SECTION 1. INTRODUCTION

1.1 BACKGROUND

In response to the requirements of the Disaster Mitigation Act of 2000 (DMA 2000), Montgomery County, and the towns and villages located therein, have developed this Multi-Jurisdictional All-Hazard Mitigation Plan (HMP), which is an update of the 2008 Montgomery County Hazard Mitigation Plan. DMA 2000 amends the Stafford Act and is designed to improve planning for, response to, and recovery from, disasters by requiring State and local entities to implement pre-disaster mitigation planning and develop HMPs. The Federal Emergency Management Agency (FEMA) has issued guidelines for HMPs. The New York State Division of Homeland Security & Emergency Services (NYS DHSES) also supports plan development for jurisdictions in New York State.

Hazard Mitigation is any sustained action taken to reduce or eliminate the long term risk and effects that can result from specific hazards.

FEMA defines a Hazard Mitigation Plan as the documentation of a state or local government evaluation of natural hazards and the strategies to mitigate such hazards.

Specifically, DMA 2000 requires that States with support from local governmental agencies update HMPs on a five year basis to prepare for and reduce the potential impacts of natural hazards. DMA 2000 is intended to facilitate cooperation between state and local authorities, prompting them to work together. This enhanced planning will better enable local and State governments to articulate accurate needs for mitigation, resulting in faster allocation of funding and more effective risk reduction projects.

1.1.1 DMA 2000 Origins -The Robert T. Stafford Disaster Relief and Emergency Assistance Act

The ***Federal Emergency Management Agency*** (FEMA) estimates that for every dollar spent on damage prevention (mitigation), twice that amount is saved through avoided post-disaster damage repair.

In the early 1990s, a new federal policy regarding disasters began to evolve. Rather than simply reacting whenever disasters strike communities, the federal government began encouraging communities to first assess their vulnerability to various disasters and proceed to take actions to reduce or eliminate potential risks. The logic is simply that a disaster-resistant community can rebound from a natural disaster with less loss of property or human injury, at much lower cost, and, consequently, more quickly. Moreover, other costs associated with disasters, such as the time lost from productive activity by business and industries, are minimized.

DMA 2000 provides an opportunity for States, tribes and local governments to take a new and revitalized approach to mitigation planning. DMA 2000 amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act by repealing the previous mitigation planning provisions (Section 409) and replacing them with a new set of requirements (Section 322). This section sets forth the requirements that communities evaluate natural hazards within their respective jurisdictions and develop an appropriate plan of action to mitigate those hazards, while emphasizing the need for State, tribal and local governments to closely coordinate mitigation planning and implementation efforts.

The amended Stafford Act requires that each local jurisdiction identify potential natural hazards to the health, safety and wellbeing of its residents and identify and prioritize actions that can be taken by the community to mitigate those hazards—before disaster strikes. For communities to remain eligible for hazard mitigation assistance from the federal government, they must first prepare, and then maintain and update an HMP (this plan).

Responsibility for fulfilling the requirements of Section 322 of the Stafford Act and administering the FEMA Hazard Mitigation Program has been delegated to the State of New York, specifically to NYS DHSES. FEMA also provides support through guidance, resources, and plan reviews. Copies of the applicable federal and state regulations are found in Appendix A.

1.1.2 Organizations Involved in the Mitigation Planning Effort

Montgomery County and the participating jurisdictions intend to implement this HMP with full coordination and participation of County and local departments, organizations and groups, as well as by coordinating with relevant State and Federal entities. Coordination helps to ensure that stakeholders have established communication channels and relationships necessary to support mitigation planning and mitigation actions included in Section 6 and in the Jurisdictional Annexes in Volume II, Section 9.

In addition to Montgomery County, all jurisdictions within the County have participated in the planning process (Table 1-1 and Figure 1-1).

Table 1-1. Participating Jurisdictions in Montgomery County

Jurisdictions		
Montgomery County		
City of Amsterdam	Town of Mohawk	Village of Ft. Johnson
Town of Amsterdam	Town of Palatine	Village of Ft. Plain
Town of Canajoharie	Town of Root	Village of Fultonville
Town of Charleston	Town of St. Johnsville	Village of Hagaman
Town of Florida	Village of Ames	Village of Nelliston
Town of Glen	Village of Canajoharie	Village of Palatine Bridge
Town of Minden	Village of Fonda	Village of St. Johnsville

1.1.3 Multiple Agency Support for Hazard Mitigation

Primary responsibility for the development and implementation of mitigation strategies and policies lies with local governments. However, local governments are not alone; various partners and resources at the regional, state and federal levels are available to assist communities in the development and implementation of mitigation strategies. Within New York State, NYS DHSES is the lead agency providing hazard mitigation planning assistance to local jurisdictions. NYS DHSES provides guidance to support mitigation planning. In addition, FEMA provides grants, tools, and training to support mitigation planning.

Additional input and support for this planning effort was obtained from a range of agencies and through public involvement (as discussed in Section 3). Oversight for the preparation of this plan was provided by the Montgomery County All Hazard Planning Committee (Planning Committee), which includes representatives from:

- Participating Jurisdictions
- Montgomery County Department of Planning and Economic Development
- Montgomery County Office of Emergency Management
- Montgomery County Highway Department
- Agencies and Non-Profit (input incorporated by stakeholder surveys and satellite meetings)

The Steering Committee is a subset of the Planning Committee and has been formed as a leadership group to plan, guide, expedite, and implement the planning process. The Steering Committee has provided guidance and

leadership, overseen the planning process, and acted as the point of contact for all partners and the various interest groups in the planning area.

A list of Steering Committee and Planning Committee members is provided in Section 3: Planning Process.

The Working Group is a subset of the Steering Committee which met periodically to review the status to the planning process and to address any comments or issues that might have had an effect on the plan schedule. The Working Group consisted of Montgomery County personnel from the Planning Department, Office of Emergency Management, and Highway Department.

Throughout the planning process, Montgomery County utilized the services of Tetra Tech Inc. (Tetra Tech) in the capacity of consultant to provide assistance in preparation of the HMP. Tetra Tech was present and participated in meetings as noted in Section 3: Planning Process. Tetra Tech developed the plan, supported the identification of goals and objectives, reviewed and compiled hazard data, performed risk analyses, hazard identification and profiling, vulnerability analyses, supported the development of mitigation strategies, provided planning support, and authored the plan with input from Montgomery County.

This HMP was prepared in accordance with the following regulations and guidance:

- Local Mitigation Plan Review Guide, October 1, 2011
- DMA 2000 (Public Law 106-390, October 30, 2000).
- 44 Code of Federal Regulations (CFR) Parts 201 and 206 (including: Feb. 26, 2002, Oct. 1, 2002, Oct. 28, 2003, and Sept. 13, 2004 Interim Final Rules).
- FEMA. 2004. "How-To Guide for Using HAZUS-MH for Risk Assessment." FEMA Document No. 433. February.
- FEMA Mitigation Planning How-to Series (FEMA 386-1 through 4, 2002), available at: http://www.fema.gov/fima/planhowto.shtm.
- FEMA Mitigation Ideas, A Resource for Reducing Risk to Natural Hazards, January 2013

Table 1-2 summarizes the requirements outlined in the DMA 2000 Interim Final Rule and where each of these requirements is addressed in this HMP.

