is the uncontrolled burning of residential, commercial, industrial, institutional, or other property. As is common in many populated areas, structural fires frequently occur within Albany County. While this specific hazard is not profiled in Section 5, an analysis of wildfires in the County is included.

Flash Flood: Flooding is the submergence of lands in the vicinity of rising waterway levels generally adjacent to water bodies and drainage areas. A distinction may be made between flash flooding, short-term, rapid flooding events, and river flooding. River flooding results in almost all of the documented flood damage that has occurred in Albany County. Section 5.4 includes details surrounding this hazard, including changes in frequency and severity due to climate change.

Food Shortage: A food shortage occurs when the normal distribution pattern and/or timely delivery of foodstuffs to retail establishments for normal consumer demand is interrupted for a substantial period of time. There is no historic documentation pointing to a food shortage within Albany County; therefore this hazard is not analyzed further in this document.

Fuel Shortage: Similar to the above, a fuel shortage may occur when the normal distribution pattern and/or timely delivery of fuel to retail establishments for normal consumer demand is interrupted for a substantial period of time. The assessment of this hazard focused on potential long-range impacts that could occur if the supply of fuel continued to decrease while the demand increased. Few incidences of a fuel shortage have occurred within Albany County. This hazard is not further detailed in Section 5.

HAZMAT – Fixed Sites: Hazardous materials at fixed site locations is defined as the discharge of hazardous materials (toxic, flammable or corrosive) into the environment from a facility located at a specific location. This hazard is not included in further assessments.

HAZMAT – In Transit: Hazardous materials in transit is the discharge of hazardous materials (toxic, flammable or corrosive) during their transport via a variety of transportation means (motor vehicle, truck, train, boat or plane). This hazard was not included for further detail in Section 5.

Hurricane: A hurricane is a type of tropical cyclone with winds exceeding 74 miles per hour (mph) accompanied by rain, thunder and lightning. High wind events are commonly documented within Albany County, but by definition are classified in this Plan Update as severe storm events. Weather patterns that begin as hurricanes are often re-classified as tropical storms or tropical depressions (two other types of tropical cyclones) by the time they reach New York State. Tropical storms are organized systems of strong thunderstorms with a defined circulation and maximum sustained winds of 39 to 73 mph. Tropical depressions are organized systems of clouds and thunderstorms with a defined circulation and maximum sustained winds of 38 mph or less. Hurricane events have been occurring in the northeastern United States at an increased rate in recent years. Though this hazard has a moderately low potential, hurricane was included in the County's risk assessment process and will be further detailed below.

Ice Jam: Ice jams occur when water bodies are clogged with large blocks of ice. The ice is normally formed by the freezing of the water body and becomes dislodged due to hydraulic conditions whereby the ice floats and may jam at sections of the water body that have a limited cross section (i.e., at bridges and natural channel contractions). Ice jam events have occurred occasionally the County especially along the Mohawk and Hudson Rivers. Rare occasions of Mohawk River ice jams have produced flooding occurrences.

Ice Storm: Ice storms include freezing rains which cause icing of roads, structures, and vegetation, and can cause structural damages and create hazardous slippery conditions. Ice storms have frequently occurred in the County based upon discussion during the risk assessment. These events routinely cause trees to topple due to the weight of the ice which has the potential to cause structural damage and utility failures. This hazard is not specifically profiled further in Section 5, but is included as part of the severe winter storm hazard profile.

Infestation: An infestation event is characterized by an excessive population of plants, insects, rodents, or other animals requiring control measures due to their potential to carry diseases, destroy crops, or harm the environment. Infestation has occurred infrequently in the past in Albany County and was not included in the hazard profiles of Section 5.

Landslide: Landslides are defined as the downward movement of a sloped land mass under the force of gravity. Based upon historic information, landslides have occurred in the County on a localized basis. The potential for this hazard was determined to be a medium risk; this hazard is profiled further in Section 5.

Mine Collapse: Mine collapse is the structural failure of an underground mine used to harvest minerals from the earth. While some mining activities occur within Albany County, mine collapse is a human-caused or technological event and was not included in the risk assessment process.

Oil Spill: Oil spills include the discharge of oil into the environment by a fixed site or mobile site (vehicles). This hazard is similar to what has been mentioned with respect to hazardous material hazards. Historically, it is known that fuel oil spills have resulted due to the lack of maintenance of oil storage facilities or due to damage as a consequence of a cascade effect resulting in the structural damage of an oil containing vessel. As a major transportation crossroads on roadways, rails, and the Port of Albany-Rensselaer on the Hudson River, spills are a concern within Albany County. However, oil spills are human-caused or technological events and are not further detailed in Section 5.

Radiological – Fixed Site: Radiological materials at fixed sites is defined as the release or threat of release of radioactive material from a nuclear power generating station or research reactor or other stationary source of radioactivity. Albany County has ranked this risk as low likelihood of occurring within the County; this hazard is not included in further assessments.

Radiological – In Transit: Radiological materials in transit constitutes a release of radioactive material into the environment while in transit due possibly to an accident or malfunction in the container which holds the material. This hazard has the potential to occur in Albany County, but because it is a human-caused or technological event, this hazard was not included for further detail in Section 5.

Severe Storm: A severe storm hazard event includes hail storms, windstorms, and severe thunderstorms (with associated severe wind events such as derechos, gustnados, and downbursts). Severe storm was included in the CEPA risk assessment completed by Albany County. This hazard frequently occurs within the County and, while not specifically profiled, is included under the severe thunderstorm/wind/tornado hazard profile in Section 5.

Severe Thunderstorm: Severe thunderstorms can produce tornados, hail, flooding, or high winds. These three potential side effects of severe thunderstorms are fully described and included under the hazards severe storm (includes hail events and high winds) and tornado. This hazard is profiled as “severe thunderstorm/wind/tornado” in Section 5.

Structural Collapse: Structural collapse is the failure and caving in of a structure. In and of itself, potential for the structural collapse of a structure within the County was not historically found to be an issue. Historic occurrences were caused by another hazard. Generally, building code enforcement prevents flagrant issues from arising. In addition, programs for the demolition of abandoned structures have helped to remove abandoned structures before they collapse.

Because programs are in place to mitigate this potential hazard, structural collapse is not analyzed in this plan.

Terrorism: Terrorism is the systematic use of violence committed by groups in order to intimidate a population or government into granting their demands. Though the potential for terrorism exists within Albany County in its population centers, major shopping centers, mass transit facilities, and ethnic enclaves, this hazard is a human-caused or technological event and is not profiled in Section 5.

Tornado: Tornados are violent destructive whirling winds accompanied by a funnel-shaped cloud that progresses in a narrow path over the land. Historic tornados have been recorded within New York State. Though an infrequent event within in Albany County, such an event has the potential to cause a large amount of damage. This hazard is profiled as "severe thunderstorm/wind/tornado" in Section 5.

Tsunami-wave Action: Tsunamis are a series of enormous waves created by an underwater disturbance such as an earthquake, landslide, volcanic eruption, or meteorite. While Albany County is located in the Hudson River Estuary, its inland position largely protects it from tsunami-wave action. This hazard is not included further in this plan update.

Transportation Accident: A transportation accident is an unexpected happening causing loss or injury. Historically, minor traffic accidents frequently occur in Albany County. Some of these events are due to the cascading effects caused by other hazards such as severe winter weather or ice storms. More severe accidents are fairly common, especially within densely populated areas of the County or on main transportation routes. While major transportation accidents scored "medium" on the CEPA risk assessment, the hazard is a human-caused or technological event and will not be profiled in Section 5.

Utility Failure: Utility failure is defined as the loss of electric and/or natural gas supply, telephone service, or public water supply, as a result of an internal system failure and not by the effects of disaster agents. The potential for this hazard to occur exists, particularly as a cascading event of other hazards. However, it is not profiled in Section 5 due to its human-caused or technology-related nature.

Water Supply Contamination: Water supply contamination includes the contamination or potential contamination of surface or subsurface public water supply by chemical or biological materials that results in restricted or diminished ability to use the water source. While the potential for this hazard to occur exists, particularly as a cascading event of other hazards, it was not included for further detailed analysis in Section 5 because of its human-caused or technology-related nature.

Wildfire: Wildfires are described as the uncontrollable combustion of trees, brush, or grass involving a substantial land area which may have the potential for threatening human life and

property. This hazard was analyzed as part of Albany County's CEPA risk assessment and is profiled in further detail in Section 5.

Winter Storm (Severe): Winter storms include heavy snowfall and extreme cold and can immobilize an entire region. Major snowstorms have occurred in Albany County in the past, placing high demands on the Public Works Departments of the County, Cities, Towns, and Villages, and adding risks for emergency response personnel. This hazard is included in the County's risk assessment and hazard profiles of Section 5 due to its frequent occurrence.

4.3 Presidential Disaster Declaration

After a state has declared a State Disaster Area as the result of a particular disaster event, that state and its local governments will evaluate recovery options, capabilities, and costs. If the damage from the disaster event is beyond the recovery capabilities of the state, the governor will send a letter to the President, through FEMA, detailing the situation. The president then makes the decision whether to declare a major disaster or emergency. After a presidential declaration is made, FEMA designates the impacted area eligible for assistance and announces the types of assistance available. FEMA provides supplemented assistance for the recovery of state and local governments; the federal share will always be at least 75% of the total eligible costs (FEMA, Presidential Disaster Declarations, 2009). Figure 4.3a, on the following page, shows the total number of Presidential Disaster Declarations that have occurred between 1954 and 2013 for every County in New York State. Albany County has had nine (9) declarations within this time period.

Figure 4.3a – Presidential Disaster Declarations for New York State, 1954-2013

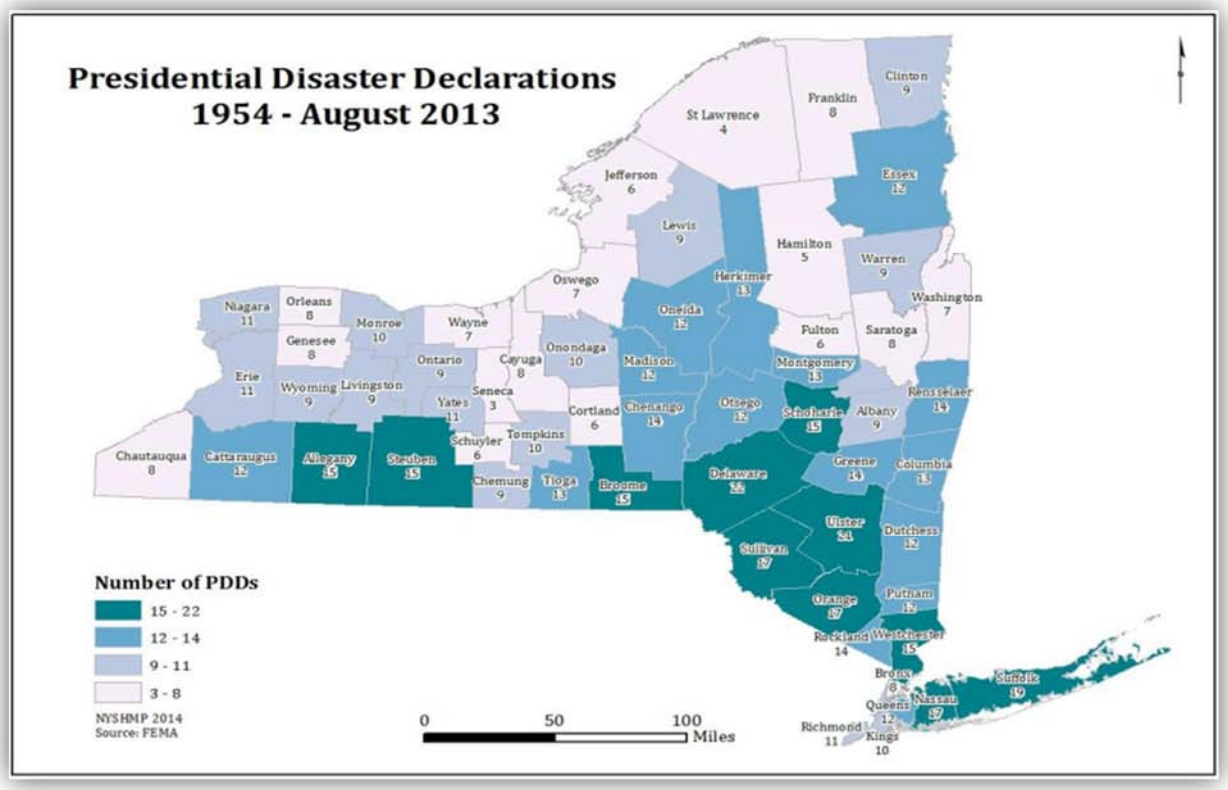


Table 4.3a – Presidential Disaster Declarations for New York State, 1954-2015
Major Disaster Declarations
(denotes declarations known to be applicable to Albany County)*
(PA – Public Assistance, IA – Individual Assistance)

Number	Date	Incident Description	Estimated Assistance
4322*	7/12/2017	Severe Winter Storm and Snowstorm	PA - $21,091,281.28
4204	12/22/2014	Severe Winter Storm, Snowstorm, and Flooding	PA - $30,882,036.45
4180	7/8/2014	Severe Storms and Flooding	PA - $26,982,775.19
4129	7/12/2013	Severe Storms and Flooding	PA - $57,025,857.67
4111	4/23/2013	Severe Winter Storm and Snowstorm	PA - $23,938,333.17
4085	10/30/2012	Hurricane Sandy	PA - $14,041,582,661.44 IA – 1,012,875,939.76
4031	9/13/2011	Remnants of Tropical Storm Lee	PA - $321,932,570.08 IA - $55,168,479.65
4020*	8/31/2011	Hurricane Irene	PA – $548,022,202.31

Table 4.3a – Presidential Disaster Declarations for New York State, 1954-2015
Major Disaster Declarations
(denotes declarations known to be applicable to Albany County)*
(PA – Public Assistance, IA – Individual Assistance)

Number	Date	Incident Description	Estimated Assistance
			IA - $102,888,713.10
1993	6/10/2011	Severe Storms, Flooding, Tornadoes, and Straight-Line Winds	PA - $ 34,404,603.07
1957	2/18/2011	Severe Winter Storm and Snowstorm	PA - $42,725,881.83
1943	10/14/2010	Severe Storms, Tornadoes, And Straight-Line Winds	PA - $22,213,776.98
1899	4/16/2010	Severe Storms And Flooding	PA - $86,159,317.61
1869	12/31/2009	Severe Storms And Flooding Associated With Tropical Depression Ida And A Nor'easter	PA - $14,742,880.72
1857	9/1/2009	Severe Storms And Flooding	PA - $40,957,788.89 IA - $4,626,437.19
1827*	3/4/2009	Severe Winter Storm	PA - $18,571,978.65
1724	8/31/2007	Severe Storms, Flooding, And Tornado	IA - $5,101,498.73
1710	7/2/2007	Severe Storms And Flooding	PA - $12,737,075.85
1692*	4/24/2007	Severe Storms And Inland And Coastal Flooding	PA - $85,489,609.26 IA - $12,307,474.22
1670	12/12/2006	Severe Storms And Flooding	N/A
1665	10/24/2006	Severe Storms And Flooding	PA - $112,329,438.73 IA - $9,121,209.04
1650	7/1/2006	Severe Storms And Flooding	PA - $217,192,862.58 IA - $31,528,398.09
1589	4/19/2005	Severe Storms And Flooding	PA - $52,010,898.76 IA - $8,072,710.16
1564	10/1/2004	Severe Storms And Flooding	PA - $14,073,648.07 IA - $2,883,537.86
1565	10/1/2004	Tropical Depression Ivan	PA - $11,575,109.97 IA – $1,612,140.93
1534*	8/3/2004	Severe Storms And Flooding	PA - $18,467,868.44
1486	8/29/2003	Severe Storms, Tornadoes And Flooding	PA - $23,721,241.42 IA - $1,792,438.30
1467	5/12/2003	Ice Storm	PA - $18,090,813.62 IA - $25,872,687.19
1415	5/16/2002	Earthquake	N/A
1404	3/1/2002	Snowstorm	PA - $5,913,137.10
1391*	9/11/2001	Terrorist Attack	PA - $4,732,560,097.40
1335*	7/21/2000	Severe Storms	PA - $31,020,492.12
1296*	9/19/1999	Hurricane Floyd	PA - $41,182,922.07
1244	9/11/1998	Severe Storms	PA - $31,274,411.72

Table 4.3a – Presidential Disaster Declarations for New York State, 1954-2015
Major Disaster Declarations
(denotes declarations known to be applicable to Albany County)*
(PA – Public Assistance, IA – Individual Assistance)

Number	Date	Incident Description	Estimated Assistance
1233	7/7/1998	Severe Storms And Flooding	N/A
1222	6/16/1998	Severe Thunderstorms And Tornadoes	N/A
1196	1/6/1998	Severe Winter Storms	N/A
1148	12/9/1996	Severe Storms/Flooding	N/A
1146	11/19/1996	Severe Storms/Flooding	N/A
1095*	1/24/1996	Severe Storms/Flooding	N/A
1083*	1/12/1996	Blizzard	N/A
984	4/2/1993	World Trade Center Explosion	N/A
974	12/21/1992	Coastal Storm, High Tides, Heavy Rain, Flooding	N/A
918	9/16/1991	Hurricane Bob	N/A
898	3/21/1991	Severe Storm, Winter Storm	N/A
801*	11/10/1987	Severe Winter Storm	N/A
792	5/15/1987	Flooding	N/A
750	10/18/1985	Hurricane Gloria	N/A
734	3/22/1985	Snow Melt, Ice Jams	N/A
733	3/20/1985	Flooding	N/A
725	9/25/1984	Severe Storms, Flooding	N/A
702	4/17/1984	Coastal Storms, Flooding	N/A
527	2/5/1977	Snowstorms	N/A
520	9/3/1976	Hurricane Belle	N/A
515	7/21/1976	Severe Storms, Flooding	N/A
512	6/29/1976	Flash Flooding	N/A
494	3/19/1976	Ice Storm, Severe Storms, Flooding	N/A
487	10/2/1975	Severe Storms, Heavy Rain, Landslides, Flooding	N/A
447	7/23/1974	Severe Storms, Flooding	N/A
401	7/20/1973	Severe Storms, Flooding	N/A
367	3/21/1973	High Winds, Wave Action, Flooding	N/A
338	6/23/1972	Tropical Storm Agnes	N/A
311	9/13/1971	Severe Storms, Flooding	N/A

Table 4.3a – Presidential Disaster Declarations for New York State, 1954-2015
Major Disaster Declarations
(denotes declarations known to be applicable to Albany County)*
(PA – Public Assistance, IA – Individual Assistance)

Number	Date	Incident Description	Estimated Assistance
290	7/22/1970	Heavy Rains, Flooding	N/A
275	8/26/1969	Heavy Rains, Flooding	N/A
233	10/30/1967	Severe Storms, Flooding	N/A
204	8/18/1965	Water Shortage	N/A
158	8/23/1963	Heavy Rains, Flooding	N/A
129	3/16/1962	Severe Storm, High Tides, Flooding	N/A
52	3/29/1956	Flood	N/A
45	8/22/1955	Hurricane, Floods	N/A
26	10/7/1954	Hurricanes	N/A

Table 4.3b - NYS Emergency Declarations			
Number	**Date**	**Incident Description**	**Estimated Assistance**
3351*	10/28/2012	Hurricane Sandy	N/A
3341*	9/8/2011	Remnants of Tropical Storm Lee	$3,194.36
3328	8/26/2011	Hurricane Irene	$1,313,887.82
3299*	12/18/2008	Severe Winter Storm	$11,498,194.84
3273	2/23/2007	Snow	$2,617,215.44
3268	10/15/2006	Snowstorm	N/A
3262*	9/30/2005	Hurricane Katrina Evacuation	$2,760,835.92
3195	3/3/2004	Snow	$2,696,280.98
3186*	8/23/2003	Power Outage	$5,419,372.81
3184*	3/27/2003	Snowstorm	$33,681,870.19
3173*	2/25/2003	Snowstorm	$16,025,623.46
3170*	12/31/2001	Snowstorm	$16,619,808.60
3157	12/4/2000	Snow Storm	$4,999,310.11
3155*	10/11/2000	Virus Threat	$4,668,512.48
3149	9/18/1999	Hurricane Floyd	N/A
3138	3/10/1999	Winter Storm	$3,132,714.82
3136	1/15/1999	Winter Storm	$4,673,921.01
3107*	3/17/1993	Severe Blizzard	$11,978,567.70
3080	5/21/1980	Chemical Waste, Love Canal	$131,270.00
3066	8/7/1978	Chemical Waste, Love Canal	N/A
3027	1/29/1977	Snowstorms	N/A
3004	11/2/1974	Flooding (NYS Barge Canal)	N/A

Table 4.3c - Fire Management Assistance Declarations			
Number	**Date**	**Incident Description**	**Estimated Assistance**
2269	8/9/1999	West Point Fire Complex	$728,217.43
2115	8/25/1995	Sunrise Complex	N/A

4.4 Crude Oil Transportation

A recent study in the Hudson River Valley by the NYS Water Resources Institute found that while most communities are aware that oil trains pass through their communities and have some form of emergency plans, most communities rely on local volunteer emergency services that may not have the capacity to respond if a major accident were to occur.

Crude oil transport by rail has increased dramatically since 2010. Many Albany County communities such as Ravena, Coeymans, Bethlehem, New Scotland, Albany, Menands, Colonie, Green Island, and Cohoes are located along the routes where oil trains travel every day. There are increased risks to communities traversed by crude oil trains. Although train accidents have detrimental environmental, human and economic consequences, prior research that assesses whether communities have adequate emergency preparations is limited. This issue was addressed and considered at the local jurisdiction level. Communities where this topic is of concern considered the inclusion of mitigation actions and strategies that could be implemented to minimize the potential impacts from crude oil transport within their municipal boundaries. Such actions and strategies, if proposed, can be found in the municipal sections located in Section 10 of this document.

5.0 Hazard Data and Profiles

Detailed profiles of hazards identified in the previous section as worthy of further evaluation in the overall risk assessment are provided in this section. Each hazard profile includes a description of the hazard and its causes and impacts, the location and extent of areas subject to the hazard, known historical occurrences, and the probability of future occurrences. The level of detail included for each hazard was limited by the amount of historical data and prior cost and damage estimates available. The profiles also include specific information noted by members of the Steering Committee and jurisdiction representatives, including unique observations or relevant anecdotal information regarding individual historical hazard occurrences and individual jurisdictions. Table 5.0a below shows the probability of future occurrence of each different hazard analyzed.

Table 5.0a - Probability of Future Hazard Occurrence

Hazard	Probability of Future Occurrence
Extreme Temperatures	Medium
Severe Thunderstorm	High
Wind	High
Hailstorms	High
Tornado	Low
Multi-Vortex Tornado	Low
Hurricanes	Low
Tropical Storms	Low
Floods	Medium
Drought	Low
Landslides	Low
Earthquakes	Low
Winter Storm/Ice Storm	High
Wildfires	Low
Ice Jams	Low

5.1 Extreme Temperatures

Extreme temperatures principally affect the health and safety of the human population, although they can also impact livestock, agricultural crops, and may also cause damage to infrastructure and property. This section provides detailed profiles of both extreme high and extreme low temperatures.

Description

As per the National Weather Service an extreme temperature event is determined to occur if an event lasted for at least three (3) days with a temperature colder than -10 degrees Fahrenheit (cold wave) or hotter than 95 degrees Fahrenheit (heat wave). This hazard is further defined by extended periods of excessive cold or hot weather with a serious impact on human and/or animal populations, particularly elderly and/or persons with respiratory ailments. People living in urban environments may be at greater risk from the effects of prolonged heat wave than those living in rural areas due to the "urban heat island effect." See Figures 5.1a and 5.1b for heat index and wind chill/cold index charts, respectively.

Figure 5.1a – Heat Index
(National Weather Service Weather Forecast Office, 2014)

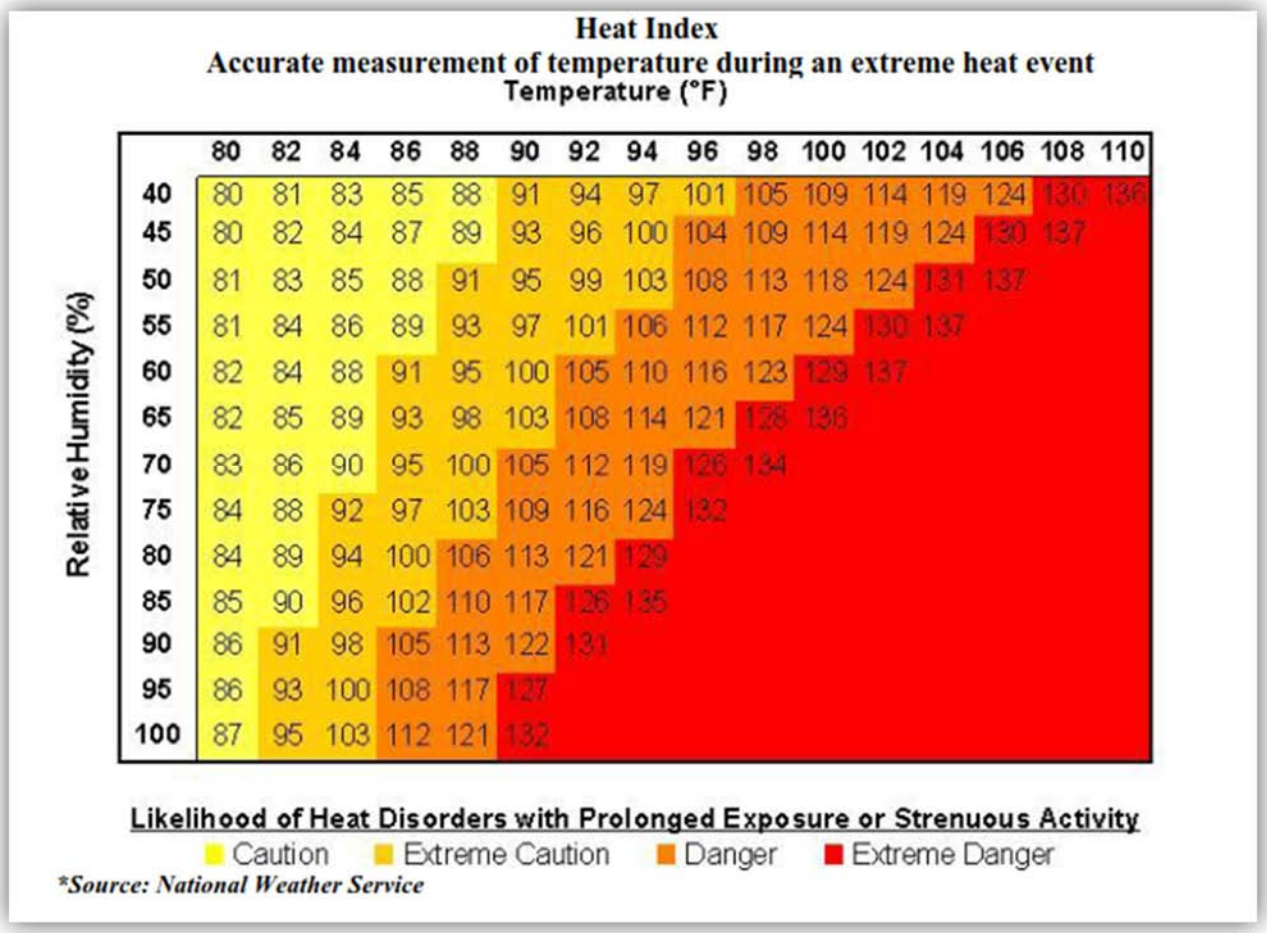
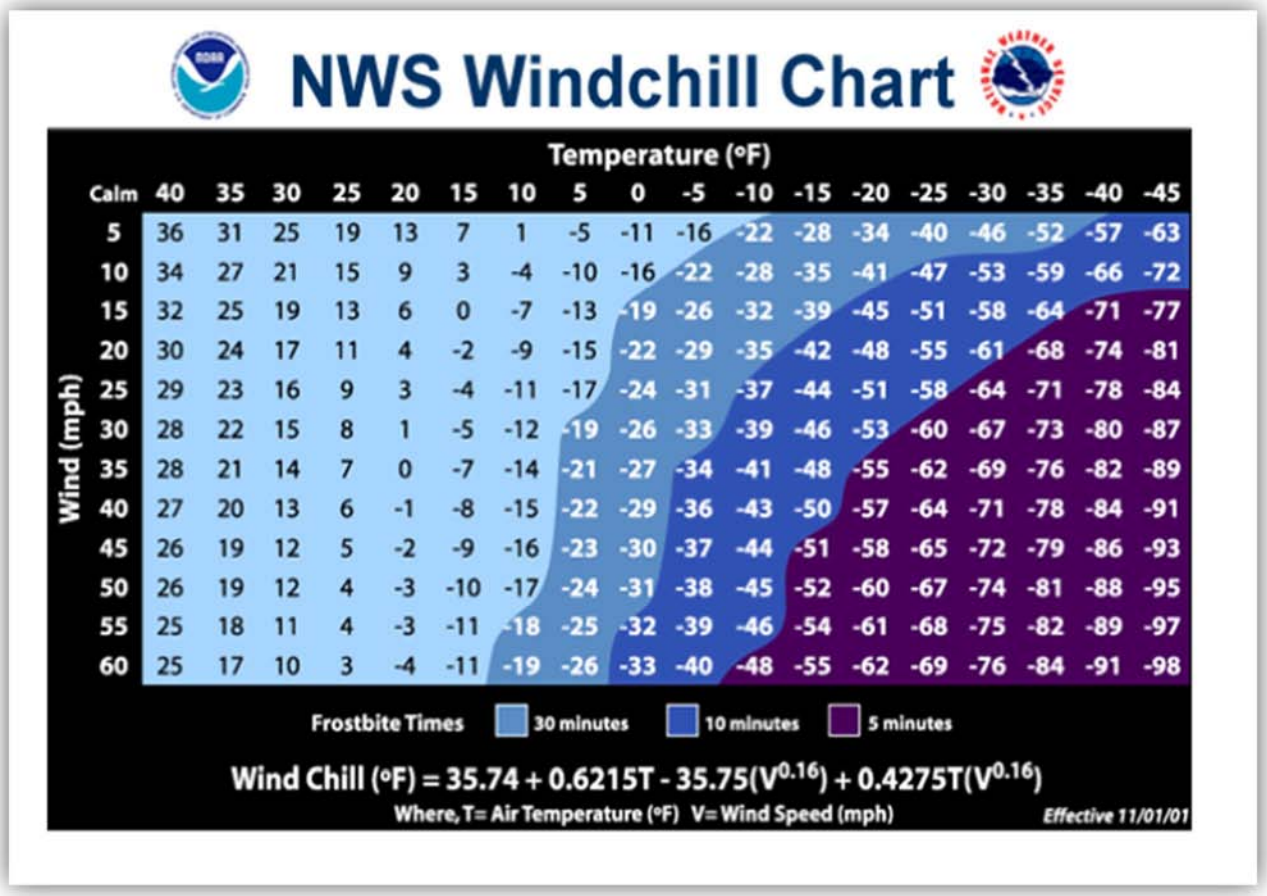


Figure 5.1b – Windchill Chart
(National Weather Service Weather Forecast Office, 2014)



Location and Extent

Albany County is located in a region of the country that is susceptible to extreme heat and extreme cold. During periods of extreme temperature conditions the effects will be felt over widespread geographic areas, and it is generally assumed that Albany County and all of its municipalities are uniformly exposed to extreme heat and extreme cold. The effects of extreme temperatures will be primarily limited to the elderly and homeless populations, those with pre-existing medical conditions, with occasionally minor, sporadic property damages (i.e. bursting pipes) and damages to crops and other vegetation.

Historical Occurrences

Recent (January 2010 through May 2018) notable extreme temperature events in the Albany County region, as reported by the National Climatic Data Center (NCDC) at the National Oceanic and Atmospheric Administration (NOAA), include:

Extreme Heat

July 21, 2011: Bermuda high pressure dominated the region with broad southwest flow aloft. This flow ushered in hot and humid air. Temperatures across much of east central New York warmed well into the 90s with some locations reaching the century mark in the mid-Hudson Valley. On Friday July 22nd the heat wave spread to affect much of the Upstate New York area.

The most oppressive day was Thursday, July 21st, due to very high dew points in the 70s. The high humidity, combined with temperatures in the 90s, resulted in heat indices of 105 to 110 degrees up the Hudson River Valley. The New York Independent System Operator (NYISO) reported that New York State's power consumption on the 21st peaked between 4 pm and 5 pm EDT and was the third highest peak on record.

Extreme Cold

January 07, 2015: Behind an arctic cold front, bitter cold air moved into the region for the night of Wednesday, January 7th. Overnight lows were below zero in most areas, with temperatures as low as -10 to -30 degrees over the Adirondacks and the Lake George and Saratoga Region.

With strong northwesterly winds in place, this allowed for winds chill values to be as low as -40 degrees during the late night hours into the morning hours on Thursday, January 8th. Due to the dangerously cold temperatures, many towns and cities opened shelters and warming stations for residents who needed a place to stay overnight. Many school districts also delayed the start of school due to the extremely cold temperatures and low wind chill values.

Although temperatures remained frigid through the day, winds became light, allowing for wind chill values to improve by the late morning hours on Thursday, January 8th.

February 15, 2015: Behind a rapidly developing coastal storm, extremely frigid Arctic air masses pour into the region from the north, beginning during the late morning hours on Sunday, February 15th. With the developing storm just east of the region, a strong pressure gradient allowed for very strong winds. Northwest winds frequently gusted over 30 MPH, with some gusts as high as 46 MPH through the evening hours.

Temperatures fell quickly through the day and dropped below zero for Sunday night into the morning of Monday, February 16th. Some temperatures were as cold as 30 degrees below zero. With winds continuing to be gusty during the overnight and morning hours, wind chill values dropped as low as 15 to 45 degrees below zero.

With much of the month experiencing cold temperatures, many towns and cities continued to keep warming shelters open. There were many reports of bursts water mains and pipes due to the frigid temperatures penetrating deep into the ground. This was especially true in areas where the infrastructure was older.

By the afternoon hours on Monday, February 16th, wind chill values finally rose above dangerous levels, although it remained rather cold through the remainder of the day.

February 13, 2016: Behind an Arctic cold front, very cold temperatures poured into the region upon brisk northwesterly winds. Temperatures dropped through the day on Saturday, February 13th, reaching lows of 8 to 33 degrees below zero across eastern New York on Saturday night. Along with winds gusting 20 to 40 MPH, wind chill values reached 15 to 45 degrees below zero for Saturday night into Sunday morning.

The cold temperatures and low wind chills resulted in several water main breaks across the region. In addition, the Red Cross responded to seventeen (17) emergency calls over the weekend, including for house fires in Albany, Schodack, and Gilboa. Around $3000 of aid was given to families affected by these fires.

With temperatures warming up and winds diminishing, the threat for dangerously cold temperatures and low wind chills ended on the afternoon hours of Sunday, February 14th.

January 01, 2018: A frigid air mass combined with northwesterly winds up to 15 miles per hour resulted in dangerously cold wind chills on the first and second days of 2018. Wind chills fell as low as 15 to 35 below zero in many locations across the region on New Year's morning.

January 05, 2018: A deep upper level trough swept across the southern US and turned northeastward offshore of the east coast from the morning of January 3rd through the morning of January 4th, 2018. The interaction between the cold upper trough and the relatively warmer Atlantic waters resulted in tremendous intensification of a surface low pressure system that tracked from around Miami, FL to just offshore of Cape Cod on January 3rd and 4th. A good deal of moisture wrapped into this system and was lifted across much of the East Coast, resulting in a broad area of moderate to heavy snowfall. To the west of the heavy snowband across the Hudson, Mohawk, and Schoharie Valleys, a widespread three (3) to seven (7) inches of snowfall occurred. Gusty northerly winds occurred with this system as well, with gusts of 30-45 mph recorded. The winds and falling snow contributed to reduced visibility and blowing and drifting of snow. The snowfall tapered off in the evening of January 4th.

As the system pulled away, brutally cold Arctic air rushed southward into New York, resulting in an extended period of extremely cold conditions from January 5th through January 7th. The coldest wind chills occurred during the mornings of January 6th and 7th, when frigid air combined with westerly winds gusting to 30-40 mph resulted in widespread wind chills as low as 20 to 40 degrees below zero. High temperatures on January 6th were mainly in the single digits above and below zero (0). Many warming shelters were opened across the state.

Historical Cost and Damage Estimates

According to the NCDC storm event database, Albany County has been included in the area affected by six (6) serious extreme temperature events between January 2010 and May 2018. Of these, one (1) was extreme heat and five (5) were extreme cold events. These events resulted in no fatalities. All five (5) extreme cold events occurred in either January or February, the time of year when extreme cold events are most common in the area. The extreme heat event occurred in July. New York State has received no Federal Disaster or Emergency Declarations due solely to extreme temperature events.

Most concern related to extreme heat events occur when people or animals are overexposed to heat and have over-exercised for their age and/or physical condition. Older adults, young children, and those who are sick or overweight are more likely to experience the adverse effects of extreme heat. Similarly, cold events have a greater potential to affect elderly populations. Historically, Albany County has opened cooling centers at various designated venues across the county to provide heat relief to the public, especially vulnerable populations.

Future Potential Impacts

Extreme temperature events will remain a very frequent occurrence in Albany County, and the probability of future occurrences in Albany County is certain.

Based on historical records from the NCDC over the last fifteen (15) years (2000-2015), in New York State, extreme temperature events of all types can be expected to occur approximately 15.1 times per year. Of these anticipated yearly occurrences, 9.7 are likely to be extreme cold events, and 5.4 are likely to be extreme heat events, making extreme cold events more likely to occur in any given year with over double the frequency of occurrence when compared to extreme heat events. This trend is different in Albany County, where, based on NCDC records collected over the last fifteen (15) years, extreme temperature events have occurred approximately 0.40 times per year, with extreme heat to be expected approximately 0.2 times per year.

The impact of such occurrences on people and property is typically minimal. Furthermore, such events are not expected to pose a significant threat to human lives and safety due to relatively low percentages of young children and elderly populations (combined) in many of Albany County's municipal jurisdictions (ranging from a minimum of 16.62% in the City of Albany to 22.43% in the Village of Colonie, with an overall county-wide average of 18.97%). "Young children" are considered to be those less than five (5) years old while the "elderly" population is defined as those over the age of sixty-five (65).

5.2 Severe Thunderstorm/Wind/Tornado/Hail

Description

Severe storms include hail storms, windstorms, and severe thunderstorms (with associated severe wind events such as derechos, gustnados, and downbursts). The National Weather Service (NWS) defines a severe storm as one with a tornado and/or surface hail ¾ inches or greater and/or wind gusts 50 knots (58 mph) or greater. Such storms can cause damage from wind, hail, heavy rainfall, and/or lightning strikes.

Severe Thunderstorms: The National Weather Service (NWS) estimates that over 100,000 thunderstorms occur each year on the U.S. mainland. Approximately 10% are classified as "severe". Thunderstorms can produce deadly and damaging tornadoes, hailstorms, intense downburst and microburst winds, lightning, and flash floods. Thunderstorms spawn as many as 1,000 tornadoes each year as well. On average, three hundred (300) people are injured and eighty (80) people are killed each year by lightning in the United States. Flash flooding is responsible for more fatalities – more than one hundred forty (140) annually—than any other thunderstorm-associated hazard.[1]

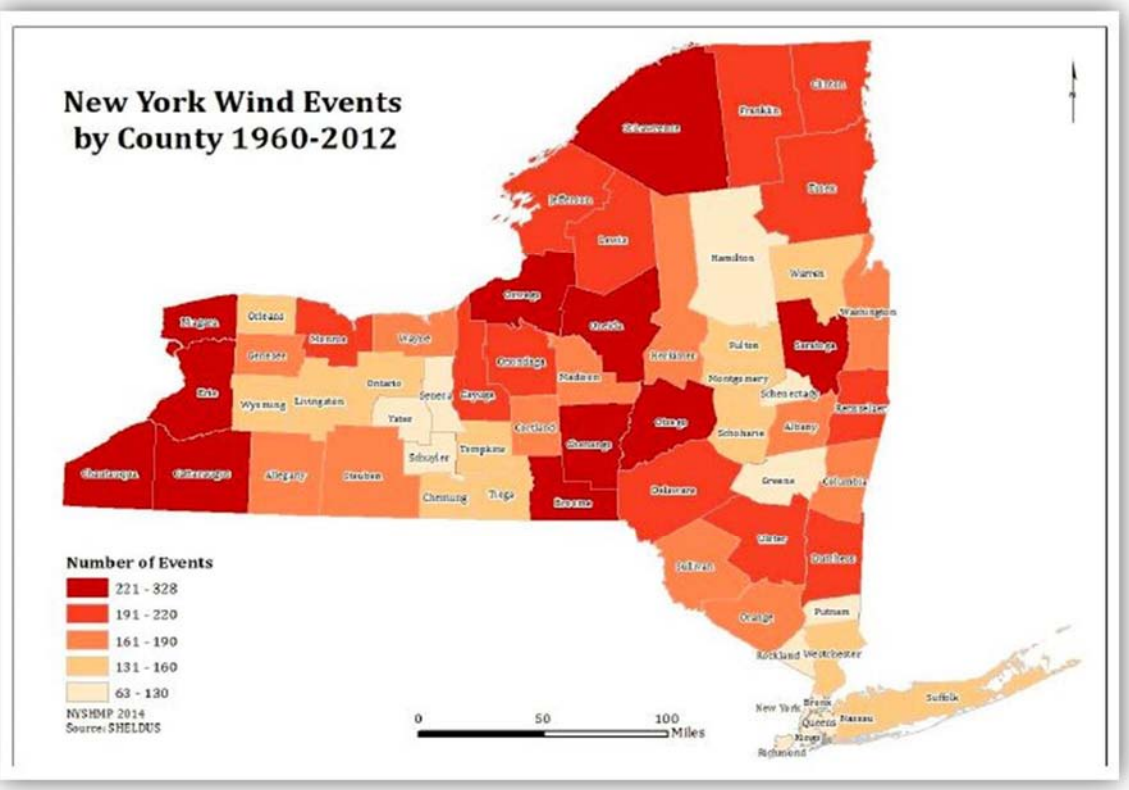
The duration of a thunder event is determined by measuring the time between the first peal of thunder and the last. The last peal of thunder is defined to be that which is followed by a period of at least fifteen (15) minutes without an additional peal. A "thunder day" is defined as any day in which at least one (1) thunder peal is heard. Downburst winds are strong, concentrated, straight-line winds created by falling rain and sinking air that can reach speeds of 125 mph (200 km/h). Microburst winds are more concentrated than downbursts, with speeds up to 150 mph (240 km/h). Severe damage can result from the spreading out of downbursts and microbursts, which generally last five (5) to seven (7) minutes. Due to wind shear and detection difficulties, they pose the biggest threat to aircraft departures and landings.

Lightning, which occurs during all thunderstorms, can strike anywhere. Generated by the buildup of charged ions in a thundercloud, the discharge of a lightning bolt interacts with the best conducting object or surface on the ground. The air in the channel of a lightning strike reaches temperatures higher than 50,000ºF. The NWS classifies a thunderstorm as severe if its winds reach or exceed 58 mph (km/h), produces a tornado, or drops surface hail at least 0.75 in (1.91 cm) in diameter (FEMA, MHIRA, 1997). According to lightning fatality data collected by NOAA, one hundred thirty-nine (139) fatalities occurred in New York State between 1959 and 2013 that are attributable to lightning strikes (Vaisala, Inc., 2014). Only four (4) lightning deaths occurred in New York State from 2005 to 2014 (Vaisala, Inc., 2015). On average, lightning strikes are fatal to about 10% of people who are struck (The Weather Channel, 2015).

[1] https://www.fema.gov/media-library-data/20130726-1545-20490-4583/mhira_n1.pdf - pg. 28

For reference, a derecho is a widespread and long-lived wind storm that is associated with a band of rapidly moving showers or thunderstorms (Storm Prediction Center, "About Derechos"). A typical derecho consists of numerous microbursts, downbursts, and downburst clusters. A gustnado is a short-lived, ground-based vortex that develops on a gust front associated with either showers or thunderstorms (National Weather Service, 2009).

Figure 5.2a – Number of High Wind Events Reported For New York State Between 1960 and 2012
(NYS DHSES, 2014)



Wind: Wind is defined as the motion of air relative to the earth's surface. The horizontal component of the three-dimensional flow and the near-surface wind phenomenon are the most significant aspects of the hazard. Extreme wind events are associated with tropical cyclones, winter cyclones, and severe thunderstorms. Winds vary from 0 at ground level to 200 mph (89 m/s) in the upper atmospheric jet stream at six (6) to eight (8) mi (10 to 13 km) above the earth's surface. Large-scale extreme wind phenomena are experienced over every region of the United States and its territories. The number of high wind events in NYS by County between 1960 and 2012 is shown above in Figure 5.2a. Albany County falls into the "161-190" bracket.

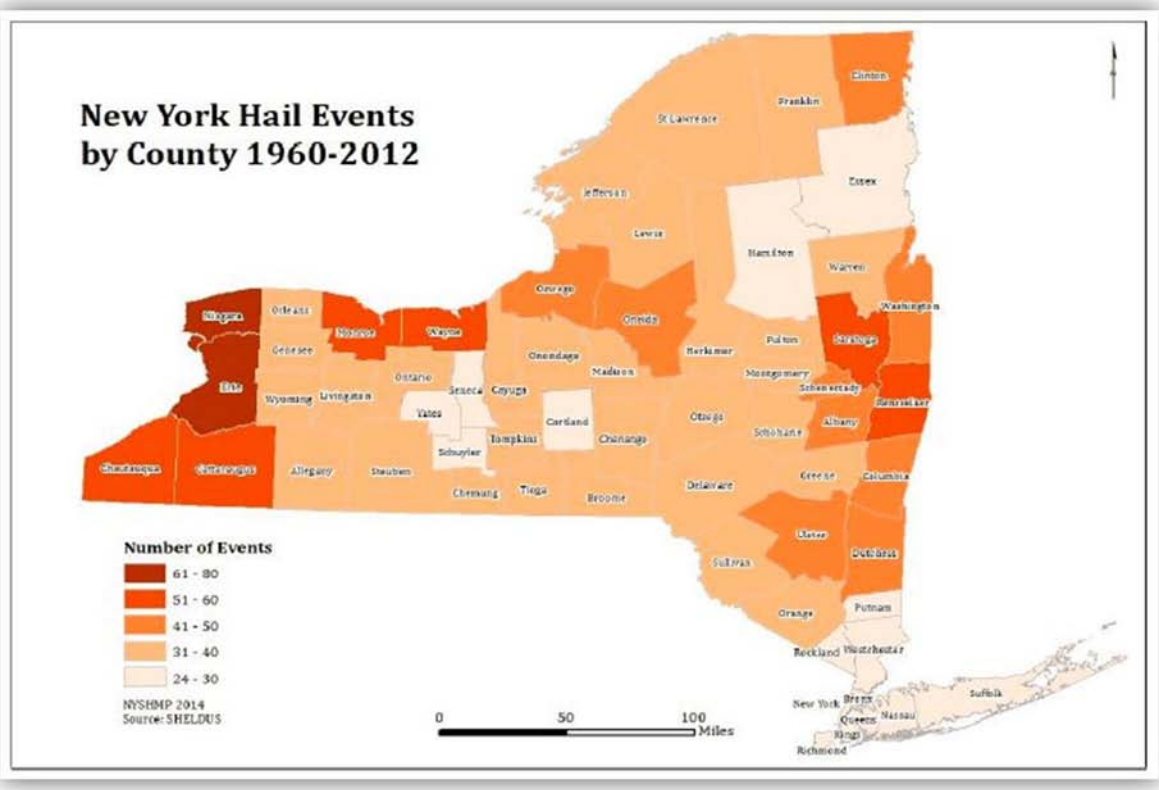
Hailstorms: Hailstorms are often associated with severe thunderstorms. Hailstorms are characterized by the balls or irregularly shaped lumps of ice greater than 0.75 inches (1.91 cm) in

diameter which fall with rain. Early in the developmental stages of a hailstorm, ice crystals form within a low-pressure front due to warm air rising rapidly into the upper atmosphere and the subsequent cooling of the air mass. Frozen droplets gradually accumulate on the ice crystals until they reach a certain weight, after which they fall as precipitation. The size of hailstones is a direct function of the severity and size of the storm. High velocity updraft winds are required to keep hail in suspension in thunderclouds. The strength of the updraft is a function of the intensity of heating at the Earth's surface. Higher temperatures at the surface increase the suspension time of hail in the thunderclouds and increase the size of the hailstones themselves (FEMA, MHIRA, 1997).

Peak periods for hailstorms are late spring and early summer, the time of year when the jet stream migrates northward across the U.S. Hailstorms can extensively damage agriculture crops, particularly those that are herbaceous and long-stemmed. Severe hailstorms can also cause damage to buildings and automobiles, but rarely cause fatalities or serious injury.

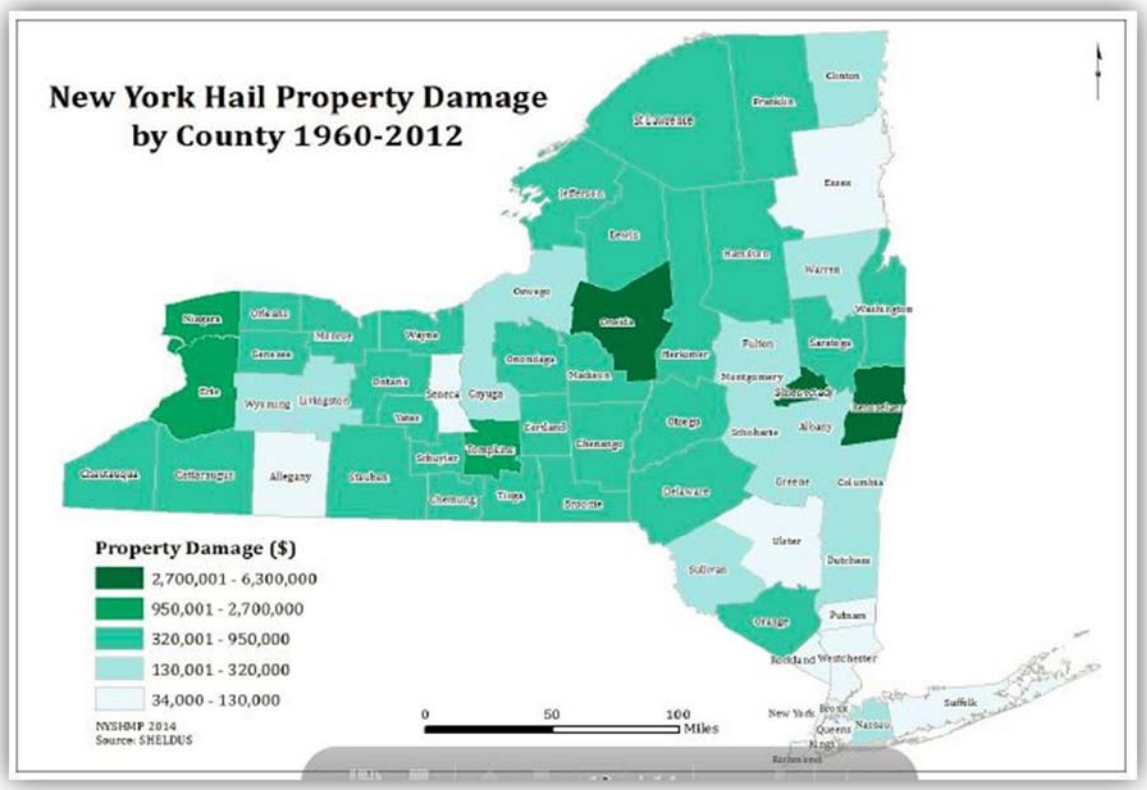
Figure 5.2b is located on the following page and illustrates the number of hail wind events reported in NYS between 1960 and 2012. Albany County is shown in the “42-50” event category.

Figure 5.2b – Number of Hail Wind Events Reported For New York State Between 1960 and 2012
(NYS DHSES, 2014)



According to the NOAA's NCDC, one hundred thirty-one (131) recorded hail events have affected Albany County between January 1960 and December 2012, with the exception of tornado events. Within Albany County, there were no deaths or injuries. Albany County experienced an estimated average annual loss of $3,095 from hail events between 1960 and 2012 (NYS DHSES, 2014). Figure 5.2c, on the following page, illustrates that Albany County experienced a total of between $130,001 and $320,000 in crop damage from hail events that occurred between 1960 and 2012.

Figure 5.2c – Hail Property Damage in New York State, 1960-2012
(NYS DHSES, 2014)



Impacts to public utilities are commonly reported as a result of severe storm events. Such impacts require an immediate response by utility company personnel and are often fixed quickly. Hail events can cause minimal damage to private property, especially vehicles, but often do not result in an increased need for County emergency services or other resources. After a severe storm event ends, the County and municipal public works departments are sometimes called upon to clean up debris or fix infrastructure damage that may have occurred.

Tornado: Tornadoes are described as local atmospheric storms, generally of short duration, formed by winds rotating at very high speeds, usually in a counter-clockwise direction. The vortex of the tornado can be up to several hundred yards wide and is visible to the observer as a whirlpool-like column of winds rotating about a hollow cavity or funnel. Tornado winds have been estimated to be as high as 400 miles per hour (HIRA-NY, Definitions of Hazards).

The National Weather Service describes tornadoes as violently rotating columns of air that come in contact with the ground and extend from the base of a cumuliform cloud. A condensation funnel does not need to reach to the ground for a tornado to be present; a debris cloud underneath a thunderstorm is all that is needed to confirm the presence of a tornado, even in the absence of a

condensation funnel. Tornadoes always start as funnel clouds and may be accompanied by a loud roaring noise.

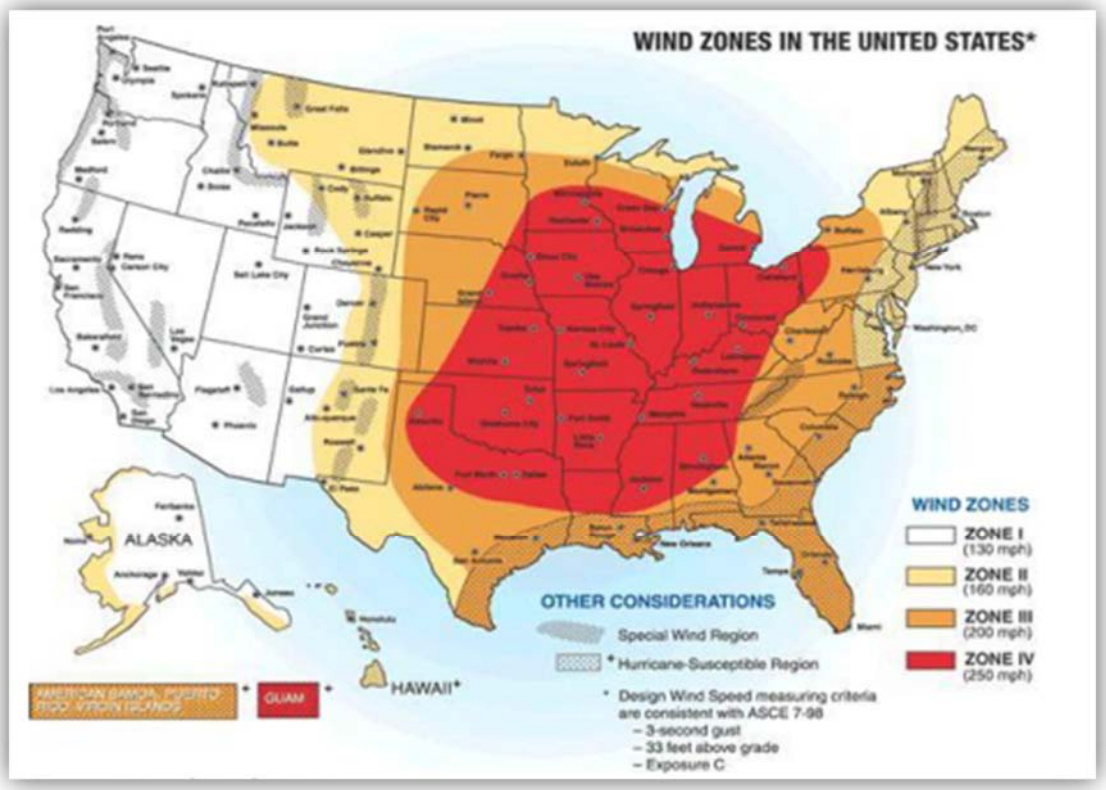
The most destructive and deadly tornados occur from supercells, which area described as rotating thunderstorms with a well-defined radar circulation called a mesocyclone. Supercells are also capable of producing damaging hail, severe winds, frequent lightning, and flash flooding.

Multi-Vortex Tornado: A multi-vortex tornado contains two (2) or more small, intense subvortices orbiting the center of the larger tornado. When a tornado does not contain too much dust and debris, the multiple vortices may be visible. These vortices may form and die within a few seconds and can happen in all sorts of tornado sizes. Subvortices are the cause of most of the narrow, short, extreme swaths of damage that sometimes arc through larger tornado paths.

Location and Extent

Extreme wind events are experienced in every region of the United States. A useful tool for determining the location of the extreme wind hazard area in a jurisdiction is depicted in Figure 5.2d - Wind Zones in the United States. This map of design wind speeds was developed by the American Society of Civil Engineers. It divides the United States into four (4) wind zones, geographically representing frequency and magnitude of potential extreme wind events. The figure shows that a single wind zone covers Albany County and its jurisdictions; Zone II, with a design wind speed for shelters of 160 mph. Albany County is additionally mapped in the Hurricane-Susceptible Region.

Figure 5.2d - Wind Zones in the United States



The severity of a severe wind event depends upon the maximum sustained winds experienced in any given area. Extreme winds pose a significant threat to lives, property and infrastructure due to direct wind forces but also flying debris, such as rocks, lumber, fuel drums, sheet metal and loose gear of any type that can be picked up by the wind and hurled with great force. Extreme winds also down trees and power lines that often result in power outages across an affected area. Table 5.2a illustrates the severity and typical effects of various wind speeds, as obtained from the NOAA NCDC website (2016).

Table 5.2a – Severity and Typical Effects of Various Speed Winds
(NOAA, NCDC, 2016)

Maximum Wind Speeds	Equivalent Saffir-Simpson Scale* (Hurricanes)	Equivalent Fujita Scale (Tornadoes)	Severity	Typical Effects
40-72 mph (35-62 kt)	Tropical Storm = 39-73 mph	F0	Minimal	Some damage to chimneys; breaks twigs and branches off tress; pushes over shallow-rooted trees; damages signboards; some windows broken; hurricane wind speed begins at 73 mph.
73-112 mph (63-97 kt)	Cat 1 = 74-95mph Cat 2 = 96-110 mph Cat 3 = 111-130 mph	F1	Moderate	Peels surfaces off roofs; mobile homes pushed off foundations or overturned; outbuildings demolished; moving autos pushed off the roads; trees snapped or broken.
113-157 mph (98-136 kt)	Cat 3 = 111-129 mph Cat 4 = 130-156 mph Cat 5 > 155 mph	F2	Considerable	Roofs torn off frame houses; mobile homes demolished; frame houses with weak foundations lifted and moved; boxcars pushed over; large trees snapped or uprooted; light-object missiles generated.
158-206 mph (137-179 kt)	Cat 5 > 157 mph or higher	F3	Severe	Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forests uprooted; heavy cars lifted off the ground and thrown; weak pavement blown off roads.
207-260 mph (180-226 kt)	Cat 5 > 157 mph or higher	F4	Devastating	Well-constructed homes leveled; structures with weak foundations blown off some distance; cars thrown and disintegrated; large missiles generated; trees in forest uprooted and carried some distance away. The max. wind speeds of hurricanes are not likely to reach this level.
261-318 mph (227-276 kt)	N/A	F5	Incredible	Strong frame houses lifted off foundations and carried considerable distance to disintegrate; automobile-sized missiles fly through the air in excess of 300 ft (100 m); trees debarked; incredible phenomena will occur. The max. wind speeds of hurricanes are not expected to reach this level.
Greater than 319 mph (277 kt)	N/A	F6	N/A	The max. wind speeds of tornadoes are not expected to reach this level. The max. wind speeds of hurricanes are not expected to reach this level.

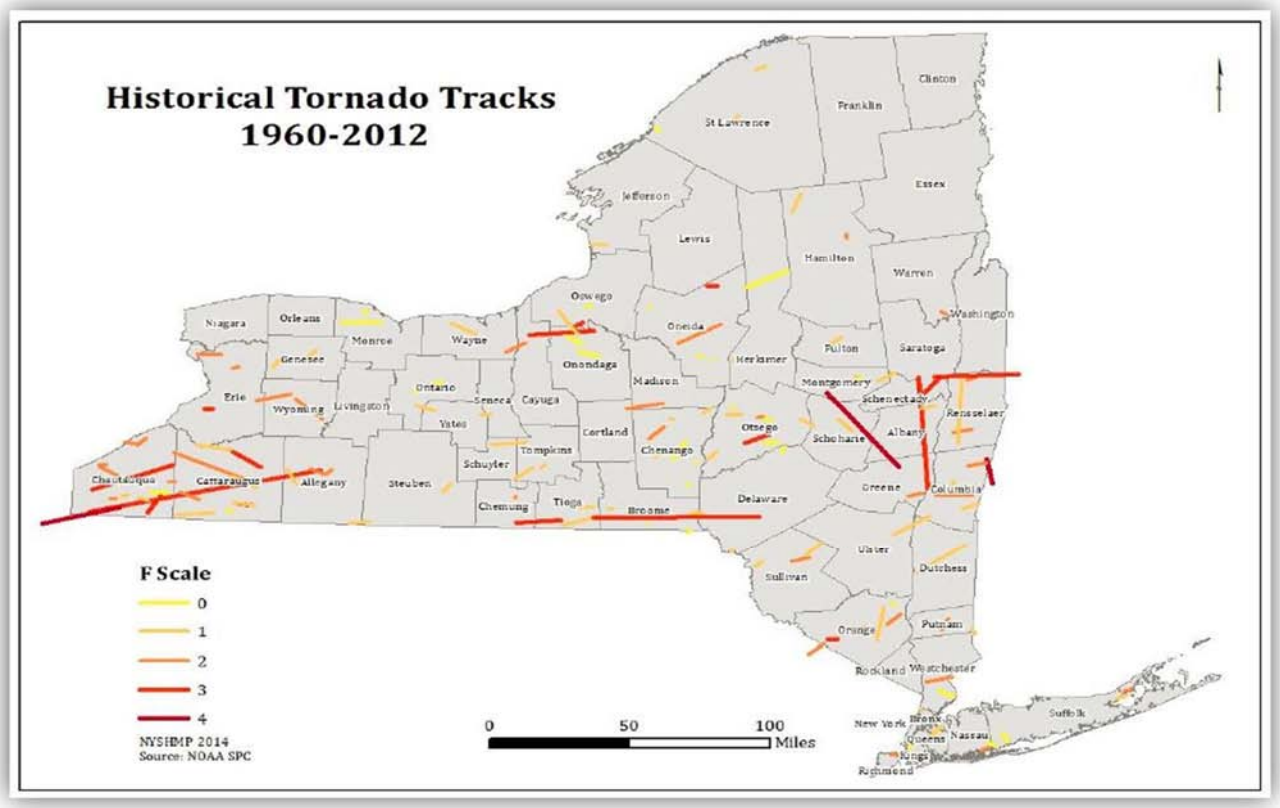
* The Saffir-Simpson Scale is a five-category wind speed/storm surge classification scale used to classify Atlantic hurricane intensities. The Saffir-Simpson values range from Category 1 to Category 5. The strongest SUSTAINED hurricane wind speeds correspond to a strong F3 (Severe Tornado) or possibly 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 Occurrences

Albany County's CEPA Program results identify Severe Thunderstorm/Wind/Tornado as having a 'high' likelihood of occurrence and a medium level of consequence (Albany County, 2014), which resulted in a 'medium' ranking.

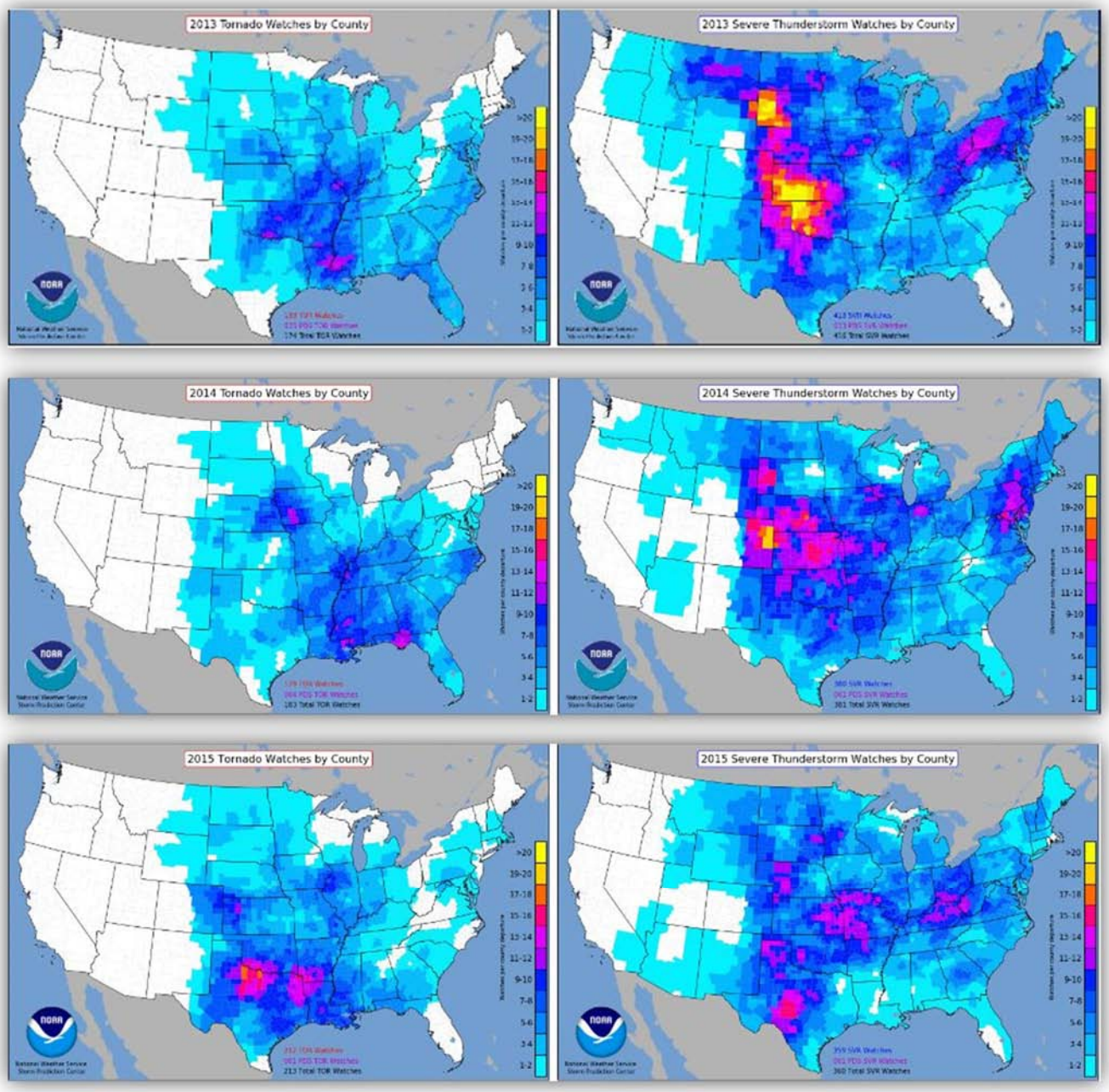
Albany County has experienced two hundred six (206) high wind events between 1960 and 2012. During the same date range, one hundred thirty-one (131) hail events have also been documented within Albany County. Six (6) tornados have touched down in Albany County between 1960 and 2012 (Figure 5.2e). These occurrences were predominately concentrated in the eastern portion of the county, with two (2) occurrences located in the southwestern portion of the county. Out of these six (6) tornado events, the occurrence that received the highest F scale designation, an F-4 (see Figure 5.2e for details), occurred on July 10th, 1989, and resulted in no injuries.

Figure 5.2e – New York State Historical Tornado Paths, 1960-2012
(NYS DHSES, 2014)



The three (3) sets of images below, Figure 5.2f, illustrate the total tornado and severe thunderstorm watches issued for the United States in 2013, 2014, and 2015. In 2013 and 2015, Albany County was included in two (2) tornado watches, while no tornado watches were issued for New York State in 2014. The rate of severe thunderstorm watches for Albany County totaled nine (9) to ten (10) in 2013 and, but dropped to a rate of seven (7) to eight (8) for 2014, 2015 was the lowest of the three (3) years at one (1) to two (2) (NOAA Storm Prediction Center).

Figure 5.2f – Storm Prediction Center's Tornado and Severe Thunderstorm Watch Frequency Maps – 2013, 2014, & 2015
(NOAA SPC, 2016)



A list of some more recent (within the past seventeen (17) years) and notable severe thunderstorm, high wind, and tornado events to have affected Albany County include the following:

July 4, 2001: A cold front, plowing into an unstable air mass, triggered widespread thunderstorms across eastern New York on the evening of Independence Day. Some of the storms became strong to locally severe. Large tree limbs fell on two (2) cars in the city of Albany.

June 16, 2002: Thunderstorms developed along an occluded frontal boundary by midday June 16th. Their intensity was aided by a large cold pocket of air aloft combined with the strong June midday sunshine. As the storms approached the Hudson Valley of eastern New York, some of them became severe. Most of the reports were of hail damage. Damage was mostly confined to many downed and twisted trees. One (1) tree did fall onto a garage thereby damaging it. Thunderstorm winds blew two (2) trees down on Ravena Road in the town of Coeymans, Albany County.

August 14, 2002: An upper level disturbance triggered scattered thunderstorms across eastern New York during the afternoon of August 14th. The air mass was exceptionally hot and humid, allowing some of the storms to pulse to severe levels. Severe thunderstorms especially pounded Albany County, depositing quarter size hail in the city of Albany during the afternoon hours. Winds from the storm blew a 40 by 40 foot tent, used by city vendors, into one of the pools at the Empire State Plaza, resulting in nine (9) injured people. Three (3) of them had to be hospitalized. Winds from the storms brought down trees and powerlines in the town of Colonie. A microburst, with winds estimated as high as 80 mph, hit the town of Guilderland, namely the Fort Hunter and Guilderland Center sections. Many trees were destroyed in these areas. One (1) tree fell on a car, trapping the driver and resulting in minor injuries. This microburst not only downed a huge swath of trees, but many of the trees fell down on, or even into, buildings, producing at least minor damage to as many as fifty (50) structures. A two-story residence was nearly cut in half when a pine tree fell on it. A farmhouse was damaged when a stand of trees was blown onto it. Part of the roof at the Town's Highway Department was torn off as well as the Guilderland High School. Trees were toppled onto the New York State Thruway, temporarily closing the road between exit 25 and exit 26. A portion of a cornfield was flattened. The town Supervisor of Guilderland declared a state of emergency for that town. Guilderland also filed for Federal Aid.

July 18, 2008: A frontal boundary retreated to the north of the region during Friday, July 18th, allowing hot and humid conditions to overspread eastern New York and adjacent western New England. This contributed to the development of numerous thunderstorms during Friday afternoon and evening, some of which became severe. Penny size hail was reported in Westerlo and Berne during the thunderstorm.

July 26, 2008: Strong upper level dynamics, well ahead of a cold front approaching from the west, triggered widespread showers and thunderstorms across portions of the Capital Region during the late afternoon hours of Saturday July 26th, into the early morning hours of Sunday July 27th. Penny size hail fell in Cohoes during the thunderstorm.

July 27, 2008: A cold front moved east across eastern New York and western New England during the late morning through mid-afternoon hours of Sunday July 27th. The interaction of this front, and a warm, moist and unstable air mass, led to the development of numerous showers and thunderstorms across the mid-Hudson Valley region. Nickel size hail was reported in Delmar during the thunderstorm.

August 11, 2008: An upper level low pressure system moved slowly northeast from central Pennsylvania into east central New York State during Monday, August 11th. The upper level dynamics of this system, combined with abundant low level moisture, and significant instability led to the development of numerous, slow moving thunderstorm clusters during Monday afternoon. Penny to quarter size hail was reported in Watervliet during the thunderstorm.

June 15, 2009: The combination of a passing upper level trough, and unusually cold air in the mid and upper levels of the atmosphere, led to the development of numerous thunderstorms across eastern New York during the late morning into the early evening hours on Monday June 15th, many of which contained large quantities of hail. The thunderstorms developed during the late morning hours, and continued through early evening. In addition, some thunderstorms were slow moving, and produced locally very intense rainfall rates. This led to flash flooding in some areas.

Hail ranging from penny to quarter size was reported to have fallen in Guilderland, Coeymans Hollow, North Bethlehem, Cohoes, Colonie, Ravena, near Buckingham Pond, and at the NWS Albany Office on the campus of the University of Albany during thunderstorms. The hail accumulated up to two (2) inches in depth in some areas.

July 01, 2009: An unstable air mass remained in place across the area Wednesday, July 1st. A strong upper level low over the Great Lakes Region with disturbances rotating about it triggered numerous thunderstorms across eastern New York during the afternoon and early evening hours, some of which became severe. In addition, some thunderstorms produced torrential downpours leading to flash flooding, especially in areas that received heavy rainfall on June 30th.

Hail ranging from penny to nickel size was reported in Roessleville and approximately five (5) miles west of Cohoes during thunderstorms.

July 07, 2009: A closed upper level low and pool of unusually cold air in the mid and upper levels of the atmosphere moved over the region Tuesday, July 7th, leading to the development

of numerous thunderstorms across eastern New York, many of which contained large quantities of hail. The severe thunderstorms developed during the late morning hours, and continued through early evening. Penny size hail was reported in Albany and New Salem during the thunderstorms.

July 16, 2009: A low pressure system approached the region Thursday, July 16th. A warm front associated with the low moved northeast of the region by early afternoon, placing the local area in a very unstable air mass. A cold front then moved across the area Thursday night. In addition, an upper level low was approaching from the Great Lakes Region. Severe thunderstorms developed and moved southeastward across east central New York through the rest of the afternoon into the early evening hours.

Hail in various shapes and sizes was reported throughout the County. Altamont, Guilderland , Delmar, Trumpeter Palace in Slingerlands, approximately five (5) miles west of Colonie, approximately three (3) miles north northwest of Albany, Hiawatha Trails Golf Course on State Route 155 off of Western Avenue, the intersection of Interstate 87 south and Interstate 90, approximately four (4) miles west northwest of Colonie, approximately two (2) miles northwest of Albany, Guilderland Center, the NWS Albany Office on the campus of the University of Albany, approximately three (3) miles west northwest of Albany, Krumkill Road in Albany, Crossgates Commons in Guilderland, approximately two (2) miles west northwest of Albany, and South Allen Street in Albany all experienced hail during thunderstorms.

Tennis ball size hail was reported in McKownville during a thunderstorm. Hail size was verified by photos.

June 6, 2010: A low pressure system moved eastward across New York State, paralleling Interstate 90, into New England on Sunday, June 6th. The air mass ahead of the system's cold front was warm and unstable. Thunderstorms preceded and accompanied the cold front as it moved across the area during the late morning through the midafternoon hours across east central New York.

A tree was reported down and fell through a house in Delmar due to strong thunderstorm winds. Two people were home, but no one was injured. Multiple trees were also reported down in Westmere.

July 17, 2010: A pre-frontal boundary and upper level disturbance moved across the region during the late afternoon and evening hours of Saturday, July 17th. With an unstable air mass in place, several clusters of strong to severe thunderstorms developed and moved across east central New York. Hail one and one-half (1 ½) to two (2) inches in diameter was reported during a thunderstorm in Thatcher State Park in Albany.

December 01, 2010: A strong cold front swept across east central New York Wednesday, December 1st, bringing strong and gusty winds and heavy rains to the area. With the passage of the cold front, winds quickly shifted from the south-southeast to the west, and temperatures rapidly dropped from the 50s into the 30s.

Ahead of the cold front, a very strong south to southeast low level jet resulted in wind gusts up to 55 mph, and with the passage of the front there were wind gusts up to around 50 mph. These strong wind gusts downed trees and power lines, resulting in power outages.

Generally, one (1) to three (3) inches of rain fell across the area. According to the Albany International Airport, three (3) planes, including one (1) international flight on route from Newfoundland to Newark Liberty International Airport, were forced to land at the Albany International Airport due to the extreme weather conditions along the East Coast.

June 08, 2011: The area was in a warm, humid and very unstable air mass on Wednesday, June 8th. A strong disturbance in the upper levels of the atmosphere moved across the region, tapping the explosive instability and triggering severe thunderstorms that produced large hail and damaging winds during the late afternoon hours into the early morning hours of Thursday, June 9th.

Hail in various shapes and sizes was reported in Guilderland, Albany, Colonie, at the Albany National Weather Service Forecast Office, Loudonville, Guilderland Center, near Boght Corners, and approximately one (1) mile south southwest of Albany.

August 18, 2011: A weak frontal boundary moved across east central New York Thursday afternoon, August 18th, triggering showers and thunderstorms. One of the thunderstorms produced nickel size hail in Albany County.

May 16, 2012: The combination of an unstable air mass in place over the region, the approach of a strong mid/upper level trough, the presence of a pre-frontal trough, and the passage of cold front set the stage for the development of severe thunderstorms across east central New York.

The pre-frontal trough became diffuse during the afternoon and consolidated with the cold front as it moved through. The convection formed into a broken line from mainly the Capital District north and east. Most of the severe reports were hail. The convection tended to diminish in severity by around 7 pm EDT, as by the time the cold front approached the southeast portion of the local area and the instability decreased. Quarter size (measured) hail was reported during a thunderstorm in Boght Corners.

July 23, 2012: A warm and humid air mass was in place over the region. A potent storm system was moving across the Upper Great Lakes with a surface cold front across southern Canada. A pre-frontal trough out ahead of this system moved across eastern New York

during the afternoon and evening hours. Despite weak wind shear aloft, large amounts of instability and steep lapse rates over the area allowed storms to grow rather tall. Large hail, some as large as 2.50 in diameter, occurred with some storms across parts of eastern New York. In addition, thunderstorm winds produced damage to trees as well. These storms produced a large amount of lightning, which drew a lot of attention from area residents.

Quarter sized hail was reported during a thunderstorm in the Town of New Scotland, just to south of the village of Voorheesville.

September 18, 2012: A complex and powerful low pressure system moved across the region bringing damaging winds and widespread heavy rainfall. A low pressure system originating in the Deep South approached the region from the southwest during the day as a strong cold front approached from the Great Lakes region. These systems merged and moved across the northeastern United States. Moisture was transported into the region on a very strong low level jet. Rainfall totals ranged from just over an inch up to around seven (7) inches. This heavy rainfall in a short period of time produced flash flooding over portions of the area. Despite instability being very limited, the winds field was so strong aloft that showers and low-topped thunderstorms were able to transport strong, damaging winds to the surface, producing widespread damage to trees and power lines.

December 21, 2012: An intense area of low pressure moved into the Great Lakes region on the evening of Thursday, December 20th. The storm's warm front extended into the Northeastern United States. Light precipitation occurred across the eastern New York during the overnight hours, with mainly rain for valley areas and light snow and mixed precipitation across the higher elevations.

As the storm lifted into southern Canada, the storm's cold front approached the region on the morning of Friday, December 21st. Very strong east to southeast winds were present aloft ahead of this front as it moved towards eastern New York State. A few breaks in the clouds allowed for some of these strong winds to reach the surface across eastern portions of the Hudson Valley

The threat for heavy rain and strong winds ended with the passage of the cold front by midday on Friday the 21st. Winds switched to a westerly direction at lower speeds for the afternoon hours.

A tree was reported down and on multiple power lines in Cohoes due to high winds.

January 31, 2013: A strong area of low pressure moved from the Great Lakes on the afternoon of Wednesday, January 30th towards the St. Lawrence Valley during the morning of Thursday, January 31st. A strong cold front was associated with this area of low pressure. Ahead of the storm, southerly winds allowed warm and moist air to move into the region.

While it took some time for the warmer air to overtake the cold, dense air in place, temperatures warmed into the 40s and 50s during the early morning hours of January 31st.

Just ahead of the cold front, a line of heavy rain showers developed just prior to sunrise. Strong wind gusts up to 60 mph accompanied some of this rainfall as it moved across eastern New York. This caused damage to some trees and power lines, causing power outages throughout the region.

With the rainfall falling heavy in intensity and warmer temperatures allowing for some snow melt, some ponding of water on roadways caused some isolated urban and street flooding. A few minor ice jams developed on small streams, but any flooding issues were very localized.

Behind the cold front, winds switched to a westerly direction and continued to be gusty throughout the day on Thursday, as colder temperatures moved into the region. Additional wind gusts of 35 to 55 mph occurred during the daytime hours on Thursday, January 31st with some additional damage to trees and power lines. Winds diminished by late Thursday afternoon as the pressure gradient began to relax over the area.

A tree was reportedly knocked over and on a car due to high winds. A shed was also heavily damaged by high winds in Cohoes. A wind gust to 55 MPH was reported in Latham at 6:41 AM EST and 52 mph at Albany International Airport at 6:19 AM EST.

May 21, 2013: A very warm and humid air mass was in place across eastern New York on Tuesday, May 21st. A slow moving frontal boundary was situated just north of the area across the Saint Lawrence River Valley along the United States-Canadian border. During the day, a wave of low pressure moved along this boundary, allowing the boundary to slowly push southward towards the area. With strong wind shear aloft and plenty of low level moisture in place, thunderstorms developed during the early afternoon hours.

Thunderstorms initially formed as single cells and supercells, but eventually organized into several broken lines, which moved from west to east across the area. Many of these storms produced wind damage to trees and power lines. In addition, some thunderstorms produced hail, which was reported in Delmar and the South End section of Albany.

June 24, 2013: The region remained in a warm and humid air mass as an upper level ridge remained just south and east across the western Atlantic Ocean. At the same time, a weak upper level disturbance passed by to the north across southern Canada. This upper level disturbance allowed showers and thunderstorms to develop across the region during the afternoon and early evening hours of Monday, June 24th. With a moist and unstable atmosphere in place, some of these storms became severe, with large hail and damaging wind gusts. Thunderstorms dissipated by later in the evening, as the disturbance moved east of the region and the atmosphere stabilized. Nickel size hail was reported to have fallen in Ravena during a thunderstorm.

May 22, 2014: A large supercell thunderstorm developed over the southern Adirondacks and eastern Mohawk Valley and it quickly strengthened. As this storm continued to strengthen even further, it moved south to southeast towards western parts of the Capital Region, where it produced a tornado. The tornado continued into northwestern Albany County after a long path across Schenectady County. The tornado produced damage to trees and a roof on Bozenkill Road before dissipating. Although the entire path of the tornado was nearly seven (7) miles, it was only on the ground in Albany County for about a half of a mile. The tornado reached EF3 strength with maximum winds of 140 MPH. Minor injuries were reported and an over turned tractor trailer on I-88 along the border of Albany and Schenectady County's closed portions of the highway, significantly impacting traffic in and out of Altamont and the surrounding towns. Quarter size hail was also reported in the Town of Knox on Bozenkill Road. **May 30, 2014:** The combination of an approaching cold front and potent upper level jet allowed for some thunderstorms to develop in the late afternoon and early evening hours on Friday, May 30th. A few of these thunderstorms became severe, producing hail to the size of quarters and wind damage to trees and power lines. Thunderstorm activity waned by later in the evening, as the front moved to the east of the region.

July 9, 2014: Despite being behind a cold front, the region remained in a warm and humid air mass. This allowed the atmosphere to become quite unstable. As yet another cold front approached the region during the afternoon hours, clusters of thunderstorms developed across eastern upstate New York. For the third day in a row, thunderstorms produced reports of wind damage across the region, with a few reports of large hail as well, as the storms moved from west to east. The threat for storms ended during the evening hours, as the cold front moved across the area and into New England.

July 27, 2014: A strong area of low pressure was situated over the Great Lakes region on Sunday, July 27th. An upper level shortwave, combined with an approaching warm front, allowed for strong to severe thunderstorms to break out during the afternoon hours on July 27th over the Capital Region. Hail up to half-dollar size was reported, as well as damage to trees and power lines due to gusty thunderstorm winds.

August 05, 2014: A warm and humid air mass was in place on Wednesday, August 5th. As a cold front approached from the west, clusters of thunderstorms developed during the afternoon hours.

Another slow moving thunderstorm produced locally heavy rainfall, gusty winds and hail in the immediate Capital District. As the thunderstorm drifted southward from Latham into Albany, it redeveloped over the same locations. As a result, nearly three (3) inches of rainfall fell in less than an hour's time. This caused significant flooding of urbanized areas around Latham and Albany, which caused many travel problems, as it occurred during the evening

rush hour. Several swift water rescues had to take place and many roads were closed due to high water.

Hail in various shapes and sizes was reported to have fallen in Buckingham Pond, Eagle Hill, Albany, and one (1) mile southeast of Boght Corners in Latham.

July 19, 2015: A very warm and humid air mass was in place over eastern Upstate New York on Sunday, July 19th with temperatures reaching over 90 degrees in many areas. The warm and humid conditions allowed the atmosphere to become quite unstable.

As a cold front approached from the eastern Great Lakes, clusters of thunderstorms developed over the region during the late afternoon and early evening hours and moved eastward. Many of these thunderstorms became severe, producing damaging wind gusts. A few of the storms also produced hail, with one storm moving from eastern Albany County into southwestern Rennselaer County producing hail as large as two (2) inches in diameter. This particular storm produced a significant amount of wind damage across eastern Albany County. About 1,000 customers lost power from this one storm alone.

Hail in ranging from penny size to egg size was reported in the Town of Bethlehem, the Cedar Hill hamlet of Bethlehem, Selkirk, at Exit 7 of the Adirondack Northway (Interstate 87) in Latham, and on Fairway Lane in Colonie.

August 03, 2015: A warm and humid air mass was in place on Monday, August 3rd. Ahead of a cold front, a surface pre-frontal trough was moving across the area during the afternoon hours from west to east. Showers and thunderstorms developed along this boundary and a few of the thunderstorms became severe, producing large hail and damaging winds, especially in the Capital Region. Penny size hail was reported during a thunderstorm in Cohoes.

September 03, 2015: An unusually hot and humid air mass was situated over eastern New York during the afternoon on Thursday, September 3rd. With temperatures in the upper 80s F, the atmosphere became quite unstable. With no large-scale weather systems close enough to produce widespread activity, thunderstorms were fairly isolated across the region. However, one of these thunderstorms became severe, as it moved southward out of Saratoga County into Albany County during the mid-afternoon hours. This thunderstorm produced heavy rainfall and gusty winds over the populated Capital Region, causing tree damage in the Colonie area. Some of these trees fell on cars and power lines, causing power outages across the region.

Hail ranging from dime to quarter size was reported during thunderstorms in Colonie and Latham.

July 15, 2016: A cold front was moving across the region on Friday, July 15th. Just ahead of this boundary, widely scattered showers and thunderstorms moved from the Mohawk Valley towards the Capital Region between the late afternoon and early evening hours. A few of these thunderstorms became strong enough to produce gusty winds and hail. Newspaper media reported up to two thousand customers were without power as a result of thunderstorms.

Quarter size hail was reported by a meteorologist on Lawson Lake Road in the Town of New Scotland.

March 01, 2017: A cold front passed through the region Wednesday, March 1st. Winds became strong and gusty behind the front Wednesday evening into Thursday. Widespread trees and power lines were down across the region as a result of the high winds. Wind gusts of 40 to 60 mph were common across the region. Some of the downed trees and power lines resulted in road closures and school closings. Power companies reported more than 35,000 people were without power for a period of time.

August 12, 2017: After widespread rain moved through overnight associated with a warm front, early clouds gave way to breaks of sun ahead of an approaching cold front and upper level disturbance on Saturday, August 12th. Dew points were in the mid to upper 60s throughout the region with strong wind shear in place aloft. The upper level disturbance and an approaching cold front served as main focus for severe weather.

A Severe Thunderstorm Watch was issued shortly before 3 PM that afternoon for much of eastern New York. Strong to severe thunderstorms developed and moved through the area during the afternoon and early evening hours. These storms results in multiple reports of trees and power lines down as well as hail. Hail up to 0.88 inches was reported by a meteorologist in Voorheesville.

October 30, 2017: A low pressure system developed off the southeast coast and rapidly intensified as it tracked northward tapping into tropical moisture. The powerful low moved across eastern New York Sunday night into early Monday morning bringing damaging winds, power outages, heavy rainfall and flooding to the region. Several river flood warnings were issued with mainly minor flooding as a result.

As the system departed the region, strong winds ensued, causing thousands of power outages across eastern New York. There were numerous reports of trees and wires down across the area. A 60 mph wind gust was measured near Albany at 2:44 PM. There were about 141,000 customers without power across Albany County.

The pressure at the Albany International Airport dropped to 28.82 inches as the low moved through. This sets a new record low pressure for the month of October.

Historical Cost and Damage Estimates

Albany County has experienced numerous types of damaging extreme wind events in the past including severe thunderstorms, tornadoes, hurricanes, tropical storms and nor'easters, not all of which are included in this hazard profile.

According to information provided from each participating municipality in the Hazard Event Description Worksheets, an estimated $54.8 million worth of damages has occurred in the County over the past decade due to severe thunderstorms alone. Additionally, reported damage from strong wind storms totaled $510,000 and from tornadoes totaled $800,000. These estimates only account for those storms in which the municipalities provided cost estimates of the damage; in reality, the total cost of damage over the past decade is at least several million dollars more than these numbers.

Future Potential Impacts

Extreme wind events will remain a very frequent occurrence in Albany County, and the probability of future occurrences in Albany County is certain. The entire planning area is susceptible to a wide variety of recurring events that cause extreme wind conditions including severe thunderstorms (most frequent), tornadoes, hurricanes, tropical storms and nor'easters.

Since 2000, there have been one hundred forty-seven (147) high wind events (50+ mph winds of any event type except tornadoes) in Albany County according to NOAA's NCDC storm event database. This reduces to almost ten (10) events per year (9.8), with data available only through December 2015.

Extreme winds are a probabilistic natural phenomenon: it is impossible to predict in what years windstorms will occur or how severe the winds will be. Wind hazards are often expressed in terms of wind frequencies or recurrence intervals, such as a 10-year wind or a 100-year wind. A "100-year wind" means that there is a 1% chance in any given year of a wind at the 100-year or higher wind speed. A 10-year wind means that there is a 10% chance in any given year of a wind at the 10-year or higher wind speed. Wind recurrence intervals don't mean that windstorms occur exactly at these intervals; rather, they express probabilities of winds. Thus, a given location may experience two (2) 100-year windstorms in a short time period or go several decades without experiencing a 10-year windstorm.

According to the 2014 New York State Hazard Mitigation Plan (NYSHMP) the probability of future wind events in Albany County is anticipated to be 306%. Extreme winds can occur during tornadoes, hurricanes, tropical cyclones, extra-tropical cyclones (northeasters), destructive wind, and thunderstorms, but can also occur in their absence as mere "windstorms". Extreme winds have a history of occurrence throughout Albany County, and are highly likely to occur in the future.

In addition to the anticipated probability for wind the 2014 NYSHMP identifies the probability of future hail events to impact all jurisdictions within Albany County to be 81%.