Table 1-2. FEMA Local Mitigation Plan Review Crosswalk

FEMA Local Mitigation Plan Review Crosswalk	
Plan Criteria	Primary Location in Plan
Prerequisites	
Adoption by the Local Governing Body: §201.6(c)(5)	Volume I, Section 2.0; Appendix B
Planning Process	
Documentation of the Planning Process: §201.6(b) and §201.6(c)(1)	Volume I, Section 3.0
Risk Assessment	
Identifying Hazards: §201.6(c)(2)(i)	Volume I, Sections 5.2
Profiling Hazards: §201.6(c)(2)(i)	Volume I, Section 5.3
Assessing Vulnerability: Overview: §201.6(c)(2)(ii)	Volume I, Section 5.4
Assessing Vulnerability: Identifying Structures: §201.6(c)(2)(ii)(A)	Volume I, Section 4.0 Volume I Section 5.4
Assessing Vulnerability: Estimating Potential Losses: §201.6(c)(2)(ii)(B)	Volume I, Section 5.4
Assessing Vulnerability: Analyzing Development Trends: §201.6(c)(2)(ii)(C)	Volume I, Section 4.0; Section 9 Annexes
Mitigation Strategy	
Local Hazard Mitigation Goals: §201.6(c)(3)(i)	Volume I, Section 6.0; Volume II, Section 9 Annexes
Identification and Analysis of Mitigation Actions: §201.6(c)(3)(ii)	Volume I, Section 6.0; Volume II, Section 9 Annexes

FEMA Local Mitigation Plan Review Crosswalk	
Plan Criteria	Primary Location in Plan
Implementation of Mitigation Actions: §201.6(c)(3)(iii)	Volume I, Section 6.0; Volume II, Section 9 Annexes
Multi-Jurisdictional Mitigation Actions: : §201.6(c)(3)(iv)	Volume I, Section 6.0; Volume II, Section 9 Annexes
Plan Maintenance Process	
Monitoring, Evaluating, and Updating the Plan: §201.6(c)(4)(i)	Volume I, Section 7.0
Incorporation into Existing Planning Mechanisms: §201.6(c)(4)(ii)	Volume I, Section 7.0
Continued Public Involvement: §201.6(c)(4)(iii)	Volume I, Section 7.0

Organization

The Montgomery County Hazard Mitigation Plan Update has been organized into a two-volume plan to facilitate use of this plan as a resource for each participant. The plan provides a detailed review and analysis of hazards of concern, resources, and demographics of Montgomery County and participating municipalities.

Volume I is intended for use as a resource for on-going mitigation analysis. Volume II consists of an annex dedicated to each participating jurisdiction. Each annex summarizes each jurisdiction's legal, regulatory, and fiscal capabilities; vulnerabilities to natural hazards; status of past mitigation actions; and provides an individualized mitigation strategy. The annexes are intended to provide an expedient resource for each jurisdiction for implementation of mitigation projects and future grant opportunities.

Goals and Objectives

The plan has incorporated a goals and objectives hierarchy as a basis for the planning process and to address all hazards of concern. This plan update has retained the 2008 goals, with corresponding objectives that meet multiple goals. A cross-walk indicating the plan criteria and location in the plan is included in Table 1-2.

Hazards of Concern

Montgomery County and participating jurisdictions reviewed natural hazards that caused measurable impacts in the planning area and evaluated the risk and vulnerability due to each of the hazards of concern on the assets of each participating jurisdiction. Although the resulting hazard risk rankings varied for each jurisdiction, the summary risk rankings corresponded with that of Montgomery County and are indicated in each jurisdictional annex. The hazard risk ranks were used to focus and prioritize individual jurisdictional mitigation strategies.

Plan Integration into Other Planning Mechanisms

It is the intention of this planning process that municipalities shall incorporate findings and recommendations of this plan into future local planning efforts and into overall execution of local land-use planning process (e.g. site plan review, permitting, and code enforcement).

1.1.4 Implementation of the 2008 Plan

The status of the mitigation projects in the 2008 plan are provided in Sections 6 and 9 of the plan. Numerous projects and programs have been implemented that have reduced hazard vulnerability to assets in the planning area. Due to the lack of resources, the 2008 plan has not been integrated with planning processes in many jurisdictions, but the integration of the 2013 plan is a high priority for the next five year cycle as noted in the municipal annexes and the plan maintenance procedure. The municipal annexes and plan maintenance procedure have been developed to encourage specific activities such as review of the HMP during update of codes, ordinances, zoning, and development to ensure that a more thorough integration, with its related benefits, will be completed within the upcoming 5-year planning period.

The County Hazard Mitigation Coordinator will encourage all jurisdictions to incorporate hazard mitigation plan aspects into their comprehensive and master plan updates, as well as making specific recommendations, such as having the Floodplain Administrator review all site plan review and zoning permits within the 100-year floodplain and including the hazards map in their plan.

1.2 IMPLEMENTATION OF THE PLANNING PROCESS

The planning process and findings are to be documented in local HMPs. To support the planning process in developing this HMP Update, Montgomery County and the participating jurisdictions have accomplished the following:

- Developed a Planning Committee
- Reviewed the 2008 Montgomery County Hazard Mitigation Plan
- Identified/reviewed hazards that are of greatest concern to the community (hazards of concern) to be included in the update
- Profiled these hazards
- Estimated the inventory at risk and potential losses associated with these hazards
- Confirmed mitigation goals and actions that address the various hazards that impact the area
- Reviewed 2008 mitigation strategy and actions to indicate progress
- Developed new mitigation actions to address reduction of vulnerability of hazards of concern
- Developed mitigation plan maintenance procedures to be executed after obtaining approval of the plan from NYS DHSES and FEMA

Based on a hazards identification worksheet and ranking process, subsequent input from the Planning Committee, and review of other available data, the planning process then proceeded to identify, rank, and profile those hazards of concern. The hazard profiles include location, extent, previous occurrences and losses, and the probability of future events. The process also included a vulnerability assessment to evaluate which county, town, and village assets are exposed or vulnerable to the hazards. The rankings have been updated with respect to the 2008 results primarily due to a more accurate vulnerability analysis and steering committee input.

To address the requirements of DMA 2000 and better understand potential vulnerabilities to and losses associated with hazards of concern, Hazards U.S. – Multi-Hazard (HAZUS-MH or HAZUS) software package (discussed in greater detail later in this Plan) supplemented by local data, as feasible, was used to support the risk assessment and vulnerability evaluation. HAZUS-MH assesses risk and estimates potential losses for natural hazards. It produces outputs that will assist state and local governments, communities, and the private sector in implementing emergency response, recovery, and mitigation programs, including the development of HMPs.

As required by DMA 2000, Montgomery County and participating jurisdictions have informed the public and provided opportunities for public comment and input. In addition, numerous agencies and stakeholders have participated as core or support members, providing input and expertise throughout the planning process.

This Multi-Jurisdictional All-Hazard Mitigation Plan Update documents the process and outcomes of Montgomery County and the jurisdictions' efforts. Additional information on the plan update process is included in Section 3, Planning Process. Documentation that the prerequisites for plan approval have been met is included in Section 2, Plan Adoption.

1.2.1 Benefits of Mitigation Planning

The planning process will help prepare citizens and government agencies to better respond when disasters occur. Also, mitigation planning allows Montgomery County as a whole, as well as the participating Montgomery County cities, towns, and villages to remain eligible for mitigation grant funding for mitigation projects that will reduce the impact of future disaster events. The long-term benefits of mitigation planning include:

- An increased understanding of hazards faced by communities
- More sustainable and disaster-resistant communities
- Financial savings through partnerships that support planning and mitigation efforts
- Focused use of limited resources on hazards that have the biggest impact on the community
- Reduced long-term impacts and damages to human health and structures and reduced repair costs

1.2.2 Organization of this Mitigation Plan

This Plan was organized in accordance with FEMA and NYS DHSES guidance. The structure of this Plan follows the four-phase planning process recommended by FEMA and summarized in Figure 1-2. The Plan is organized into two volumes: Volume I includes all information that applies to the entire planning area (Montgomery County); and Volume II includes participating jurisdiction-specific information.

Volume I of this Plan includes the following sections:

Section 1: Introduction: Overview of participants and planning process

Section 2: Plan Adoption: Information regarding the adoption of the Plan by Montgomery County and each participating jurisdiction.

Section 3: Planning Process: A description of the Plan methodology and development process, Planning Committee and stakeholder involvement efforts, and a description of how this Plan Update will be incorporated into existing programs.

Section 4: County Profile: An overview of Montgomery County, including: (1) general information, (2) economy, (3) land use trends, (4) population and demographics, (5) general building stock inventory and (6) critical facilities.

Section 5: Risk Assessment: Documentation of the hazard identification and hazard risk ranking process, hazard profiles, and findings of the vulnerability assessment (estimates of the impact of hazard events on life, safety and health; general building stock; critical facilities and the economy). Description of the status of local data and planned steps to improve local data to support mitigation planning.

Section 6: Mitigation Strategies: Information regarding the mitigation goals and objectives identified by Montgomery County in response to priority hazards of concern.

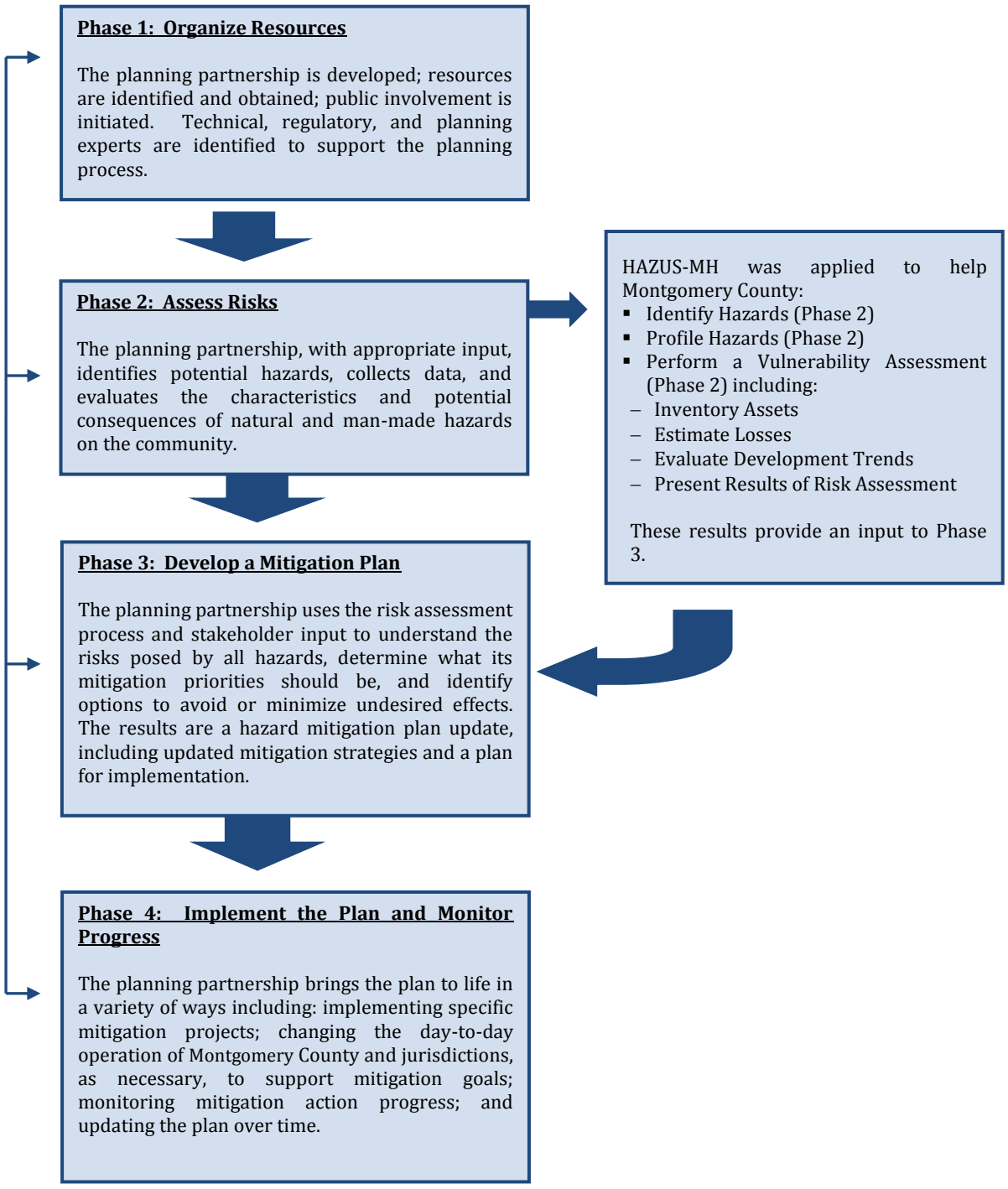
Section 7: Plan Maintenance Procedures: The system established by Montgomery County to continue to monitor, evaluate, maintain and update the Plan.

Volume II of this Plan includes the following sections:

Section 8: Planning Partnership: Description of the planning partnership, and jurisdictional annexes.

Section 9: Jurisdictional Annexes: A jurisdiction-specific annex for each participating jurisdiction and Montgomery County containing their hazards of concern, hazard risk ranking, capability assessments, mitigation actions, action prioritization specific only to Montgomery County or that jurisdiction, progress on 2008 mitigation actions, and an overview of 2008 plan integration into local planning processes.

Figure 1-2. Montgomery County Hazard Mitigation Planning Process



Appendices

SECTION 2. PLAN ADOPTION

2.1 OVERVIEW

This section contains information regarding adoption of the Plan Update by Montgomery County and each participating jurisdiction.