5.3 Hurricanes and Tropical Storms

Description

A hurricane is a severe tropical cyclone with winds that have reached a constant speed of 74 miles per hour or more. Hurricane winds blow in a large spiral around a relative calm center known as the "eye." The "eye" is generally twenty (20) to thirty (30) miles wide, and the system can extend outward from the eye by up to four hundred (400) miles. In the Northern Hemisphere, circulation is in a counterclockwise motion around the eye. These storms are usually short in duration but are extremely powerful and cause the greater amount of damage due to significant storm surges and high winds. If these systems have wind speeds of between 39 and 73 miles per hour, they are classified as tropical storms.

In the Atlantic basin, hurricanes and tropical storms are most likely to occur between June 1st and November 30th, with the peak number of events typically occurring between mid-August and late October.

Hazards Associated with Hurricane and Tropical Storm Events

Hazards associated with a hurricane or tropical storm event are: high winds, flooding (including storm surge), coastal erosion, and wave action. Each of the unique hazards associated with a hurricane and/or tropical storm event are summarized briefly below, and addressed specifically elsewhere in the plan. Hurricane and tropical storm events are discussed in the remainder of this section.

Winds: After making landfall, hurricane winds can remain at or above hurricane force well inland (sometimes more than 100 miles). In addition, hurricanes can also spawn tornadoes. Typically, the more intense a hurricane is, the greater the tornado threats. High winds are addressed separately in section 5.2 of this document.

Flooding: Upon making landfall, a hurricane rainfall can be as high as twenty (20) inches or more in a 24-hour period, with amounts in the ten (10) to fifteen (15) inch range being most common. If the storm is large and moving slowly, the rainfall amounts can be much higher. Heaviest rainfall tends to be along the coastline, but sometimes there is a secondary maximum further inland. Following a hurricane, inland streams and rivers can flood and trigger landslides. Flooding can also be caused when drainage system capacities are exceeded. Flooding is addressed separately in section 5.4 of this document.

Storm Surge: Even more dangerous than the high winds of a hurricane is the storm surge, a dome of ocean water that is basically pushed ashore by the hurricane winds. Hurricane storm surge can be as much as twenty (20) feet at its peak and fifty (50) to one hundred (100) miles

wide, depending on hurricane strength and depth of offshore waters. Generally, the stronger the hurricane and the shallower the offshore water depths, the higher the storm surge. Most hurricane fatalities and coastal damages are attributable to storm surge, as opposed to hurricane winds. Storm surge can cause the most damage when it occurs during high tides. Storm surge can come ashore as much as five (5) hours in advance of the time that a hurricane makes landfall.

Coastal Erosion: The currents created by the tide and storm surge, combined with wave action, can severely erode coastlines. Many buildings withstand hurricane force winds until their foundations, undermined by erosion, are weakened and fail.

Wave Action: Hurricanes and tropical storms are also associated with significant wave action, which can damage not only buildings but infrastructure and protective features along ocean shorelines.

Location and Extent

Most hurricanes that reach the New York State area are likely to become downgraded to tropical storms if they move any distance inland. Given its geographic position within the Hudson River Estuary and its exposure to ocean tides, Albany County is somewhat likely to experience the impacts of tropical systems, with the southeastern areas of the County at greater risk because of their more immediate proximity to the Atlantic coast. However, Albany County can still be affected even when the eye makes landfall near the coast. The hazards associated with hurricane and tropical storm events have distinct hazard area locations. For Albany County, these include wind and flood hazards.

The magnitude or severity of hurricanes is categorized by the Saffir-Simpson Scale. The Saffir-Simpson Scale is a five-category wind speed/storm surge classification scale used to classify Atlantic hurricane intensities. The scale is used to give an estimate of the potential property damage and flooding that can be expected. The Saffir-Simpson values range from Category 1 to Category 5, as shown in Table 5.3a. Wind speed is the determining factor in the scale, as storm surge values are highly dependent on the slope of the continental shelf in the landfall region.

Note that, for tropical storms (not represented on the scale), winds are between 39 and 73 miles per hour and typical effects include breakage of twigs and branches off tress, toppling of shallow-rooted trees, and some damage to signboards and windows.

Table 5.3a – Saffir-Simpson Hurricane Scale
(FEMA, 2008)

Category	Wind Speed (MPH)	Storm Surge (ft. above normal sea level)	Expected Damage	Damage Description	Photo Example
1	74-96	4-5 ft	Minimal	Damage is done primarily to shrubbery and trees, unanchored mobile homes are damaged, some signs are damaged, no real damage is done to structures	
2	96-110	6-8 ft	Moderate	Some trees are toppled, some roof coverings are damaged, and major damage is done to mobile homes.	
3	111-129	9-12 ft	Extensive	Large trees are toppled, some structural damage is done to roofs, mobile homes are destroyed, and structural damage is done to small homes and utility buildings.	
4	130-156	13-18 ft	Extreme	Extensive damage is done to roofs, windows, and doors; roof systems on small buildings completely fail; some curtain walls fail.	
5	157+ mph	18+ ft	Catastrophic	Roof damage is considerable and widespread, window and door damage is severe, there are extensive glass failures, and entire buildings could fail.	

The magnitude or severity of hurricane and tropical storm events will increase under the following conditions:

- as the storm category increases;
- as the diameter of the storm system increases;
- as the system's forward speed decreases;
- as rainfall amounts increase; and
- as the quantity of people, structures and infrastructure in the affected areas increases.

For the sake of clarity, it should also be noted that, for communities with mapped erosion, surge, or wave action zones, the magnitude or severity will also increase with increasing degree of erosion, surge and/or wave action. While waves are discussed in the state plan under flood hazard, damage-causing waves are considered a coastal phenomenon, and since Albany County is located more than thirty (30) miles from the nearest coastline it is not likely to be affected by wave action, they are not regarded as a hazard for the purposes of this plan.

Historical Occurrences

There have been no historical occurrences of hurricanes within Albany County. However, there is a potential for the County to be effected by hurricanes and tropical storms in the future. From January 2010 through May 2018 Albany County has been affected by two (2) tropical storm events as reported by the National Climatic Data Center (NCDC) at the National Oceanic and Atmospheric Administration (NOAA):

August 28, 2011: Tropical Storm Irene tracked north northeast across eastern New York and western New England during Sunday, August 28th, producing widespread flooding, and damaging winds across the region.

The greatest impact from Irene across eastern New York and western New England was heavy to extreme rainfall, which resulted in catastrophic flooding across portions of the region.

Four (4) deaths occurred due to flooding from Irene. In Albany County, a woman was washed into Onesquethaw Creek in the Hamlet of Clarksville and drowned. Strong winds also occurred across eastern New York, resulted in widespread long duration power outages; approximately 36,000 residents in Albany County. On August 31st, 2011 a Major Disaster Declaration was declared, FEMA-4020-DR. This declaration made Individual Assistance available to twenty-eight (28) counties in New York State including Albany County.

October 30, 2012: Hurricane Sandy moved northward off the eastern seaboard of the United States during the last week of October 2012. Due to a very strong blocking ridge of high pressure situated over the Atlantic Ocean, the storm turned back to the northwest and rapidly strengthened as it moved toward the mid-Atlantic coast. Although the storm began transitioning into non-tropical nor'easter storm, it remained an extremely powerful cyclone.

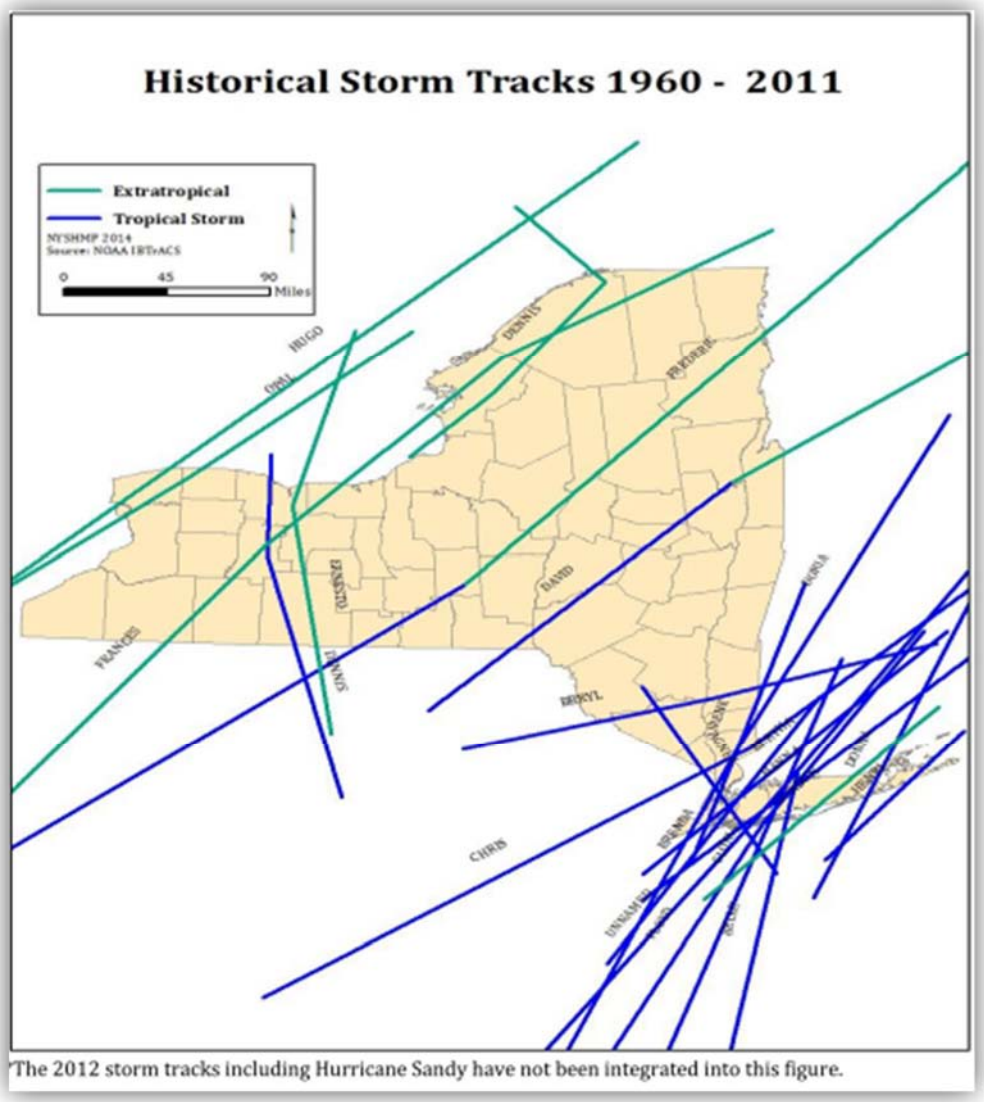
As the storm made landfall in southern New Jersey during the evening of October 29th, bands of rain moved across eastern New York. Strong and gusty winds in association with the storm caused damage to trees and power lines across the region. Although not quite as widespread as areas across southeastern New York and New Jersey, power outages occurred throughout the region, mainly across the higher terrain. It was also reported that utility National Grid had 8,000 customers without power in eastern New York at the height of the storm. Wind gusts of 40 to 60 mph were common from the afternoon of the 29th until the early morning hours of the 30th. Wind gusts reached 50 mph at the National Weather Service Forecast Office Albany.

These strong north to northeast winds caused very large waves of area lakes. ||In addition, the powerful storm caused a storm surge of water that moved up the Hudson River from the New York City area. Record flooding occurred on the Hudson River at Poughkeepsie as the river reached 9.54 feet. This surge of water moved all the way up to Albany. Flooding occurred along the Hudson River in Albany County, causing damage to homes and businesses located near the river. Tidal flooding occurred along the waterfront of the Hudson River in Coeymans. Yanni's Restaurant was flooded with 4 feet of water. The water peaked at 3:00 am EST in Coeymans. The Coeyman's Landing Marina had significant flooding. Tidal flooding on the Hudson River also flooded an onramp to Interstate 787 in Albany near the Corning Preserve Park.

Historical Cost and Damage Estimates

Hurricanes and tropical storms have impacted Albany County and its component jurisdictions in the past, and will continue to do so in the future. Albany County was significantly impacted by Hurricane Irene in 2011 and Tropical Storm Sandy in 2012 *(not illustrated in the following figure).*

Figure 5.3a – Historical Storm Tracks 1960-2011
(NYS DHSES, 2014)



Future Potential Impacts

Internet resources on NOAA's Atlantic Oceanographic and Meteorological Laboratory (AOML) website were researched to gain an understanding of the relative likelihood of Albany County being impacted by a coastal storm. The likeliness of future hurricanes to impact the County will continue to increase as climate change further impacts sea level rise.

5.4 Floods

Description

Floods are natural events for rivers and streams where excess water from snowmelt, rainfall, or storm surges accumulates and overflows onto the banks and adjacent floodplains of these waterbodies. Floodplains are lowland areas located adjacent to waterbodies that are subjected to recurring flood events.

Several factors determine the severity of floods, including intensity and duration of rainfall or other water sources. A large amount of rainfall over a short period can result in flash flood conditions. Even a small amount of precipitation can result in flood events in locations where the soil is already saturated or in areas with large amounts of impervious surfaces (i.e., large parking lots, roadways, developments, etc.). Topographic and cover type characteristics are also factors that contribute to the severity of flood events. Water runoff is greater in areas with steep slopes and little or no vegetative ground cover. Frequency of inundation depends on the climate, soil, and channel slope of a particular area.

Waterbody impoundment, such as dams, poses additional, man-made hazards. Failure of this infrastructure cascades into aforementioned flooding hazards for communities downgrade from the impoundment. In Albany County, there are one hundred five (105) dams according to NYSDEC. Of these, eleven (11) are categorized as “low hazard,” fourteen (14) as “intermediate hazard”, twelve (12) as “high hazard”, and five (5) are unclassified. More information on dams and other high impact facilities in the County can be found in Section 2.8.

Flash Flooding: Flash floods can develop very quickly, often in just a few minutes and without any visible signs of rain. Flash floods are known to have a high velocity of water that carries rocks, mud, and other debris with it and can sweep away most items in its path (FEMA, Flood, 2009). Flash flood damage tends to occur in areas immediately adjacent to a stream or arroyo (gulch that temporarily fills with water after a heavy rain), due to a combination of heavy rain, dam failure, levee failure, rapid snowmelt, and ice jams. Additionally, heavy rain falling on steep terrain can weaken soil and cause debris flow, damaging homes, roads, and property.

Mountains and steep hills produce rapid runoff and quick stream response. Rocks and clay soils do not allow much water to infiltrate the ground. Steep narrow valleys generate rapid flowing waters that can rise quickly to a considerable depth. Saturated soil also can lead rapidly to flash flooding. Other high risk areas include canyons, low water crossings, recent burn areas in mountains, and developed areas from pavement and roofs which concentrate rainfall runoff (NOAA, NWS, 2005).

National Flood Insurance Program: The Federal Emergency Management Agency (FEMA), which is the government entity that administers the National Flood Insurance Program (NFIP), has mapped the known floodplains within much of the United States. When a flood study is

completed for the NFIP, the information and maps are assembled into a Flood Insurance Study (FIS). A FIS compiles flood risk data for specific waters or hazard areas within specific communities and includes the main causes of flooding in these areas. The FIS delineates Special Flood Hazard Areas (SFHAs), designates flood risk zones, and establishes base flood elevations (BFEs) within certain areas. BFEs are based on the flood event that has a 1% chance of occurring annually, or the 100-year flood. At present, every individual municipality in Albany County is an active member of the NFIP (See Table 8.2a page 167).

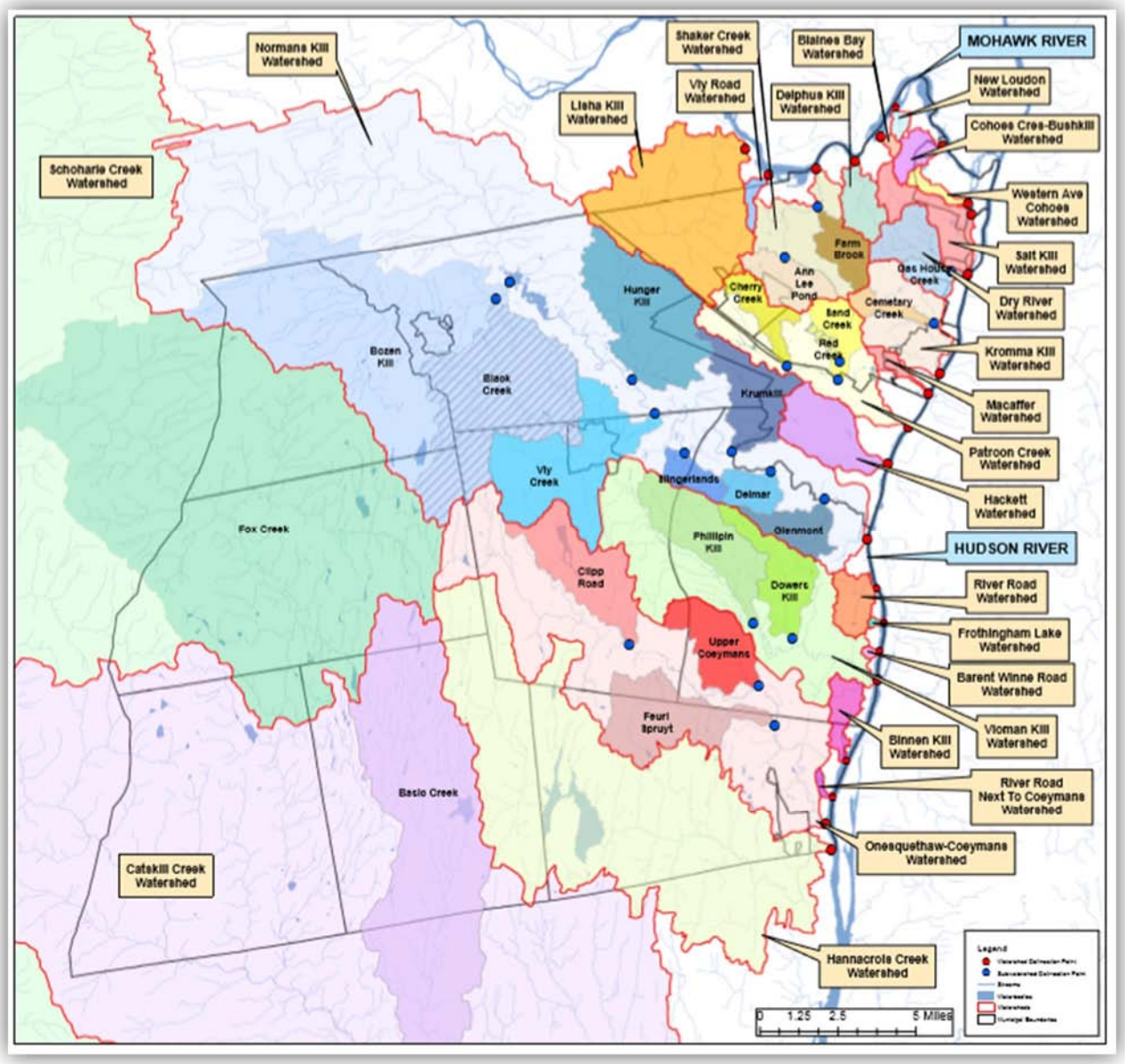
Special Flood Hazard Area: The Special Flood Hazard Area designates an area that is covered by the floodwaters of the base flood; that is, a flood that has on average a 1% chance of occurring in any given year. It is important to note that a base flood, also referred to as a 100-year flood, could occur during subsequent years or once every ten (10) years, not necessarily once every one hundred (100) years. The base flood is the standard that has been adopted for use in the NFIP. As indicated on Federal Insurance Rate Maps (FIRMs), base flood elevations (BFEs) indicate the elevation of surface water resulting from a flood that has a 1% chance of occurring in any given year. The BFE is the height of the base flood, normally in feet, relative to the geographic datum referenced in the FIS report (i.e., National Geodetic Vertical Datum (NGVD) of 1929, North American Vertical Datum (NAVD) of 1988, etc.)

Location and Extent

Albany County and its jurisdictions experience several types of flooding. Although Albany County is not located near the Atlantic Coast shoreline, the Hudson River is tidally influenced. The County is located within the Hudson Valley putting portions located along the Hudson River at higher risk of flooding than other parts of the County. Albany County has experienced flooding on many of the County's roadways. Flooding has also impacted County parks, sewer treatment facilities, and pump stations throughout.

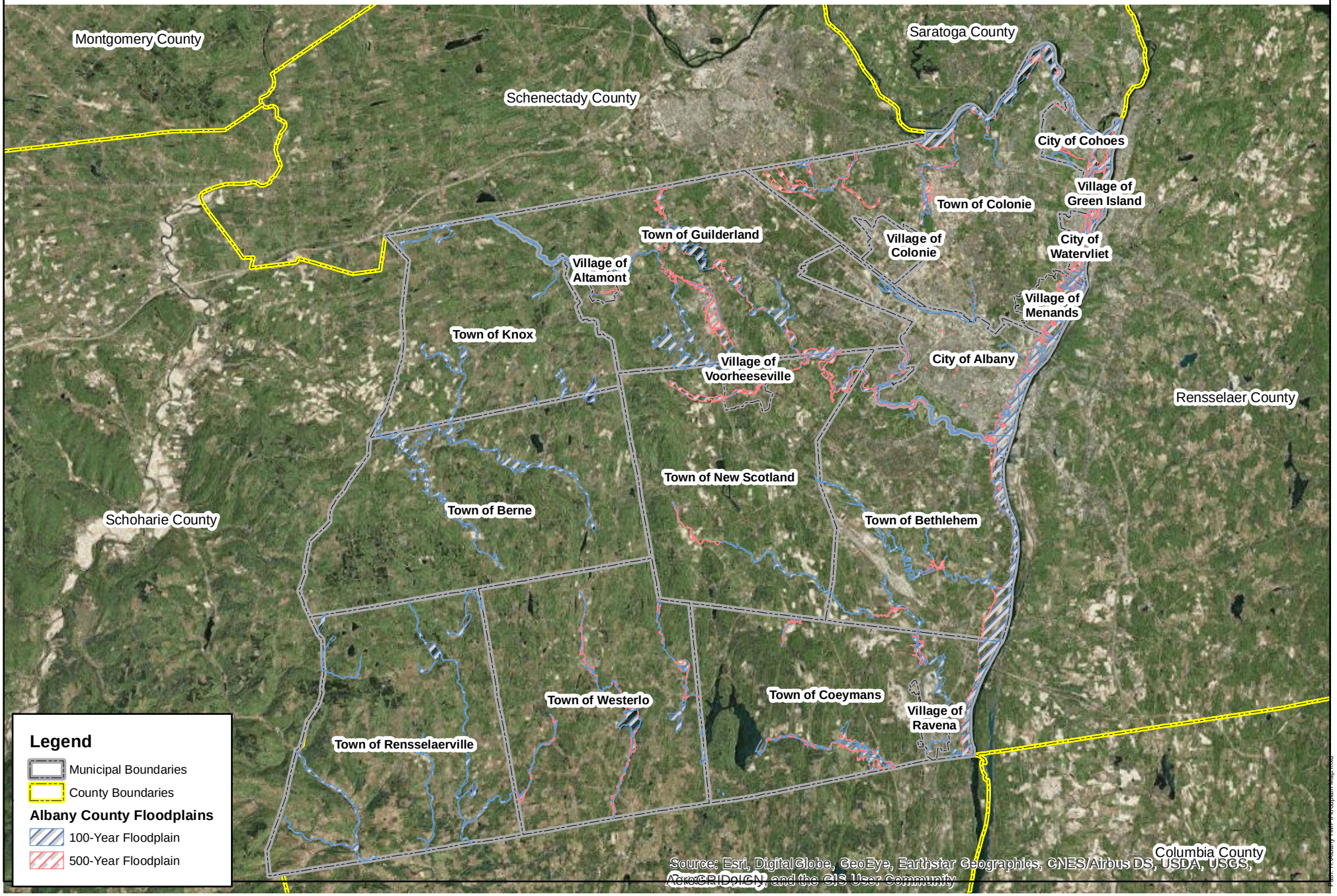
The County is comprised of twenty-five (25) major watersheds, which include the Normans Kills, Schoharie Creek, Catskill Creek, Hannacrios Creek, Lisha Kill, Vly Road, Shaker Creek, Delphus Kill, Blaines Bay, New Loudon, Cohoes Cres-Bushkill, Western Ave Cohoes, Salt Kill, Dry River, Kromma Kill, Macaffer, Patroon Creek, Hackett, River road, Frothingham Lake, Barent Winne Road, Vloman Kill, Binnen Kill, River Road Next to Coeymans, and the Onesquethaw-Coeymans. Seven (7) of these watershed drain to the Mohawk River located along a portion of the northern boundary of the County. The other seventeen (17) watersheds delineate to the Hudson River, which makes up the entire eastern boundary of the County. The Schoharie Creek watershed does not delineate to either the Hudson River or the Mohawk River. There are dozens of sub-watersheds located within these watersheds. Figure 5.4a provides a description of all the watersheds within each municipality within Albany County.

Figure 5.4a – Albany County Watersheds and Subwatersheds
(Stormwater Coalition of Albany County, 2016)



The extent of flooding associated with a 1% probability of occurrence – the "100-year flood" or "base flood" – is used as regulatory boundaries by a number of federal, state and local agencies. Also referred to as the "special flood hazard area", this boundary is a convenient tool for assessing vulnerability and risk in flood prone. FEMA's DFIRM data was used to identify the location of flood hazard areas in Albany County. According to the FIRM data, high/moderate flood risk zones exist in all Albany County Municipalities. Figure 5.4b on the following page illustrates the mapped flood risk using FEMA zone designations, which are explained in more detail in the following paragraph.

Figure 5.4b - Albany County Floodplain Map



1 inch = 23,333 feet

Hazard Mitigation Plan

Albany County Floodplain Map

Albany County July 2018 New York

Figure 5.4b

Project No. 923.008.001

The FEMA Flood Insurance Rate Map (FIRM) data uses advanced engineering and refined standards to improve data quality and is regarded as FEMA's most reliable flood hazard data.

FEMA's DFIRM mapping was overlaid upon the Albany County GIS Base Map to summarize the flood mapping and flood risk areas for all municipalities in Albany County, and the collated data is presented in Tables 5.4a and 5.4b.

In total only 5.9% of the County area lie within high flood risk zones and 0.54% of the County lies within a 500-year floodplain, or the moderate flood risk zone, according to FIRM data. The municipalities with the highest risk of flooding are the city of Cohoes, the Town/Village of Green Island, and the City of Watervliet.

The City of Cohoes has the highest proportion of its area within a high flood risk zone (82.22%), and the second highest proportion of its area located within the moderate risk zones (2.80%). The Town/Village of Green Island has 55.34% of its area covered by high flood risk, and 15.94% covered by moderate flood risk. The City of Watervliet has 22.52% of its area located within the high risk zone, and 15.07% located within the moderate risk zone.

According to the current flood mapping, all jurisdictions have some proportion of their land area located within a high flood risk zone. The town of Berne, Town of Knox, and the Town of Rensselaerville have no land area located within the moderate flood risk zone.

Table 5.4a – Summary of Land Areas in Flood Hazard Areas

(Albany County GIS data, 2016)

Municipality	Total Land (Acres)	High Flood Risk (Acres) A, AE, AH, AO	Moderate Flood Risk (Acres) X500	Low Flood Risk (Acres) X	Land in High Flood Risk A, AE, AH, AO	Land in Moderate Flood Risk X500
Albany, City of	13967.89	1,442.20	220.11	12,305.61	10.33%	1.58%
Berne, Town of	41,425.96	1,454.77	0.00	39,971.21	3.51%	0.00%
Bethlehem, Town of	31,704.30	2,778.40	163.65	28,762.26	6.66%	0.52%
Coeymans, Town of (includes Ravena, Village)	33,944.52	3,357.95	173.33	30,413.25	9.89%	0.51%
Cohoes, City of	2,704.49	2,223.73	75.73	2,147.99	82.22%	2.80%
Colonie, Town of *(includes Colonie & Menands, Village)*	36,983.08	2,791.40	381.31	33,810.36	4.55%	1.03%
Green Island, Town/Village of	587.93	325.38	93.70	0.00	55.34%	15.94%
Guilderland, Town of *(includes Altamont, Village)*	37,540.31	3,375.40	366.10	33,967.70	8.99%	0.98%
Knox, Town of	26,818.10	451.85	0.00	26,366.23	1.68	0.00%
New Scotland, Town of *(includes Voorheesville, Village)*	37,350.91	1,491.34	88.50	35,771.04	3.99%	0.24%
Rensselaerville, Town of	39,566.35	1,024.28	0.00	38,542.11	2.59%	0.00%
Watervliet, City of	949.03	213.72	143.02	0.00	22.52%	15.07%
Westerlo, Town of	38,397.62	1,939.96	126.91	36,923.01	5.05%	0.33%
Albany County Total	**340,991.51**	**20178.43**	**1,832.41**	**318,980.78**	**5.92%**	**0.54%**

Table 5.4b – Summary of Total Values in Flood Hazard Areas
(FEMA DFIRM Data, Albany County Real Property, 2016)

Municipality	Total Value in High Flood Risk Areas Zones A, AE, AH, AO		Total Value in Moderate Flood Risk Areas Zone X500		Total Value in Low Flood Risk Areas Zone X	
	$	%	$	%	$	%
Albany, City of	$1,011,599,788	7.57%	$506,782,090	3.79%	$11,848,142,435	88.64%
Altamont, Village of	$24,441,330	14.97%	$19,907,765	12.19%	$118,896,947	72.84%
Berne, Town of	$40,067,460	15.99%	-	-	$210,439,886	84.01%
Bethlehem, Town of	$348,109,151	6.73%	$241,603,135	4.66%	$4,585,839,124	88.61%
Coeymans, Town of	$327,509,190	16.49%	$173,436,285	8.73%	$1,485,406,348	74.78%
Cohoes, City of	$100,691,695	13.43%	$73,589,863	9.81%	$575,515,948	76.76%
Colonie, Town of (includes village of Colonie)	$1,051,665,451	13.92%	$319,980,685	4.24%	$6,181,657,597	81.84%
Green Island, Town/Village of	$141,768,901	36.73%	$146,625,306	38.04%	$97,236,971	25.23%
Guilderland, Town of	$134,178,476	3.70%	$93,449,176	2.58%	$3,394,746,202	93.72%
Knox, Town of	$15,346,723	9.67%	-	-	$143,315,520	90.33%
Menands, Village of	$84,253,749	13.17%	$92,566,983	14.47%	$462,689,921	72.35%
New Scotland, Town of	$50,662,149	6.45%	$3,476,837	0.44%	$731,234,465	93.11%
Ravena, Village of	$11,145,172	2.91%	-	-	$372,113,016	97.09%
Rensselaerville, Town of	$26,302,266	13.18%	-	-	$173,278,870	86.82%
Voorheesville, Village of	$24,018,060	7.41%	$26,129,860	8.06%	$274,131,480	84.54%
Watervliet, City of	$517,324,100	30.94%	$345,790,800	20.68%	$808,889,856	48.38%
Westerlo, Town of	$586,160	9.92%	$348,905	5.90%	$4,975,946	84.18%
Albany County Total	**$3,909,669,821**	**10.44%**	**$2,074,974,690**	**5.54%**	**$31,468,510,432**	**84.02%**

Historical Occurrences

Floods have occurred in Albany County's communities in the past, and will continue to do so in the future. Albany County and its component municipalities have generally been impacted when heavy rain events overwhelm the existing Stormwater infrastructure. To illustrate the flooding history of Albany County in terms of damage to private property over the last three decades can be derived from the recorded flood losses and payments data from the NFIP. This data is presented in Section 8.0, along with the total number of current policies and the total coverage values. At the time of composing this Draft Report, none of the municipalities in Albany County were eligible for participation in FEMA's Community Rating System (CRS). FEMA's CRS allows municipalities implementing and enforcing floodplain management measures above and beyond the NFIP minimum requirements are rewarded with discounted flood insurance premiums.

Tables 8.2a (page 167) and 8.2b (page 168) show that Albany County NFIP insured flood losses have totaled just over $4,013,096 since 1978, or over $105,608 per year. This figure experienced a significant jump since the 2007 Albany County Hazard Mitigation Plan, when the average annual NFIP payment to Albany County was approximately $61,675. Actual property flood losses community-wide are likely to be higher, since this value only includes NFIP claims for which payments were made and does not include losses incurred on properties the owners of which do not participate in the NFIP, losses for which a claim was not submitted, or losses for which payment on a claim was denied.

The average NFIP payment for the County overall was approximately $12,235 per individual loss. Over 50% of all NFIP losses in Albany County (in terms of total losses) have occurred in three (3) municipalities – the Town of Colonie, the City of Albany, and the Town of Bethlehem. The highest average payment per loss in any single municipality is in the Town of Colonie, where payments have been over $15,000 per loss. Of the eighteen (18) municipalities participating in the NFIP, the Town of Knox is the only jurisdiction who has not experienced any flood damage resulting in NFIP payments.

Repetitive Losses:

FEMA defines a Repetitive Loss (RL) property as any insurable building for which two (2) or more claims of more than $1,000 were paid by the NFIP within any rolling 10-year period, since 1978. A repetitive loss property may or may not be currently insured by the NFIP.

Flood Disaster Declarations:

The New York State Emergency Management Office reports Albany County as having been affected by one (1) Presidential Disaster Declarations specifically due to flooding or due to weather events which are recorded as having caused serious flooding. Table 5.4c summarizes the occurrence and causes of these disaster declarations, including which form of post-disaster assistance received after the declaration.

Through the Public Assistance (PA) Program, FEMA provides supplemental Federal disaster grant assistance for debris removal, emergency protective measures, and the repair, replacement, or restoration of disaster-damaged, publicly owned facilities and the facilities of certain Private Non-Profit (PNP) organizations. The Individual Assistance (IA) Program provides money or direct assistance to individuals, families and businesses in an area whose property has been damaged or destroyed and whose losses are not covered by insurance. It is meant to assist with critical expenses that cannot be covered in other ways, rather than to restore damaged property to its condition before the disaster.

Table 5.4c - Flood Related Disaster Declarations Affecting Albany County 2000-2017
(FEMA)

Number	Date	Incident Description	Total Public Assistance Received	Total Individual Assistance Received
1692	4/24/2007	Severe Storms and Inland and Coastal Flooding	$83,756,675	$1,209,623

The FEMA Disaster Declarations database recorded one (1) major flood-related disaster declaration in Albany County from January 2000 to December 2017 (Table 5.4c). FEMA administrated $83 million in funds through the PA program for those who were affected by this flood event. The IA program administered $1 million in assistance for the same event. The April 2007 event affected portions of Albany County and surrounding areas as well. The NCDC database reports fourteen (14) flood occurrences from January 2007 to December 2017 (Table 5.4d). These events caused a combined $145,000 in damages within the County. Some events that caused significant flooding have been described in the hurricane and tropical storms and nor'easter hazard profiles.

Table 5.4d - Flood Occurrences in Albany County 2007-2017
(NCDC)

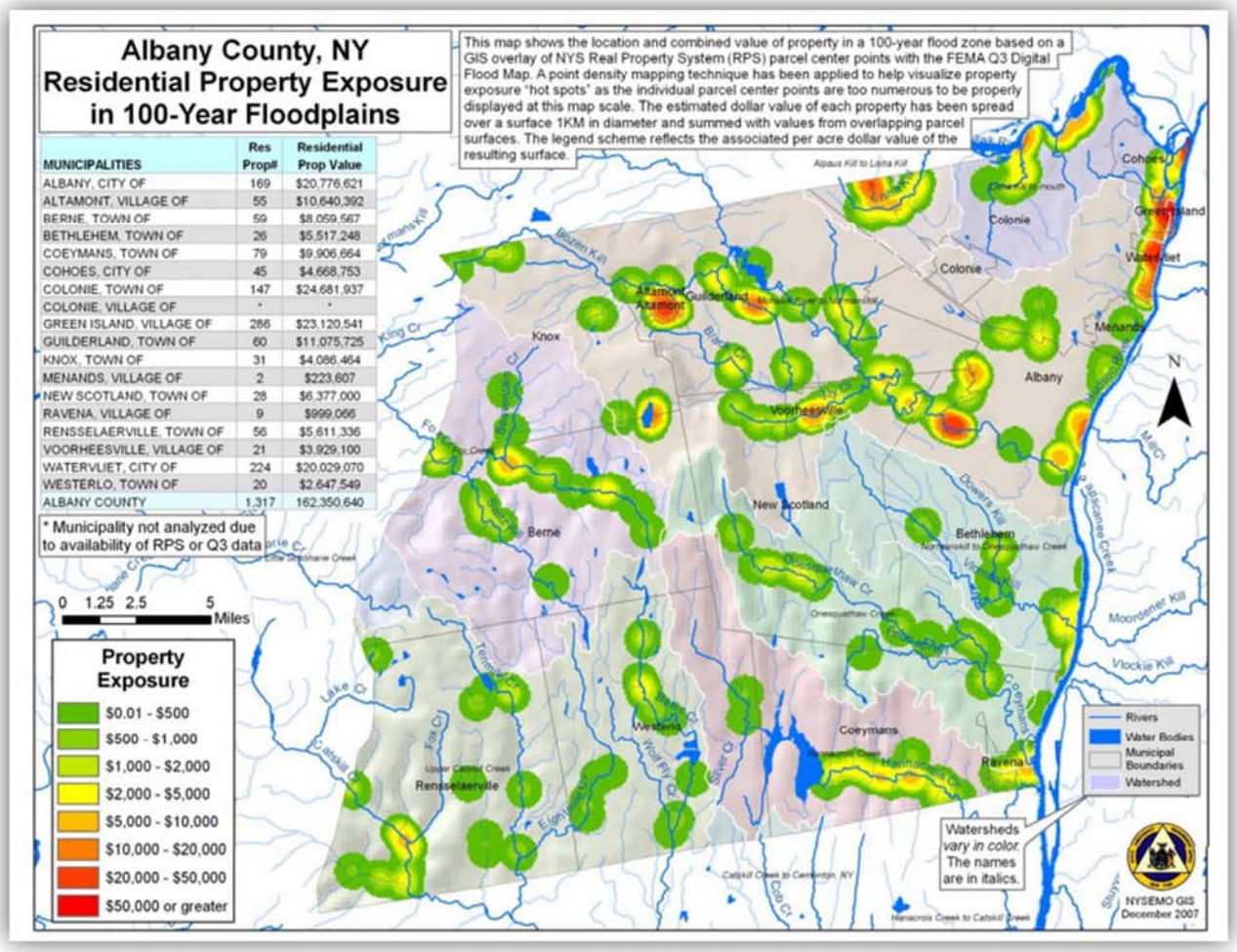
Event #	Location	Date	Reported Property Damage
20949	Cohoes	3/16/2007	-
26734	Coeymans	4/16/2007	-
88867	Colonie	3/5/2008	$100,000
260381	Bethlehem	9/30/2010	$15,000
264678	Colonie	10/1/2010	$30,000
293723	Menands	3/11/2011	-
293679	Colonie	3/12/2011	-
344760	Colonie	8/28/2011	-
346401	Colonie	8/29/2011	-
350123	Coeymans	9/6/2011	-
350141	Berne	9/7/2011	-
350130	Menands	9/7/2011	-
597943	Colonie	9/30/2015	-
615140	Bethlehem	2/24/2016	-

Future Potential Impacts

The probability of an occurrence of a flood at a given location is expressed in percentages as the chance of a flood of a specific magnitude occurring in any given year. The probability of a flood occurrence is expressed as the percent likelihood of a flood of a certain magnitude to occur in any given year. For example, the “100-year flood” has a 1% chance of occurring in any given year. The 100-year flood is often also referred to as the “base flood”. The probability of occurrence might imply that a 100-year flood would occur only once every 100 years. In reality, this is not the case; a 100-year flood can happen multiple times in a single year, or not at all in more than one hundred (100) years. Properties located in FEMA-mapped A- and V-Zones are within the footprint of the 100-year floodplain. FEMA A Zones represent the 100-year floodplain.

For all floodplains, there is an associated water surface elevation. This elevation is unique to any given location on the map (in other words, 100-year flood levels vary from one community to the next throughout Albany County, and also within individual communities). Figure 5.4c depicts residential property exposure in the 100-year floodplain across communities in Albany County.

Figure 5.4c – Albany County, NY Residential Property Exposure in 100-year Floodplains
(NYS DHSES, 2007)

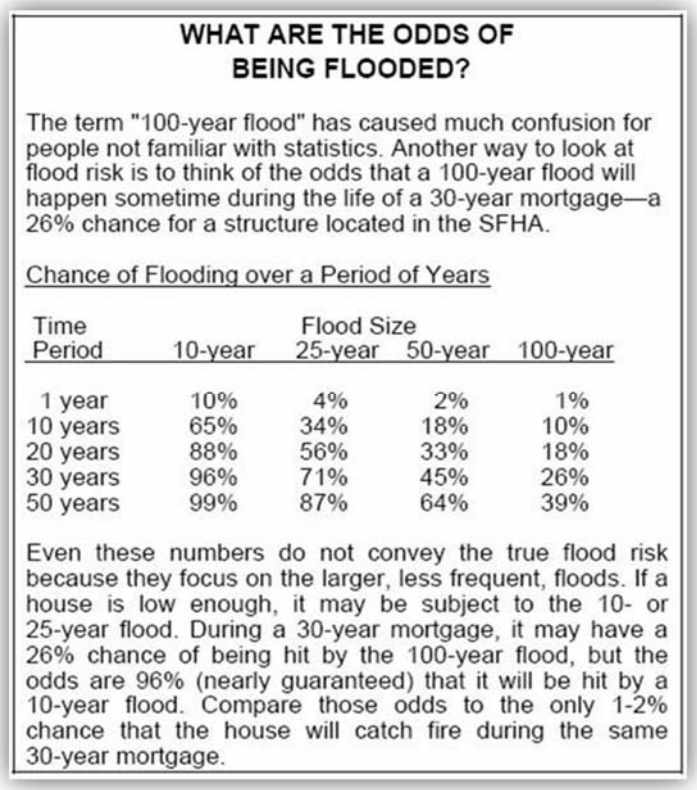


Within the 100-year floodplain, flooding can occur at less than the 100-year flood level, and also more than the 100-year flood level. The 100-year flood represents a flood of high magnitude – it is a deep and widespread event. The 500-year flood is of a greater magnitude, and would be deeper and more widespread than a 100-year event. However, it is not as likely to occur. Smaller floods, with magnitudes of 10-years or 50-years for example, are also possible within the 100-year floodplain. These are not as deep or as widespread as a 100-year flood would be, however, they are much more likely to occur.

The term "100-year flood" can often be confusing to someone not intimately familiar with flooding or statistics. FEMA's *NFIP Floodplain Management Requirements: a Study Guide and Desk Reference for Local Officials* (FEMA-480), suggests that another way to look at flood risk is to think of the odds that a 100-year flood will happen sometime during the life of a 30-year mortgage of a home in the floodplain. Figure 5.4d illustrates these odds, over various time

periods for different size floods. In any given year, a property in the 100-year floodplain has a 10% chance of being flooded by a 10-year flood, and a 1% chance of being flooded by a 100-year flood. While it may seem insignificant, over a 30–year period, that same location has a 96% chance of being flooded by a 10-year flood and a 26% chance of being flooded by a 100-year flood.

Figure 5.4d – The Odds of Being Flooded *(NFIP, FEMA-430, 2004)*



WHAT ARE THE ODDS OF BEING FLOODED?

The term "100-year flood" has caused much confusion for people not familiar with statistics. Another way to look at flood risk is to think of the odds that a 100-year flood will happen sometime during the life of a 30-year mortgage—a 26% chance for a structure located in the SFHA.

Chance of Flooding over a Period of Years

Time Period	Flood Size 10-year	25-year	50-year	100-year
1 year	10%	4%	2%	1%
10 years	65%	34%	18%	10%
20 years	88%	56%	33%	18%
30 years	96%	71%	45%	26%
50 years	99%	87%	64%	39%

Even these numbers do not convey the true flood risk because they focus on the larger, less frequent, floods. If a house is low enough, it may be subject to the 10- or 25-year flood. During a 30-year mortgage, it may have a 26% chance of being hit by the 100-year flood, but the odds are 96% (nearly guaranteed) that it will be hit by a 10-year flood. Compare those odds to the only 1-2% chance that the house will catch fire during the same 30-year mortgage.

5.5 Drought

Description

A drought is a prolonged period of time with little or no rain – particularly during the planting and growing season in agricultural areas. Limited winter precipitation accompanied by moderately long periods during the spring and summer months can also lead to drought conditions (2014 NYS HMP). An absolute drought consists of a period of at least fifteen (15) consecutive days where none of the days experience 0.01 inches of rain or greater. A partial drought is a period of at least twenty (20) consecutive days where the mean daily rainfall does not exceed 0.01 inches. A dry spell consists of a period of at least fifteen (15) consecutive days where none of the days experience 0.04 inches or more of rainfall (USGS, 2009).

Four (4) types of drought are generally recognized by the climatological community (NOAA, NCDC, 2016):

1. **Meteorological drought:** occurs when dry weather patterns dominate the area;
2. **Hydrological drought:** occurs when low water supply becomes evident, especially in streams, reservoirs, and groundwater levels, usually after many months of meteorological drought;
3. **Agricultural drought:** occurs when crops become affected; and
4. **Socioeconomic drought:** relates the supply and demand of various commodities to drought.