2.1.1 Plan Adoption by Local Governing Bodies

Adoption by the local governing bodies demonstrates the commitment of Montgomery County and each participating jurisdiction to fulfill the mitigation goals and objectives outlined in the Plan. Adoption legitimizes the Plan and authorizes responsible agencies to execute their responsibilities. In order for the multi-jurisdictional plan to be approved, each jurisdiction included in the Plan must have its governing body adopt the Plan before its submission to NYS DHSES and FEMA, even when a cross-jurisdiction agency has the authority to prepare such plans in the name of the respective jurisdictions.

Each participating jurisdiction will proceed with formal adoption proceedings when FEMA provides conditional approval of this Plan. Each participating jurisdiction understands that a conditional approval of the Plan will be provided for those municipalities that meet the planning requirements with the exception of the adoption requirement as stated above. Following adoption or formal action on the Plan, each participating jurisdiction must submit a copy of the resolution or other legal instrument showing formal adoption (acceptance) of the Plan to NYS DHSES. These will then be submitted to FEMA with the resolution in Appendix B of this Plan. Each participating jurisdiction understands that FEMA will transmit acknowledgement of verification of formal plan adoption and the official approval of the plan to the mitigation plan coordinator.

The resolutions issued to support adoption of the plan by each jurisdiction are included as Appendix B, Resolutions of Plan Adoption.

In addition to being required by DMA 2000, adoption of the plan is necessary because:

- It lends authority to the plan to serve as a guiding document for all local and state government officials;
- It gives legal status to the plan in the event it is challenged in court;
- It certifies the program and grant administrators that the plan's recommendations have been properly considered and approved by the governing authority and jurisdictions' citizens; and
- It helps to ensure the continuity of mitigation programs and policies over time because elected officials, staff, and other community decision-makers can refer to the official document when making decisions about the community's future.

Source: FEMA. 2003. "How to Series"-*Bringing the Plan to Life* (FEMA 386-4).

SECTION 3. PLANNING PROCESS

3.1 INTRODUCTION

This section includes a description of the planning process used to update the Montgomery County Multi-Jurisdictional All-Hazard Mitigation Plan, including how it was prepared, who was involved in the process, and how the public was involved.

To ensure that the Plan met the requirements of the DMA 2000, an approach to the planning process and plan documentation was developed to achieve the following two goals:

- The Plan will be multi-jurisdictional and consider natural hazards facing Montgomery County, thereby satisfying the natural hazards mitigation planning requirements specified in DMA 2000. Montgomery County invited all municipalities in Montgomery County to join with them in the update of the Montgomery County Multi-Jurisdictional All-Hazard Mitigation Plan. Montgomery County and all its municipalities are participating in the Plan update process as indicated in Table 3-1 below.

Table 3-1. Participating Montgomery County Jurisdictions

Jurisdictions		
Montgomery County		
City of Amsterdam	Town of Mohawk	Village of Ft. Johnson
Town of Amsterdam	Town of Palatine	Village of Ft. Plain
Town of Canajoharie	Town of Root	Village of Fultonville
Town of Charleston	Town of St. Johnsville	Village of Hagaman
Town of Florida	Village of Ames	Village of Nelliston
Town of Glen	Village of Canajoharie	Village of Palatine Bridge
Town of Minden	Village of Fonda	Village of St. Johnsville

- The plan considers all natural hazards facing the area, thereby satisfying the natural hazards mitigation planning requirements specified in DMA 2000.
- The plan was developed following the process outlined by DMA 2000, FEMA regulations, and prevailing FEMA and NYS DHSES guidance. Following this process ensures that all the requirements are met and support Plan review. In addition, this Plan will meet criteria for the National Flood Insurance Program (NFIP) Community Rating System (CRS) and the Flood Mitigation Assistance (FMA) programs.

The Montgomery County Multi-Jurisdictional All-Hazard Mitigation Plan (HMP) update was written using the best available information obtained from a wide variety of sources. Throughout Plan update, a concerted effort was made to gather information from municipal and regional agencies and staff as well as stakeholders, federal and state agencies, and the residents of Montgomery County. The HMP Planning Committee solicited information from local agencies and individuals with specific knowledge of certain natural hazards and past historical events. In addition, the Committee took into consideration planning and zoning codes, ordinances, and other recent planning decisions. The hazard mitigation strategies identified in this Plan Update have been developed through an extensive planning process involving local, county and regional agencies, County residents, and stakeholders.

This section of the Plan describes the mitigation planning process, including (1) Preparing to Plan; (2) Planning Partnership – Organization and Activity; (3) Stakeholder and Public Outreach and Involvement; (4) Coordination with Existing Mitigation Efforts and Programs; (5) Integration of Existing Data, Plans, and Information; and (6) Continued Public and Stakeholder Involvement.

3.2 ORGANIZATION OF PLANNING PROCESS

This section of the Plan identifies how the planning process was organized with the many "planning partners" involved, and outlines the major activities that were conducted in the development of this Plan Update.

3.2.1 Organization of Planning Partnership

Montgomery County applied for and was awarded a multi-jurisdictional planning grant under the Hazard Mitigation Grant Program (HMGP-4020-005), which has supported in the development of this HMP Update.

Project management and grant administration has been the responsibility of the Montgomery County Department of Economic Development and Planning. A contract planning consultant (Tetra Tech) was tasked with:

- Assisting with the organization of a Steering Committee and municipal planning partnership;
- Assisting with the development and implementation of a public and stakeholder outreach program;
- Data collection;
- Facilitation and attendance at meetings (Steering Committee, municipal, stakeholder, public and other);
- Review and update of the hazards of concern, and hazard profiling and risk assessment;
- Assistance with the review and update of mitigation planning goals and objectives;
- Assistance with the review of past mitigation strategies progress;
- Assistance with the screening of mitigation actions and the identification of appropriate actions;
- Assistance with the prioritization of mitigation actions; and
- Authoring of the draft and final plan documents.

To facilitate plan development, Montgomery County developed a Steering Committee to provide guidance and direction to the HMP update effort, and to ensure the resulting document will be embraced both politically and by the constituency within the planning area. All municipalities participating in the plan update authorized the Steering Committee to perform certain activities on their behalf, via the Letter of Intent to participate (FEMA mitigation planning "combination model"). Specifically, the Steering Committee was charged with:

- Providing guidance and oversight of the planning process on behalf of the general planning partnership;
- Attending and participating in Steering Committee meetings;
- Assisting with the development and completion of certain planning elements, including:
    - Reviewing and updating the hazards of concern,
    - Developing a public and stakeholder outreach program,
    - Assuring that the data and information used in the plan update process is the best available
    - Reviewing and updating the hazard mitigation goals,
    - Identification and screening of appropriate mitigation strategies and activities; and
- Reviewing and commenting on plan documents prior to submission to NYS DHSES and FEMA.

The Steering Committee provided guidance and leadership, oversight of the planning process, and acted as the point of contact for all participating jurisdictions and the various interest groups in the planning area. The makeup of this committee was selected to provide the best possible cross section of views to enhance the planning effort and to help build support for hazard mitigation.