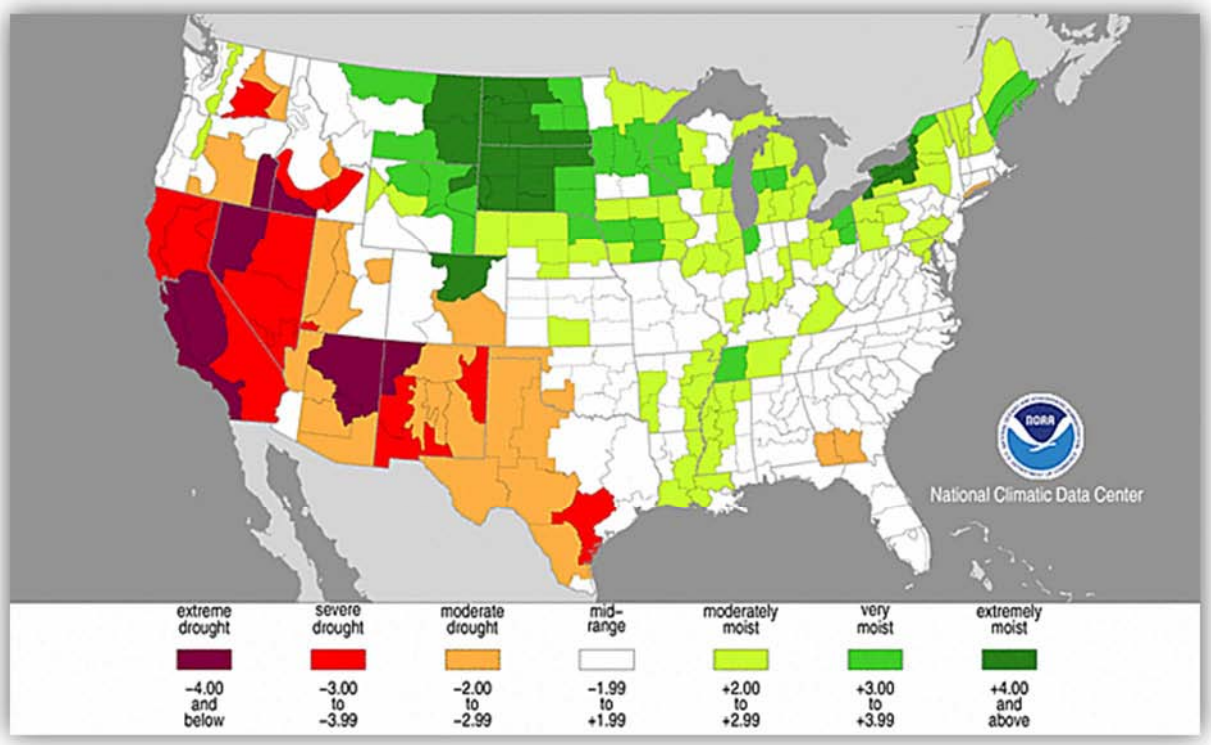
Drought is often referred to as a "creeping disaster" in which its exact onset and end are often difficult to pinpoint until long after the event has passed (NOAA, NCDC, 2016).

Location and Extent

Droughts occur in all parts of the country and at any time of year, depending on temperature and precipitation over time. Arid regions are more susceptible to long-term or extreme drought conditions, while other areas (including Albany County) tend to be more susceptible to short-term, less severe droughts.

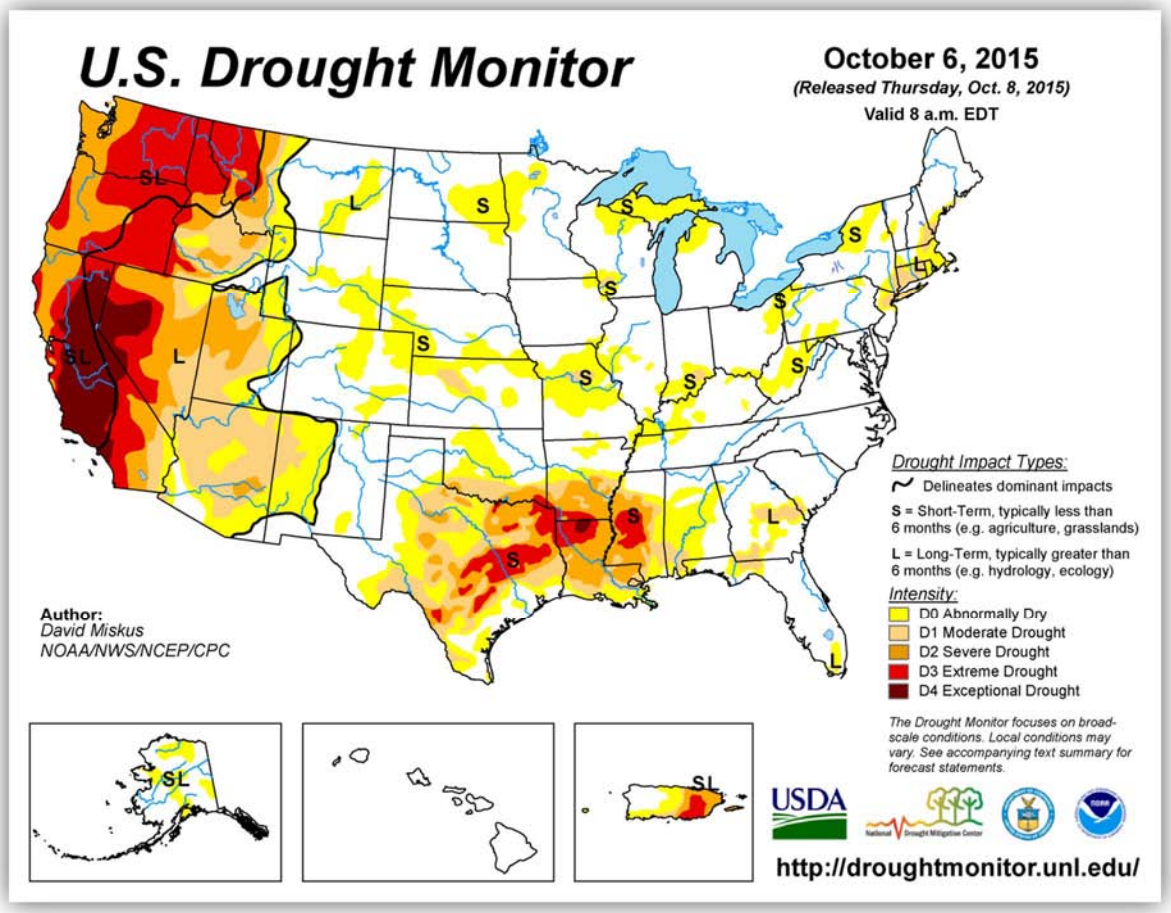
The Palmer Drought Severity Index (PDSI) attempts to measure the duration and intensity of the long-term drought-inducing circulation patterns. Long-term drought is cumulative, so the intensity of drought during the current month is dependent on the current weather patterns plus the cumulative patterns of previous months. Since weather patterns can change almost overnight from a long-term drought pattern to a long-term wet pattern, the PDSI can respond fairly rapidly. The following map depicts the PDSI in August 2014, indicating that Albany County is in the "mid-range" or "moderately moist" range of drought vs. moist conditions.

Figure 5.5a – Palmer Drought Severity Index, August 2014
(NCDC, 2015)



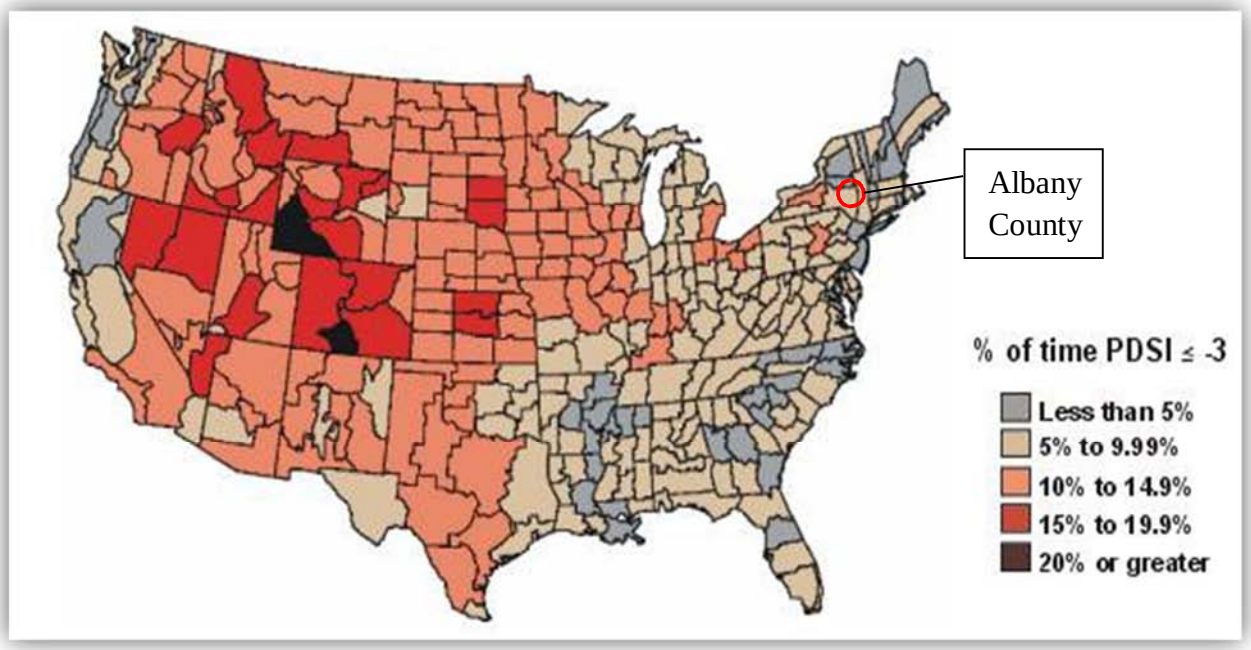
The U.S. Drought Monitor graphic as of October 6, 2015 shows that drought conditions in Albany County are of "normal dryness" (Figure 5.5b).

Figure 5.5b – U.S. Drought Monitor, October 6 2015
(NOAA, NWS, 2015)



To illustrate long term trends, Figure 5.5c on the following page shows the Palmer Drought Severity Index (PDSI) Summary Map for the United States from 1895 to 1995. PDSI drought classifications are based on observed drought conditions and will range from -0.5 (incipient dry spell) to -4.0 (extreme drought). According to the PDSI map, Albany County is in a zone that experienced severe drought conditions less than 5% of the 100-year period during 1895 to 1995, meaning that severe drought conditions are a low risk for Albany County. However, short term droughts of less severity are more common and may occur several times in a decade.

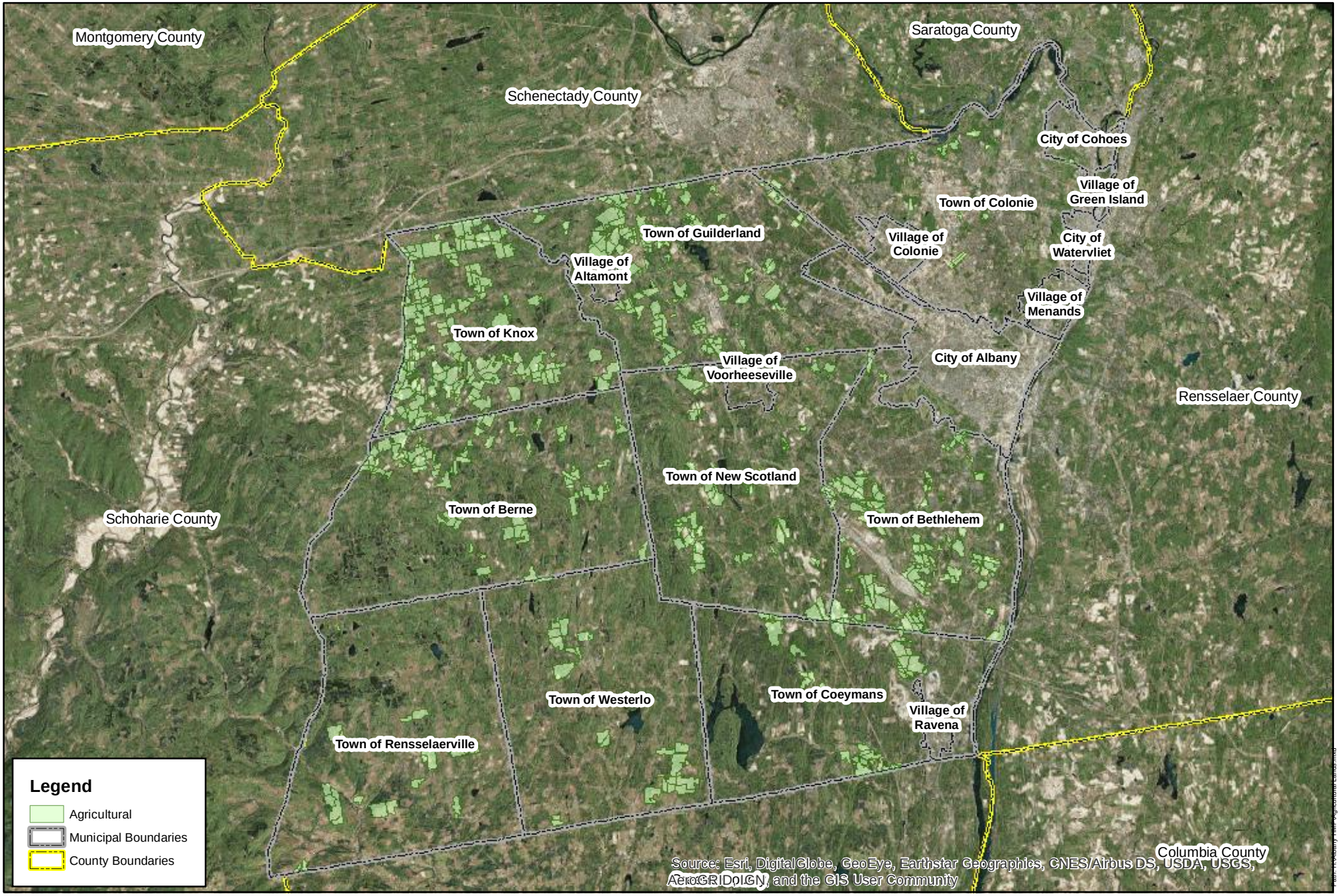
Figure 5.5c – Palmer Drought Severity Index (PDSI) Summary Map for the United States



While the extent of drought impacts for Albany County may include all of the issues listed above, some of the most immediately quantifiable effects of drought in the County are likely to be experienced by farmers, who can suffer heavy financial losses due to crop damage or loss. Figure 5.5d shows the extent, location and distribution of agricultural land across Albany County, and Table 5.5a presents a breakdown of agricultural land by municipality, based on the Albany County GIS land use data. It is evident from the figures that a significant proportion of the municipal areas in the northwest portion of the County are devoted to agriculture in some form.

According to the USDA Census of Agriculture of 2012, there are four hundred ninety-four (494) farms in Albany County, with a market production value of more than $45,957,000. About 68% of this value is accounted by crop sales, with livestock and poultry products accounting for about 32%. The County's four hundred ninety-four (494) farms occupy approximately 30,900 acres (9% of the County area).

Figure 5.5d - Albany County Agricultural Lands



1 inch = 23,333 feet

Hazard Mitigation Plan

Albany County Agricultural Lands

Albany County July 2018 New York

Figure 5.5d

Project No. 923.008.001

Table 5.5a – Distribution of Agricultural Land in Albany County
(Albany County GIS, 2016)

Municipality	Total Area (Acres)	Total Agricultural Land (Acres)	Total Agricultural Land %
Albany, City of	13,967.89	0	0%
Berne, Town of	41,425.96	3,709.27	8.95%
Bethlehem, Town of	31,704.30	4,800.41	15.14%
Coeymans, Town of (includes Village of Ravena)	33,944.52	1,943.28	5.72%
Cohoes, City of	2,704.49	41.96	0.11%
Colonie, Town of (includes Village of Colonie & Village of Menands)	36,983.08	494.1	1.34%
Green Island, Town/Village of	587.93	0	0%
Guilderland, Town of (includes Village of Altamont)	37,540.31	5,317.08	14.16%
Knox, Town of	26,818.10	8,441.28	31.48%
New Scotland, Town of (includes Village of Voorheesville)	37,350.91	2,385.12	6.39%
Rensselaerville, Town of	39,566.35	0	0%
Watervliet, City of	949.03	0	0%
Westerlo, Town of	38,397.62	2,011.08	5.24%
Albany, County of	340,991.51	30,954.39	9.08%

Figure 5.5d, Table 5.5a, and Table 2.5b (page 16) indicate that the impact of drought would be experienced most significantly for crop farmers predominately located in the northwest portion of the County. The Town of Knox and the Town of Guilderland have 31.48% and 14.16% of the land being used for agricultural purposes. The Town of Bethlehem has 15.14% of their land being used for agriculture. These figures put these three (3) municipalities at the highest risk in the event of a drought because they are reliant on rain for their farms.

Historical Occurrences

Historical occurrences of drought in Albany County have been identified using the NOAA NCDC database. The NCDC database records the following significant drought events which specifically list Albany County as an affected area since January 1999, the point at which NCDN drought record begin for Albany County:

> **April 1 - 30, 1999:** April 1999 was officially the second driest April on record in Albany and the driest of this century. Only 0.60 inches of rain fell at the Albany International Airport and only 0.56 inches at the N.W.S. office located on the University at Albany (SUNY) Campus. Rainfall amounts were a little bit higher to the south of Albany, but still fell well short of

normal. The combination of low rainfall, along with frequent gusty winds, turned the underbrush into very dry tinder.

August 1 – 31, 1999: August 1999 was the peak of the long term drought across Eastern New York that began in July of 1998. The fourteen (14) month stretch, ending in August, saw rainfall and melted snowfall throughout the region only tallying up to about 80% of normal. At the Albany International Airport 35.41 inches of water equivalent was recorded from July 1998 through August 1999, compared to the thirty (30) year normal of 42.82 inches. The long term drought combined with the heat of the summer, resulted in a drought warning across much of the region as well as a declaration of agricultural disaster. Most communities implemented voluntary or mandatory water restrictions.

May 1 – 12, 2001: After heavy rains ended on April 9th, an extended dry spell settled in across portions of eastern New York and adjacent New England. Between April 10th and May 11th, only 0.07 inches of rain fell at Albany International Airport. This was the driest thirty-one (31) days in over fifty-six (56) years.

Since there had been a lot of precipitation prior to the dry spell, the ground water levels did not become low enough for this dry spell to develop into a full drought. During the dry spell, numerous brush fires were noted. Scattered showers and thunderstorms brought some relief to the area on the afternoon of May 12th. More substantial rains reversed the dry trend region-wide during the last ten (10) days of May.

Future Potential Impacts

Based on NCDC records, Albany County has directly experienced three (3) significant droughts during the twenty (20) year period from 1995 through 2015 for which the NCDC keeps detailed records. This is consistent with Figures 5.5a (page 105) and 5.5b (page 106) illustrate that Albany County is less prone to drought conditions than other parts of the country. However, Albany County may experience an increase in the frequency of drought conditions in the foreseeable future if some of the current predictions regarding climate change prove to be accurate.

5.6 Landslides

Description

Landslides are defined as the downward and outward movement of slope-forming materials reacting to the force of gravity. Slide materials may be composed of natural rock, soil, artificial fill, or combinations of these materials. Landslide is a general term that can include rock falls, rockslides, creep, block glides, debris slides, earth-flow, and slump. During a landslide event, masses of rock, earth, or debris move down a slope. These events vary is speed of occurrence and how large of an area is impacted.

Landslides are activated by storms, earthquakes, volcanic eruptions, fires, alternate freezing or thawing, and steepening of slopes by erosion or human modification. Landslide problems can be caused by land mismanagement, especially in mountainous and coastal regions. In areas with high landslide potential, land-use zoning, professional inspections, and proper design can minimize many landslide, mudflow, and debris flow problems.

Location and Extent

Areas that are commonly considered to be safe from landslides include areas that have not experienced landslides in the past, areas of minimal slope, and areas set back from the tops of slopes. Conversely, areas that are commonly considered to be more prone to landslides tend to be areas where a landslide has occurred in the past, bases of steep slopes or drainage channels, and developed hillsides where leach field septic systems are used.

The potential for landslides exists across the whole of New York State, although according to USGS and NYGS the vast majority of the state (80%) has a low susceptibility to landslide hazard. Landslide hazard mapping has been completed for New York State. In general the highest potential for landslides can be found along major rivers and lake valleys that were formerly occupied by glacial lakes resulting in glacial lake deposits (glacial lake clays) and usually associated with steeper slopes, such as the Hudson River valley. USGS landslide susceptibility mapping uses three (3) basic classifications to communicate the risk, in conjunction with three (3) further classifications to communicate the combinations of susceptibility and incidence:

- High incidence (Greater than 15 % of the area involved)
- Moderate incidence (1.5% - 15% of the area involved)
- Low incidence (Less than 1.5% of the area involved)
- High susceptibility/moderate incidence
- High susceptibility/low incidence
- Moderate susceptibility/low incidence

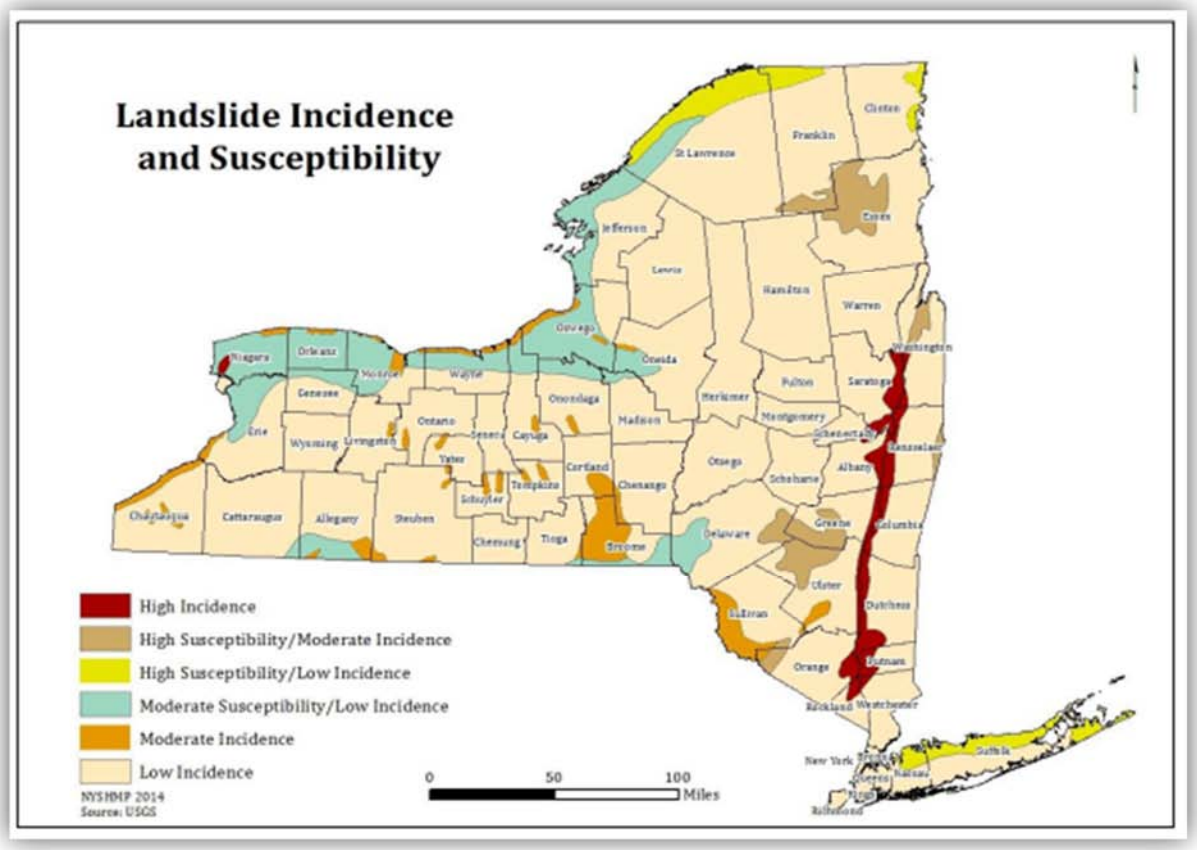
The USGS provides the following supporting narrative for the landslide hazard classifications:

“Susceptibility not indicated where same or lower than incidence. Susceptibility to land sliding was defined as the probably degree of response of [the areal] rocks and soils to natural or artificial cutting or loading of slopes, or to anomalously high precipitation. High, moderate, and low susceptibility are delimited by the same percentages used in classifying the incidence of land sliding. Some generalization was necessary at this scale, and several small areas of high incidence and susceptibility were slightly exaggerated.”

USGS landslide susceptibility mapping for NYS is presented in Figure 5.6a. The map shows that there is one (1) main area in the County which may be considered to have a significant

landslide risk. The portion of the County that is located within the Hudson Valley, along the Hudson River. This area is noted as being "High Incidence" for landslides. The 2014 DHSES HMP identifies that 197,010 residents live in the area of high incidence and susceptibility. The municipalities most at risk for landslides are the City of Cohoes, City of Watervliet, City of Albany, Village of Menands, Town of Bethlehem, Town of Coeymans, and the Town/Village of Green Island.

Figure 5.6a – Landslide Incidence and Susceptibility in NYS
(USGS, NYS DHSES 2014)



The severity of a landslide depends in large part on the degree of development in the area in which it occurs and the geographic area of slide itself. Generally speaking, landslides often result in devastating consequences, but only in localized areas. A landslide occurring in an undeveloped area would be less severe because lives and property would not be affected; the only impacts would be to land, vegetation, and possibly some wildlife. On the contrary, a landslide occurring in a developed area could have devastating effects, ranging from structure and infrastructure damage to injury and/or loss of life. Structures or infrastructure built on susceptible land would likely collapse as their footings slide downhill, while those below the

land failure would likely be crushed. Landslides in the area of roadways could have the potential to fall and damage or destroy vehicles, and force other drivers to have accidents.

Figures 5.6b and 5.6c identify the locations of individual landslide events that have been recorded by the New York State Geological survey by County from 1960 – 2012 and their estimated damage totals. Albany County has had two (2) landslide events, amounting to $510,000 to $1,000,000 in damage.

Figure 5.6b – NYS Landslide Events by County 1960-2012
(NYS DHSES, 2014)

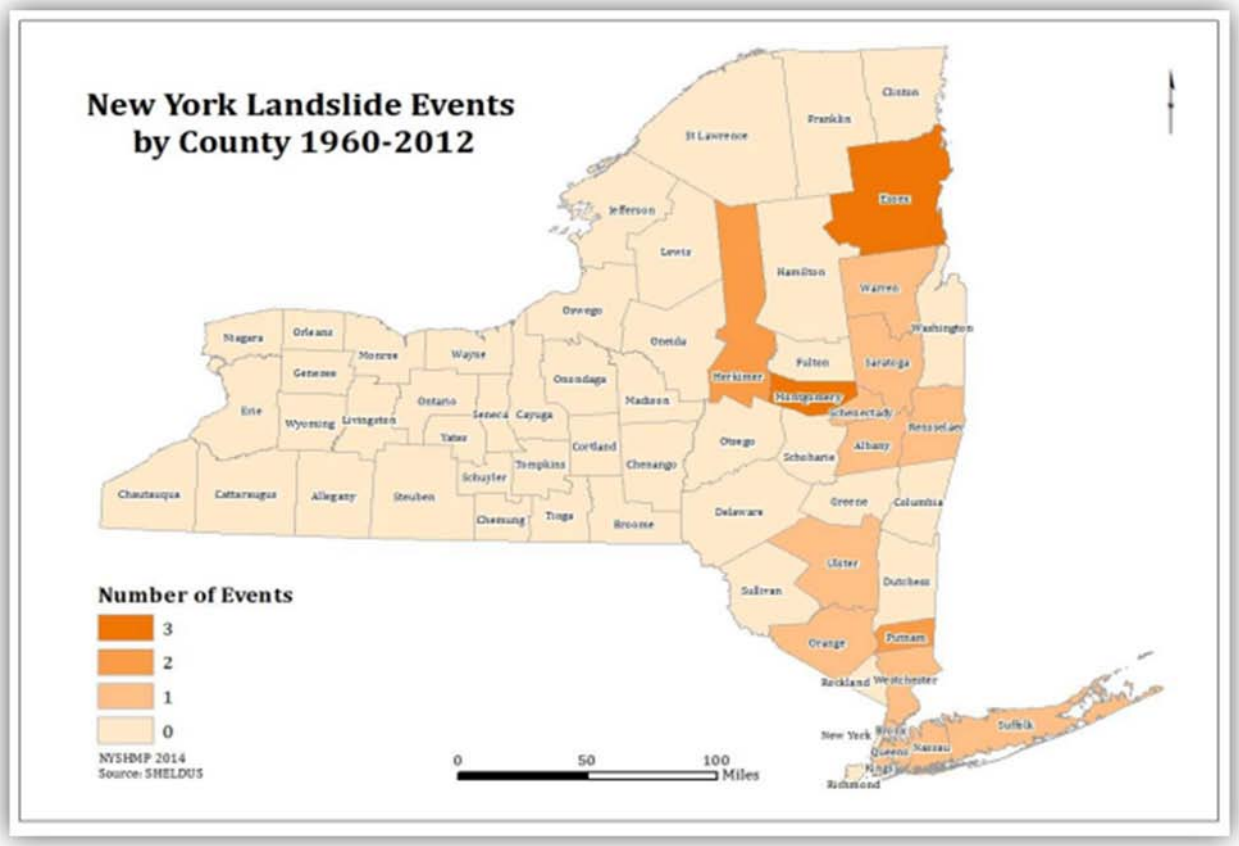
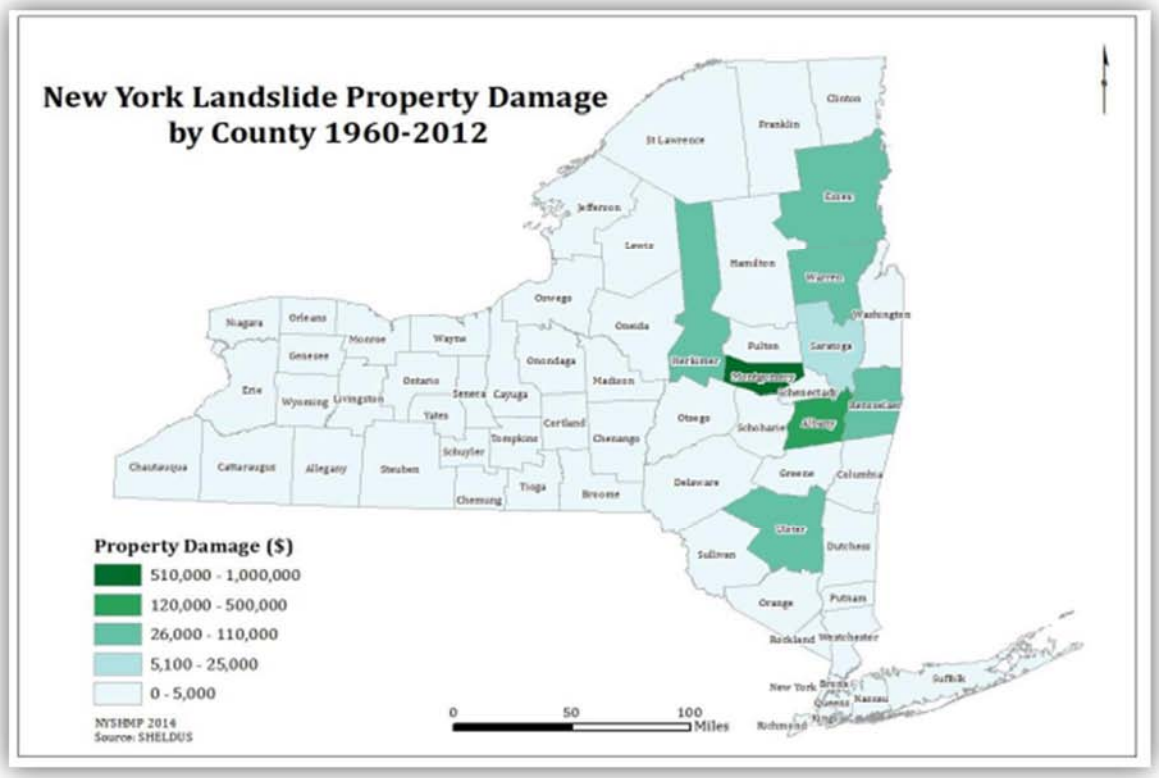


Figure 5.6c – NYS Landslide Property Damage by County 1960-2012
(NYS DHSES, 2014)



Historical Occurrences

The New York State Geological Survey records a total of three hundred twenty-nine (329) significant landslide events that have occurred in New York State between 1837 and 2007. According to the NYS DHSES 2014 HMP there has been one (1) landslide event in Albany County. However, according to recent data from local knowledge via the Times Union, there was one additional landslide that occurred in 2015. The Plan also identifies Albany County as the fourth most susceptible county for landslides in the State and has been placed in a "moderately high" risk ranking category.

NYS DHSES 2014 HMP and the Spatial Hazard Events & Losses Database for the U.S. (SHELDUS) has identified one (1) landslide event occurring in Albany County from 1960 to 2012. No Presidential Disaster Declarations for Landslide Events have been declared for Albany County from 1594 to 2013.

> **April 19, 2015:** Late Sunday evening a section of slope near the Normanside Country Club in the Town of Bethlehem gave way and began to block a section of the Normanskill Creek. Reports say the blockage was more than two (2) football fields in length. The blocked section of the golf course affected both the Normanside County Club in the Town of Bethlehem and

the Capital Hills Golf Course in the City of Albany. Cracking sounds of shifting earth could still be heard well into the following day. A state of emergency was declared on the County level as waters were no longer able to drain normally into the creek. The incident caused no deaths of injuries, $500,000 in damages were reported (Times Union, 2015). The onset of the slide was sudden and unexpected due to this the speed and intensity was not able to be measured.

Historical Cost and Damage Estimates

Although portions of Albany County are located within an area with high probability of a landslide event occurring this hazard has been ranked by the County as a medium likelihood of occurrence with medium consequences. Landslide events are most common on vacant properties. Localized areas are most often damaged by landslide events, which do not result in extensive damage to existing infrastructure. The need to collect more detailed data on annual occurrences and damages that result from landslide events has been identified.

Future Potential Impacts

While it is certainly possible for landslides to occur within Albany County, the 2014 NYS HMP has calculated that there is a 2% probability of landslides in the future for Albany County. While the overall probability of future occurrence is assumed to be low for most of the County, there are significant portions (including highly developed areas) of the City of Albany, Town of Coeymans, Town of Bethlehem, Village of Menands, City of Watervliet, Town/Village of Green Island, and the City of Cohoes. Based on overall landslide susceptibility and the number of historic events, Albany County is ranked in the New York State Plan as the fourth most threatened by landslides out of the sixty-two (62) counties in the state (2014 NYS HMP). Neighboring Rensselaer County has been ranked as the jurisdiction most threatened by landslides.

5.7 Earthquakes

Description

An earthquake is a sudden motion or trembling that is caused by a release of strain accumulated within or along the edge of Earth's tectonic plates. The effects of an earthquake can be felt at distances beyond its actual occurrence, though the effects are less severe as the distance increases. Earthquakes often occur without warning and can quickly cause extensive damage and extensive casualties. Common effects of earthquakes include ground shaking, surface fault ruptures, and tectonic deformation (NYS DHSES HMP, 2014).

The U.S. Geological Society describes and defines a list of hazards resulting from earthquakes. These are as follows:

- **Surface Faulting:** Displacement that reaches the earth's surface during slip along a fault. Commonly occurs with shallow earthquakes, those with an epicenter less than twenty (20) kilometers
- **Ground Motion (Shaking):** The movement of the earth's surface from earthquakes or explosions. Ground motion or shaking is produced by waves that are generated by sudden slip on a fault or sudden pressure at the explosive source and travel through the earth and along its surface
- **Landslide:** A movement of surface material down a slope
- **Liquefaction:** A process by which water-saturated sediment temporarily loses strength and acts as a fluid, like when you wiggle your toes in the wet sand near the water at the beach. This effect can be caused by earthquake shaking
- **Tectonic Deformation:** A change in the original shape of a material due to stress and strain
- **Tsunami:** A sea wave of local or distant origin that results from large-scale seafloor displacements associated with large earthquakes, major submarine slides, or exploding volcanic islands
- **Seiche:** The sloshing of a closed body of water from earthquake shaking (USGS, 2012)

As noted in the 2014 NYS HMP, earthquake intensity and classification are commonly measured using two (2) different scales, the Maximum Modified Mercalli Intensity Scale (MMI) and the Richter Magnitude Scale (often shortened to Richter scale). The MMI Scale estimates the shaking strength of an earthquake at a specific location, such as the epicenter, or over a specific area by considering its effects on people, objects, and buildings. The strength reduces as the distance from the epicenter increases. The Richter scale uses whole numbers and decimal fractions to quantify the energy released during an earthquake. This determination is based on logarithms from the amplitude of waves recorded by seismographs. Table 5.7a provides ranking and classification definitions for the two (2) scales.

Table 5.7a – Modified Mercalli scale v Richter scale
(NYS DHSES, 2016)

Modified Mercalli Scale vs. Richter Scale

Category	Effects	Richter Scale (approximate)
I. Instrumental	Not felt	1-2
II. Just perceptible	Felt by only a few people, especially on upper floors of tall buildings	3
III. Slight	Felt by people lying down, seated on a hard surface, or in the upper stories of tall buildings	3.5
IV. Perceptible	Felt indoors by many, by few outside; dishes and windows rattle	4
V. Rather strong	Generally felt by everyone; sleeping people may be awakened	4.5
VI. Strong	Trees sway, chandeliers swing, bells ring, some damage from falling objects	5
VII. Very strong	General alarm; walls and plaster crack	5.5
VIII. Destructive	Felt in moving vehicles; chimneys collapse; poorly constructed buildings seriously damaged	6
IX. Ruinous	Some houses collapse; pipes break	6.5
X. Disastrous	Obvious ground cracks; railroad tracks bent; some landslides on steep hillsides	7
XI. Very disastrous	Few buildings survive; bridges damaged or destroyed; all services interrupted (electrical, water, sewage, railroad); severe landslides	7.5
XII. Catastrophic	Total destruction; objects thrown into the air; river courses and topography altered	8

Source: http://www.sms-tsunami-warning.com/pages/mercalli-scale

Location and Extent

Earthquakes are possible within any of Albany County's communities. Figures 5.7a and 5.7b show the earthquake hazard maps for the conterminous United States and also New York State, which are prepared by the USGS Earthquake Hazards Program. It shows that the earthquake hazard in New York State is low relative to other parts of the country (for example the west coast of the USA), but the possibility for noticeable earthquakes does exist in the State.

Figure 5.7a – US 2014 Earthquake Hazard Map (PGA, 2% in 50 years)
(USGS, 2016)

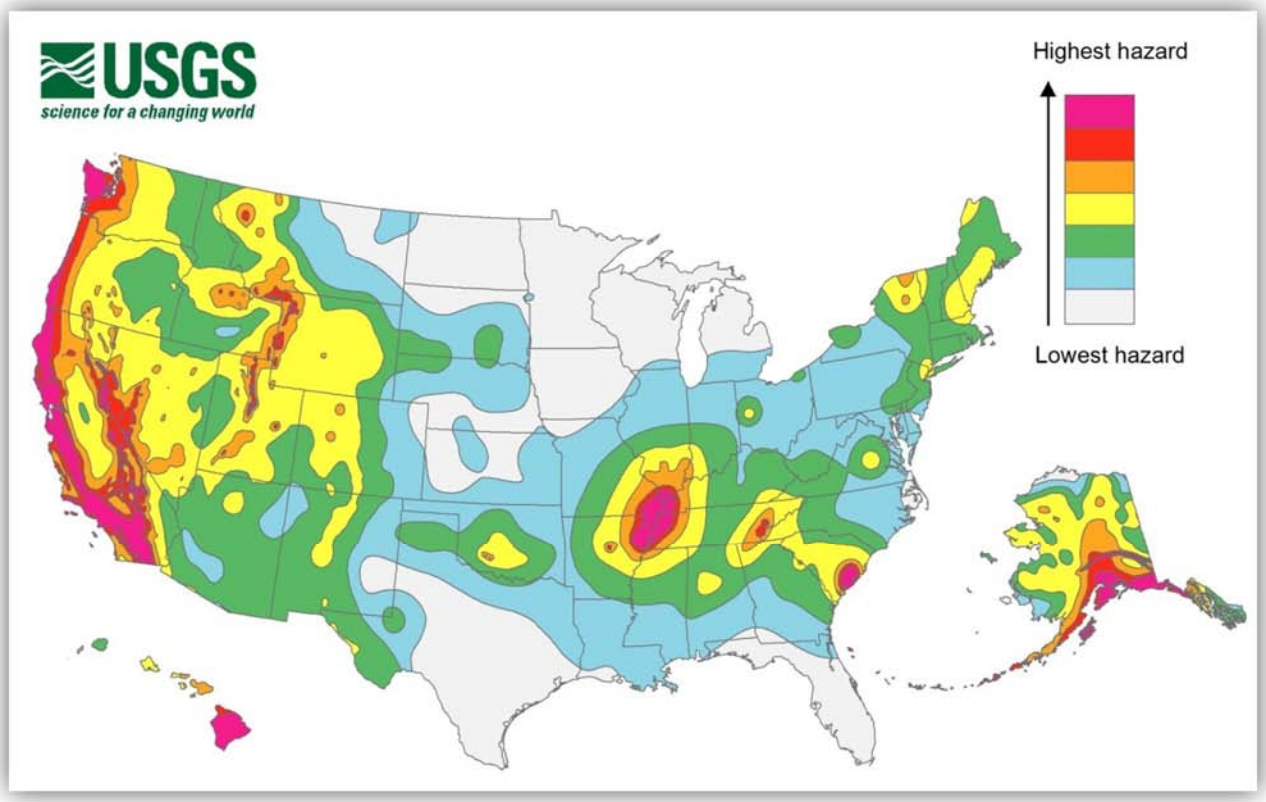
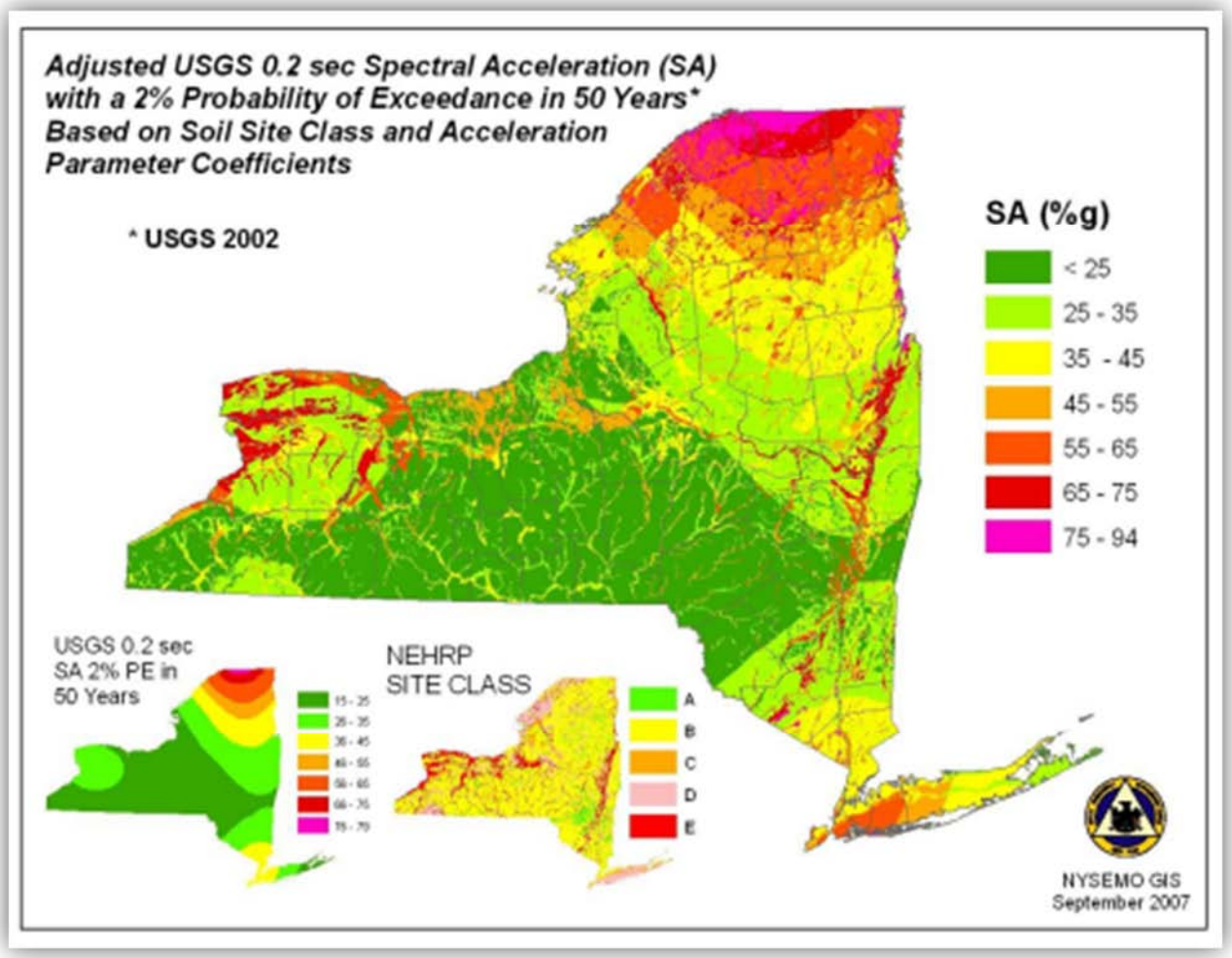


Figure 5.7b – NYS 2002 Earthquake Hazard Map (SA 2% in 50 years)
(USGS, NYS DHSES, 2002)



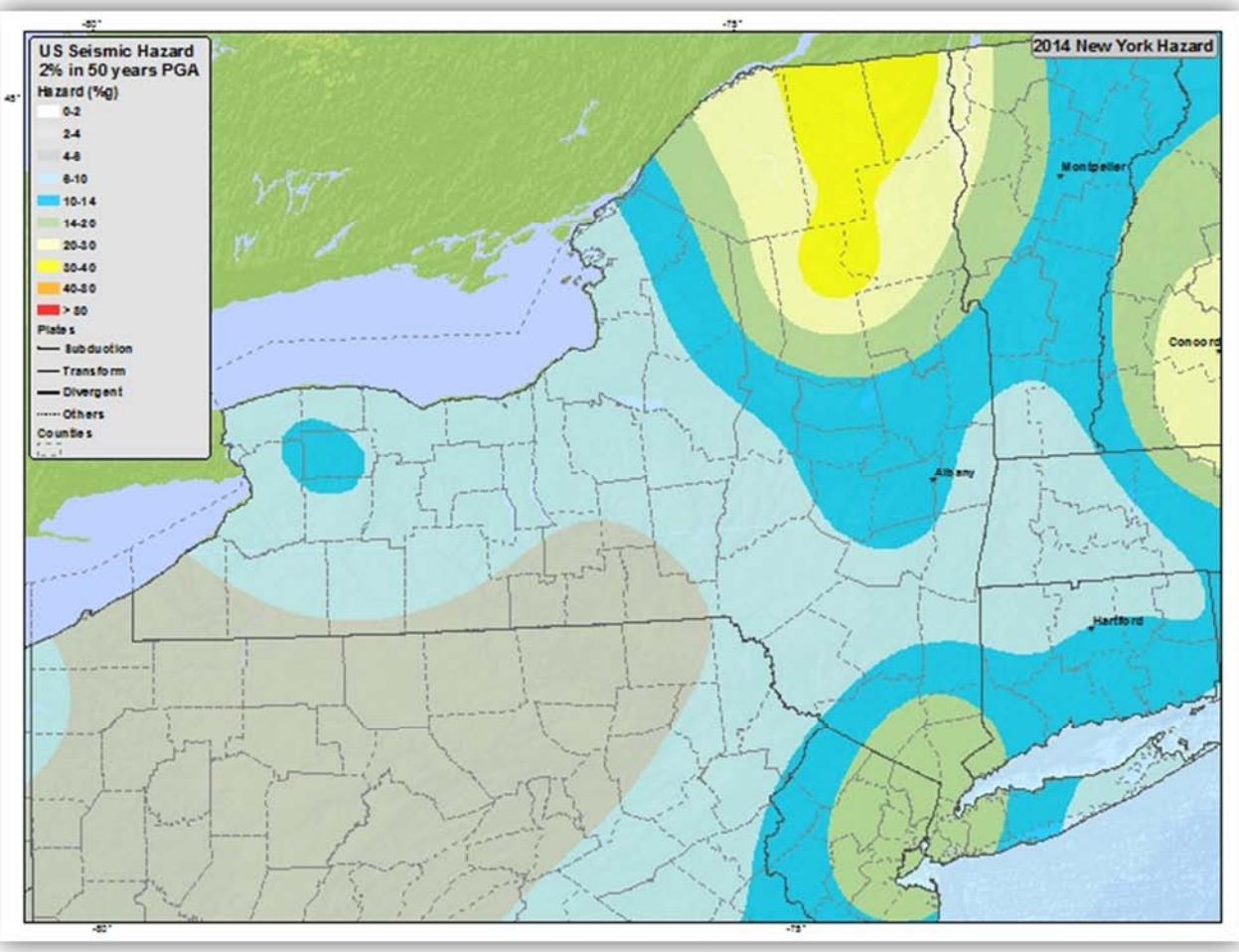
Earthquake prediction in Albany County is challenging because unlike most earthquakes, which occur on the plate boundaries (approximately 98% according to The Geological Society), these earthquakes are called “interplate,” meaning that they occur in the interior of a tectonic plate. The causes of intraplate earthquakes are not fully understood making their occurrence and effects challenging to predict.