Prior to the general project Kick-off meeting, a more limited working group was assembled on June 20, 2013, to initiate the planning process and assist with overall project administration, including the formation of the full Steering Committee. This group included the co-chairs as well as county representatives from the Montgomery County Department of Economic Development and Planning. The Steering Committee was comprised of appropriate municipal personnel, local emergency first responders, and other stakeholders to effectively guide the overall process, provide significant input, and partner with Tetra Tech to develop a FEMA-approved Plan Update.

In August 2013, the County notified all municipalities within the county of the pending planning process and invited them to formally participate. Jurisdictions were asked to formally notify the County of their intent to participate (via a Letter of Intent) and to identify planning points of contact to facilitate municipal participation and represent the interests of their respective communities. After a delay due to the change of planning personnel and reorganization of the County governing structure, in December of 2014 the municipalities were again requested to participate in the mitigation planning process after which a county-wide municipal kick-off meeting was convened in January 2014.

A Planning Committee was assembled to represent each of the municipalities participating in the plan update process, consisting of all members of the Steering Committee, and at least one representative from each of the participating municipalities. As noted above, each municipality received a copy of the Planning Partner Expectations, outlining the responsibilities of the participants and the agreement of the partners to authorize the Steering Committee to represent the jurisdiction in the completion of certain planning elements as noted above.

The Planning Committee was charged with the following:

- Represent their jurisdiction throughout the planning process;
- Establish Plan Update development goals;
- Establish a timeline for completion of the Plan Update;
- Ensure that the Plan Update meets the requirements of DMA 2000 and FEMA and NYS DHSES guidance;
- Solicit and encourage the participation of regional agencies, a range of stakeholders, and citizens in the plan update process;
- Assist in gathering information for inclusion in the Plan, including the use of previously developed reports and data;
- Organize and oversee the public involvement process;
- Report on progress of 2008 HMP mitigation actions;
- Identify, develop and prioritize appropriate mitigation initiatives;
- Report on progress of 2008 HMP integration into other planning processes and municipal operations;
- Review, amend, and approve all sections of the Plan;
- Develop and author the updated jurisdictional annex for their jurisdiction; and
- Develop, revise, adopt, and maintain the Plan.

Table 3-2 shows the current members of the planning partnership as of the time of publication of this plan update.

Table 3-2. Montgomery County Hazard Mitigation Plan Planning Partnership Members

Organization	Name	Title	Primary POC	Secondary POC
Montgomery County	William Roehr*	Senior Planner	X	
	Amanda M. Bearcroft (Mahar)	Senior Planner/GIS		X
	Jeffrey Smith*	Director of Emergency Management		
	Paul Clayburn*	Department of Public Works		
Ames (Village)	Michael McMahon	Mayor	X	
City of Amsterdam	Michael Whitty	Fire Chief	X	
	Richard A. Liberti	Fire Chief (former)	X (former)	
	Richard Miller*	City Engineer		X
Amsterdam (Town)	Tom DiMezza	Supervisor	X	
	Linda Hughes	Town Clerk		X
Canajoharie (Town)	David Hodge	Superintendent of Highways	X	
	Herb Allen	Town Supervisor		X
Canajoharie (Village)	Jeffrey Swartz	Superintendent DPW/Water	X	
	Francis Avery	Mayor		X
Charleston (Town)	Robert Sullivan	Supervisor	X	
	Paul Orzelik	Councilperson		X
Florida (Town)	Eric Mead	Supervisor	X	
	Bill Weller	Superintendent of Highways		X
	Bill Strevy	Supervisor (former)		X (former)
Fonda (Village)	Bill Peeler	Mayor	X	
	Christine Kerns	Clerk		X
	JoAnn Downing	Clerk (former)		X (former)
Ft. Johnson (Village)	Kenneth Walter	Mayor	X	
	Barbara Smith	Clerk		X
	Christopher Blessing	Trustee		X
Ft. Plain (Village)	George Capese, Jr.*	Superintendent of Public Works	X	
	Guy Barton	Mayor		X
Fultonville (Village)	Tom DiMezza	Clerk/Treasurer	X	
	Robert Headwell Jr	Mayor		X
Glen (Town)	Lawrence Coddington	Supervisor	X	
	Roxanne Douglass	Clerk		X
Hagaman (Village)	Robert Krom	Mayor	X	
	Virginia Salamack	Village Clerk		X
Minden (Town)	Scott Crewell	Superintendent of Highways	X	
	Thomas Quackenbush	Town Supervisor (former)		X (former)
	Cheryl Reese	Town Supervisor		X
Mohawk (Town)	William Holvig*	Highway Superintendent	X	
	Greg Rajkowski	Town Supervisor		X
Nelliston (Village)	Doug Bathrick	Mayor	X	
	Randy Conrad	DPW Director		X
Palatine Bridge (Village)	James F.Post	Mayor	X	
	Cliff Dorrough	DPW Director		X
Palatine (Town)	Sarah Niccoli	Supervisor	X	
	Art Logan	Highway Superintendent		X
Root (Town)	Gary Kamp	Supervisor	X	
	Laurel "Sherrie" Eriksen	Clerk		X
St. Johnsville (Town)	Dominick Stagliano	Supervisor (former)	X	

Organization	Name	Title	Primary POC	Secondary POC
			(former)	
	Wayne Handy	Supervisor	X	
	Lyn Stever	Clerk		X
St. Johnsville (Village)	Robert Smith	Planning	X	
	Karen Crouse	Clerk/Treasurer		X

**Indicates Steering Committee Member*

It is noted that the Letter of Intent to Participate identifies the above "Planning Partner Expectations" as serving to identify those activities comprising overall participation by jurisdictions throughout the planning process. It is recognized that the jurisdictions in Montgomery County have differing levels of capabilities and resources available to apply to the plan update process, and further, have differing exposure and vulnerability to the natural hazard risks being considered in this Plan Update. It was Montgomery County's intent to encourage participation by all-inclusive jurisdictions, and to accommodate their specific needs and limitations while still meeting the intents and purpose of Plan Update participation. Such accommodations have included the establishment of a Steering Committee, engaging a contract consultant to assume certain elements of the plan update process on behalf of the jurisdictions, and the provision of additional and alternative mechanisms to meet the purposes and intent of mitigation planning.

Ultimately, jurisdictional participation is evidenced by a completed annex of the HMP wherein jurisdictions have individually identified their planning points of contact, evaluated their risk to the hazards of concern, identified their capabilities to effect mitigation in their community, and identified and prioritized an appropriate suite of mitigation initiatives, actions, and projects to mitigate their hazard risk; and eventually, by the adoption of the updated plan via resolution. Refer to Section 9 of this HMP.

Extensive outreach efforts by the Montgomery County Department of Economic Development and Planning resulted in participation by stakeholders and Montgomery County municipalities. Planning Department leads effectively engaged city, town, and village staff members and other representatives from Montgomery County municipalities, ensuring a complete understanding of the process and the goals of the mitigation Plan Update.