The severity of an earthquake at a given location depends on the amount of energy released at the epicenter, and the location’s distance from the epicenter. The terms “magnitude” and “intensity” are terms used to describe the severity of an earthquake. An earthquake’s “magnitude” is a measurement of the total amount of energy released while its “intensity” is a measure of the effects of an earthquake at a particular place.

Another way to express an earthquake's severity is to compare its acceleration to the normal acceleration due to gravity. Earthquake hazard maps – sometimes referred to as "PGA maps" – are used as a tool to project the likelihood of a various intensity quake being exceed at a certain location over a given period of time. Peak Ground Acceleration (PGA) measures the rate of change in motion of the earth's surface and expresses it as a percent of the established rate of acceleration due to gravity (9.8 m/sec^2).

Figure 5.7c shows that, for Albany County, PGA values of between 2 and 4%-g have a 10% chance of being exceeded over fifty (50) years. All of Albany County has some degree of exposure to the earthquake hazard.

Figure 5.7c – PGA % Seismic Hazard Map
(USGS 2014 Seismic Hazard Map, NYS DHSES)



An approximate relationship between PGA, magnitude, and intensity is shown in Table 5.7b below. Using Table 5.7b, one can approximate that, for an earthquake of expected severity for the majority of Albany County (PGA values of 2 to 4%-g), perceived shaking would be light to moderate (depending upon the distance from the epicenter) and potential damage could range from none to very light (also depending upon the distance from the epicenter).

Table 5.7b – Modified Mercalli Intensity (MMI) and PGA Equivalents
(USGS 2013, NYS DHSES, 2014)

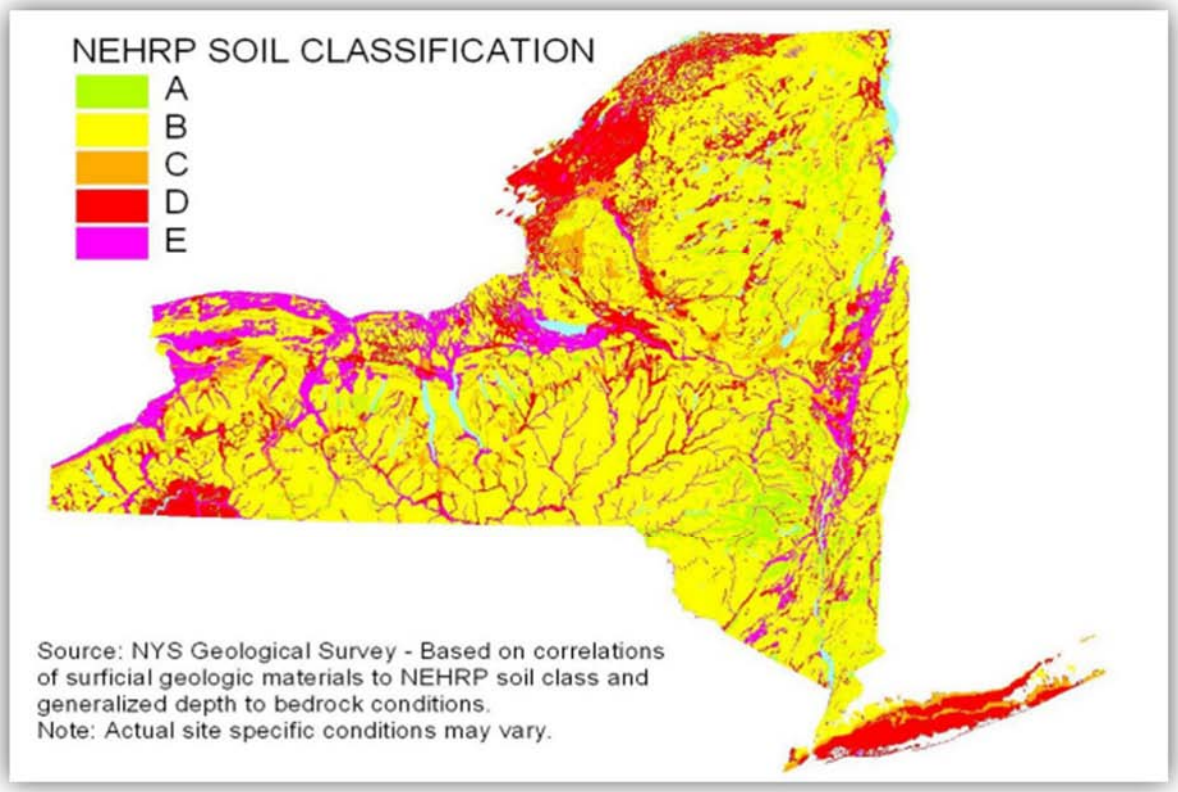
MMI	Acceleration (%g)(PGA)	Perceived Shaking	Potential Damage
I	<.17	Not Felt	None
II	.17 – 1.4	Weak	None
III	.17 – 1.4	Weak	None
IV	1.4 – 3.9	Light	None
V	3.9 – 9.2	Moderate	Very Light
VI	9.2 – 18	Strong	Light
VII	18 – 34	Very Strong	Moderate
VIII	34 – 65	Severe	Moderate to Heavy
IX	65 – 124	Violent	Heavy
X	>124	Extreme	Very Heavy
XI	>124	Extreme	Very Heavy
XII	>124	Extreme	Very Heavy

An earthquake with a 10% chance of exceedance over fifty (50) years in Albany County would have a PGA of 3 to 4%-g and an intensity ranging from only IV to V, which would result in light to moderate perceived shaking, and damages ranging from none to very light. For comparison purposes, an earthquake of Intensity IV on the Modified Mercalli Scale would most likely cause vibrations similar to heavy trucks driving over roads, or the sensation of a jolt. Hanging objects would swing; standing cars would rock; windows, dishes and doors would rattle; and, in the upper ranges of Intensity IV, wooden walls and frames would creak. An earthquake of Intensity V on the Modified Mercalli Scale would be felt outdoors, awaken sleepers, disturb or spill liquids, displace small unstable objects, swing doors, and cause shutters and pictures to move.

As noted in the 2014 New York State Hazard Mitigation Plan, soil type can have an impact on the severity of an earthquake at a given location. For example, soft soils (i.e., fill, sand) are more likely to amplify ground motion during an earthquake. Liquefaction is also more likely to occur in areas of soft soils. In contrast, harder soils (i.e., granite) tend to reduce ground motion during an earthquake. Figure 5.7d was developed by the National Earthquake Hazard Reduction Program (NEHRP) and NYS Geological Survey. It shows soil types in five (5) basic categories

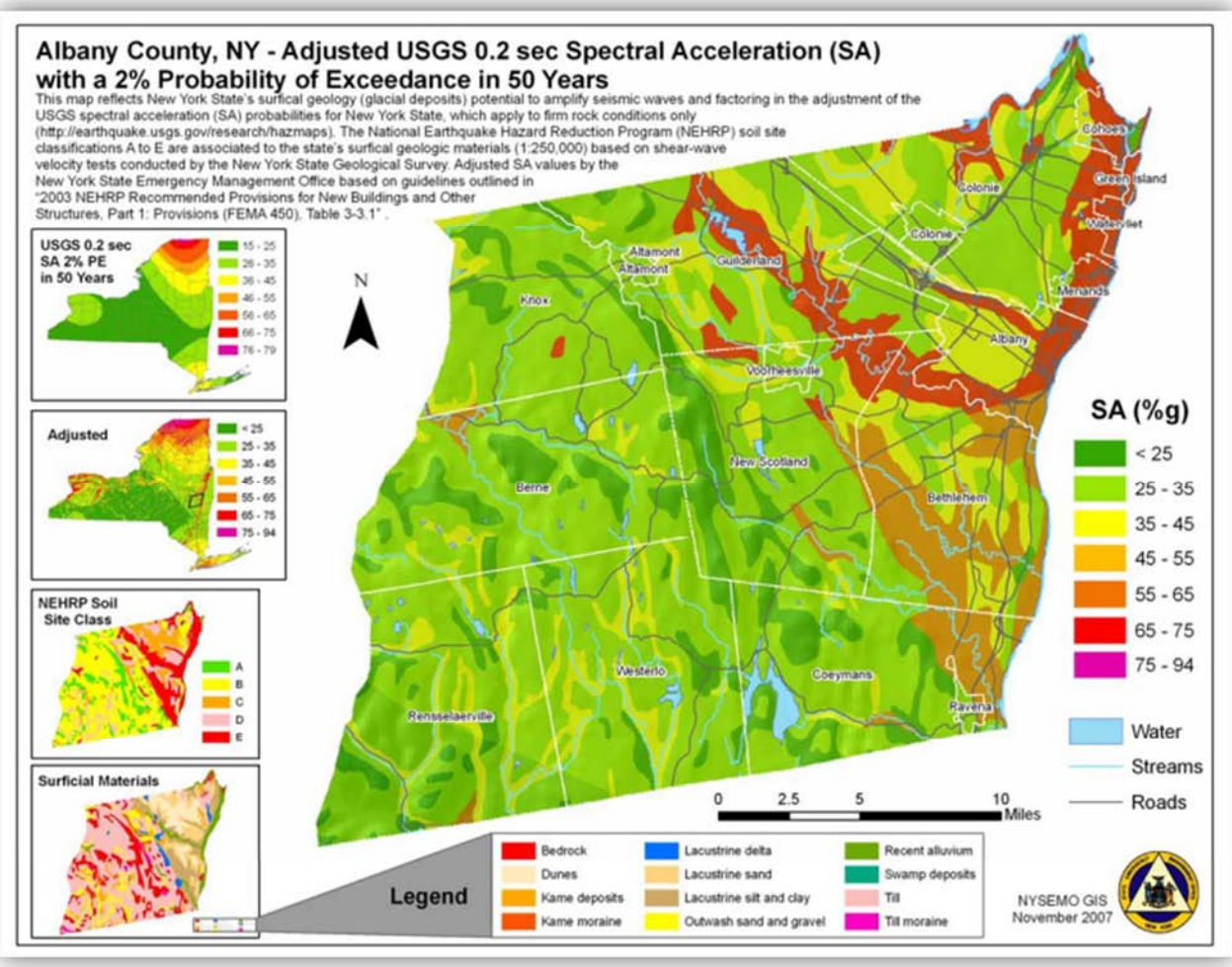
with varying degrees in likelihood of amplifying the effects of an earthquake, with Category A being far less likely to amplify the seismic motion than Category E.

Figure 5.7d – NEHRP Soil Classification in NYS
(NEHRP, NYS Geological Survey, NYS DHSES, 2014)



The soil types and surficial materials have been combined with the baselines seismic hazards by NYSEMO/NYSGS in Figure 5.7e (2014 New York State Hazard Mitigation Plan) to provide an adjusted, more refined picture of the earthquake hazard in terms of earthquake spectral acceleration, which is a better indicator of damage to buildings. While PGA (Peak Ground Acceleration) is what is experienced by a particle on the ground, SA (Spectral Acceleration) is an approximation of what is experienced by a building, as modeled by a particle on a massless vertical rod having the same natural period of vibration as the building, according to the USGS definition.

Figure 5.7e – Albany County, NY Adjusted Spectral Acceleration with a 2% Probability of Exceedance in 50 years *(NYS DHSES, 2007)*



Historical Occurrences

As noted in the 2014 New York State Mitigation Plan, although the probability of damaging earthquakes in New York State is low, earthquakes do occur on a regular basis in New York.

Figure 5.7f on the following page shows historical earthquake events and the associated magnitude for the New York State. During the period of 1973 to 2012, there was one (1) event with a magnitude of 1.0 - 1.9 and approximately six (6) events with a magnitude of 2.0 – 2.9.

Figure 5.7f – New York State Historical Earthquakes 1972 – 2012
(USGS Global Earthquake Search, NYS DHSES 2014)

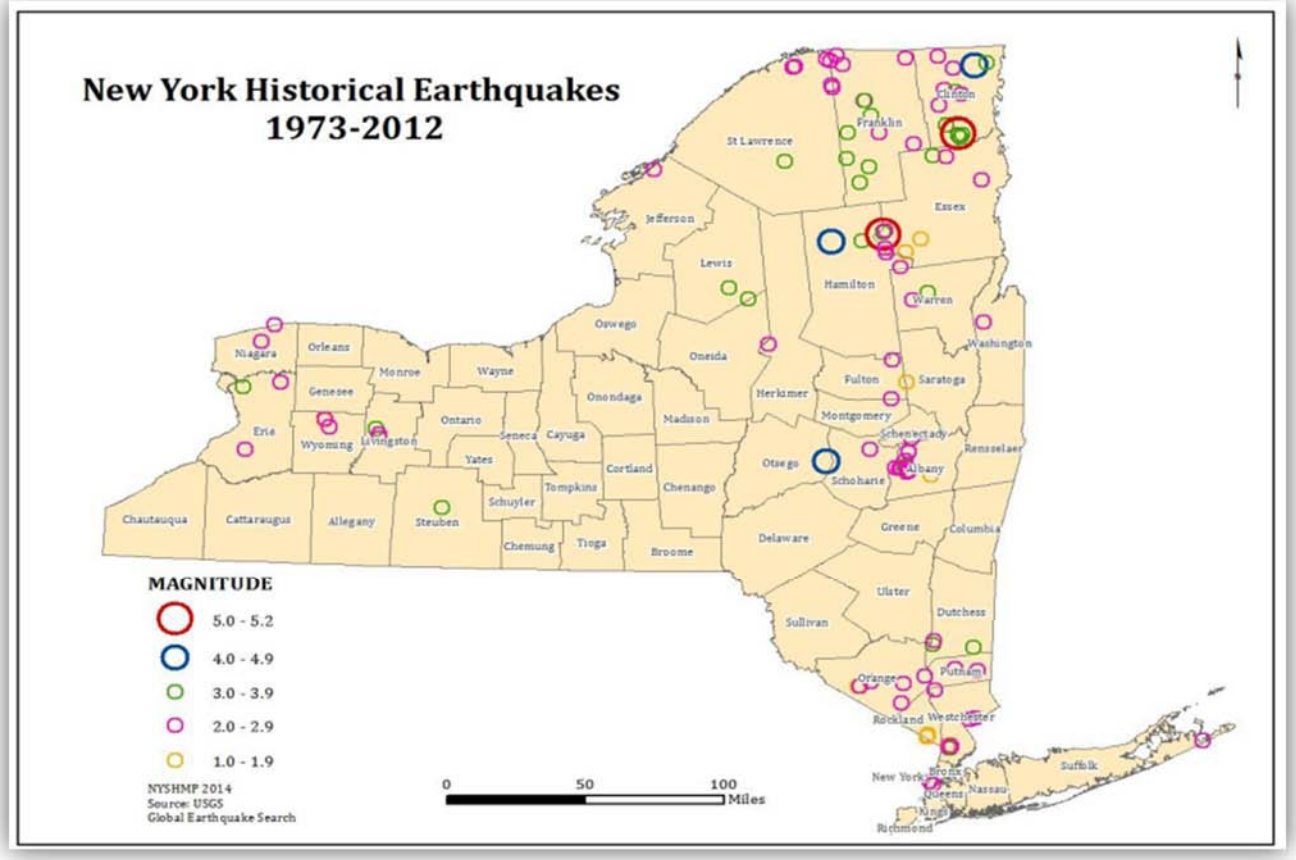


Table 5.7c presents details for earthquakes recorded in New York State since 1737 that were recorded in the 2006 NYS statistical yearbook and indicated in the 2014 NYS HMP. The list records one seismic event in neighboring Schenectady County: an earthquake with a magnitude of 3.8 in February of 1916. Reports say that the earthquake broke windows and threw residents out of their beds.

As recently as 2010, a reported 5.5 magnitude earthquake in Quebec, Canada prompted numerous reports of tremors in Albany County

Table 5.7c – Earthquake History Throughout New York State (1737 – 2005)
(NYSEMO/NYS Statistical Yearbook 2006)

Date	Location	Size	Damage Description
December 18, 1737	New York City	5.2	Bells rang, several chimneys fell
January 16, 1840	Herkimer	3.7	No reference and/or No damage reported
September 2, 1847	Offshore NYC	3.5	No reference and/or No damage reported
September 9, 1848	Rockland Lake	V	Felt by many
March 12, 1853	Lowville	VI	Machinery knocked over
February 7, 1855	Saugerties	VI	Cryoseism
October 23, 1857	Buffalo (Lockport)	4.0	Bells rang, crocks fell from shelves
December 18, 1867	Canton	4.7	Sleepers awakened
December 11, 1874	Tarrytown	3.4	No reference and/or No damage reported
November 4, 1877	Lyon Mountain	VII	Chimneys down, walls cracked, window damaged, crocks overturned
August 10, 1884	New York Bight (NYC)	5.2	Chimneys and bricks fell, walls cracked
May 28, 1897	Dannemora	4.5	No reference and/or No damage reported
February 3, 1916	Schenectady	3.8	Broke windows, people thrown out of bed
March 18, 1928	Saranac Lake	4.0	No reference and/or No damage reported
August 12, 1929	Attica	5.2	250 chimneys fell, brick buildings damaged, Attica prison walls, wells went dry
April 20, 1931	Warrensburg	4.8	Chimneys fell, church spire twisted
April 15, 1934	Dannemora	3.9	House shifted
July 9, 1937	Brooklyn	3.5	No reference and/or No damage reported
September 5, 1944	Cornwall, Ontario/Massena, NY	5.8	Nearly all chimneys fell, buildings damaged, $2 million damage
September 5, 1944	Cornwall, Ontario/Massena, NY	4.5	Chimneys destroyed, houses damaged
September 3, 1951	Rockland County	3.6	No reference and/or No damage reported
January 1, 1966	Attica	4.7	Chimneys and walls damaged
June 13, 1967	Attica	3.9	Chimneys and walls damaged
May 23, 1971	Blue Mountain Lake	4.1	No reference and/or No damage reported
May 23, 1971	Blue Mountain Lake	3.5	No reference and/or No damage reported
June 7, 1974	Wappingers Falls	3.0	Windows broken
June 9, 1975	Plattsburgh (Altona)	3.5	Chimneys and fireplaces cracked
November 3, 1975	Raquette Lake	4.0	No reference and/or No damage reported
February 2, 1983	Scarsdale-Lagrangeville	3.0	Chimneys cracked
October 7, 1983	Goodnow, Adirondack Mountains	5.1	Tombstones rotated, some cracked chimneys, windows broken, walls damaged
October 19, 1985	Ardsley	4.0	Windows broken, walls damaged
June 17, 1991	Richmondville	4.0	No reference and/or No damage reported
March 10, 1992	East Hampton, Suffolk County	4.1	No reference and/or No damage reported
April 20, 2000	Newcomb	3.8	No damage reported
April 20, 2002	Au Sable Forks	5.1	Cracked walls, chimneys fell, road collapsed, power outages
May 24, 2002	Au Sable Forks	3.1	Aftershock of the April 20, 2002 event, no damage reported

There has been one (1) Federally-declared disaster in New York State due to an earthquake, following an event of Magnitude 3.1 that occurred in the far north eastern part of the state in April 2002 (with aftershocks in May 2002). Albany County was not affected by this event.

Table 5.7d details the forty (40) earthquakes that have occurred in Albany County from 2007 – 2014. Earthquakes in Albany County in the past have been concentrated in the Town of Knox and the Town of Berne; only one (1) earthquake was reported in the Town of New Scotland. It is important to note that many of the forty (40) that have occurred in Albany County since 2007 were reported on the same day, however these were separate events.

Table 5.7d – Earthquake History in Albany County (2007-2014)
(USGS)

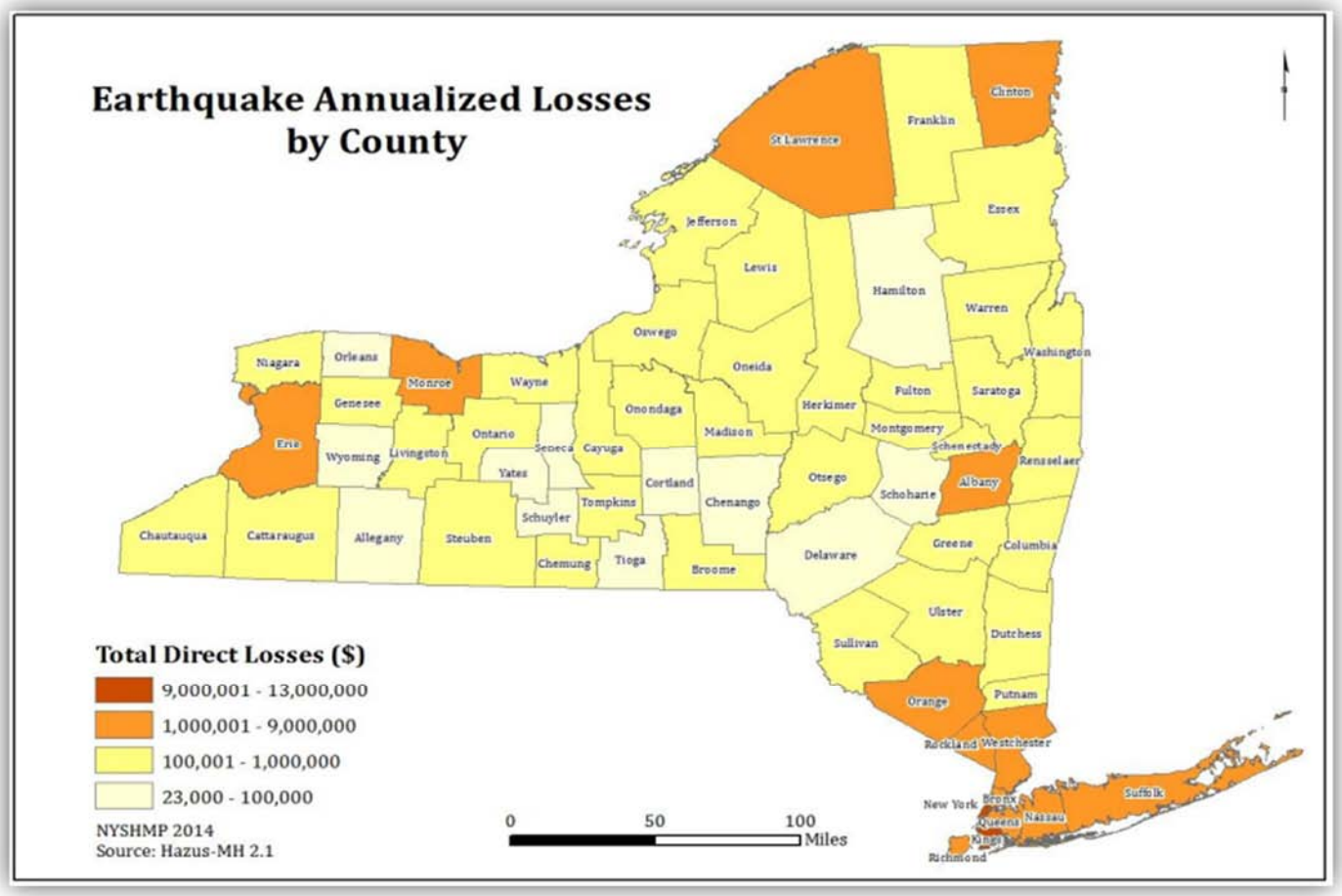
Date	Location	Magnitude
March 26, 2007	Town of New Scotland	1.8
July 24, 2007	Town of Berne	2.6
July 24, 2007	Town of Berne	3.1
February 18, 2009	Town of Berne	2.7
February 18, 2009	Town of Berne	2.4
February 20, 2009	Town of Berne	2.7
February 23, 2009	Town of Berne	2.1
March 22, 2009	Town of Berne	2.8
May 18, 2009	Town of Berne	3.0
May 18, 2009	Town of Berne	2.1
October 21, 2009	Town of Berne	2.9
December 13, 2009	Town of Berne	2.6
December 13, 2009	Town of Berne	3.1
February 15, 2010	Town of Berne	2.2
February 18, 2010	Town of Berne	2.7
March 24, 2010	Town of Berne	2.7
August 22, 2011	Town of Knox	1.4
August 22, 2011	Town of Knox	1.6
August 23, 2011	Town of Knox	2.1
August 24, 2011	Town of Knox	1.1
August 25, 2011	Town of Knox	2.7
August 25, 2011	Town of Knox	1.8
August 25, 2011	Town of Knox	2.3

Table 5.7d – Earthquake History in Albany County (2007-2014) *(USGS)*		
August 25, 2011	Town of Knox	1.2
August 25, 2011	Town of Knox	1.3
August 26, 2011	Town of Knox	1.1
August 26, 2011	Town of Knox	2.0
August 26, 2011	Town of Knox	1.3
August 26, 2011	Town of Knox	1.5
August 26, 2011	Town of Knox	1.4
August 26, 2011	Town of Knox	1.5
August 26, 2011	Town of Knox	1.3
August 26, 2011	Town of Knox	1.2
August 27, 2011	Town of Knox	1.1
August 27, 2011	Town of Knox	1.0
August 27, 2011	Town of Knox	2.8
August 28, 2011	Town of Knox	1.5
August 28, 2011	Town of Knox	1.6
March 7, 2013	Town of Berne	1.5
February 8, 2014	Town of Knox	1.4

Historical Cost and Damage Estimates

The NYS Hazard Mitigation Plan (2014) has modeled potential loss to earthquakes by County. This information, depicted by Figure 5.7g, used surficial geology and soils data to estimate earthquake risk and potential loss if such a hazard event were to occur. This mapping illustrates that damages reported within Albany County could range from $1,000,001 to $9,000,000.

Figure 5.7g – New York State Earthquake Annualized Losses by County
(NYS DHSES, HAZUS-MH 2.1, 2014)



Additional earthquake damage potential and loss estimation data is included in the state plan. According to the NYS Hazard Mitigation Plan presents details for earthquakes recorded in New York State from 1973 – 2012 recorded one hundred eighty-nine (189) earthquakes in NYS. Of those one hundred eighty-nine (189) earthquakes, forty-one (41) of them occurred in Albany County, which is the most of any of the counties in NYS. Neighboring counties, Saratoga County and Schenectady County reported one (1) and two (2) total events respectively.

Future Potential Impacts

Earthquakes cannot be predicted. They strike without warning, at any time of the year, and at any time of the day or night. According to USGS, there are an estimated seven hundred (700) shocks each year with the capability of shaking homes, rattling windows, displacing objects, or even

strong enough to cause property damage, death, and injury. It is fortunate that many of these shocks occur in unpopulated areas.

Forecasting earthquakes is often a difficult task. However, historical occurrences indicate that NYS experiences damaging earthquake events once every twenty-two (22) years, on average. Lower magnitude earthquakes are more common (NYS DHSES, 2014). Overall, the frequency of damaging earthquakes within and in the immediate vicinity of Albany County is low relative to other parts of the country and the world.

5.8 Winter Storm/Ice Storm

Description

A severe winter storm is described as a storm system that develops in late autumn to early spring and deposits wintry precipitation, such as snow, sleet, or freezing rain, with a significant impact on transportation systems and public safety.

Extreme cold and heavy snowfall can immobilize the entire state causing road closures, power outages, disruption in communication services, and no heat for several days, under the most severe circumstances. Severe storms can require persons to abandon their homes and seek shelter (2014 NYS HMP).

The severity or magnitude of a severe winter storm depends on several factors including a region's climatological susceptibility to snowstorms, snowfall amounts and rates, wind speeds, temperatures, visibility, storm duration, topography, time, day of the week, and season (2014 NYS HMP).

Ice storms are characterized by freezing rain which accumulates in a substantial glaze layer of ice resulting in serious disruptions of normal transportation and possible downed power lines. The NWS uses the term "ice storm" to describe occasions when damaging accumulations of ice are expected during freezing rain situations. Significant accumulations of ice pull down trees and utility lines resulting in the loss of power and communications. Such accumulations of ice pose a risk to walking and driving. Damage from such events could include structural damage, utility failures, and tree damage as a result of excessive weight.

The 2014 NYS Hazard Mitigation Plan describes the Northeast Snowfall Impact Scale (NESIS) as a way to classify the extent of a severe winter storm by meteorological measurements and by evaluating its societal impacts. These storms have large areas of ten (10) inch snowfall accumulations and greater. NESIS has five (5) ranking categories: Notable (1), Significant (2), Major (3), Crippling (4), and Extreme (5). Table 5.8a identifies and describes each ranking. The index differs from other meteorological indices in that it uses population information in addition to meteorological measurements. Thus, NESIS gives an indication of a storm's societal impacts.

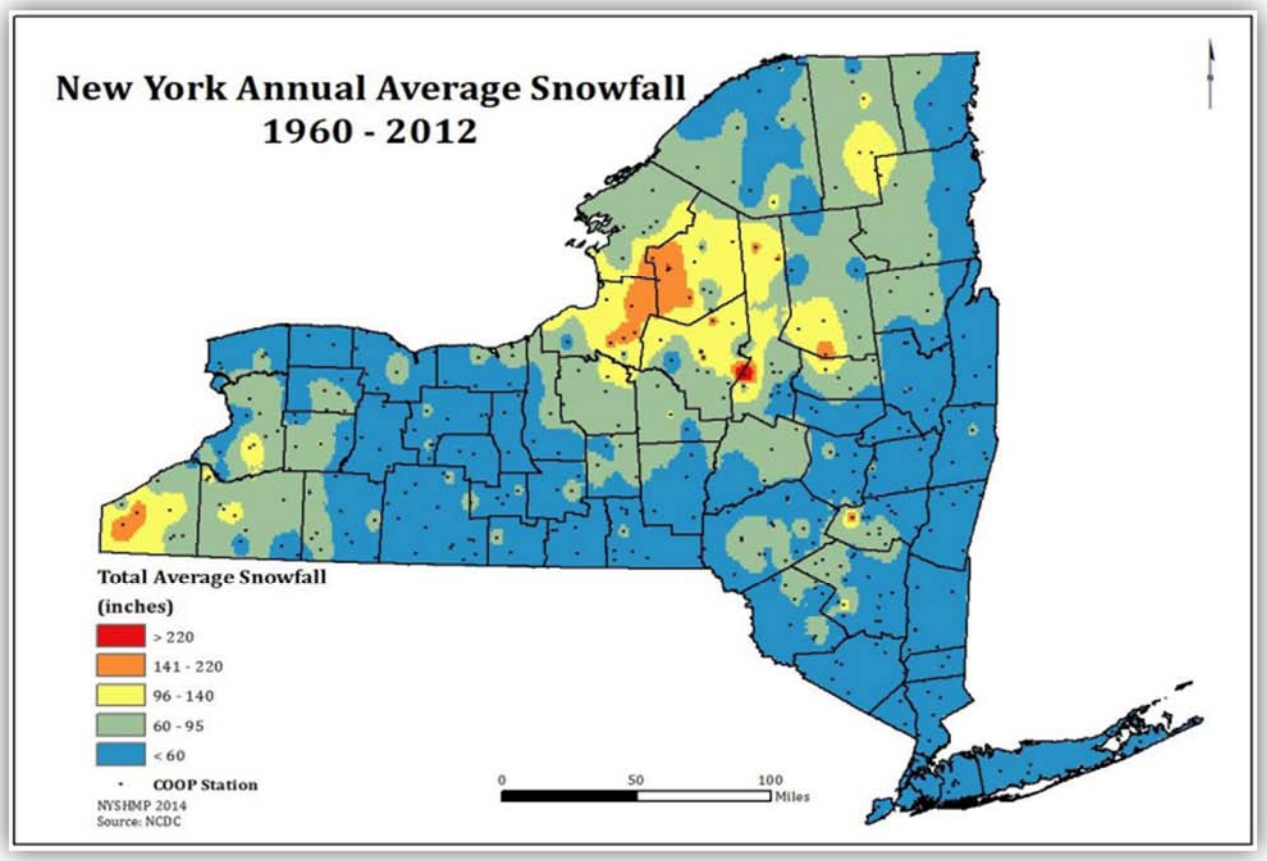
This scale was developed because of the impact northeast snowstorms can have on the rest of the country in terms of transportation and economic impact (Kocin and Uccellini, 2011).

Table 5.8a – Northeast Snowfall Impact Scale (NESIS) Ranking Categories
(Kocin and Uccellini 2004; NYS DHSES, 2014)

Category	Description	NESIS Range	Definition
1	Notable	1.0 – 2.49	These storms are notable for their large areas of 4-inch accumulations and small areas of 10-inch snowfall.
2	Significant	2.5 – 3.99	Includes storms that produce significant areas of greater than 10-inch snows while some include small areas of 20-inch snowfalls. A few cases may even include relatively small areas of very heavy snowfall accumulations (greater than 30 inches).
3	Major	4.0 – 5.99	This category encompasses the typical major Northeast snowstorm, with large areas of 10-inch snows (generally between 50 and 150 x 103 mi2 – roughly one to three times the size of New York State with significant areas of 20-inch accumulations.
4	Crippling	6.0 – 9.9	These storms consist of some of the most widespread, heavy snows of the sample and can be best described as crippling to the northeast U.S. with the impact to transportation and the economy felt throughout the United States. These storms encompass huge areas of 10-inch snowfalls, and each case is marked by large areas of 20-inch and greater snowfall accumulations.
5	Extreme	10+	The storms represent those with the most extreme snowfall distributions, blanketing large areas and populations with snowfalls greater than 10, 20, and 30 inches. These are the only storms in which the 10-inch accumulations exceed 200 x 10^3 mi^2 and affect more than 60 million people.

Statewide, according to NOAA data average annual snowfall ranges from a low of approximately ten (10) – twenty (20) inches in the New York City/Long Island area, to over two hundred (200) inches in the north of the State, in the Adirondack Mountains. According to the National Weather Service a normal seasonal (a season begins in October and ends in May) snowfall totals for Albany County between 1981 and 2010 is 60.3 inches. The 2014 NYSHMP reports that the average annual snowfall for the County is less than sixty (60) inches, as depicted in Figure 5.8a. This can vary greatly from one year to the next, particularly if several major extended-period storms impact the area (during which snowfall totals can approach or exceed annual averages), and considering Albany County's vulnerability to nor'easters from the Atlantic coast.

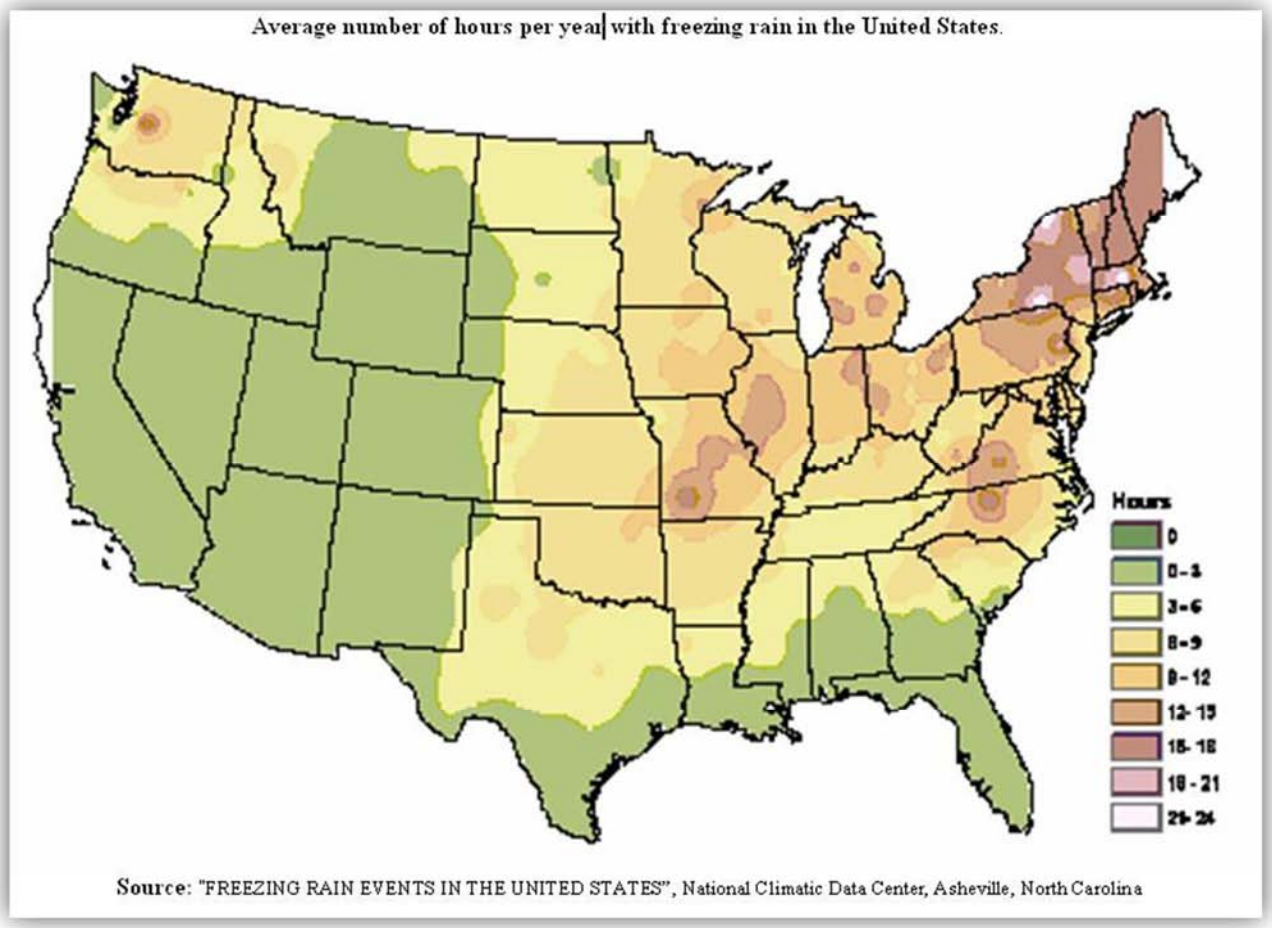
Figure 5.8a – New York State Annual Average Snowfalls 1960 – 2012
(NCDC, NYS DHSES, 2014)



Sleet is defined as pellets of ice composed of frozen or mostly frozen raindrops or refrozen partially melted snowflakes. These pellets of ice usually bounce after hitting the ground or other hard surfaces. Freezing rain is rain that falls as a liquid but freezes into glaze upon contact with the ground. Both types of precipitation, even in small accumulations, can cause significant hazards to a community (NWS, 2009).

Albany County lies within an area of the country which experiences averages of eighteen (18) to twenty-one (21) hours of freezing rain per year, while much of New York State further north experiences even greater amounts per year (See Figure 5.8b). Freezing rain is comparatively uncommon in the USA outside the northeastern states.

Figure 5.8b - Freezing Rain Zones Nationwide
(NCDC, NYS DHSES, 2014)



Location and Extent

A severe winter storm can affect a small or large region of the County or the entire County at one time. A single storm can also move from one area to another and back again, making the exact locations of impact nearly impossible to predict. Severe winter storms have the ability to immobilize an entire portion of the County, severely limiting the ability of emergency agencies to respond to local emergencies. Albany County is often susceptible to coastal nor'easter snow events, which often result in high precipitation totals and/or temporarily produce white-out conditions. Figure 5.8c shows the accepted scale for ice storms.

Figure 5.8c – The Sperry Ice Accumulation Index
(SPIA Index)

The Sperry-Piltz Ice Accumulation Index, or "SPIA Index" – Copyright, February, 2009

ICE DAMAGE INDEX	DAMAGE AND IMPACT DESCRIPTIONS
0	Minimal risk of damage to exposed utility systems; no alerts or advisories needed for crews, few outages.
1	Some isolated or localized utility interruptions are possible, typically lasting only a few hours. Roads and bridges may become slick and hazardous.
2	Scattered utility interruptions expected, typically lasting 12 to 24 hours. Roads and travel conditions may be extremely hazardous due to ice accumulation.
3	Numerous utility interruptions with some damage to main feeder lines and equipment expected. Tree limb damage is excessive. Outages lasting 1 – 5 days.
4	Prolonged & widespread utility interruptions with extensive damage to main distribution feeder lines & some high voltage transmission lines/structures. Outages lasting 5 – 10 days.
5	Catastrophic damage to entire exposed utility systems, including both distribution and transmission networks. Outages could last several weeks in some areas. Shelters needed.

(Categories of damage are based upon combinations of precipitation totals, temperatures and wind speeds/directions.)

A severe winter storm can adversely affect roadways, utilities, business activities and can cause loss of life, frostbite, or freezing. The severity of the effects of winter storms and ice storms increases as the amount and rate of precipitation increase. In addition, storms with a low forward velocity are in an area for a longer duration and become more severe in their affects. Storms that are in full force during the morning or evening rush hours tend to have their affects magnified because more people are out on the roadways and directly exposed. Storms that arrive at high tide can also have exacerbated affects in coastal areas.

The magnitude of a severe winter storm or ice storm can be qualified into five (5) main categories by event type, as shown below:

- **Heavy Snowstorm:** Accumulations of four (4) inches or more of snow in a six (6)-hour period, or six (6) inches or more of snow in a twelve (12)-hour period
- **Sleet Storm:** Significant accumulations of solid pellets which form from the freezing of raindrops or partially melted snowflakes causing slippery surfaces posing hazards to pedestrians and motorists
- **Ice Storm:** Significant accumulations of rain or drizzle freezing on objects (tress, power lines, roadways, etc.) as it strikes them, causing slippery surfaces and damage from the sheer weight of ice accumulation
- **Blizzard:** Wind velocity of 35 miles per hour or more, temperatures below freezing, considerable blowing snow with visibility frequently below one-quarter mile prevailing over an extended period of time
- **Severe Blizzard**: Wind velocity of 45 miles per hour, temperatures of 10 degrees Fahrenheit or lower, a high density of blowing snow with visibility frequently measured in feet prevailing over an extended period of time

Historical Occurrences

In Albany County, severe winter snow and ice storms are normal and expected. Historically, severe winter, snow, and ice storms have impacted the entire county during specific events thereby impacting every municipality. However, due to the varying types of topography in the county the hill communities tend to be impacted more frequently and to a greater extent during events. The valley communities are often less impacted by these events because of fluctuations in temperature and altitude. The NCDC database holds snow and ice events for Albany County from January 2000 to June2018, and a review of the NCDC database yielded one hundred twenty-four (124) significant snow and ice events reported as having affected Albany County during this period. Details and descriptions for some of these events are as follows:

> **December 30, 2000:** Energy from a strong upper level disturbance, diving southeast from the northern Plains into the Ohio Valley, developed a coastal area of low pressure off the Delmarva peninsula by early Saturday December 30th. This low deepened while tracking almost due northward... about fifty (50) miles east of the coastline. The storm reached central Long Island by midafternoon and interior southern New England by the evening hours. The low then tracked more to the northeast near the I-95 Corridor and slid off the coastline near Boston by early Sunday December 31st.With plenty of cold air in place, this storm brought a significant snowstorm to all of eastern New York. The snow began during the early morning hours across southeastern New York, then spread quickly across the remainder of eastern New York by midday. Snow fell at the rate of two (2) to three (3) inches per hour at times during the midday and early afternoon hours. For the fifth time in 2000, an official daily snowfall record was broken as 10.2 inches fell on the 30th. The storm total at Albany

International Airport was 12.6 inches. A snowfall swath of eight (8) to sixteen (16) inches fell across most of eastern New York.

Since the storm hit during a holiday weekend its impact was minimized. Some businesses were forced to close early on Saturday. While Albany International Airport never closed, there were as many as fifty (50) cancellations of flights reported. There were numerous traffic accidents, but no major injuries were reported to the National Weather Service. There was some blowing and minor drifting with the snow, especially in outlying regions.

February 05, 2001: Two (2) areas of low pressure, one centered over the Ohio valley and the other in Florida, merged into one storm off the North Carolina coast by early February 5th. This potent storm further intensified as it moved up the eastern seaboard to become the season's second major nor'easter. The air was cold enough for most of the precipitation to fall as snow with this storm, though a little sleet did mix in across the Mid-Hudson Valley. A swath of heavy snowfall, accumulating seven (7) inches or more, fell across much of eastern New York. A stripe of very heavy snow fell across portions of the Mid-Hudson Valley. In these areas, snowfall rates exceeded four (4) inches per hour during the height of the storm, which took place during the later afternoon hours. A foot or more of snow accumulated there by the time the storm ended later in the evening.

Specific reports included 8.1 inches of snowfall at the Albany International Airport, a new daily snowfall record for February 5th.. The snow resulted in about fifty (50) canceled flights.

January 06, 2002: A compact low pressure area developed across the Gulf States on Sunday, January 6th. This storm loaded up with Gulf of Mexico moisture, then swiftly tracked up along the Atlantic seaboard, and was already in the Gulf of Maine by Monday morning. The upper level support to this system moved across the region during the day Monday and brought another round of lighter snow. While the two (2) systems never really did evolve into an especially powerful storm, they did manage to produce one of the biggest January snowstorms in recent memory over sections of eastern New York. Snow, in excess of a foot, fell across portions of the eastern Mohawk Valley and Capital District. What was unusual was the intensity of heavy snow that fell late Sunday evening. Eight (8) inches fell in just two (2) hours' time in Albany. The official storm total was 17.4 inches, the 5th biggest January snowstorm on record.

The snow was heavy and wet, and caused up to 2,000 power outages across the region. While the brunt of the storm fell during Sunday night, the lighter round on Monday, coupled with falling temperatures, produced icy roads. The slick surfaces produced a plethora of vehicular accidents, some of which were fatal. While the Albany International Airport remained opened, some flights were cancelled throughout the storm, and many more delayed.

December 11, 2002: A fast moving low pressure system tracked northeast along the eastern seaboard on December 11th. While the surface low was fairly weak, it brought a nasty winter mix of precipitation to much of eastern New York. Following on the heels of the surface storm, a compact upper air low brought a burst of heavy snow across the Catskills, Mohawk Valley and Greater Capital District, mainly on the west side of the Hudson River. Snowfall rates reached up to three (3) inches per hour across much of the area and some thunder snow was reported. Snowfall accumulations included 6.3 inches in Albany and 10.0 inches in Knox. The combination of the ice, sleet and heavy wet snow resulted in some spotty power outages and many school delays or closings.

December 25, 2002: A low pressure area from the Mississippi Valley moved northeastward and rapidly redeveloped along the North Carolina coast by early on Christmas morning. The storm dramatically deepened as it tracked northeast along the Atlantic Coast and reached just south of eastern Long Island by late Christmas night. With plenty of cold polar air in place, the stage was set for a record breaking snowstorm across eastern New York, the biggest snowstorm since the Superstorm of 1993. The snow began in earnest before midday across the Catskills and Mohawk Valley, and overspread the remainder of eastern New York by the afternoon. During the late day and evening hours, snowfall rates averaged one (1) to three (3) inches per hour. The bulk of the crippling snowstorm fell in about a fifteen (15) hour period, winding down a little after midnight on December 26th. A little sleet mixed in across the Hudson Valley during the early portions of the storm, but snow was the primary precipitation type. A specific snowfall amount included 21.0 inches at Albany in Albany County. The 19.2 inches of snow that fell on Christmas Day easily smashed the 13.8 inch Christmas day record previously set in 1978. It was the 9th greatest snowstorm in Albany's history. Not only did the snow come down at a furious clip, but 15 to 30 mph wind gusts produced some blowing and drifting of the snow and travel was next to impossible during the height of the storm. Near blizzard conditions were noted across the higher terrain, where winds briefly gusted to 50 mph. Many vehicular accidents were reported and many vehicles became stuck or went off roadways. 95% of flights were cancelled out of Albany International Airport, stranding many at the airport through Christmas night. In the city of Albany the estimated cost of the snow removal was 250,000 dollars.

January 03, 2003: A low pressure area developed in the Mississippi valley by late on January 2nd. The storm tracked northward into the southern Ohio Valley, and then rapidly redeveloped along the Mid Atlantic seaboard on January 3rd. From there, it moved northeast to just off the coast of Cape Cod by late on January 4th. With plenty of cold air in place the stage was set for another snowstorm across eastern New York. Although this storm was not as powerful as the Christmas Day storm, it moved very slowly allowing for a longer duration of snow and another blockbuster snowstorm across eastern New York. Light snow began falling early on the January 3rd, and then it became heavier and steadier as the day wore on. A heavy band of snow formed over the Mohawk Valley, in a similar location to the storm on

Christmas Day. By the time the snow ended, a general one (1) to two (2) foot mantle of fresh snow covered eastern New York. Specific snowfall amounts included 20.8 inches at Albany, which made it the second greatest January snowstorm on record, and the 10th all-time heaviest snowstorm ever. Also, it was the first season since 1887-88 that two storms of more than twenty (20) inches were recorded at Albany during the same season. Alcove Dam in Albany County reported the highest localized amount with 24.6 inches. The heavy snow combined with the ice leftover from the previous storm, to bring down many large evergreen limbs and whole trees. The towns of Guilderland, New Scotland, and Delmar suffered the most tree damage. The large limbs and trees brought down many power lines, resulting in power losses to as many as 30,000 Capital District residents. The weight of the snow also caused some roofs to collapse. The storm resulted in fifteen (15) cancellation of flights from the Albany International Airport. Many businesses and schools were forced to close early. The impact of this snowstorm was somewhat minimized by the fact that the majority of the snowfell fell during a weekend.

January 28, 2009: A low pressure system developed over the lower Mississippi Valley during Tuesday January 27th. The low then strengthened, and tracked northeast from the lower Ohio Valley Wednesday morning on January 28th, into Pennsylvania during Wednesday afternoon, and into northern New England by Thursday morning January 29th.This storm spread a significant wintry mix of precipitation across eastern New York State, with a significant mix of snow, sleet and freezing rain occurring throughout the region.

December 26, 2010: A major nor'easter brought significant snows and blizzard conditions to much of east central New York Sunday, December 26th into Monday, December 27th. Bands of heavy snow with snowfall rates of one (1) to three (3) inches an hour occurred across the region. Snowfall totals of one (1) to two (2) feet occurred mainly east of the Hudson River with amounts dropping off dramatically to the northwest of the Capital District. In addition, strong and gusty winds of 35 to 45 mph caused significant blowing and drifting of the snow.

Snow emergencies were declared in the following locations: City of Albany, City of Watervliet, Village of Castleton-on-Hudson, and Village of Ravena.

January 11, 2011: Low pressure developed along the southeast coast Tuesday, January 11th, and explosive deepening cyclogenesis, occurred Tuesday night as the low tracked northeastward. The storm passed over eastern Long Island and Cape Cod Wednesday morning, January 12th, then continued to strengthen during the day as it gradually moved up the New England coast.

Moderate to heavy snow fell across east central New York. Snowfall rates of one (1) to three (3) inches an hour occurred across portions of east central New York, mainly to the east of the Hudson River Valley.

It was reported that twenty-one (21) departing and eleven (11) arriving flights were cancelled at the Albany International Airport early Wednesday morning. Also, the Capital District Transit Authority, CDTA, reported system-wide delays.

Snow emergencies were declared in the City of Albany, Town/Village of Green Island, Village of Menands, and City of Watervliet.

February 1, 2011: A complex low pressure system originating from the Deep South brought heavy snow and sleet to east central New York. Initially light snow overspread the area as a result of a weak area of low pressure moving northeastward off the mid-Atlantic and northeast coasts on Tuesday, February 1st. A much stronger low approached from the Ohio Valley Tuesday night and crossed the region on Wednesday, February 2nd.

Snowfall reports across east central New York ranged from as little four (4) inches up to fifteen (15) inches with a majority of reports falling between eight (8) and twelve (12) inches. The heavy wet snow resulted in some roof collapses. In the City of Albany, the roof collapsed at a storage garage for a roofing company.

Snow emergencies were declared in the City of Albany, Town of Coeymans, Town of Cohoes, Town of Colonie, Town/Village of Green Island, Village of Menands, and Village of Ravena

February 25, 2011: Low pressure tracked northeast from the southern Plains into the Ohio Valley Thursday February 24th, then from the Ohio Valley across Pennsylvania to Long Island during Friday February 25th, before tracking rapidly northeast off the New England coast Friday night.

This storm system produced a widespread swath of heavy wet snow across the greater Capital District and surrounding area during the day Friday. Snowfall rates of one (1) to two (2) inches per hour occurred, beginning during the early morning hours, and persisting until late afternoon.

Snowfall amounts reached twelve (12) to fifteen (15) inches across northern portions of the Capital Region, with generally eight (8) to twelve (12) inches across southern portions of the Capital Region and eastern Catskills.

The heavy snow created treacherous travel conditions for the morning and evening commutes on Friday, with numerous accidents reported, including along portions of the Adirondack Northway, as well as Interstate 90. The heavy wet snow also led to numerous school and business closings across much of eastern New York on Friday.

March 06, 2011: A cold front moved gradually southeastward across the region during the day on Sunday, March 6th, as a wave of low pressure moved northeastward along the

boundary Sunday night into Monday, March 7th. Colder air was drawn into the area in the wake of the boundary, changing the ongoing rain to mixed precipitation, freezing rain and sleet, then to snow. The period of mixed precipitation only lasted a couple hours, except for across a portion of the Capital District, including western Albany, where a prolonged period of mostly sleet occurred.

Heavy snow accumulated across the Capital District. Five (5) to eight (8) inches of snow and sleet fell across the Capital District on top of the quarter to about a half of an inch of ice accretion.

At the Albany International Airport, a twelve (12) arrivals and departures were cancelled due to the weather, with another twelve (12) flights delayed.

The gazebo in front of the Reel Seafood Company restaurant on Wolf Road in Colonie was reported to have collapsed due to the weight of heavy snow and sleet.

October 29, 2011: An early season Nor'easter dumped heavy wet snow on east central New York mainly to the south and east of the Capital District with snowfall amounts dropping off rapidly to the north and west. The storm tapped both Atlantic and subtropical moisture. Snowfall rates were as high as two (2) to four (4) inches an hour in mesoscale snowbands.

A colder air mass was brought into the region on Thursday, October 27th, as an area of low pressure moved eastward along a frontal boundary to our south. This weak system produced our first snowfall of season. Low pressure began to develop along the southeast coast Friday night. The low tracked along or just north of the Gulf Stream and rapidly deepened and intensified (cyclogenesis) as it moved northeastward on Saturday, October 29th. The storm passed just southeast of Cape Cod early Sunday morning, October 30th, then headed northeastward into the Canadian Maritimes during the day.

Snowfall amounts ranged from as little one (1) to four (4) inches across the northern portion of the Capital District, to five (5) to ten (10) inches in the Hudson Valley including the southern portion of the Capital District.

Power outages occurred as trees and wires came down due to the heavy snow. The outages were the most widespread and prolonged in areas where leaves were still on the trees. Governor Andrew Cuomo declared a state of emergency for thirteen (13) New York counties, including Albany County. About 13,000 lost power in Rensselaer and Albany counties.

February 29, 2012: A complex multi-part long duration (twenty-four [24] to thirty-six [36] hour) storm blanketed east central New York with three (3) up to fifteen (15) inches of snow and sleet on Wednesday, February 29th and Thursday, March 1st.

A large low pressure system approached from the upper mid-west and Great Lakes region Wednesday. In association with the system's warm front, snow initially overspread the area Wednesday with bands of heavy snow occurring with snowfall rates of one (1) to two (2) inches an hour during the afternoon into the early evening hours. As warmer air worked its way into the area Wednesday night, the snow transitioned to a wintry mix, especially south of the Capital District. To the north and west of the Capital District, heavy snow occurred during the early morning hours Thursday with snowfall rates of one (1) to three (3) inches an hour. In addition, some sleet mixed in with the snow.

A secondary low began to form in the mid-Atlantic region early Thursday morning. This resulted in a double-barreled low pressure system which moved eastward during the day Thursday. The wintry mix transitioned back to snow which persisted most of the day. However, the snow had trouble accumulating in some locations as temperatures warmed. This limited significant additional accumulations from occurring across the Capital District and points to the south and east.

Early Wednesday morning schools mostly in the mid-Hudson Valley had announced early dismissals or were closed for the day. By late morning, most schools across east central New York announced early dismissals and cancellations of after-school and evening activities.

February 26, 2013: An area of low pressure over the Ohio Valley approached the region during the late evening of Tuesday, February 26th. Snow, moderate to heavy at times in some areas, broke out over the region for the overnight hours.

Another area of low pressure developed over the mid-Atlantic region and moved northeast inland across the Northeast for the morning hours of Wednesday, February 27th. The track of this low allowed warmer air, both at the surface and aloft, to move into the region. This allowed the precipitation to change to rain and become spotty across the lower elevations, ending the snow accumulation for these areas.

By the early morning of Thursday, February 28th, storm total snowfall amounts of six (6) to twelve (12) inches occurred across the higher terrain, while mainly just one (1) to six (6) inches occurred for valley areas. In addition, east to southeast winds were gusty ahead of the approaching low pressure area during the morning hours of February 27th.

November 26, 2014: An early season winter storm impacted all of eastern New York during the busy Thanksgiving travel period on November 26th-27th, 2014.

The storm began during the morning of Wednesday, November 26th. Snow began shortly after sunrise across southern areas and gradually began further north by the late morning or early afternoon hours. Once snow began, it increased in intensity, falling at rates at or greater than one (1) inch per hour. Although temperatures were initially above freezing, the intensity of the snow allowed temperatures to drop to or below freezing across the entire region. This

snowfall caused slow and difficult travel, which was noteworthy as this was the day before Thanksgiving.

The snow continued through the entire day and into the evening, with heavy bands of snow occurring for some locations.

December 09, 2014: A slow moving coastal storm impacted all of eastern New York with a variety of winter weather starting on Tuesday, December 9th and continuing through early in the day on Thursday, December 11th. An area of low pressure developed off the Mid-Atlantic coast on Tuesday, December 9th. With cold air in place at the surface, the precipitation initially began as freezing rain and freezing drizzle during the early morning hours. Some sleet also mixed in, especially over the higher elevations.

As surface temperatures slowly warmed above freezing, the precipitation changed to a plain cold rain for valley areas and fell heavily at times by the afternoon. High terrain areas continued to see a wintry mix of snow, sleet and freezing rain. Towards evening, the heavy nature of the precipitation allowed precipitation to change to snow for the Capital Region. Snow fell at rates of several inches per hour and was even accompanied by lightning and thunder in some locations. While other valley areas continued to see a cold rain, snow and a wintry mix continued over the higher elevations through the evening hours.

February 12, 2017: Two (2) low pressure systems approached the northeastern US on Sunday, February 12th, with snowfall breaking out over the local area around sunrise. The snow was heavy during the morning and early afternoon, with accumulation rates of one (1) to locally two (2) inches per hour at times. The snow was wet and dense and readily clung to trees. During the afternoon, warmer air resulted in precipitation changing to sleet for portions of the mid-Hudson Valley and Catskills, which cut down snowfall totals in those locales. The snowfall diminished Sunday evening.

In total, seven (7) to twelve (12) inches of snowfall occurred through most of the local area, with lesser totals over southern portions of the region where sleet occurred. Car accidents were reported and snow emergencies were in effect throughout the region.

March 14, 2017: A very significant coastal snowstorm impacted the region March 14th through 16th, featuring extremely heavy snowfall and blizzard conditions. The bulk of the snowstorm occurred during the day on Tuesday, March 14th. This snowstorm was regarded as the largest snowstorm to impact upstate New York since the Valentine's Day 2007 Snowstorm/Blizzard. Most areas saw fifteen (15) to twenty-five (25) inches, with some western parts of the area picking up an amazing thirty (30) to forty-two (42) inches of snowfall. The snow fell at one (1) to four (4) inches per hour for much of the day. There was a widespread extreme public impact, with many roads severely impacted and schools closed for two (2) days. A state of emergency was issued for all New York Counties, and tractor-

trailers were banned on most area interstates. Numerous counties issued travel bans on county roads. Much of the train service across the region was cancelled, and all flights were grounded at Albany International Airport. According to media reports, total statewide government costs for response and recovery from the storm were $31.4 million, allowing the state to qualify for a federal disaster declaration. In addition to the snowfall, gusty winds up to 45 mph resulted in near-zero visibility and blizzard conditions across the Capital District. The winds brought considerable blowing and drifting of snow along with numerous power outages.

Although the most severe impacts from the storm occurred on March 14th, periods of light snow and blowing snow continued to affect the region through the early morning hours of March 16th.

February 07, 2018: A winter storm brought mixed wintry precipitation to the region. Precipitation began as snow during the morning hours but changed to a mix of sleet, freezing rain and snow during the afternoon hours. Precipitation transitioned back to snow during the evening hours before exiting the region northwest to southeast. Snowfall and sleet totals ranged from one (1) inch to twelve (12) inches, with the higher totals generally north and west of the Greater Capital District.

March 02, 2018: An area of low pressure rapidly intensified off the coast of Long Island on March 2nd, 2018. A large swath of tropical moisture was fed into the storm and wrapped back into the advancing cold air, resulting in heavy, wet snowfall across eastern New York. The snow began in the wee hours of March 2nd and quickly became heavy, with moderate to heavy snowfall continuing for much of the day before tapering off in the evening hours. The heavy snowfall resulted in the closure of Interstate 88 to tractor trailers, buses, and high-profile vehicles.

Winds increased during the afternoon and evening, gusting to 35 to 50 mph across many areas. The combination of the heavy, wet snowfall and the winds resulted in downed trees and wires and power outages. Nearly 100,000 people were without power in eastern New York.

March 07, 2018: A weakening low pressure system brought some light snow to eastern New York during the early to mid-morning hours of March 7th, 2018. Meanwhile, a Nor'easter strengthened rapidly along the Atlantic Coast, which resulted in increasing snow intensity during the afternoon and evening hours. West of the heaviest bands, eight (8) to twelve (12) inches of snow accumulated across much of the Capital District. The heavy snowfall resulted in the closure of Interstates 84 and 88 and the New York State Thruway to high-profile vehicles. This event was the second major winter storm in less than a week.

March 12, 2018: During the late evening hours of March 12th, a rapidly developing area of low pressure was off the mid-Atlantic coast. Light snow began to overspread the region in association with this system and began to increase in intensity towards daybreak on March 13th. Much of the snow was located from the Hudson Valley on eastward. During the day on the 13th, this low pressure became quite strong as it lifted northeast tracked well east of Cape Cod. Despite the storm taking a rather far easterly track, portions of eastern New York saw light snowfall continuing through the day, thanks to a large upper level low that tracked across the Great Lakes and along the New York/Pennsylvania border region.

Areas of snowfall continued into the evening hours of the 13th and became locally moderate to heavy across parts of the Capital Region. By the early morning on March 14th, the steady accumulating snowfall became more tied to upslope and lake-enhanced areas as the large upper level low slowly slid eastward into New England through the day.

Two (2)-day snowfall totals were highly variable, with eight (8) to twelve (12) inches in portions of the Capital District. This was the third heavy snowfall event in the first half of March 2018. The City of Albany recorded around a foot of snow in each of the events, bringing their March total to 36.0 inches through the 15th, and making 2018 the third-snowiest March on record.

Historical Cost and Damage Estimates

Severe winter storms result in little or no private property or public infrastructure damage. Ice storm events, or winter storms that have an ice component, can cause much more extensive damage, mostly to utility infrastructure, but moderate damage to private property has been documented. Actual damage costs can range from the thousands to millions, depending upon severity, duration, and nature of the event. Elderly and impoverished populations are typically more vulnerable during severe winter storm or ice storm events, especially if power failure results. For this reason, particular care is provided to these populations including the establishment of emergency and warming shelters during prolonged storm or power outage events. Severe winter storms are typically more impactful in the high terrain of the western portion of the County.

Future Potential Impacts

This plan indicates the probability of future occurrences in terms of frequency based on historical events. Using the historical data presented above, and the generic descriptions of the events recorded by the NCDC as having affected Albany County, Table 5.8b summarizes the occurrence of winter storm events and their annual occurrence: Albany County and its municipal jurisdictions have experienced one hundred twenty-four (124) recorded significant winter storms/ice storms between December 2000 and June 2018 – an average of more than six (6) events per year.

Table 5.8b – Occurrence of Winter Storms/Ice Storms, Albany County (2000 – 2018)
(NOAA's NCDC Storm Events Database)

Type	Total Number of Events	Average Annual Number of Events
Blizzard	1	0.06
Heavy Snow	26	1.44
Winter Storm	41	2.28
Ice Storm	3	0.17
Winter Weather	53	2.94
Total	124	6.89

Winter storm events will remain a very frequent occurrence in Albany County, and the probability of future occurrences in the County is certain, but the impacts of snow and ice storms are more likely to be major disruptions to transportation, commerce and electrical power as well as significant overtime work for government employees, rather than large scale property damages and/or threats to human life and safety. While climate change may lift average temperatures around the world, its affects will not be uniformly felt. For instance, changing weather patterns may result in more frequent stormy weather during winter months, this increases the probability of severe winter storms.

5.9 Wildfires

Description
A wildfire is defined as an uncontrollable combustion of trees, brush, or grass involving a substantial land area which may have the potential for threatening human life and property. Dry conditions at various times of the year can increase the potential for wildfire events. Often, wildfires begin abruptly and spread quickly, creating a dense smoke that can fill the surrounding area for miles. Humans start four (4) out of every five (5) wildfires, typically due to debris burns, arson, or carelessness. Lightning strikes are the second most leading cause of wildfires (NYS DEC, "Wildfire in New York State," 2013).

Wildfires can occur at any time of the year, but will usually occur during warmer and dryer months. As reported by the Wildland Fire Assessment System (WFAS) wildfires resulting from a lightning strike largely depend on the duration of the current and the kind of fuel the lightning hits. Spread of the wildfire after ignition usually depends primarily on fuel moisture.

Location and Extent
Areas that are typically considered to be safe from wildfires include highly urbanized, developed areas that are not contiguous with vast areas of wild lands. Areas typically considered to be prone to wildfires include large tracts of wild lands containing heavier fuels with high continuity, at steeper slopes.

Wildfires have the potential to occur throughout Albany County, especially in the protected areas located in and around the Albany Pine Bush Preserve (encompasses the Town and Village of Colonie, Town of Bethlehem, and Town of Guilderland). Many of the areas at risk from wildfires are also popular with hikers and campers. Several major transportation routes such as the New York State Thruway (I-87), US Route 9 and 20, and State Route 32, 85, 85A, 143, 145, 146, 156, 157, 157A, 378, and 443 traverse forested areas, leaving them vulnerable to closure during forest fire due to smoke conditions. Areas in Albany County where the magnitude and severity of the hazard are the greatest tend to exhibit the lowest population densities in the County; as a result, exposure of people living and working in the highest hazard areas is often relatively low. Figure 5.9a shows the most recent NYSDEC Fire Danger Rating Area scale. Figure 5.9b shows the wildfire occurrences as reported by NYSDEC forest rangers from 1988 to 2012.

Figure 5.9a – Fire Danger Rating Area Risk Map
(NYSDEC, 2018)

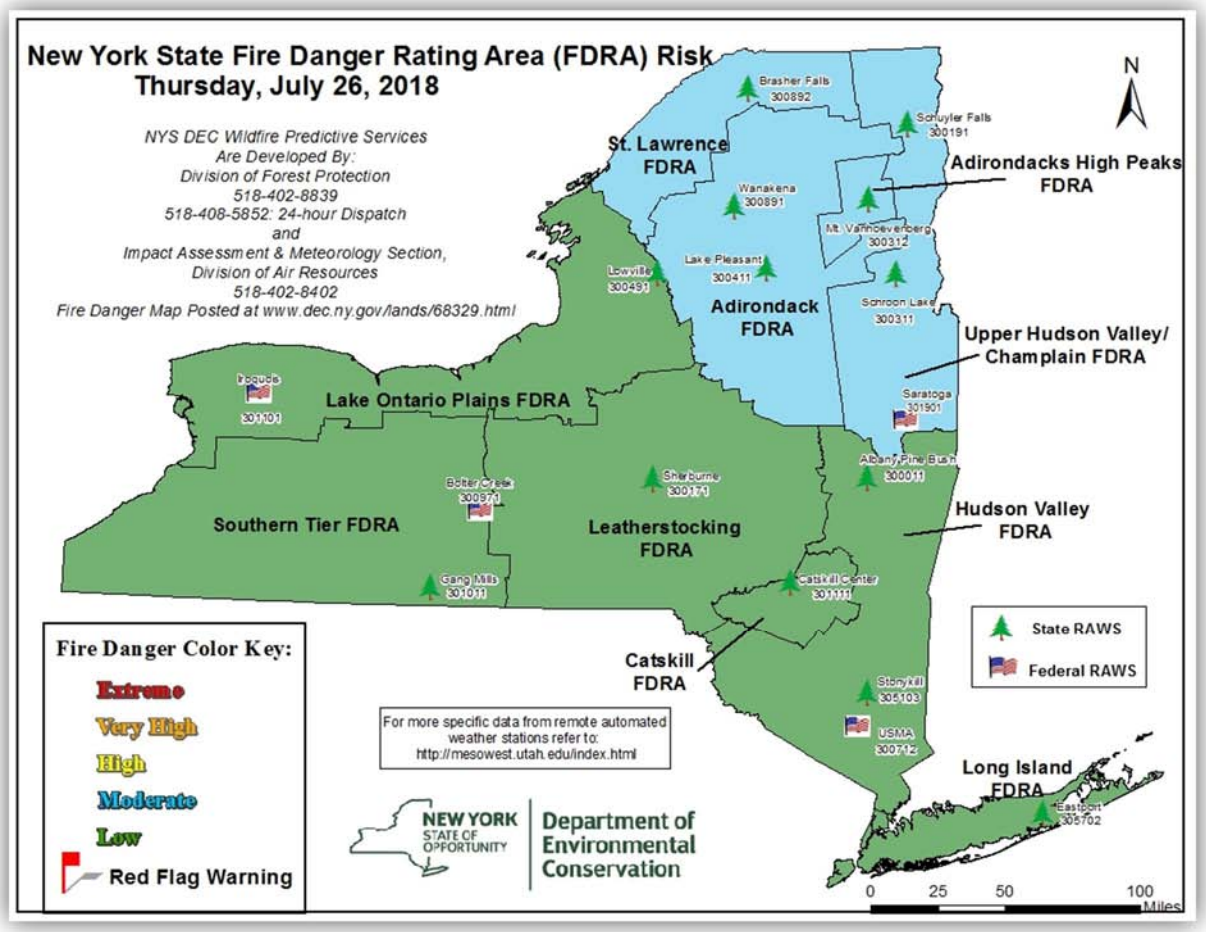
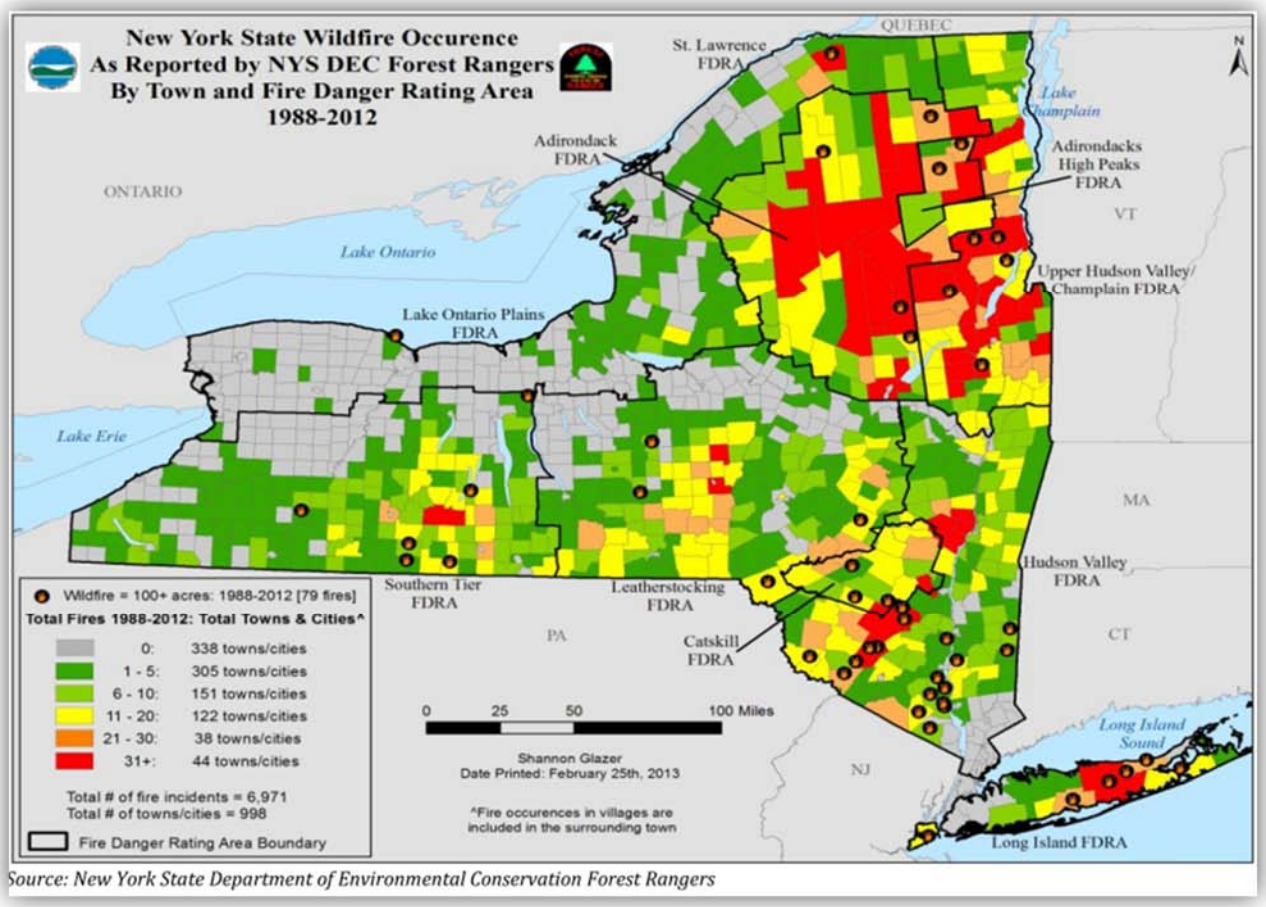


Figure 5.9b – New York State Wildfire Occurrences 1988-2012
(NYSDEC, NYS DHSES 2014)



Source: New York State Department of Environmental Conservation Forest Rangers

Historical Occurrences

Wildfire incidents in Albany County are relatively infrequent occurrences. Details and a description of a notable recent example is as follows:

> **November 30, 2017:** An inferno in downtown Cohoes was started by an amateur bladesmith in the afternoon of November 30th. While not a natural occurring wildfire, the blaze was stoked by 20-30 mph winds that drastically exacerbated the extent of the damages. In total, three (3) buildings were completely destroyed, twenty-eight (28) others were damaged, and at many as twenty-eight (28) people were displaced. Some people sustained minor injuries and a firefighter was hospitalized. The city declared a state of emergency, and the mayor stated the fire was "the worst disaster the city has ever seen." Several streets were shut down as three (3) city blocks were engulfed in smoke and flames, and power was cut in much of the downtown, forcing businesses several blocks from the fire to close.

The party responsible was charged in the matter and is now serving a one (1) year jail sentence in the Albany County Jail. It is estimated that millions of dollars in damage were caused by the fire.

Future Potential Impacts

It is hard to predict the likelihood of wildfires, as there are many factors which contribute to the ignition of a wildfire. Debris burning is common across the County, as well as camping and backpacking and these harmless fires often are the sources of wildfires. It is likely that wildfires will continue across the County, particularly if drought conditions become more prevalent in the future. The likelihood of increased future development (particularly residential) can only result in an increase in the length of the urban-wildland interface, an increase in the improved value of property within wildfire hazard zones, and a greater risk of property damage and danger to the public in future years. The 2014 New York State Hazard Mitigation Plan lists four (4) reasons why wildfire risks are increasing:

- The way forests were handled in the past allowed fuel in the form of fallen leaves, branches and plant growth, to accumulate. Now this fuel is lying around the forest with potential to "feed" a wildfire
- Increasingly hot, dry weather in the U.S.
- Changing weather patterns across the country
- More homes built in the areas called the Wildland/Urban Interface, meaning homes are built closer to wildland areas where wildfires can occur

In 2010, NYSDEC revised its open burning policies to now ban brush burning from March 15th through May 15th – a period when 47% of all fire department-response wildfires occur. The results have been immediate, with a 74% reduction in wildfires caused by debris burning in upstate New York when compared to the previous 10-year average (2014 NYS HMP). Regulatory advancements like this will help reduce future wildfire risks. According to the NYS DEC Forest Rangers Annual Report 2015 marked the third consecutive year in which the primary cause of wildfires was not debris burning. This continued reduction in debris burning is related to the 2010 annual burning ban. In 2015, 21% of fires reportedly began through campfires, 18% were caused by intentional incendiary fires, and only 17% of fires were reported as debris burning.

5.10 Ice Jams

Description

An ice jam is described as a large accumulation of ice in rivers or streams that interrupts the normal flow of water and often leads to flooding conditions and/or damage to nearby structures. Ice jam events are often short-lived and often affect only a localized reach or area of a body of water (U.S. Army CRREL, 2004).

Ice jams form when ice floating downstream in a river stalls and begins to build into a jam, forming a dam. The "reservoir" behind the dam quickly fills with water until out of bank flooding occurs. The observed effect can be very similar to flash flooding, and sudden flooding downstream may be caused by the sudden failure or release of the ice jam. Ice jams generally form at locations where the ice transport downstream is reduced by an obstruction or a significant hydrologic change. Natural obstructions in the river can include bends, intact sheet ice cover, or a decrease in channel slope. Man-made obstructions can include bridges, existing dams, waterline crossings, and other constructions in the channel.

Ice jams and resulting floods can occur during fall freeze-up from the formation of frazil ice (soft or amorphous ice formed by the accumulation of ice crystals in water that is too turbulent to freeze solid) during midwinter periods when stream channels freeze solid forming anchor ice, and during spring break-up when rising water levels from snowmelt or rainfall break existing ice cover into large floating masses that lodge at bridges or other constructions. Damage from ice jam flooding may exceed that caused by open water flooding – flood elevations are usually higher than predicted for ice jam flooding conditions and water levels may change rapidly. During cold weather, there is a reduction in evapotranspiration, infiltration (due to frozen ground) and surface storage, (due to the filling of ground depressions with snow and ice), which result in more water being delivered to the channel. Therefore for equal amounts of total available water during cold and warm seasons, the amount of excess water available for runoff will be greater during the cold season. Additional damage may be caused by the force of floating ice colliding with buildings, other structures, and automobiles.

Specific areas along a stream are more apt to form an ice jam than others (Montana Dept. Military Affairs, 2010):

- **Flat stream slopes** – where the slope of the river or stream flattens out; there is not enough slope for gravity to move ice further toward the stream channel;
- **Narrowed channels** – where the stream channel is naturally narrow, where the channel has been channelized or modified with rip rap, where there are bridge or other flow constrictions, or other areas where there is an absence of natural floodplain;
- **Downstream of open water** – ice can continually form where there are open water areas, contributing ice to the stream; these pieces of ice can accumulate in narrow places downstream; and
- **Floodplains** – naturally, floodplains act as places for floating ice and debris to fall out of the stream channel. If structures or stream modifications alter the natural pattern and location of the floodplains, the possibility of flooding and ice build-up increases.

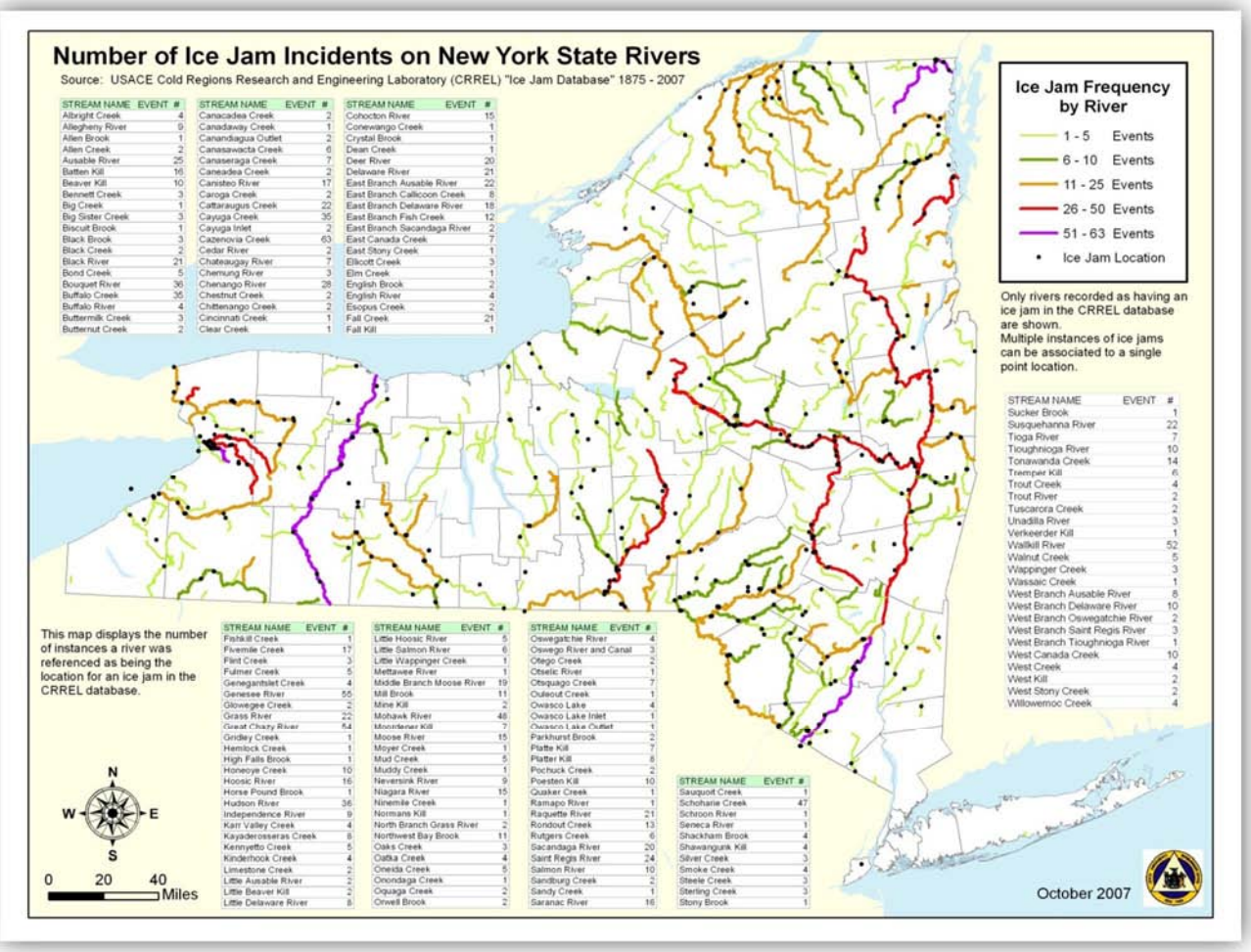
Location and Extent

The exact location of ice jams can be often difficult to specify. Ice jams are common in New York State which, according to the US Army Corps of Engineers Cold Region Research and Engineering Laboratory (CRREL), has experienced more ice jam events than any other state

except Montana. Figure 5.10a on the following page depicts the locations of ice jams across the state from 1857 to 2007. Figure 5.10a identifies the Hudson River as one of the waterbodies that incurs the highest number of ice jams within the State. The Hudson River has an estimated 26-50 events from 1857 to 2007, two (2) of which occurred within Albany County. The Mohawk River has estimated 1-5 events that have occurred, one (1) of which occurring within Albany County. Although only three (3) ice jam events have occurred within the County, ice jams upstream from the County could cause flooding events to occur within Albany County.

The following municipalities are located along the three major rivers in Albany County: Town of Colonie, City of Cohoes, Town/Village of Green Island, Village of Menands, City of Albany, Town of Bethlehem, City of Watervliet, Town of Coeymans, Village of Ravena, Town of New Scotland, Village of Voorheesville, and the Town of Guilderland.

Figure 5.10a – NYS Ice Jam Incidents 1875-2007
(NYS DHSES, 2007)



Historical Occurrences

Table 5.10a on the following page lists the nine (9) ice jam events that have been recorded by USACE CRREL since 1900 in Albany County. Eight (8) of the nine (9) ice jams since 1900 have occurred in the Mohawk River, affecting the Town of Colonie along the river the most. The City of Cohoes is also at risk because they border the Hudson River to the east, and the Mohawk River to the north. This puts the Town of Colonie and the City of Cohoes at the highest risk of receiving damages from flooding. Only one (1) of the reported ice jams occurred in the Hudson River. The Hudson River is not as prone to ice jams around Albany County as the Mohawk River. This is because of the type of lock system that each river has in place as part of the NYS Canal System. The Hudson River has fixed dams ice jams are not as much of a problem. Since the river was dredged and depended (1930), the river has not seen many ice jam problems occurring around Albany County. The lock dams on the Mohawk River are removable which makes them more susceptible for flooding (National

Weather Service, no date). The Normans Kill is also located within Albany County. NYS DHSES reports one ice jam occurring on the Normans Kill between 1875 and 2007.

Descriptions of impacts and damages resulting from these events were not always recorded with these entries on the CRREL ice jam database. Some descriptions were drawn from other sources as noted. Summaries of ice jam events with recorded descriptions follows.

March 28, 1914: Ice jams were reported in the Mohawk River, no description was recorded. The jams did cause wreckage of many homes and bridges, and several falsities were reported.

March 6, 1964: Ice jams were reported in the Mohawk River near the City of Cohoes. The event reported an annual maximum average daily discharge of 143,000cfs (cubic feet per second). This measurement acts as an indicator that the river will likely flood. No damages were reported from this event

March 15, 2007: Days of above normal temperatures led to high amount of snow melt as well as some ice melt within the Mohawk River. The snow melt combined with rains beginning on March 14th which led to sufficient discharge to the River to cause ice jams and eventually flooding affecting the Town of Colonie. There were no damages reported from this event.

March 16, 2007: Days of above normal temperatures led to high amount of snow melt as well as some ice melt within the Hudson River. The snow melt combined with rains beginning on March 14th which led to sufficient discharge to the River to cause ice jams and eventually flooding affecting the Town/Village of Green Island. There were no damages reported from this event.

December 28, 2007: No description or damages of this event were reported. The ice jam occurred in the Mohawk River along the Town of Colonie.

March 8, 2009: Ice jam related flooding was reported from the Mohawk River, affecting the Town of Colonie. No damages were reported from this event.

January 26, 2010: A January thaw combined with heavy rains was responsible for ice jams that led to flooding. This event occurred in the Mohawk River and affected mainly the Town of Colonie. No damages were reported from this event.

March 7, 2011: An ice jam in the Mohawk River caused flooding of nearby communities, mainly the Town of Colonie. Several houses were reported as flooded after this event took place.

April 1, 2015: An ice jam occurred on the Mohawk River, near the Town of Colonie. No description of the event, or damages was reported.

Table 5.10a - Ice Jam Occurrences in Albany County
(USACE CRREL Database)

Jurisdiction	Location	Date	Description	Reported Damages
Colonie	Mohawk River	3/28/1914	No description reported	Several deaths, wrecked homes and bridges
Cohoes	Mohawk River	3/6/1964	Reported an annual maximum average daily discharge of 143,000cfs	No damages reported
Colonie	Mohawk River	3/15/2007	Snowmelt runoff combined with rain that was sufficient enough to breakup ice causing jamming and causing flooding	No damages reported
Green Island	Hudson River	3/16/2007	Snowmelt runoff combined with rain that was sufficient enough to breakup ice causing jamming and causing flooding.	No damages reported
Colonie	Mohawk River	12/28/2007	No description reported	No damages reported
Colonie	Mohawk River	3/8/2009	Ice jam flooding reported	No damages reported
Colonie	Mohawk River	1/26/2010	A January thaw with heavy rain was responsible for ice jams and flooding in those areas	No damages reported
Colonie	Mohawk River	3/7/2011	Jam caused flooding of nearby communities	Several houses flooded
Colonie	Mohawk River	4/1/2015	No description reported	No damages reported

Future Potential Impacts

It is likely that ice jams will continue to affect portions of the County lining the Mohawk and Hudson Rivers in the future, particularly the areas that have been most affected in the past such as, the Town of Bethlehem, the City of Albany, the Town of Colonie, the Village of Menands, the Town/Village of Green Island, and the City of Cohoes. The Normans Kill is also a waterbody of concern for the County.

The frequency and damage extent of future ice jam events is more difficult to estimate, but based on historical trends ice jam events can be expected to occur two (2) to three (3) times per decade somewhere in the County. Recent years have produced a drop-off in the frequency of ice jam events and could lead to fewer future events if this short term trend prevails over the long term.

6.0 Hazard Vulnerability

The Albany County CEPA risk assessment was completed in December of 2014 to identify hazards with the highest potential to impact the County and associated jurisdictions. This information was used to guide the subsequent ranking of such hazards in order of the most severe and/or frequently occurring type to the least frequent, to help determine the highest priority of need with respect to implementation of pre-disaster actions, and to guide the focus for recommendations and mitigation actions to be included in this HMP. After the hazards were identified and profiled, a vulnerability assessment was completed to provide a quantitative estimate of the people and property that may be susceptible to a particular hazard event.