3.2.2 Planning Activities

Members of the Committee (individually and as a whole), as well as key stakeholders, convened and/or communicated on an as-needed basis to share information and participate in workshops to identify hazards; assess risks; review existing inventories of and identify new critical facilities; assist in updating and developing new mitigation goals, objectives and actions; and provide continuity through the plan update process to ensure that natural hazards vulnerability information and appropriate mitigation strategies were incorporated into the Plan Update. Each member of the Planning Committee had the opportunity to review the Plan Update and supported interaction with other stakeholders and assisted with public involvement efforts.

A summary of planning partnership activities, including Planning and Steering Committee meetings held during the development of this Plan Update, is included in Table 3-4. This summary table identifies only the formal meetings held during the plan update process, and does not reflect the larger universe of planning activities conducted by individuals and groups throughout the planning process. In addition to these meetings, there was a great deal of communication between Planning and Steering Committee members through electronic mail (email) and by phone.

After completion of the Plan Update, implementation and ongoing maintenance will become a function of the Planning Committee. The Planning Committee is responsible for reviewing the Plan Update and accepting public comment as part of an annual review and as part of the five year mitigation plan update.

Table 3-3 presents a summary of key milestones and planning partnership efforts implemented during the development process for this Plan Update. This table also identifies which DMA 2000 requirements the activities satisfy. Documentation of meetings (agendas, sign-in sheets, minutes, etc.) may be found in Appendix B.

Table 3-3. Summary of Planning Outreach

Date	DMA 2000 Requirement	Description of Activity	Participants
February 24, 2009	1b	Submitted LOI for Combined HMPG-1957-1993-4020-4031and outline project scope.	
September 19, 2012	1b	Approval for HMPG Application #4020-0005	
DATE	1a	NYS DHSES grant agreement executed by Montgomery County	---
June 20, 2013	2	Pre-Project Kickoff Meeting	Montgomery County: Doug Green; Paul Clayburn Amsterdam (c): Richard (Rich) C. Miller Fort Plain (v): George Capece Jr. Mohawk (t): William Holvig Tetra Tech: Cynthia Bianco
September 5, 2013	3	Steering Committee Meeting	Montgomery County: Doug Greene; Paul Clayburn Amsterdam ©: Rich Liberti Mohowk (t): William Holvig
September 9, 2013	3	Conference Call	Montgomery County: Doug Greene
September 17, 2013	1b	County Board Presentation	Montgomery County: Doug Greene
January 21, 2014	2, 3	Municipal Kickoff Meeting	Montgomery County: Jeffrey T. Smith Amsterdam (c): Richard Miller, Rich Liberti Amsterdam (t): Tom DiMezza Canajoharie (t): David Hodge, Herbert Allen Canajoharie (v): Francis Avery, Jeff Swartz Florida (t): Eric M. Mead Fonda (v): Robert Galusha, Timothy F. Healey Fort Johnson (v): Chris Blessing, William E. Smith Glen (t): Larry Coddington Mohawk (t): William Holvig Palatine (t): Art Logan Palatine Bridge (v): Rodney Sutton Root (t): Cliff Dorrough St.Johnsville (v): Robert E. Smith
August 4, 2015	3	Steering Committee Meeting	Montgomery County: William Roehr; Jeffrey Smith, Andrew Santillo; Paul Clayburn Amsterdam ©: Richard C. Millar, PE Mohawk (t): William Holvig Ft. Plain (v): George Capese FEMA: Paul Hoole
August 4, 2015	4	FEMA Mitigation Workshop	Montgomery County: William Roehr; Jeffrey Smith, Andrew Santillo; Paul Clayburn; Ryan Weitz Ames (v): Michael McMahon Amsterdam ©: Richard C. Millar, PE

Date	DMA 2000 Requirement	Description of Activity	Participants
			Canajoharie (v): Francis Avery; Cliff Dorrough; Chief Brian McFadden Canajoharie (t): David Hodge; Herb Allen Ft. Johnson (v): William F. Smith; Ken Walter; Chris Blessing Florida (t): Eric M. Mead Ft. Plain (v): George Capese Glen (t): John Thomas; Larry Coddington Hagaman (v): Robert Krom Minden (t): Scott Crewell Mohawk (t): William Holvig Nelliston (v): Cliff Dorrough Palatine (t): Cliff Dorrough; Sarah NIccoli Palatine Bridge (v): Cliff Dorrough Root (v): Cliff Dorrough; Gary A. Kamp FEMA: Paul Hoole

Note:
TBD = To Be Determined.
MC = Montgomery County
Each number in column 2 identifies specific DMA 2000 requirements, as follows:
1a – Prerequisite – Adoption by the Local Governing Body
1b – Public Participation
2 – Planning Process – Documentation of the Planning Process
3a – Risk Assessment – Identifying Hazards
3b – Risk Assessment – Profiling Hazard Events
3c – Risk Assessment – Assessing Vulnerability: Identifying Assets
3d – Risk Assessment – Assessing Vulnerability: Estimating Potential Losses
3e – Risk Assessment – Assessing Vulnerability: Analyzing Development Trends
4a – Mitigation Strategy – Local Hazard Mitigation Goals
4b – Mitigation Strategy – Identification and Analysis of Mitigation Measures
4c – Mitigation Strategy – Implementation of Mitigation Measures
5a – Plan Maintenance Procedures – Monitoring, Evaluating, and Updating the Plan
5b – Plan Maintenance Procedures – Implementation through Existing Programs
5c – Plan Maintenance Procedures – Continued Public Involvement

3.3 STAKEHOLDER OUTREACH AND INVOLVMENT

This section details the outreach to, and involvement of, the many agencies, departments, organizations, non-profits, districts, authorities and other entities that have a stake in managing hazard risk and mitigation, commonly referred to as "stakeholders."

Diligent efforts were made to assure broad regional, county, and local representation in this planning process. To that end, a comprehensive list of stakeholders was developed with the support of the Steering and Planning committees. Stakeholder outreach was performed early and throughout the planning process. In addition to "mass media" notification efforts, identified stakeholders were invited to attend the kick-off meeting, while key stakeholders were requested to participate on the Steering Committee. Information and input provided by these stakeholders has been included throughout this plan where appropriate, as identified in the references.

The following is a list of the various stakeholders that were invited to participate in the development of this plan, along with a summary of how these stakeholders participated and contributed to the plan. This summary listing cannot represent the sum total of stakeholders that were aware of and/or contributed to this plan since formal and informal outreach efforts were utilized throughout the process by the many planning partners involved in the overall effort. Complete documentation of such broad-based and often locally-focused efforts

is impossible. Instead, this summary is intended to demonstrate the scope and breadth of the stakeholder outreach efforts made during the planning process.

Please see Appendix C (Participation Matrix) for further details regarding federal agency participation. All responses to the surveys may be found in Appendix D.

3.3.1 Federal Agencies

FEMA Region II: Provided updated planning guidance; provided summary and detailed NFIP data for planning area; attended meetings; conducted a Mitigation Strategy Workshop; conducted plan review.