Each participating jurisdiction within Albany County was asked to provide information concerning the occurrence of hazards in their community and to help identify what areas are most vulnerable. This information was combined with information provided by FEMA and the NYS DHSES with respect to relative cost of damages reported for various declared disaster events in New York State. Table 6.0a summarizes the hazards that each participating jurisdiction reviewed and determined to be relevant to their community. It is noted that, while these hazards were determined to be relevant to the communities, many of these communities determined that some of the hazards did not require a mitigation action as listed in Table 6.0a. Furthermore, Table 6.0a includes natural, technological, and human-caused hazards. However, it is still acknowledged that FEMA will only fund mitigation actions that address natural hazards.

Additionally, it should be noted that Albany County as a whole is represented within Table 6.0a. As the participating jurisdictions are located in Albany County, the hazards listed below would also effect the County.

Table 6.0a – Detailed Hazards per Jurisdiction

Municipality	Drought	Earthquake	Flood	Hurricane	Ice Jam	Ice Storm	Infestation	Landslide	Severe Winter Storm	Severe Thunderstorm/Wind	Tornado	Wildfire	Extreme Temperatures	Air Contamination	Civil Unrest	Dam Failure	Epidemic	Explosion	Fire	Fuel Shortage	HazMat – Fixed Site	HazMat – In Transit	Oil Spill	Radiological – Fixed Site	Radiological – In Transit	Structural Collapse	Terrorism	Transportation Accident	Utility Failure	Water Supply Contamination
Albany (C)		X	X			X		X	X	X				X	X	X	X	X	X		X	X	X			X	X	X	X	X
Altamont (V)	X	X	X	X	X	X			X	X			X			X										X				X
Berne (T)			X			X			X																					
Bethlehem (T)		X	X	X		X		X	X	X	X		X			X		X	X		X	X	X	X	X	X	X	X	X	
Colonie (T)	X	X	X	X				X	X	X	X	X	X																	
Cohoes (C)	X	X	X	X		X		X	X	X		X	X																	
Coeymans (T)	X		X			X		X	X	X						X		X	X	X	X	X	X		X	X	X	X		
Green Island (T/V)	X	X	X	X	X	X			X	X			X	X		X				X	X	X	X			X	X	X		X
Guilderland (T)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X
Knox (T)	X		X			X	X	X	X	X		X	X	X		X		X	X	X	X	X	X			X		X	X	X
Menands (V)			X	X	X	X	X		X	X			X	X	X	X	X	X	X	X	X	X			X	X		X	X	X
New Scotland (T)	X		X	X		X		X	X	X	X	X	X	X		X		X	X	X		X	X			X		X	X	X
Ravena (V)	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X		X	X		X	X	X		X	X		X	X	X
Voorheesville (V)	X		X	X	X	X	X		X	X		X	X	X	X	X	X	X	X			X	X			X		X	X	X
Watervliet (C)			X			X			X							X						X							X	X
Westerlo (T)	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

6.1 Identify Assets

The critical facilities within Albany County were identified by representatives of each jurisdiction, as well as by County representatives. Critical facilities identified within Albany County include, but are not limited to, schools, fire departments, hospitals, medical centers, County and Town highway garages, municipal buildings, police departments, utility substations and operation centers, airports, water and waste water treatment and supply locations, and parks. These facilities represent examples of the critical assets that are located within Albany County.

Each participating jurisdiction was requested to provide an Asset Inventory to identify the critical infrastructure or facilities within their community. Many of the critical facilities identified for each participating jurisdiction are clustered around Hamlets, Villages and the City of Albany, Cohoes, and Watervliet. A listing of the identified critical facilities and their specific locations within each participating jurisdiction are included in Appendix F. These lists were compiled with assistance from municipal representatives, meeting attendees, and County personnel. Each participating municipality completed an Asset Identification Checklist to identify and consider the various assets available within each jurisdiction. The description of the potential impacts on each municipality for each hazards effect on people, structures, facilities, systems, and capabilities are listed within the completed worksheets in Appendix F. It should be noted that limited data from participating jurisdictions was available on some of the identified hazard impacts. In anticipation of the next HMP Update these municipalities will be directed to keep more accurate records and data for future reference.

6.2 Damage Potential

The damage potential for housing within Albany County was estimated using housing characteristics and housing values reported by the U.S. Census Bureau's American Fact Finder. In 2014, 122,945 occupied housing units were identified in Albany County; 72,312 (58.8%) were owner occupied and 50,633 (41.2%) were renter occupied. These numbers represent a 10.8% vacancy rate among existing residential structures in the County. Tables 6.2a, 6.2b, and 6.2c, below, further detail the housing type and values reported for the County.

Table 6.2a – Housing Types
(2010-2014 American Community Survey – U.S. Census Bureau)

	Total Occupied Housing Units in County	
Type of housing	**Count**	**Percent**
Single unit structures	75,782	54.97%
Multi-unit structures	60,216	43.68%
Mobile homes	1,817	1.13%

Table 6.2b – Age of Structures
(2010-2014 American Community Survey – U.S. Census Bureau)

	Total Owner Occupied Housing Units in County	
Structure Built Date	**Count**	**Percent**
2010 or later	712	0.98%
2000 – 2009	8,824	12.06%
1980 – 1999	23,750	32.84%
1960-1979	32,480	44.92%
1940-1959	26,761	37.01%
1939 or prior	45,432	62.83%

Table 6.2c – Housing Values
(2010-2014 American Community Survey – U.S. Census Bureau)

Value	Percent of Total Owner Occupied Housing Units in County
$50,000 or less	3.5%
$50,000 - $99,000	6.2%
$100,000 - $149,000	13.3%
$150,000 - $199,000	23.7%
$200,000 - $299,000	31.9%
$300,000 - $499,000	17.5%
$500,000 or greater	3.9%

These data reveal that housing construction in Albany County has decreased drastically since the 1980-1999 time period. The housing stock in Albany County is very old, with 62.83% of units being built in 1939 or earlier. Overall, housing trends had been very stable from 1939 onward until 1980, with 23,000 – 32,000 housing units being built each decade. Older houses are typically more susceptible to impacts or damage from an ice storm, winter storm, windstorm, fire event, etc. 1.13% of occupied housing in Albany County is represented by mobile homes that are more vulnerable to damage from major disasters. In addition, nearly 11% of all housing within the County remains unoccupied. Vacant structures and properties often fall into a state of disrepair, increasing their vulnerability to damage caused by storm events.

The approximate median value of an occupied housing unit in Albany County is $208,600. If 1% (1,230 units) of the total occupied housing units in Albany County were demolished by a severe storm event, a tornado for example, the potential value of damage could amount to $256,578,000. Granted, natural storm damage does not typically amount to complete destruction of homes in Albany County, but this scenario does demonstrate how significant the damage has the potential to be when only a limited amount of total infrastructure within the County is

affected. Even if 1% of houses in the County each sustained only $1,000 in minor damage from a storm event, it would still amount to a considerable sum: $1,230,000.

6.3 Development Trends

The growth rate of the population and households has a direct impact on the County's land use patterns and, by extension, natural hazard vulnerability. Increasing numbers of single family homes and commercial developments outside urban areas has required conversion of farmland and open space into other uses. The County will continue to grow – some areas will grow more rapidly than others. According to the Capital District Regional Planning Commission (CDRPC), Albany County is only projected to grow 1.8% over the next ten (10) years, which is almost half as much growth as the County experienced over the previous ten (10) years (2000 - 2010). CDRPC projects that most of this growth will occur in Guilderland, Knox, Berne, and Menands. The Village of Colonie, Green Island, Albany, and Watervliet are expects to see negative population rates or very little growth.

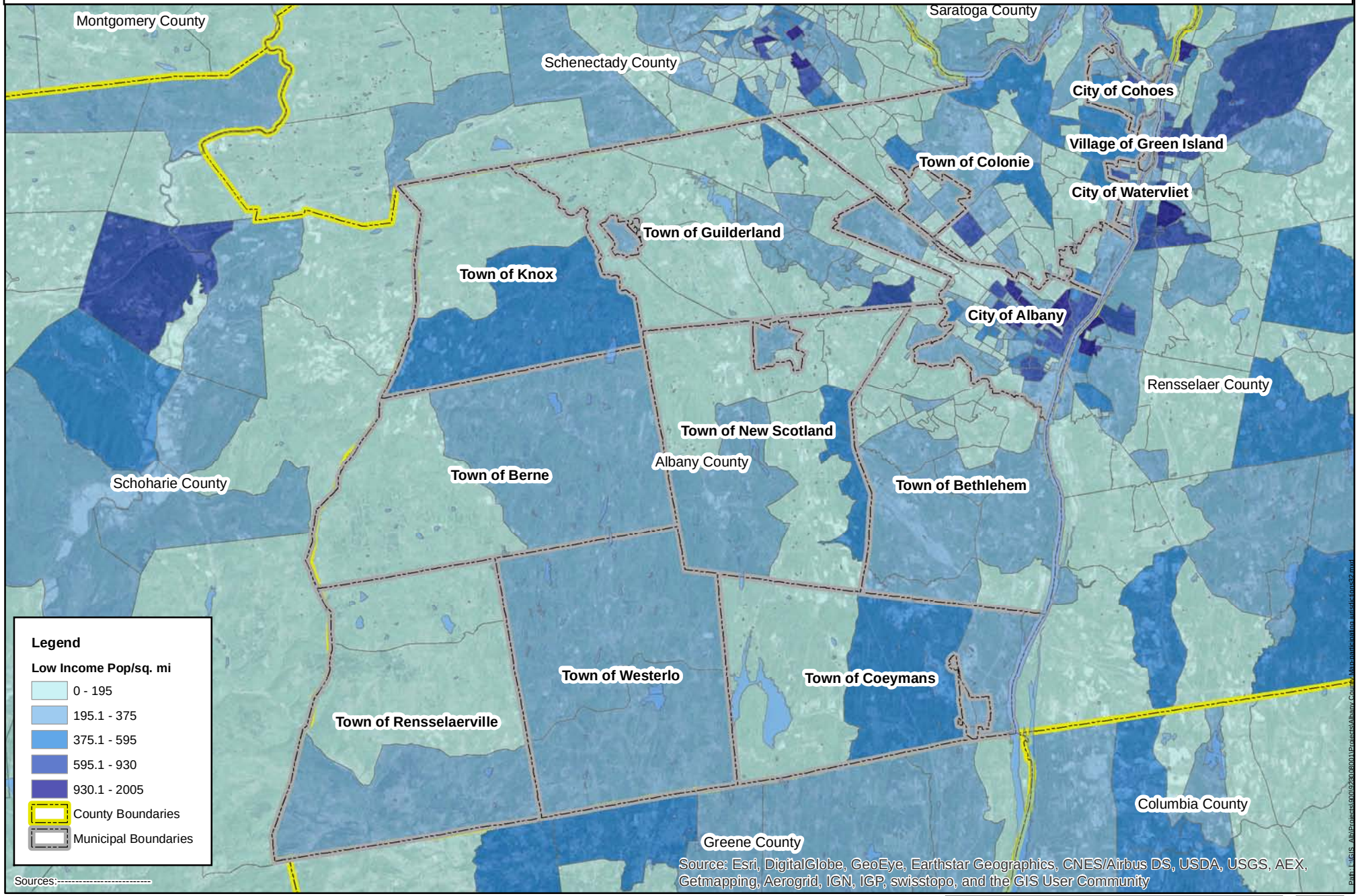
In general, historic and future growth patterns for such uses are expected to mirror the availability of public infrastructure and services. The primary elements of this infrastructure are roads and centralized sewer and water.

Vulnerable Populations

According to the 2010-2014 American Community Survey, over 60,000 people are considered “vulnerable populations” based on age – that is, age cohorts under the age of 5 and age 65 and over. This accounts for almost 20% of the total county population. The municipality with the highest percentage of vulnerable populations included in this plan is the City of Menands, with 22.13% of the total population classified as vulnerable. The Village of Colonie and Town of Rensselaerville, who have not decided to be a part of this plan, have the two highest percentages of vulnerable populations in the County at 22.43% and 22.14%, respectively. The municipalities with the lowest percentage of vulnerable populations include the City of Albany, the Town of Knox, and the Village of Altamont at 16.62%, 16.72%, and 17.79% respectively.

Senior citizen centers are located across Albany County. However, the County Aging Department is located downtown in the City of Albany. Figure 6.3b shows the percentage of the population 65 or older for the county.

Figure 6.3a - Low to Moderate Income Map



Barton & Loguidice, D.P.C.
Engineers • Environmental Scientists • Planners • Landscape Architects

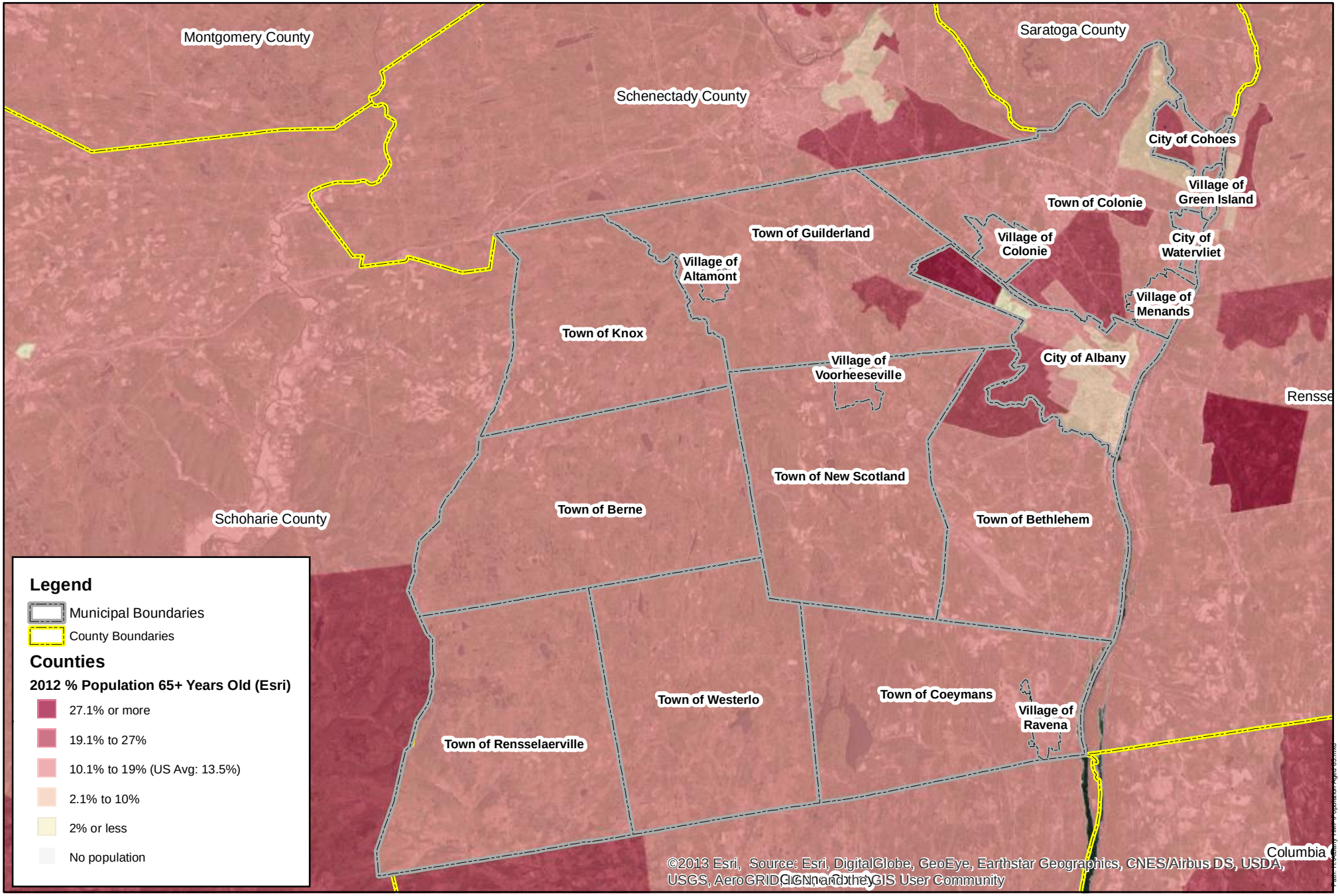
1 inch = 22,500 feet

Hazard Mitigation Plan
Low to Moderate Income
Albany County | July 2018 | New York

Figure 6.3a

Project No. 923.008.001

Figure 6.3b - Population Aged 65+



Crude Oil Trains and Natural Gas Pipelines

A recent study in the Hudson River Valley by the NYS Water Resources Institute found that while most communities are aware that oil trains pass through their communities and have some form of emergency plans, most communities rely on local volunteer emergency services that may not have the capacity to respond if major accidents happen.

Crude oil transport by rail has increased dramatically since 2010 (Christopherson & Hung (2015). Many Albany County communities such as Ravena, Coeymans, Bethlehem, New Scotland, Albany, Guilderland, Menands, Colonie, Watervliet, Green Island, and Cohoes are located along the routes where oil trains travel every day. There are increased risks to communities traversed by crude oil trains. Although train accidents have detrimental environmental, human and economic consequences, prior research that assesses whether communities have adequate emergency preparations is limited. This issue was addressed and considered at the local jurisdiction level. Communities where this topic is of concern considered the inclusion of mitigation actions and strategies that could be implemented to minimize the potential impacts from crude oil transport within their municipal boundaries. There are increased risks to communities traversed by crude oil trains.

Natural gas pipelines are also of concern in Albany County. Currently there are two (2) pipelines that cut through the County, the Iroquois Gas Transmission System and the Kinder Morgan Tennessee Gas Pipeline. The Iroquois Pipeline runs through Albany County from the northwest to the southeast through the Towns of Knox, Berne, Westerlo and Coeymans. Located in the Town of Berne are a compressor station, a line junction and a looping corridor (Iroquois, no date). Looping Corridors are utilized in order to get a larger amount of flow through a single right-of-way (EIA, 2008). The Tennessee Pipeline runs through Albany County from the northwest to the southeast through the Towns of Knox, Berne, New Scotland and Bethlehem (Kinder Morgan, 2015). The Tennessee Pipeline does not have any related facilities located in Albany County.

7.0 Hazard Mitigation

The 2007 HMP served as the basis for this Plan Update and all hazards, mitigation goals, objectives, and actions in that original plan were reviewed and, if they were still deemed to be relevant priorities, incorporated into the update. The planning process for the Plan Update encouraged the evaluation of new information, emerging issues, ideas, and actions to ensure that the plan is a living document that will be well-used by participants in the future.

7.1 Background and Past Mitigation Accomplishments

Per requirements in the Disaster Mitigation Act of 2000, a discussion regarding past mitigation activities and an evaluation of such efforts is needed to establish a foundation in developing the goals, objectives, and actions proposed in this Plan. Over the past ten (10) years, the County has displayed a pro-active approach to implementing the recommendations of the 2007 HMP. Based on this approach there have been no new major developments in hazard prone areas, specifically flood prone areas, in any of the participating municipalities. However, there have been minor developments reported by participating jurisdictions.

As of 2017, all of the one hundred eight (108) actions recommended in the 2007 All-Hazard Mitigation Plan have been identified as “in-progress.” Due to the specific nature of the previously recommended actions they have not been identified as “completed” per FEMA standards.

Although the 2007 HMP was never adopted efforts have still been made on the County and municipal level to reduce the impacts of disasters on the community. The 2007 HMP mitigation actions were reviewed to determine their statuses and implementation details. It has been determined that the previously recommended actions will be presented as “objectives” in the 2017 Multi-Jurisdictional Multi-Hazard Mitigation Plan. The objectives have been included in the attached appendices, and are accompanied by their level of completion (active *(re-included/under development)*, inactive *(deleted)*, or completed) as well as any additional details.

7.2 Mitigation Strategy

The overall approach used to update the County hazard mitigation strategies are based on FEMA and NYS regulations and guidance regarding local mitigation plan development, including:

- DMA 2000 regulations, specifically 44 CFR 201.6 (local mitigation planning) and 44 CFR 201.7 (Tribal mitigation planning)
- FEMA “Local Mitigation Planning Handbook,” March 2013
- FEMA “Integrating Hazard Mitigation into Local Planning,” March 2013
- FEMA Mitigation Planning How-To Guide #3, Identifying Mitigation Actions and Implementing Strategies (FEMA 386-3)
- FEMA “Mitigation Ideas,” January 2013

The mitigation strategy update approach includes the following steps that are further detailed in later subsections of this section:

- Review and update mitigation goals and objectives
- Identify mitigation capabilities and evaluate their capacity and effectiveness to mitigate and manage hazard risk
- Identify progress on previous County and local mitigation strategies
- Develop updated County and local mitigation strategies
- Prepare an implementation strategy, including the prioritization of projects and initiatives in the updated mitigation strategy

Mitigation Actions

Numerous mitigation actions were proposed by participating jurisdictions to reduce the impact of potential hazard events. The proposed actions were evaluated in a public process and resulted in the identification of at least one (1) key action to be taken by each jurisdiction to help achieve the goals outlined in the Plan Update. For the purpose of this plan the proposed actions have been grouped into six (6) broad categories as indicated by FEMA 386-3:

- **Prevention** – Government administrative or regulatory actions or processes that influence the way land and buildings are developed and built. These actions also include public activities to reduce hazard losses. Examples include planning and zoning, building codes, capital government programs, open space preservation, and storm water management regulations.
- **Property Protection** – Actions that involve the modification of existing buildings or structures to protect them from a hazard, or removal from the hazard area. Examples include acquisition, elevation, relocation, structural retrofits, storm shutters, and shatter-resistant glass.
- **Public Education and Awareness** – Actions to inform and educate citizens, elected officials, and property owners about the hazards and potential ways to mitigate them. Such actions include outreach projects, real estate disclosure, hazard information centers, and school-age and adult education programs.
- **Natural Resource Protection** – Actions that, in addition to minimizing hazard losses also preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.
- **Emergency Services** – Actions that protect people and property during and immediately after a disaster or hazard event. Services include warning systems, emergency response services, and protection of critical facilities.
- **Structural Projects** – Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include dams, levees, floodwalls, seawalls, retaining walls, and safe rooms.

All the mitigation actions included in this Plan Update have been reviewed by plan participants to ensure that they meet the goals of the plan. The proposed actions represent a range of projects that are well distributed throughout the six (6) categories of mitigation. It is realized that some of the proposed actions included in this plan represent maintenance actions or post-hazard actions, which are generally not eligible for funding under FEMA's Hazard Mitigation Assistance Program. Regardless, such actions were deemed important to the community and are included in this plan. Other grants and funding sources will be sought to complete such proposed efforts.

Appendix F outlines each participating jurisdiction's self-identified mitigation strategies. Each participating jurisdiction proposed at least one (1) implementable, pre-disaster mitigation activity to be included in this document.

7.3 Mitigation Goals

The prime objective of setting hazard mitigation goals is to reduce or eliminate losses and damages from hazard events. It is important to create goals that are tangible. The goals identified below represent what the participants and municipalities are hoping to achieve through the implementation of this hazard mitigation plan.

The Albany County Multi-Jurisdiction Multi-Hazard Mitigation Plan Goals can be defined as broad, long-term statements of what the County will work to achieve over time through implementation of the plan. They are based on the findings of the risk assessment and they will apply to the Albany County government and to each participating jurisdiction.

1) Minimize injury and loss of life from hazards
2) Minimize losses to existing and future structures within hazard areas
3) Protect natural resources, such as open space, drinking water and recreation areas from hazards
4) Protect cultural resources such as historic structures and museums from hazards
5) Provide for Continuity of Government (COG) and Continuity of Operations Program (COOP) during and in the aftermath of disasters in order to ensure that the government continues to function and to minimize negative impacts from events

These goals were developed based on the risk assessment results, the 2007 HMP, County-wide vulnerabilities, County and jurisdiction capabilities, and overall disaster preparedness. The establishment of goals helped the jurisdictions to focus on effective and meaningful mitigation actions.

To further elaborate on these goals, the County also has reviewed and approved "objectives" from the 2007 HMP for continued use and added as additional objective. For the purpose of this plan "objectives" are more details and specific efforts that the County and participating jurisdictions will take to achieve the goals listed above. The 2017 Hazard Mitigation Plan Update (HMPU) has identified the following objectives:

1) Increase awareness in participating jurisdictions for hazards that may occur within the County and put in place the measures that will enable the County to continue to operate during and in the aftermath of disasters
2) Increase public awareness of hazards in order to gain participation from the public for hazard mitigation
3) Reduce the impact on the community from storms that cause flooding, damaging winds, and ice
4) Reduce the damage caused by fire
5) Reduce the threat of terrorism
6) Reduce the risk of extreme temperatures to the public
7) Reduce the risk of damage from earthquakes
8) Prevent the spread of infestation
9) Reduce the damage from drought
10) Reduce the risk of epidemic in the community
11) Reduce the risk of soil, water, and air contamination from petroleum and HAZMAT releases
12) Reduce the risk of utility failure
13) Reduce the risk of transportation accidents
14) Reduce the risk of structural collapse
15) Increase public security and reduce the threat of civil unrest
16) Retain data on past damage from hazards
17) Maintain up-to-date data regarding critical facilities and infrastructure systems for internal County use

In addition to the objectives identified in the 2007 HMP, the County will also recognize previously identified “actions” as “objectives in the 2017 Multi-Jurisdictional Multi-Hazard Mitigation Plan Update. They are, as follows:

1) Preform an inventory and maintain a list of all items, including records that would have to be removed from Municipal Facilitates and Municipal Hall of Records if flooding or storm surge is expected to inundate structures and plan where these items and records would be relocated
2) Update and test the Municipal Emergency Operations Plan regarding relocation of items and records
3) Wherever possible, retrofit municipal facilities and take into consideration potential impact of moderately high hazards (flood/wind/fire/terrorism)
4) Continue to provide all-hazard information for the general public through the use of municipal websites and print media

5) Insure that COOP and COG plans are in place and tested
6) Purchase portable equipment to enable interagency communication between municipal, external governmental agencies, and NGOs (non-governmental organizations)
7) Purchase a crisis management software package to assist with organizing emergency disaster response in EOC (Emergency Operations Center)
8) Construct EOC/OPS (Emergency Operations Center/Operation) center in the event of a severe storm, ice storm, severe winter storm or utility failure, fire, or terrorist attack of great proportions
9) Insure that construction of all new governmental facilities for municipalities take in consideration that potential impact of moderately high hazards (flood/wind/fire/terrorism)
10) Insure the NYS building code is enforced for all construction projects, pre- and post-disaster, specifically regarding wind speed and erosion
11) Preform a structural review of wind load for municipal buildings and structures
12) Recommend to other governmental, NGO, and commercial entities that a structural review of wind load be conducted on local buildings; especially multi-story buildings such as hospitals, courts, and offices
13) Assist critical care facilities such as hospitals and nursing homes that need to shelter-in-place, by relocating generators, electrical and computer equipment, "hardening" facilities *(i.e. shatter resistant glazing for windows)*, and protect from flooding
14) Create and enforce use limitations for buildings using structural makeup and vulnerability as a basis
15) Ensure that dead trees and branches near electric service for critical care facilities, municipal facilities, and along local roads are removed or pruned back to reduce the possibility for interruption of service through the implementation of a tree pruning program
16) Increase public awareness of severe storm and tornado hazards to reduce injury and property damage; provide outreach for vulnerable populations, such as residents of mobile home parks and households where English is a second language
17) Educate the public on the hazards of flooding and benefits of flooding insurance
18) Create hazard information centers to disseminate information to residents in case of emergency
19) Spread awareness of NYS system for emergency management personnel
20) Update and test all components of evacuation plans to ensure all components are working properly and effectively
21) Develop hazard information procedures and identify points of contact for 211 system and initiate early warning forecast systems to ensure public safety

22) Work with mobile home parks to ensure evacuation of residents when severe weather is expected
23) Reduce the number of trees that are in conflict with overhead utilities, where necessary, without challenging local stormwater management practices or contributing to a significant reduction in tree canopy
24) Ensure that surge protection is in place for all electric and electronic equipment in municipal facilities and buildings
25) Use municipal website and print materials to educate the public on safety during utility failure and educate the public regarding emergency supplies and emergency power for appliances and heating
26) Reduce the peak day and peak time power usage through education and outreach
27) Analyze past utility failure data to measure the number of home and critical infrastructure impacted
28) Provide alternative power sources for traffic signals during power outages through implementation of drop down STOP signs
29) Provide emergency lighting for critical areas during power outages
30) Ensure salt and sand stockpiles are adequate in the event of severe icing
31) Install temperature sensing devices for critical bridges and roads
32) Increase public awareness of selective planting practices in the vicinity of utility lines vis municipal websites and print media
33) Prevent against injurious amounts of salt and sand do not wash into environmentally sensitive areas by implementing best management practices
34) Use early warning forecast services to warn of icing conditions
35) Plan redundancy of services for identified critical facilities
36) Encourage burying of utility lines in future developments and in critical areas
37) Create maps of known landslide areas, collect data regarding past events, and analyze potential future events
38) Consider steep slope development regulations or incentives to protect areas of steep slope at the local level
39) Control of development in landslide areas and creation of setback requirements
40) Encourage the use of erosion control and stormwater management best management practices (BMPs) for construction projects to mitigate against future threat of landslides such as, structural bracing and reinforcement, slope stabilization projects, armoring slopes and relocating threatened structures or other improvements
41) Perform a structural review of wind load for municipal buildings and structures

42) Recommend to other governmental, NGO, and commercial entities that a structural review of wind load be conducted on buildings in Albany County; this would be especially important for multi-story buildings such as the hospitals, court, and offices
43) Train emergency response management personnel for hazard recognition
44) Strict enforcement of requirements for containment booms around tanks, vessels during transfer operations, and inlet structures
45) Remove underground storage tanks and requiring secondary containment for aboveground tanks
46) Create a program for placing "Drains to Waterway" medallions on storm drains
47) Use Albany County website and print material to encourage proper recycling of waste oil and other recyclables
48) Organize drills for local response agencies
49) Review, evaluate, and revise emergency response plans as necessary
50) Ensure adequate stockpile of containment and sorbent materials
51) Provide for stormwater management and drainage system maintenance with regular inspections of storm systems and clearing of storm drains, culverts, and natural stream beds to ensure reduce flooding from stormwater runoff
52) Create and enforce floodplain regulations by utilizing Planning and Zoning regulations for construction in floodplains and flood prone areas
53) Utilize planning and zoning mechanisms at the local level to reduce or limit impervious coverage in areas where stormwater runoff may cause flooding in flood prone areas when new developments are proposed
54) Transfer of development rights to governmental/environmental agencies for undeveloped flood prone properties
55) Encourage retrofit of homes in flood prone areas at the local level *(i.e. elevate homes subject to reputed inundation)*
56) Evaluate and if applicable implement dewatering projects for areas with repetitive basement flooding due to rise in groundwater
57) Encourage those in flood prone areas to purchase flood insurance through educational outreach and public awareness programs
58) Ensure streams and rivers are free of man-made waste and debris that impedes flow to reduce flood hazard through clean-up programs
59) Acquire vacant land for open space preservation, especially in flood prone areas
60) Ensure that flood warning systems and warnings for other emergencies are up-to-date
61) Improve overall roadway drainage in flood prone areas
62) Evaluate spillway control and consider reservoir modifications to protect adjacent properties in the case of flooding

63) Construct dikes or leaves where needed to protect critical areas

64) Evaluate and consider raising roads above the floodplain in critical areas

7.4 Capability Assessment

As part of the planning process for Albany County and each of its seventeen (17) participating jurisdictions, each participant was required to prepare a capability assessment. This capability assessment examines the ability of Albany County as a whole to implement and manage a comprehensive mitigation strategy, which includes a range of mitigation actions. The strengths, weaknesses, and resources are identified in this assessment as a means to develop an effective hazard mitigation program. According to FEMA Mitigation Planning How-To Guide #3, a capability assessment is an inventory of a community's missions, programs and policies; and an analysis of its capacity to carry them out. The County and each participating jurisdiction identified and assessed their planning and regulatory, administrative and technical, and fiscal capabilities utilizing the Capabilities Assessment worksheet that can be found in Appendix F.

A summary of the various federal, state, county and local planning and regulatory, administrative and technical, and fiscal programs available to promote and support mitigation and risk reduction in Albany County are presented below.

Planning and Regulatory Capabilities - County and Local

Municipal Land Use Planning and Regulatory Authority

The County and municipalities have various land use planning mechanisms that can be leveraged to mitigate flooding and support natural hazard risk reduction, as shown in Table 3.3a – Jurisdictional Capability Assessment and Resource Availability on page 36. These tools are valuable instruments in pre and post disaster mitigation as they facilitate the implementation of mitigation activities through the current legal and regulatory framework.

Building Code

Building codes regulate construction standards and are developed for specific geographic areas of the country. They consider the type, frequency, and intensity of hazards present in the region. Structures built to applicable building codes are inherently resistant to many hazards such as strong winds, floods, and earthquakes. Due to the location specific nature of the building codes, these are very valuable tools for mitigation. Albany County municipalities adhere to a building code through County authority. The authority for enforcing the building code comes from the New York State Unified Code.

Zoning Ordinance

Zoning is a useful tool to consider when developing a mitigation strategy. It can be used to restrict new development, require low-density development, and designate specific uses (e.g. recreational) in the hazard prone areas. Private property rights must be considered, but enacting a zoning ordinance can reduce or potentially eliminate damages from future hazard events.

All of the participating jurisdictions have adopted a zoning ordinance.

Subdivision Ordinance
Subdivision ordinances offer an opportunity to account for natural hazards prior to the development of land as they formulate regulations when the land is subdivided. Subdivision design that incorporates mitigation principles can reduce the exposure of future development to hazard events

All of the participating jurisdictions have adopted a subdivision ordinance with the exception of the Town/Village of Green Island.

Special Purpose Ordinance
A special purpose ordinance is a form of zoning in which specific standards dependent upon the special purpose or use must be met. For example, many special purpose ordinances include basic development requirements such as setbacks and elevations. The special purpose ordinance is a useful mitigation technique particularly when implemented to reduce damages associated with flooding and coastal erosion. The only special purpose ordinances identified by any of the jurisdictions was their floodplain ordinances and natural hazard specific ordinance.

All of the participating jurisdictions have adopted a floodplain ordinance and all of the participating jurisdictions have adopted a natural hazard specific ordinance with the exceptions of the Towns of Berne, Coeymans, and Colonie and the Villages of Altamont and Ravena.

Site Plan Review Requirements
Site plan review requirements are used to evaluate proposed development prior to construction. An illustration of the proposed work, including its location, exact dimensions, existing and proposed buildings, and many other elements are often included in the site plan review requirements. The site plan reviews offer an opportunity to incorporate mitigation principles, such as ensuring that the proposed development is not in an identified hazard area and that appropriate setbacks are included.

All of the participating jurisdictions have adopted site plan review requirements.

Comprehensive Plan
A comprehensive plan or a master plan is a document which illustrates the overall vision and goals of a community. It serves as a guide for the community's future and often includes anticipated demographics, land use, transportation, and actions to achieve desired goals. Integrating mitigation concepts and policies into a comprehensive plan or master plan provides a means for implementing initiatives through legal frameworks and enhances the opportunity to reduce the risk posed by hazard events.

All of the participating jurisdictions have adopted a comprehensive or master plan with the exceptions of the Town/Village of Green Island, and Villages of Menands and Voorheesville.

Capital Improvement Plan
Capital Improvement Plans schedule the capital spending and investments necessary for public improvements such as schools, roads, libraries, and fire services. These plans can serve as an important mechanism to reduce vulnerability growth in identified hazard areas through limited public spending and can be used as a to develop a match for mitigation projects.

All of the participating jurisdictions have adopted a comprehensive or master plan with the exceptions of the Cities of Cohoes and Watervliet, Towns of Coeymans, New Scotland, and Westerlo, and the Villages of Menands, Ravena, and Voorheesville. Economic Development Plan

Economic Development Plans offer a comprehensive overview of the local or regional economic state, establish policies to guide economic growth, and include strategies, projects, and initiatives to improve the economy in the future.

Furthermore, Economic Development Plans, similar to capital improvement plans, offer an opportunity to reduce development in hazard prone areas by encouraging economic growth in areas less susceptible to hazard events.

All of the participating jurisdictions have adopted a comprehensive or master plan with the exceptions of the City of Cohoes, Towns of Berne, New Scotland, and Westerlo, and Villages of Altamont, Menands, and Ravena.

Emergency Response Plans & Evacuation Routes

Emergency response plans provide an opportunity for local governments to anticipate an emergency and plan the response accordingly. In the event of an emergency, a previously established emergency response plan can improve response and reduce negative effects as the responsibilities and means by which resources are deployed has been previously determined.

All participating jurisdictions in the County have a local emergency operations plan except the City of Watervliet, Town of Coeymans, and the Village of Voorheesville. It should also be noted that these local plans are shared on a county-wide basis with neighboring jurisdictions.

However these local emergency operations plans do not have specific emergency evacuation route plans or route lists contained within them. Based on consultation with the County Sherriff's Office as well as with the County Emergency Management Officer, it was noted that Albany County itself currently does not have a formal emergency evacuation route plan. Evacuation routes would be very location and situation dependent. As such, there are no specific County-wide evacuation plans. For example, a severe flood occurrence would be different from a Hazmat release. In either instance, the main interstate highways and US and State routes that traverse across Albany County would be primary routes just like every day during rush hour. As per recommended implementation actions, all municipal Supervisors and Mayors will be contacted and urged to update their own municipal Emergency Response Plans and include local emergency evacuation routes prior to the next All Hazard Mitigation Plan update.

National Flood Insurance Program (NFIP)

The Federal Emergency Management Agency (FEMA), which is the government entity that administers the National Flood Insurance Program (NFIP), has mapped the known floodplains within much of the United States. When a flood study is completed for the NFIP, the information and maps are assembled into a Flood Insurance Study (FIS). A FIS compiles flood risk data for specific waters or hazard areas within specific communities and includes the main causes of flooding in these areas. The FIS delineates Special Flood Hazard Areas (SFHAs),

designates flood risk zones, and establishes base flood elevations (BFEs) within certain areas. BFEs are based on the flood event that has a 1% chance of occurring annually, or the 100-year flood. At present, all participating jurisdictions located in Albany County have an active NFIP policy (See Table 8.2a, page 167). Additionally, the two (2) non-participating jurisdictions (Village of Colonie and Town of Rensselaerville) have an active NFIP policy.

To maintain FEMA requirements with the NFIP policies a representative from the Albany County Department of Public Works has distributed the NFIP Best Practices incorporation guidance document via email to all floodplain administrators within the County. It will be up to the floodplain administrators to review the guidance document and maintain compliance with NFIP policies.

NFIP Community Rating System (CRS)

The Community Rating System is a voluntary incentive program that recognizes and encourages floodplain management activities at the community level. As a result of CRS participation, flood insurance premium rates are discounted to reflect the reduced flood risk that results from community actions to meet the three goals of the CRS: reduce flood loss, facilitate accurate insurance ratings, and promote flood insurance awareness (FEMA, 2016). There are currently no communities in Albany County which are participants in the CRS.

Local Waterfront Revitalization Program (LWRP)

The Waterfront Revitalization of Coastal Areas and Inland Waterways Act offers local governments the opportunity to participate in the State's Coastal Management Program (CMP) on a voluntary basis by preparing and adopting a Local Waterfront Revitalization Program (LWRP), providing more detailed implementation of the State's CMP through use of such existing broad powers as zoning and site plan review. (NYS Department of State – Office of Planning & Development)

When an LWRP is approved by the New York State Secretary of State, State agency actions are required to be consistent with the approved LWRP to the maximum extent practicable. When the federal government concurs with the incorporation of an LWRP into the CMP, federal agency actions must be consistent with the approved addition to the CMP. Title 19 of NYCRR Part 600, 601, 602, and 603 provide the rules and regulations that implement each of the provisions of the Waterfront Revitalization of Coastal Areas and Inland Waterways Act including but not limited to the required content of an LWRP, the processes of review and approval of an LWRP, and LWRP amendments.

A Local Waterfront Revitalization Program consists of a planning document prepared by a community, and the program established to implement the plan. An LWRP may be comprehensive and address all issues that affect a community's entire waterfront, or it may address the most critical issues facing a significant portion of its waterfront.

An approved LWRP reflects community consensus and provides a clear direction for appropriate future development. It establishes a long-term partnership among local government, community-based organizations, and the State. Also, funding to advance preparation, refinement, or implementation of Local Waterfront Revitalization Programs is available under Title 11 of the

New York State Environmental Protection Fund Local Waterfront Revitalization Program (EPF LWRP) among other sources.

In addition, State permitting, funding, and direct actions must be consistent, to the maximum extent practicable, with an approved LWRP. Within the federally defined coastal area, federal agency activities are also required to be consistent with an approved LWRP. This "consistency" provision is a strong tool that helps ensure all government levels work in unison to build a stronger economy and a healthier environment. The City of Albany and the City of Watervliet are the only two (2) jurisdictions within Albany County with an approved LWRP.

Planning and Regulatory Capabilities – State and Federal

New York State Floodplain Management

There are two (2) departments that have statutory authorities and programs that affect floodplain management at the local jurisdiction level in New York State: the New York State Department of Environmental Conservation (NYSDEC) and the Department of State's Division of Code Enforcement and Administration (DCEA).

In 1992, the New York State Legislature amended an existing law, finding that "it is in the interests of the people of this state to provide for participation" in the NFIP (New York Laws, Environmental Conservation, Article 36). Although the Legislature recognized that "land use regulation is principally a matter of local concern" and that local governments "have the principal responsibility for enacting appropriate land use regulations," the law requires all local governments with land use restrictions over SFHAs to comply with all NFIP requirements. The law clearly advises local governments that failure to qualify for the NFIP may result in sanctions under Federal law, and specifies that the State "will cooperate with the federal government in the enforcement of these sanctions."

The 1992 law that provides for local government participation in the NFIP also requires state agencies to "take affirmative action to minimize flood hazards and losses in connection with state-owned and state-financed buildings, roads and other facilities, the disposition of state land and properties, the administration of state and state-assisted planning programs, and the preparation and administration of state building, sanitary and other pertinent codes." In particular, the commissioner of the NYSDEC is to assist state agencies in several respects, including reviewing potential flood hazards at proposed construction sites.

The NYSDEC is charged with conserving, improving, and protecting the state's natural resources and environment, and preventing, abating, and controlling water, land, and air pollution. Programs that have bearing on floodplain management are managed by the Bureau of Flood Protection and Dam Safety, which cooperates with federal, state, regional, and local partners to protect lives and property from floods, coastal erosion, and dam failures. These objectives are accomplished through floodplain management and both structural and nonstructural means.

The Coastal Management Section works to reduce coastal erosion and storm damage to protect lives, natural resources, and properties through structural and nonstructural means. The Dam Safety Section is responsible for "reviewing repairs and modifications to dams, and assuring [sic]

that dam owners operate and maintain dams in a safe condition through inspections, technical reviews, enforcement, and emergency planning." The Flood Control Projects Section is responsible for reducing flood risk to life and property through construction, operation, and maintenance of flood control facilities.

The Floodplain Management Section is responsible for reducing flood risk to life and property through management of activities, such as development in flood hazard areas, and for reviewing and developing revised flood maps. The Section serves as the NFIP State Coordinating Agency and in this capacity is the liaison between FEMA and New York communities that elect to participate in the NFIP. The Section provides a wide range of technical assistance. (FEMA, 2013)

Administrative and Technical Capabilities – County and Local

Office of the Albany County Executive
The Office of the Albany County Executive in conjunction with the Local Emergency Planning Committee and the Emergency Management Office serves as the local lead agency in promoting this goal. These offices all operate through the Office of the Albany County Sheriff. Local supporting agencies include the Department of Public Works, Albany County Sheriff's Department, and the Albany County Health Department (Albany County, no date (3)).

The Office of Emergency Management has the day-to-day responsibility for:

- Developing and implementing emergency management programs and activities;
- Coordinating all aspects of the counties mitigation, preparedness, response, and recovery capabilities; and
- Assisting the County Executive and County Legislature relative to these matters as authorized or required pursuant to the provisions of the Executive Law or other statute, or as may be delegated to said office by the Office of the Sheriff, County Legislature, or the County Executive.

Albany County Planning Department
Planning and Land Use staff provides recommendations and assistance to the County Planning Board, County Executive, County Legislature, and other County and municipal agencies in areas of land use planning and regulation, as necessary and required. This includes fulfillment of New York State General Municipal Law, §239 (l-n); participation on the County Capital Budgeting Committee and various regional planning, transportation and land use committees; and responding to technical land use planning and regulation concerns.

New York State General Municipal Law (Article 12-B, §239-l, m, and n) requires that local communities refer certain development applications, proposed zoning changes, and comprehensive plans to the County Planning Board for review, comment, and recommendations before taking final action. The purpose of this law is to encourage local decision-makers to consider the inter-community and countywide impacts of local land use changes and to add a regional perspective to local land use decisions. The process also allows communities without the benefit of professional planning staff to take advantage of the planning expertise at the

County level and helps the County Planning Board follow development trends throughout the County.

Albany County Soil and Water Conservation District
The Soil and Water Conservation District is responsible for carrying out the district's program for conservation. This program includes use and development of soil, water and related resources. The district also provides County with information, services, and technical/financial assistance to agricultural, rural, urban, and suburban constituents.

Albany County Department of Public Works (DPW)
The Department of Public Works is responsible for providing construction and maintenance services for all County roadways, certain state highways and County-owned parks and recreation areas. This includes: repair and reconstruction of five hundred ninety-four (594) lane miles of County highways, seventy-eight (78) bridges, and thousands of culverts; maintenance of thousands of road signs and road markings; snow plowing and de-icing on all County Roads and on one hundred thirty-six (136) miles of State Highways during the winter; and maintenance of three (3) County-owned recreation areas.