Information regarding hazard identification and the risk assessment for this HMP update was also requested and received or incorporated by reference from the following agencies and organizations:

- National Climatic Data Center (NCDC)
- National Hurricane Center (NHC)
- National Oceanic and Atmospheric Administration (NOAA)
- National Weather Service (NWS)
- Storm Prediction Center (SPC)
- U.S. Army Corps of Engineers (USACE)
- U.S. Census Bureau
- U.S. Department of Agriculture (USDA)
- U.S. Environmental Protection Agency (USEPA)
- U.S. Geological Survey (USGS)

3.3.2 State Agencies

New York State Department of Homeland Security and Emergency Services (NYS DHSES: Headquarters and Region I): Administered planning grant and facilitated FEMA review; provided updated planning guidance; attended meetings and workshops (incl. mitigation strategy workshop); provided information on grant applications from County and municipalities; provided review of Draft and Final Plan.

New York State Department of Environmental Conservation (NYSDEC): Provided data and information to plan, including NFIP statistics and information on floodplain mapping and updates. Regularly apprised of planning project.

3.3.3 County and Regional Agencies, Commissions and Non-Profits

Montgomery County Economic Development and Planning

Montgomery County Department of Public Works

Montgomery County Office of Emergency Management

3.3.4 Regional and Local Stakeholders

Academia (School districts and other academic institutions): All school districts, higher education and many technical/vocational institutions were provided the Academic Stakeholder survey and invited to provide input, while some have identified specific mitigation actions/projects included in the County or local mitigation strategies.

Fire Districts and Fire Departments: The following were contacted directly and responded to the stakeholder survey distributed to all fire departments and EMS in the County. The survey requested identification of specific mitigation actions/projects.

- Fultonville Fire Department
- GAVAC Ambulance

Law Enforcement: The following were contacted directly and responded to the stakeholder survey distributed to all police departments in the County. The survey requested identification of specific mitigation actions/projects.

- Saint Johnsville Police Department
- Fort Plain Police Department

Hospitals and Health Care Facilities: Hospitals and health-care facilities in the county were provided the Hospitals and Health Care Stakeholder survey and invited to provide input.

Ambulance/Emergency Medical Services: All ambulance and emergency medical service providers in the County were provided the Ambulance/Emergency Medical Services stakeholder survey and invited to provide input, while some have identified specific mitigation actions/projects included in the County or local mitigation strategies. The following have provided input to the planning process:

- GAVAC Ambulance

Highway and Public Works: All county and local highway and public works departments were advised of the Highway and Public Works Stakeholder Survey and encouraged to provide input.

Utilities: All utility providers in the county were provided the Utilities Stakeholder survey and invited to provide input.

Business and Commerce: All businesses and commerce in the county were provided the Business/Commerce stakeholder survey and invited to provide input.

3.3.5 Adjacent Counties

The County has made an effort to keep surrounding counties and municipalities appraised of the project, and allowed the opportunity to provide input to this planning process. Specifically, the following adjoining and nearby County representatives were contacted in August 4, 2015 to inform them about the availability of the project website, draft plan documents and surveys, and invited to provide input to the planning process via an online plan review survey:

- Fulton County
- Saratoga County
- Schenectady County
- Schoharie County
- Otsego County
- Herkimer County

Additionally, on May 26, 2016, Montgomery County notified surrounding counties that the Draft Plan document was available for review and comment.

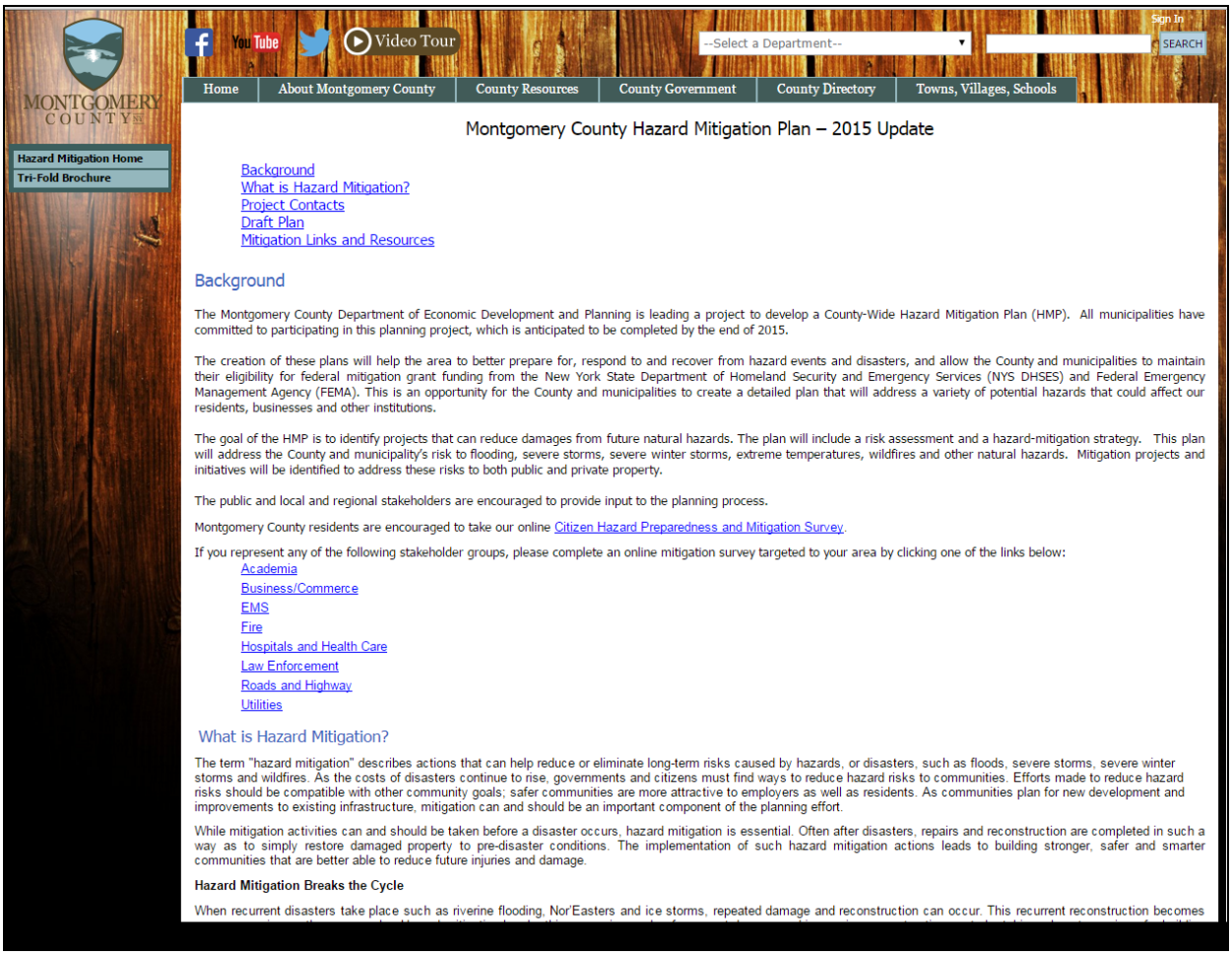
3.4 PUBLIC PARTICIPATION – CITIZEN INVOLVEMENT

In order to facilitate better coordination and communication between the Planning Committee and citizens and to involve the public in the planning process, it was determined that draft documents will be made available to the public through a variety of venues including printed and online format. This effort is intended to increase the likelihood of hazard mitigation becoming one of the standard considerations in the evolution and growth of Montgomery County.