Albany County Department of Economic Development, Conservation and Planning
The Department of Economic Development, Conservation and Planning is responsible for the formulation and implementation of plans and recommendations which promote sound and coordinated planning of the entire County. The department also provides support for the Planning Board by providing information and technical expertise in zoning, the review of land use, and subdivision applications.

The department has four (4) main programs, including: economic development, natural resource conservation, stormwater, and mapping. Portions of the department are managed by the Albany County Department of Public Works, whereas others are managed under the Albany County Executive's Office.

Administrative and Technical Capabilities – State and Federal

New York State Division of Homeland Security and Emergency Services (NYS DHSES)
The NYS DHSES (formerly New York State Office of Emergency Management) is responsible for coordinating activities to protect New York's communities, the state's economic well-being, and the environment from natural, man-made and technical disasters and emergencies. DHSES routinely assists local governments, voluntary organizations, and the private sector through a variety of emergency management programs including hazard identification and mitigation, planning, training, exercises, operational response to emergencies, technical support, and disaster recovery (both public and individual) assistance. (NYS DHSES, 2018)

Under the Disaster Recovery Program, DHSES initiates and promotes mitigation planning and project implementation to protect lives and reduce the impact of disasters on developed land including roads, bridges and buildings in New York State. DHSES provides project management and technical assistance for planning, project identification, application development, environmental review, and benefit cost analysis. Major mitigation programs include the Hazard Mitigation Grant Program, the Flood Mitigation Assistance Program, and the Pre-Disaster

Mitigation Program. DHSES also develops and maintains the State Hazard Mitigation Plan, leading a team of state, federal and academic-based partners through an on-going review and update process. (NYS DHSES, 2018)

The latest State Hazard Mitigation Plan was completed in 2014, maintaining the state's eligibility for recovery assistance from FEMA's Public Assistance. The 2014 State Hazard Mitigation Plan was also used as guidance in the development of this plan update.

New York State Department of Environmental Conservation (NYSDEC) – Division of Water – Bureau of Flood Protection and Dam Safety

The Bureau of Flood Protection and Dam Safety cooperates with federal, state, regional, and local partners to protect lives and property from floods, coastal erosion and dam failures through floodplain management and both structural and non-structural means; and, provides support for information technology needs in the Division. (NYS DHSES, No date) The Bureau is made up of the following sections:

- **Coastal Management** - This Section works to reduce coastal erosion and storm damage to protect lives, natural resources, and properties through structural and non-structural means
- **Dam Safety** - This Section is responsible for reviewing repairs and modifications to dams, and assuring that dam owners operate and maintain dams in a safe condition through inspections, technical reviews, enforcement, and emergency planning
- **Flood Control Projects** - This Section is responsible for reducing flood risk to life and property through construction, operation and maintenance of flood control facilities
- **Floodplain Management** - This Section is responsible for reducing flood risk to life and property through proper management of activities including, development in flood hazard areas and review and development of revised flood maps
- **Fiscal Planning and Management** - This section manages FEMA grants, Bureau of Flood Protection and Dam Safety contracts, Great Lakes Restoration Initiative grants, Capital Projects, Temporary Service Contracts, Water Quality Improvement Program (WQIP) contracts and office operations

Department of State's Division of Code Enforcement and Administration (DCEA)

The Division of Building Standards and Codes (BSC) administer the mandatory statewide Uniform Fire Prevention and Building Code (Uniform Code) and State Energy Conservation Construction Code (Energy Code). The Division provides a variety of services related to the Uniform Code and Energy Code. It provides technical assistance, administers variances, delivers educational courses, oversees the enforcement practices of local governments and serves as secretariat to the State Fire Prevention and Building Code Council. The DCEA publishes technical bulletins, model reporting forms, plan review and inspection checklists, and other publications that aide local code enforcement authorities related to flood hazard areas and reducing flood losses.

Fiscal Capabilities – County and Local

Municipal Fiscal Capabilities

Jurisdictions in Albany County have the ability to implement mitigation activities through existing local budgets, local appropriations via referendums or bonding, and – when available through state and federal loan and grant funding opportunities. In the current municipal fiscal climate of budgetary constraints and tax caps, it is important for local jurisdictions to creatively address mitigation strategies leveraging inter-municipal cooperation and shared services in both grant applications and locally-financed projects. This includes collaborating with Albany County departments and staff.

Fiscal Capabilities – State and Federal

New York Rising Community Reconstruction Program

The NY Rising Community Reconstruction program was established to provide additional rebuilding and revitalization assistance to communities severely damaged by Hurricanes Sandy and Irene and Tropical Storm Lee. The NY Rising Community Reconstruction program enables communities to identify resilient and innovative reconstruction projects and other needed actions based on community-driven plans that consider current damage, future threats and the communities' economic opportunities. Communities successfully completing a recovery plan will be eligible to receive funds to support the implementation of projects and activities identified in the plans (NYS GOSR, 2013).

Each NY Rising Community has a Planning Committee that includes, among others, a representative from the County, Town or Village, elected legislative representatives, local residents, and leaders of other organizations and businesses in the community. The Planning Committee will take the lead in developing the content of the plan. The State has provided each NY Rising Community with a planning team to help prepare a plan.

Consultants have been hired through a State process administered by New York State Homes and Community Renewal (NYS HCR) through its Office of Community Renewal (OCR) and the Housing Trust Fund Corporation (HTFC). Planning experts from the Department of State and Department of Transportation have been assigned to each community to provide assistance to the community and help oversee the planning consultants.

Albany County is not a community participating in NY Rising Initiatives, and no communities within the County are eligible for NY Rising grants or other funding resources (NYS GOSR, 2013).

Federal Hazard Mitigation Funding Opportunities

Hazard mitigation funding from the federal government is available to all municipalities with a current and FEMA-approved hazard mitigation plan. This plan, the 2017 Albany County Multi-Jurisdictional Multi-Hazard Mitigation Plan Update, will be the current plan for the County and the nineteen (19) participating jurisdictions when it is approved by FEMA and adopted locally.

Grant programs from FEMA are available but usually require local share funding percentages – 10% to 25% of the total project costs will need to be provided by the applicant while the

awarding grant program will fund 75% to 90%. Hazard mitigation grant programs sponsored by FEMA are described below:

Hazard Mitigation Grant Program

The Hazard Mitigation Grant Program (HMGP) can provide grants to State and local governments after a disaster has been declared. These grants provide funds to assist with the cost of mitigation measures like strengthening buildings to withstand earthquakes or raising furnaces, storage areas, or entire buildings above flood elevations. Hazard mitigation refers to measures that protect lives and property from future damages caused by natural disasters. In the long term, mitigation measures reduce personal loss, save lives, and reduce the future difficulty and cost of responding to and recovering from disasters. (FEMA, 1999)

Examples of types of mitigation measures eligible for HMGP funding include:

- Acquisition of real property in high hazard areas, demolition or relocation of structures, and conversion of land to open space use
- Strengthening existing structures against high winds
- Seismic rehabilitation and structural improvements to existing structures
- Elevation of flood-prone structures
- Implementing vegetation management programs to reduce wildfire hazard to high-risk structures

Individuals can work with their communities to identify potential mitigation measures. The communities in a declared State can apply for HMGP funding for these measures from the State. The State is responsible for selecting and prioritizing local projects and then forwarding selected applications to FEMA for approval. The amount of funding available for the HMGP under a disaster declaration is 15% of FEMA's estimated total grants for all other categories of assistance from that disaster. The State sets funding priorities and allocates funds among communities. The HMGP can provide grants to assist with 75% of the total cost of mitigation projects. Once a project is approved, the State and local community are responsible for implementing it and providing a 25% funding match. This match is from State and local sources. (FEMA, 1999)

Flood Mitigation Assistance Program

The Flood Mitigation Assistance (FMA) grant program provides funding to States, Federally-recognized Indian tribal governments, and communities so that cost-effective measures are taken to reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insured under the National Flood Insurance Program (NFIP). The long-term goal of FMA is to reduce or eliminate claims under the NFIP through mitigation activities. Three (3) types of grants are available under FMA: Planning, Project, and Technical Assistance. (FEMA, 2007 (2))

This program is funded on an annual basis and no federal disaster declaration is required for eligibility. Only NFIP-insured homes and businesses, however, are eligible for mitigation projects. Individuals must apply via local governments or other eligible organizations. Applicant municipalities must have a FEMA-approved local flood mitigation plan. The FMA program

funds 75% of the total project cost while the remaining 25% must come from non-federal sources.

Pre-Disaster Mitigation Program

The goal of the Pre-Disaster Mitigation Grant Program is to reduce overall risk to the population and structures from future hazard events, while also reducing reliance on Federal funding in future disasters. This program awards planning and project grants and provides opportunities for raising public awareness about reducing future losses before disaster strikes. PDM grants are funded annually by Congressional appropriations and are awarded on a nationally competitive basis. The program requires a 25% local share and no disaster declaration is required. As with the HMGP and FMA programs, a FEMA-approved local hazard mitigation plan is required.

Federal and State Disaster and Recovery Assistance Programs

Disaster recovery funding is available from local, state, and federal levels in the aftermath of a disaster. The extent and severity of the disaster dictates the variety and quantities of funding available in a given event. According to the 2014 NYS Hazard Mitigation Plan, the following general types of funding assistance may be available following a major disaster. Additionally, Appendix H provides a more detailed breakdown, including hyperlinks, to these programs.

- Public Assistance (PA) Grant Program;
- Individual Assistance (IA) Grant Program;
- Community Development Block Grant (CDBG) – Department of Housing and Urban Development; and
- Federal Highway Administration – Emergency Relief Program.

Additional sources of funding from the state and federal levels may be sought from the following programs:

- Social Services Block Grant (NYS)
- Homeland Security Grant Program (NYS)
- U.S. Economic Development Administration
- Homeownership Repair and Rebuilding Fund – HRRF (NYS)
- Empire State Relief Fund (NYS)
- Governor’s Office of Storm Recovery – GOSR (NYS)
- Empire State Development (NYS)

7.5 Mitigation Strategy Prioritization

Mitigation Strategy

There are many factors that must be considered when implementing a mitigation action or project. Each participating jurisdiction identified specific implementation details associated with each proposed action including goals achieved, implementing agency(ies), estimated costs, possible funding sources, and implementation timeframes.

When detailed costs were not available, estimated price ranges were considered for each mitigation action. The levels for the cost estimates are as follows:

- **Low:** cost is estimated to be below $10,000
- **Medium:** cost is estimated to be between $10,000 and $100,000
- **High:** cost is estimated to be over $100,000

The implementation timeframes provided for each mitigation action are also estimated. Smaller, locally-funded projects are easier to implement and therefore have shorter timeframes, while larger, complicated actions that involve funding applications, agency reviews, etc., will likely take five years or longer to complete. The levels for the timeframe estimates for each mitigation action are as follows:

- **Short:** completion anticipated within 1-2 years
- **Moderate:** completion anticipated within 5 years
- **Long:** completion anticipated in greater than 5 years
- **Ongoing:** action involves continued coordination or effort

For some mitigation actions, timeframe is presented as a range. This indicates that the action is currently being implemented or should be implemented as soon as possible and that it will continue for an extended period of time.

Action Prioritization

A cost-benefit analysis was completed for each proposed mitigation action as a way to prioritize the many actions included in this document. This analysis was completed using STAPLEE table forms. STAPLEE is a cost/benefit analysis tool developed by FEMA that includes considerations for social, technical, administrative, political, legal, environmental, and economic issues. If a proposed mitigation action has a positive impact on the category, a "+" is placed in the box. If the action has a negative impact on the category, a "-" is placed in the box. If the action has a neutral impact or is not applicable, a "0" or "N" is placed in the box. The scores are then found by summing all the positive impacts and subtracting out the negative impacts. A higher score generally indicates a higher priority action. The table also takes into account the ease of implementation, the quickness of implementation, and if the action achieves multiple plan objectives. The priority level indicated for each action is based on the current knowledge of the mitigation actions, including their estimated costs, timeframes, and funding availability. Prioritization criteria will continue to be reviewed and revised on an annual basis during the five-year plan update timeframe. By implementing the proposed actions as part of pre-disaster

mitigation, and not as an afterthought, the implementation will be more cost effective and the incorporation of these actions into normal planning processes and operational procedures will naturally occur.

Each proposed mitigation action was evaluated against the following considerations (FEMA, 2008):

- Compatibility with goals and objectives identified in the 2014 NYS Hazard Mitigation Plan;
- Compatibility with goals of the plan update;
- Assessment of the impact of identified actions on jurisdictions within the entire planning area or region;
- Cost/benefit reviews of potential actions;
- Funding priorities identified in the current NYS Hazard Mitigation Plan; and
- Compatibility with other local and regional plans and programs.

Each participating jurisdiction evaluated the mitigation actions that applied to their jurisdiction. These evaluations considered the six (6) elements addressed above. This exercise provided the participating jurisdictions with a way to prioritize the mitigation actions using a simple cost/benefit analysis (Table 7.5a). Depending on the results of the action evaluations, each mitigation action is recognized as a high priority project, medium priority project, or low priority project.

Table 7.5a – Benefit and Cost Prioritization Rankings

	Assessment Levels and Description		
	High	**Medium**	**Low**
Benefits	Action within the next five years is important and is anticipated to have a meaningful impact on reduction of losses.	A long-term impact on the reduction of losses is anticipated. Action within the next five years is anticipated, though not critical.	It is difficult to assess the benefits of an action due to its long-term timeframe. Action within the next five year is unlikely.
Costs	Existing funding sources are inadequate or are not identified to cover implementation of the action.	Funding exists, but will have to be reapportioned or budgeted over multiple years.	Funds to implement action are available in existing budget.

Actions recorded as having a benefit level equal to or higher than the cost level, were viewed as cost-beneficial actions, therefore receiving a high priority ranking. This priority ranking process should be viewed as a preliminary analysis. The ranking system used during this evaluation will evolve based on input from participating jurisdictions, agency representatives, and other branches of state and federal government as the implementation of mitigation strategies progresses. Additional funding sources will be required for many of the proposed mitigation actions. Coordination with agencies such as NYS DHSES and FEMA will be necessary to secure funds for proposed mitigation actions, especially those with high costs and long-term implementation schedules.

Appendix F – outlines each of the participating jurisdiction's highest priority actions being proposed as part of this HMP Update. The plan update project team identified these actions as those with most importance for implementation in the next five years. This list reflects the re-inclusion of some actions from the original plan that are still relevant, but also incorporates many new actions that would also minimize potential impacts to life and property as a result of hazard events. This list represents mitigation actions that were proposed by participating jurisdictions, agencies, and members of the public, based on need. Some of the proposed actions relate to a specific type of hazard event or specific jurisdiction, while others are proposed to mitigate an array of hazards or will apply to multiple jurisdictions.

8.0 National Flood Insurance Program

Long-term mitigation of potential flood impacts can be best achieved through comprehensive floodplain management regulations and enforcement, particularly at a local level. The National Flood Insurance Program (NFIP) is regulated by FEMA. The goal of this program is to reduce the impact of flooding on private and public structures by providing affordable insurance for property owners. The program encourages local jurisdictions to adopt and enforce floodplain management regulations in order to mitigate the potential effects of flooding on new and existing infrastructure (FEMA, 2015).

Communities that participate in the NFIP adopt floodplain ordinances that require that all insured structures that are damaged over 50% of the property's market value must comply with the floodplain ordinance when the structure is repaired/re-built. These repairs could mean changes to the elevation of the structure, acquisition and demolition by the municipality, or relocation to a location outside of the floodplain. Insured structures that are located within floodplains identified on FEMA's Flood Insurance Rate Maps (FIRMs) receive funds if impacted by a flooding disaster. These distributed funds are to be used to mitigate the risk of future flooding by implementing pre-disaster mitigation actions, such as those previously referenced.

The NFIP and other flood mitigation actions are important for the protection of public and private property and public safety. Flood mitigation is valuable to communities because: (1) it creates safer environments by reducing loss of life and decreasing property damage; (2) it allows individuals to minimize post-flood disaster disruptions and to recover quicker (homes built to NFIP standards receive less damage from flood events – when damage does occur, the flood insurance program protects the homeowner's investment); and (3) it lessens the financial impacts on individuals, communities, and other involved parties (FEMA, 2015).

8.1 Albany County Flood Mapping

FEMA's Q3 flood data, which is derived from their FIRMs, were reviewed for Albany County. Flood hazard mapping associated with Albany County was updated and effective as of March, 16th, 2015. All municipalities within Albany County have been mapped and data is available online at https://msc.fema.gov/portal.

There are an estimated 25,716 acres of land in the County that are located within 100-year or 500-year mapped flood zones. A 100-year flood indicates a flood elevation that has a 1% chance of being equaled or exceeded each year. Similarly, a 500-year flood indicates a flood elevation that has a 0.2% chance of being equaled or exceeded in any given year. According to the NYS DHSES State Mitigation Plan (NYS DHSES, 2014), there are 30 properties in Albany County that have repetitive flood loss; total payments for these properties is 1,706,600.73. The State Plan also indicates that there are three (3) properties which have experienced severe repetitive losses; which account for $641,824 in total payments. The 2011 NYS DHSES State Plan includes an estimated value of structures located within 100-year mapped floodplains in Albany County. This estimate includes a median sales price of $123,273 and an estimate of 1,317 structures in 100-year floodplains, for a total calculated estimated value of $162,350,640. This potential flood loss estimate is based on 100-year floodplain mapping and estimated values of structures. The

2014 NYS DHSES State Mitigation Plan shows there are approximately 1,177 residential properties within the 100-year floodplain and of these properties a total of nine hundred fifty-two (952) are covered by NFIP policies. The 2011 plan indicates that the calculated estimate value of residential structures in the 100-year floodplain is between $140,000 and $230,000,000.

The land area in Albany County that is mapped within either of these flood zones accounts for, at least portions of, 6,924 tax parcels. A HAZUS study identified 106,181 buildings in the region with an aggregate total replacement value of $41,518,105. By occupancy, the buildings are largely residential at 66.90%, with commercial at 21.96%, and industrial at 2.99%. The remaining categories (agricultural, religion, government, and education) fall between 0.2 and 3.5%. The Mohawk and Hudson Rivers influence the majority of the hydrology. Table 8.1a lists the total number of parcels mapped in 100- and 500-year floodplains according to their jurisdiction location.

Table 8.1a – Total Parcels Mapped in 100- and 500-Year Floodplains by Jurisdiction
(2009 FEMA Flood Mapping)

Jurisdiction	Total Parcels
Albany, City of	480
Altamont, Village of	162
Berne, Town of	191
Bethlehem, Town of	146
Coeymans, Town of	187
Cohoes, City of	146
Colonie, Town of *(includes Village of Colonie)*	3,403
Green Island, Town/Village of	540
Guilderland, Town of	251
Knox, Town of	96
Menands, Village of	103
New Scotland, Town of	134
Ravena, Village of	32
Rensselaerville, Town of	212
Voorheesville, Village of	70
Watervliet, City of	671
Westerlo, Town of	100
Albany County Total	6,924

Appendix G lists the parcels by type and the corresponding values for each municipality.

8.2 Albany County NFIP Policy and Loss Statistics

National Flood Insurance Program records and claims were analyzed to determine the extent of participation, flood losses, and flood insurance policies within Albany County. All of the jurisdictions within the County are current participants in FEMA's NFIP. NFIP Policy Data and Loss statistics for all participating jurisdictions in Albany County are included on Tables 8.2a and 8.2b. These data are current as of February 29th, 2016.

The information included in Table 8.2a documents the number of flood insurance policies, coverage amounts, and premium amounts for all jurisdictions within Albany County on March 31st, 2016. Each jurisdiction within Albany County is a part of the program. The City of Albany has the highest number of policies in-force and the greatest insurance amounts in-force. The Town/Village of Green Island has the second highest number of policies in-force, and the Town of Colonie has the second greatest insurance amounts in-force.

Table 8.2a - NFIP Policy Statistics, Snapshot as of March 31, 2016
(FEMA, Policy Information)

Jurisdiction	Policy In-Force	Insurance In-Force *(whole $)*	Written Premium In-Force
Albany, City of	185	$53,080,300	339,976
Altamont, Village of	29	$7,054,000	33,156
Berne, Town of	11	$2, 772,000	3,909
Bethlehem, Town of	52	$13,550,300	31,482
Coeymans, Town of	45	$9,004,000	53,642
Cohoes, City of	29	$7,668,200	52,956
Colonie, Town of	113	$30,102,800	82,337
Colonie, Village of	1	$210,000	348
Green Island, Town/Village of	180	$26,849,100	218,088
Guilderland, Town of	41	$11,213,600	19,669
Knox, Town of	5	$938,600	2,820
Menands, Village of	55	$15,959,100	98,804
New Scotland, Town of	17	$5,039,700	11,643
Ravena, Village of	6	$808,200	7,751
Rensselaerville, Town of	12	$2,454,100	8,262
Voorheesville, Village of	23	$4,389,400	12,071
Watervliet, City of	129	$19,532,500	196,035
Westerlo, Town of	1	$70,000	241
Albany County Total	934	$207,923,900	1,173,190

Policies in-force = NFIP policies as of March 31, 2016
Insurance in-force = coverage amount for policies in-force
Written premium in-force = premium paid for policies in-force

The flood loss data included in Table 8.2b documents the number of losses and payment amounts associated with flood losses from January 1st, 1978 to March 31st, 2016. NFIP Loss Statistics indicate that the Town of Colonie has experienced the highest incidence of loss from flood events with ninety-five (95). The Town of Colonie has also experienced the most damage from these events, receiving $1,321,838 in total payouts. The City of Albany has experienced the

second highest incidents of loss and the second highest amount of payments, with fifty-three (53) events and $756,375 in total payments. The Town of Bethlehem saw the third highest incident loss from flood events with twenty-seven (27) events. The Town of Coeymans sustained the third highest amount of damage from flood events, receiving $567,611 in total payments. The Town of Knox has not received any payments from the program. The Town has made only two (2) claims, neither of which received payments.

Table 8.2b – NFIP Loss Statistics, as of March 31, 2016 for Losses Incurred Since January 1, 1978
(FEMA, Claim Information, 2016)

Jurisdiction	Total Losses	Closed Losses	Open Losses	CWOP Losses	Total Payments
Albany, City of	53	39	0	14	$756,375
Altamont, Village of	13	9	0	4	$32,587
Berne, Town of	3	3	0	0	$29,911
Bethlehem, Town of	27	18	0	9	$251,266
Coeymans, Town of	20	15	0	5	$567,611
Cohoes, City of	25	20	0	5	$94,508
Colonie, Town of	95	80	0	15	$1,321,838
Green Island, Town/Village of	7	5	0	2	$34,790
Guilderland, Town of	17	11	0	6	$342,390
Knox, Town of	2	0	0	2	$0
Menands, Village of	8	3	0	5	$69,503
New Scotland, Town of	15	10	0	5	$200,069
Ravena, Village of	4	1	0	3	$1,039
Rensselaerville, Town of	8	6	0	2	$199,437
Voorheesville, Village of	11	10	0	1	$67,231
Watervliet, City of	16	9	0	7	$67,664
Westerlo, Town of	5	4	0	1	$48,361
Albany County Totals	329	243	0	86	$4,084,580

Total losses = all losses submitted regardless of status, total claims
Closed losses = losses that have been paid
Open losses = losses that have not been paid in full
CWOP losses = losses closed without payment
Total payments = total amount paid on losses

Table 8.2c - NFIP Repetitive Loss Properties, as of November 30, 2014 for Losses Incurred Since January 1, 1978
(NFIP Legacy Systems Services, 2016)

Jurisdiction	Number of Qualifying Properties
Albany (C)	6
Altamont (V)	1
Berne (T)	0
Bethlehem (T)	4
Coeymans (T)	1
Cohoes (C)	1
Colonie (T)	14
Colonie (V)	0
Green Island (T/V)	0
Guilderland (T)	1
Knox (T)	0
Menands (V)	1
New Scotland (T)	1
Ravena (V)	0
Rensselaerville (T)	1
Voorheesville (V)	1
Watervliet (C)	0
Westerlo (T)	0
Albany County Total	32

Table 8.2d – Repetitive Loss/Severe Repetitive Loss by Structure Type
(FEMA, DHSES)

Comm. ID #	Jurisdiction	# Policies	# Claims Paid	Total Paid	Average Payment	Single Family	2-4 Family	Non Residential	Assumed Condo	# of RLP with are also SRL Properties
360001	**Albany, City of**	169	38	$726,127	$19,109	4		2		
360002	**Altamont, Village of**	33	9	$32,587	$3,621	1				
360003	**Berne, Town of**	12	3	$26,911	$8,970					
361540	**Bethlehem, Town of**	55	18	$251,266	$13,959	3	1			
360005	**Coeymans, Town of**	43	15	$567,611	$37,841	1				
360006	**Cohoes, City of**	36	20	$94,508	$4,725	1				
360007	**Colonie, Town of**	118	77	$1,302,192	$16,912	11	2		1	3
365377	**Colonie, Village of**	1								
360009	**Green Island, Village/Town**	187	5	$34,790	$6,958					
360010	**Guilderland, Town of**	40	16	$367,280	$22,955	1				
360011	**Knox, Town of**	8								
360012	**Menands, Village of**	34	2	$37,499	$18,750			1		
360013	**New Scotland, Town of**	20	10	$200,069	$20,007			1		1
361346	**Ravena, Village of**	5	1	$1,038	$1,038					
360014	**Rensselaerville, Town of**	13	6	$199,436	$33,239		1			
360015	**Voorheesville, Village of**	5	10	$67,231	$6,723	1				
360016	**Watervliet, City of**	142	9	$67,664	$7,518					
360017	**Westerlo, Town of**	1	4	$33,011	$8,253					

8.3 NFIP Mitigation Actions

As part of the Albany County Hazard Mitigation Plan Update, each participating jurisdiction was required to evaluate a specific set of mitigation actions aimed at continued compliance and participation with FEMA's NFIP. These mitigation actions are proposed in addition to the mitigation actions already included in this plan. The mitigation actions, incorporated by FEMA in their 2008 guidance and included to reduce the impacts of future flood hazard events, consist of the following:

- Revisions to floodplain management ordinances in order to comply with FEMA's latest regulations and remain consistent with the FIRMs;
- The designation of a Floodplain Administrator in each participating jurisdiction;
- Ensuring that staff members have appropriate training to adequately enforce NFIP regulations and ordinances;
- Requiring staff involved in floodplain management and/or regulations to become Certified Floodplain Managers (CFMs);
- Joining the Community Rating System (CRS).

These NFIP-specific mitigation actions are further detailed in the mitigation action strategies included in the Proposed Hazard Mitigation Initiatives tables for each participating jurisdiction, located in Section 10.

There are no communities in Albany County which are participants in the CRS. The Community Rating System is a voluntary incentive program that recognizes and encourages floodplain management activities at the community level. As a result of CRS participation, flood insurance premium rates are discounted to reflect the reduced flood risk that results from community actions to meet the three (3) goals of the CRS: reduce flood loss, facilitate accurate insurance ratings, and promote flood insurance awareness (FEMA, 2016).

Appendix I list potential sites that could be used for temporary housing in the case of an emergency. Facilities considered for temporary housing include, but are not limited to, fire stations, schools, churches and town halls. Based on information provided by the participating jurisdictions no formal shelter procedures or plans have been identified. However, this will be a priority implementation measure for all participating jurisdictions to develop prior to the next HMP update.

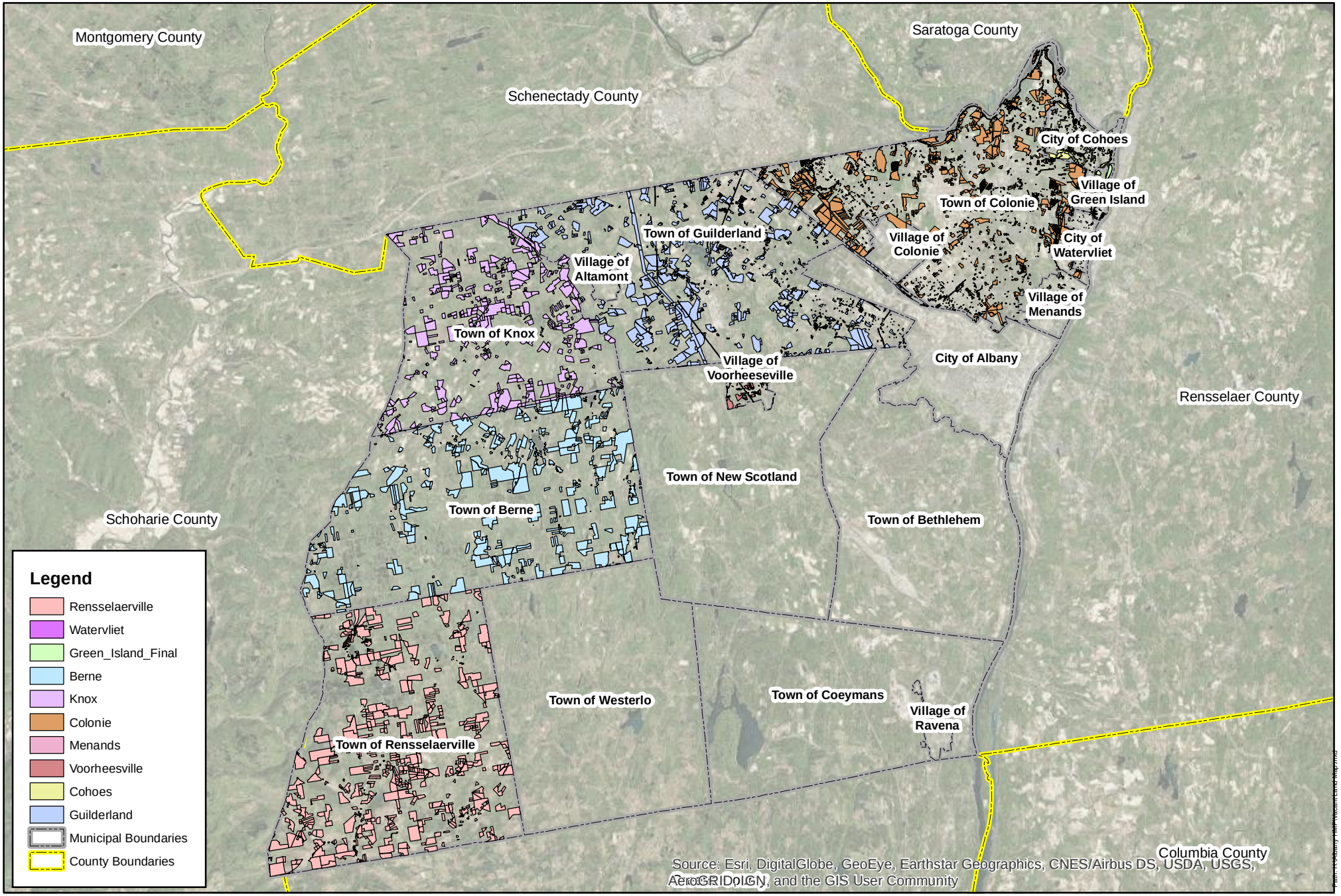
Table 8.3a provides the approximate acreage of vacant land located within the municipality that could be acquired for the purpose of relocating houses currently located within the floodplain. It should be noted that the acreage of vacant land includes commercial and industrial vacant land which may not be appropriate for housing.

Table 8.3a – Acreage of Vacant Land Available per Municipality		
Jurisdiction	Acres	Parcels
Albany, City of	N/A	319
Altamont, Village of[1]	N/A	N/A
Berne, Town of	8,920	453
Bethlehem, Town of[1]	N/A	N/A
Colonie, Town of	8,450	2,945
Colonie, Village of[1][2]	N/A	N/A
Cohoes, City of	410	676
Coeymans. Town of[1]	N/A	N/A
Green Island, Town of	140	105
Guilderland, Town of	15,520	1,174
Knox, Town of	6,620	396
Menands, Village of	110	38
New Scotland, Town of[1]	N/A	N/A
Ravena, Village of[1]	N/A	N/A
Rensselaerville, Town of	10,810	616
Voorheesville, Village of	960	103
Watervliet, City of	20	91
Westerlo, Town of[1]	N/A	N/A

(1) Vacant land data was not available
(2) Municipality not effected by 500-year floodplain

Figure 8.3a shows the location of all vacant parcels.

Figure 8.3a - Vacant Parcels within Albany County



1 inch = 23,333 feet

Hazard Mitigation Plan

Vacant Parcels within Albany County

Albany County July 2018 New York

Figure 8.3a

Project No. 923.008.001

9.0 Plan Maintenance Process

This section details the future maintenance process that will be followed for subsequent plan updates. The Disaster Mitigation Act of 2000 requires that adopted mitigation plans define and document the processes and mechanisms for maintaining and updating the hazard mitigation plan at least once every five (5) years in order for the participating jurisdictions to remain eligible for funding. This hazard mitigation plan maintenance process must include: monitoring and evaluating the plan; updating the plan; providing an implementation schedule; and outlining steps for continued public involvement. A checklist to assist with the monitoring, evaluation, and updating of this Hazard Mitigation Plan is included in Appendix C.

9.1 Plan Monitoring and Evaluation

The 2017 Albany County Multi-Jurisdictional Hazard Mitigation Plan will be monitored on an annual basis to ensure that the goals and objectives of the Plan remain relevant and that the proposed mitigation actions are being implemented efficiently. The Albany County Sheriff's Office Division of Emergency Management, who is coordinating this mitigation planning project, and the Albany County Department of Economic Development, Conservation, and Planning, will monitor overall plan maintenance for this plan. The Albany County Sheriff's Office Division of Emergency Management and the Albany County Department of Planning will work together to oversee and schedule the initiation of required plan updates going forward.

The Albany County Multi-Jurisdictional Hazard Mitigation Plan – Implementation Committee will be established and continue to hold annual meetings to review and discuss this document, recent hazard events, and how to incorporate this Plan into other County-wide planning efforts. These annual meetings will be publicized and open to the public, as a way to promote continued public involvement in this process. The Albany County Planning Department will be in charge of scheduling and moderating the Implementation Committee annual meetings, and will be responsible for compiling a meeting summary and annual report at the end of every year. This annual report should detail changes made to the HMP document, if any, and how and when these changes will be made. The meeting summary will provide important information regarding hazard events that occurred during the previous year and implementation details associated with the proposed mitigation actions included in the HMP.

The implementation of proposed mitigation actions is important to review to determine whether the plan is being executed correctly. Items that should be reviewed and recorded for each completed mitigation action include the ultimate cost of the activity, the successes and failures of the action in minimizing hazard impacts, and the funding sources used for the action. During each annual meeting of the Implementation Committee, the following HMP components will be assessed:

- Whether the goals and objectives address current and expected conditions;
- Whether the nature, magnitude, and/or type of risks have changed;
- Whether the current resources are appropriate for implementing the plan;

- Whether there are implementation problems or coordination issued with other agencies;
- Whether the outcomes have occurred as expected, and
- Whether agencies and other partners participated as originally proposed.

The schedule and tasks associated with the monitoring of Albany County's HMP are included in Appendix C. The annual reports compiled by the County Planning Department will be posted to the County's website for public review.

9.2 Plan Updating

The 2017 HMP will be updated by addendum at any time during the five-year execution period in which the Implementation Committee determines that a significant change has occurred that warrants such an action. In the event of a hazard occurrence, the goals, actions, and procedures outlines in the Plan will be reviewed, as necessary. If any revisions or changes are warranted, the plan will be updated immediately, or at the next five-year update timeframe, depending on the importance of the proposed change(s) or revision(s). During the updating process, the participating jurisdictions will be contacted to provide updated information concerning the elements of the Plan applicable to their community. This process will be completed through the issuance of a questionnaire to be returned to the Implementation Committee for review prior to their annual meeting.

Approximately 18 months prior to the end of the current five-year execution period, the Plan update process should be initiated. Participant and public review will continue to be completed during each five-year Plan Update process. All future plan updates will be submitted for re-approval in accordance with the five-year review schedule dictated in DMA 2000. Following FEMA conditional approval, each participating jurisdiction must formally adopt the new Plan by resolution. These resolutions should be collected and filed in Appendix B for documentation, and submitted to FEMA and NYS DHSES for final HMP approval. A user friendly checklist was formulated to aid Albany County in competing future five-year updates to the HMP. A copy of this checklist is provided in Appendix C. This checklist will help the County organize and complete revisions to future Plan Updates and will assist the County in adequately meeting the five-year review timeframe instituted by FEMA.

9.3 Local Planning Considerations

By adopting a resolution to accept the Multi-Jurisdictional Hazard Mitigation Plan, each participating jurisdiction agrees to reference and incorporate the document into their future local planning documents, codes, decisions, processes, and regulations. Plan elements will be considered during municipal and County-wide development actions and comprehensive planning. Planning mechanisms and current capabilities recognized among the participating jurisdictions are demonstrated by Table 3.3a in on page 36. Table 3.1a will be revised as new mechanisms and capabilities are adopted and updated by the participating jurisdictions. Table 9.3a shows how this HMP will be incorporated into the existing and future planning mechanisms and opportunities of each jurisdiction.

Table 9.3a – Planning Mechanism Incorporation	
Mechanism	How Plan Will be Incorporated
Emergency Planning	Plan will be added / referenced as an Appendix to the County's Emergency Response/Evacuation Plan. Hazard risk assessment and vulnerability data included in the mitigation plan will be reviewed during emergency planning and Emergency Response / Evacuation Plan updates.
Annual Budget	Mitigation actions will be considered when setting the annual budgets within participating jurisdictions.
Plans and Programs	Hazard Mitigation Plan information will be considered by each participating jurisdiction during program and protection updates and revisions. Programs and plans will be compared to the Hazard Mitigation Plan to ensure that goals and objectives are consistent among all documents.
Grant Applications and other Funding Opportunities	Data and maps from the HMP may be used as supporting documentation in grant applications. Mitigation actions included in the Plan will be considered during application submission and fund allocation.
Economic Development	Hazard vulnerability information will be reviewed and utilized during the siting of local development efforts within each participating jurisdiction.
Capital Improvement Planning	Current and future projects will be reviewed for hazard vulnerability. Hazard resistant construction standards will be incorporated into the design and location of potential projects, as appropriate.

Some jurisdictions in Albany County are taking a more active role in sustainable development, green infrastructure, disaster planning, etc. within their community. After a review of the planning mechanisms and capabilities associated with each jurisdiction, a list of recommended regulatory elements or planning documents was compiled. These suggested future planning efforts include:

- Comprehensive/Land Use Plan – *Town/Village of Green Island and the Villages of Menands and Voorheesville*
- Watershed Protection Plan – *all jurisdictions, especially those with repetitive flood loss*
- Flood Insurance Rate Maps – *City of Albany*
- Continuity of Operations Plan – *Cities of Cohoes, Watervliet, Towns of Berne, Coeymans, Colonie, New Scotland, and Westerlo, Town/Village of Green Island, and the Villages of Ravena and Menands*
- Natural disaster or Safety Related School Programs – *City of Watervliet, Town of Berne, Coeymans, Knox, New Scotland, and Westerlo and Villages of Altamont, Ravena, and Voorheesville*

The planning efforts made for the 2017 HMP will allow for this document to be used as a valuable planning tool and will assist with action implementation. An emphasis on such efforts will be placed over the next five-year period. The incorporation of this document in local planning efforts and processes will be reviewed and discussed on an annual basis.

9.4 Public Involvement

It is the intent of Albany County and participating jurisdictions to keep the public informed about the hazard mitigation planning efforts, actions, and projects that occur within the County. To accomplish this goal, and in addition to the public involvement already incorporated into the completion and review of this document, the following opportunities for ongoing public involvement will be made available:

- A web link will be provided on Albany County's website that will include a digital copy of the hazard mitigation plan and a list of upcoming planning activities and plan updates;
- Public announcements of, and invitations to, annual mitigation committee planning meetings and five-year mitigation plan update events; and
- Completion of public outreach and mitigation training events throughout the County, especially in higher risk hazard areas.

Public outreach efforts will be documented in future plan updates through the inclusion of samples, copies of notices, flyers, web announcements, and/or meeting minutes. If public response is lacking during subsequent update processes, additional ways to expand participation will be considered. Public outreach ideas that may be implemented to increase participation include:

- Distribute targeted questionnaires to local civic, community, and non-profit groups to received public feedback;
- Organize topic specific meetings with key individuals and experts to discuss particular concerns and brainstorm solutions; and
- Hold education programs during various community events to disseminate information and engage the public in discussions on mitigation planning and hazard preparation.

9.5 Plan Integration

While this Hazard Mitigation Plan brings together hazard awareness and risk management strategies, it builds tangible value only when integrated into public activities and decision making. The hazard mitigation actions, recommendations, and goals of this plan must be integrated into planning, policy, and budgeting procedures at all levels of government throughout Albany County and into the private sector where appropriate.

The "Planning Mechanisms and Capabilities" section of Chapter 3 (Planning Process) provides a summary and description of the existing plans, programs and regulatory mechanisms at all levels of government (Federal, State, County and local) that support hazard mitigation within the county. Each participating jurisdiction has identified an integrated hazard risk management into their existing planning, regulatory and operational/administrative framework ("integration capabilities") and how they intend to promote this integration ("integration actions").

The 2007 Albany County All - Hazard Mitigation Plan set out several recommended strategies for implementing the plan into existing planning and operational mechanisms in County government. It is logical to continue these procedures to ensure that all planning documents across the County are maintained with hazard mitigation issues in mind.

The following recommendations will be carried over from the 2007 HMP into the new 2017 Plan Update:

1) Minimize injury and loss of life from hazards
2) Minimize losses to existing and future structures within hazard areas
3) Protect natural resources, such as open space, drinking water and recreation areas from hazards
4) Protect cultural resources such as historic structures and museums from hazards
5) Provide for Continuity of Government (COG) and Continuity of Operations Program (COOP) during and in the aftermath of disasters in order to ensure that the government continues to function and to minimize negative impacts from events

For a community to succeed in reducing long-term risk, hazard mitigation must be integrated into the day-to-day local government operations.

10.0 Background

Section 201.6.a(4) of Chapter 44 of the Code of Federal Regulations (44CFR) states: "Multi-jurisdictional plans (e.g., watershed plans) may be accepted, as appropriate, as long as each jurisdiction has participated in the process and has officially adopted the plan." The Federal Emergency Management Agency (FEMA) and New York State Division of Homeland Security and Emergency Services (NYS DHSES) both encourage multi-jurisdictional planning. Therefore, in the preparation of the Albany County Multi-Jurisdictional Hazard Mitigation Plan (HMP), a planning partnership was formed to meet the requirements of the federal Disaster Mitigation Act of 2000 (DMA) for as many eligible local governments in Albany County as possible.

In addition to the County's participation, Albany County Office of the County Executive the participation of all incorporated cities, towns and villages within the County at the outset of this project.

Table 10.0a lists those jurisdictions that elected to participate in the 2017 Albany County HMP Update process, and have met the minimum requirements of participation as established by the County and Steering Committee:

Table 10.0a – Participating Jurisdictions in Albany County

City of Albany	Town of Berne	Town of Guilderland	Village of Altamont
City of Cohoes	Town of Bethlehem	Town of Knox	Village of Menands
City of Watervliet	Town of Coeymans	Town of New Scotland	Village of Ravena
	Town of Colonie	Town of Westerlo	Village of Voorheesville
			Town/Village of Green Island

10.1 Hazard Vulnerabilities and Ranking

Hazard Risk/Vulnerability Risk Ranking: The Albany County HMP Update identifies and characterizes the broad range of hazards that pose risk to the entire planning area. However each jurisdiction has differing degrees of risk exposure and vulnerability aside from the whole. The local risk ranking serves to identify each jurisdiction's degree of risk to each hazard as it pertains to them, supporting the appropriate selection and prioritization of initiatives that will reduce the highest levels of risk for each community.

More data and information on the hazards of concern, the methodology used to develop the vulnerability assessments, and the results of those assessments that serve as the basis of these local risk rankings may be found in Sections 4 and 5.

National Flood Insurance Program (NFIP) Summary: Provides NFIP summary statistics for the jurisdiction.

Critical Facilities: Identifies potential flood losses to critical facilities in the jurisdiction, based on the flood vulnerability assessment process presented in Section 5.

Other Vulnerabilities Identified by the Jurisdiction: Presents other specific hazard vulnerabilities as identified by the jurisdiction.

10.2 Capability Assessment

This subsection provides an inventory and evaluation of the jurisdiction's tools, mechanisms and resources available to support hazard mitigation and natural hazard risk reduction, organized as planning and regulatory, administrative and technical, and fiscal capabilities, respectively. Further, the municipality's level of participation in state and federal programs designed to promote and incentivize local risk reduction efforts has been identified.

National Flood Insurance Program (NFIP): This subsection documents the NFIP as implemented within the jurisdiction. This summary was based on surveys prepared by, and/or interviews conducted with, the NFIP Floodplain Administrators for each NFIP-participating community in the County.

This subsection also identifies actions to enhance implementation and enforcement of the NFIP within the community.

Integration of Hazard Mitigation into Existing Planning Mechanisms: This subsection identifies how the jurisdiction has integrated hazard risk management into their existing planning, regulatory and operational/administrative framework ("integration capabilities"), and/or how they intend to promote this integration ("integration actions").

Further information regarding Federal, State and local capabilities may be found in the Capability Assessment portion of Section 3.

10.3 Mitigation Strategy and Prioritization

Past Mitigation Initiative Status: Where applicable, a review of progress on the jurisdiction's prior mitigation strategy is presented, identifying the disposition of each prior action, project or initiative in the jurisdiction's updated mitigation strategy. Other completed or on-going mitigation activities that were not specifically part of a prior local mitigation strategy may be included in this sub-section as well.

Proposed Mitigation Strategy: The table in this subsection presents the jurisdiction's updated mitigation strategy. As indicated, applicable mitigation actions, projects and initiatives are further documented on an Action Worksheet which provides details on the project identification, evaluation, and prioritization and implementation process.

Hazard Area Extent and Location Map: A county-wide map has been complied to represent each participating jurisdiction's identified hazard zones, critical facilities, and areas of NFIP Repetitive Loss/Severe Repetitive Loss (RL/SRL).

FEMA Action Worksheets: Appended as applicable.