The Steering Committee and Planning Partnership have made the following efforts toward public participation in the development and review of the Plan:

- The public was informed of the hazard mitigation planning effort commencement at the kick-off meeting and through press releases, new articles, and public service announcements released throughout the planning process. Copies of these announcements may be found in Appendix C.
- To inform the public and county agencies of the ongoing plan update effort, updates regarding the mitigation planning process have been made at County-wide meetings including those of the County Legislature.
- A public website is being maintained as another way to facilitate communication between the Planning Committee and County residents (https://www.co.montgomery.ny.us/sites/public/government/hazardmitigation/HazardMitigation_Documents/default.aspx). The public website contains a project overview, Planning Committee contact information, and sections of the HMP for public review and comment. See Figures 3-1 for a screenshot of this public website.

Figure 3-1. Montgomery County HMP Website



- All participating municipalities have been requested and are expected to post links to the Montgomery County Hazard Mitigation website on the home web pages of each jurisdiction.
- In order to facilitate coordination and communication between the Planning Committee and citizens and involve the public in the planning process, the Plan Update will be available to the public through a variety of venues. A printed version of the Plan will be maintained at the Montgomery County Department of Planning and Economic Development.
- An on-line natural hazards preparedness citizen survey was developed to gauge household preparedness that may impact Montgomery County and to assess the level of knowledge of tools and techniques to assist in reducing risk and loss of those hazards (https://www.co.montgomery.ny.us/sites/public/government/hazardmitigation/HazardMitigation_Documents/default.aspx). The questionnaire asked quantifiable questions about citizen perception of risk, knowledge of mitigation, and support of community programs. The questionnaire also asked several demographic questions to help analyze trends.
- The questionnaire has been available on the public website since August 2015, and further advertised on the County website devoted to Hazard Mitigation Planning. Responses were collected and incorporated into mitigation actions. Response rate to date are considered poor. A summary of survey results is provided in Appendix H of this plan.

- Directed response surveys were distributed to Fire Departments, EMS, Hospitals, and Law Enforcement stakeholders August 2015.
- A hazard mitigation planning tri-fold brochure (see Appendix C) was developed to inform the public of the planning process, provide local contact information, and encourage the public to review the plan and provide input.
- In September 2015, the Draft Plan Update was posted to the public website (https://www.co.montgomery.ny.us/sites/public/government/hazardmitigation/HazardMitigation_Documents/default.aspx). This was an opportunity for public comment on the Draft Plan Update before it went under review by NYSDHSES. All public comments were directed to the Montgomery Department of Economic Development and Planning for collection and review by the Planning Committee. Any public comments received will be incorporated into the plan before submittal to FEMA.
- On February 10, 2016, the Draft Plan was posted on the Montgomery County website (https://www.co.montgomery.ny.us/sites/public/government/hazardmitigation/HazardMitigation_Documents/default.aspx)
- On July 22, 2015, an email was sent to the participating Montgomery County cities, towns, and villages requesting public/stakeholder review/comment of the Draft Plan Update and announcing the public meeting.
- A public notice announcing the Draft Plan posting, an upcoming public meeting to be held prior to Plan submittal to FEMA, and providing a link to the mitigation website was distributed on July 22, 2015.

3.5 INCORPORATION OF EXISTING PLANS, STUDIES, REPORTS AND TECHNICAL INFORMATION

The Montgomery County HMP Update strives to use the best available technical information, plans, studies and reports throughout the planning process to support hazard profiling; risk and vulnerability assessment; review and evaluation of mitigation capabilities; and the identification, development and prioritization of County and local mitigation strategies.

The asset and inventory data used for the risk and vulnerability assessments is presented in the County Profile (Section 4). Details of the source of this data, along with technical information on how the data was used to develop the risk and vulnerability assessment, is presented in the Hazard Profiling and Risk Assessment Section (Section 5), specifically within Section 5.3 (Data and Methodology), as well as throughout the hazard profiles in Section 5.4. Further, the source of technical data and information used may be found within the References section.

Plans, reports and other technical information were identified and provided directly by the County, participating jurisdictions and numerous stakeholders involved in the planning effort, as well as through independent research by the planning consultant. The County and participating jurisdictions were tasked with updating the inventory of their Planning and Regulatory capabilities (see Capability Assessment section of each jurisdictional annex in Section 9), and providing relevant planning and regulatory documents as applicable. Relevant documents, including plans, reports, and ordinances were reviewed to identify:

- Existing municipal capabilities;
- Needs and opportunities to develop or enhance capabilities, which may be identified within the County or local mitigation strategies;
- Mitigation-related goals or objectives, considered in the review and update of the overall Goals [and Objectives] (see Section 6);

- Proposed, in-progress, or potential mitigation projects, actions and initiatives to be incorporated into the updated County and local mitigation strategies.

The following local regulations, codes, ordinances and plans were reviewed during this process in an effort to develop mitigation planning goals and objectives and mitigation strategies that are consistent across local and regional planning and regulatory mechanisms; and thus develop complementary and mutually supportive strategies, including:

- Master Plans
- Building Codes
- Zoning Ordinances
- Subdivision Ordinances
- NFIP Flood Damage Prevention Ordinances
- Site Plan Requirements
- Stormwater Management
- Emergency Response Plans
- Capital Plans
- New York Rising Countywide Resiliency Plan for Montgomery County, 2014
- New York State Standard Multi-Hazard Mitigation Plan, 2014

The "Legal and Regulatory" capability assessment of each participating jurisdiction is included in Section 9, (Jurisdictional Annexes) and provides a listing of the local codes, ordinances, regulations, and planning mechanisms available in the jurisdictions and reviewed during this planning process.

A partial listing of the plans, reports and technical documents reviewed in the preparation of this plan is included in Table 3-4.

Table 3-4. Record Review (Municipalities) - Record of the review of existing programs, policies, and technical documents for participating jurisdictions (all)

Existing Plan, Program, or Technical Documents	Date	Jurisdictional Applicability
NYRCR Conceptual Plan for the City and Town of Amsterdam, and Town of Fonda	October 2013	City and Town of Amsterdam, Town of Fonda
NYRCR Montgomery County: NY Rising Countywide Resiliency Plan	July 2014	Countywide
Mohawk Valley Regional Economic Development Council 2012 Action Plan	2012	Countywide
Mohawk Valley Regional Sustainability Plan	TBD	Countywide
Mid-Montgomery County Local Waterfront Revitalization Program	February 2009	Towns of Glen and Mohawk; Villages of Fultonville and Fonda
FEMA RiskMAP Flood Risk Report	February 28, 2011	Villages of Fonda and Fort Plain
Montgomery County Business Development Center Annual Report	2012	Countywide
Mohawk River Watershed Management Plan	March 2015	Countywide
Updated Coordinated Transportation Plan for Montgomery County	December 2015	Countywide
Mohawk Valley Regional Sustainability Plan	TBD	Countywide
Montgomery County Comprehensive Emergency Management Plan	2014	Countywide

3.6 INTEGRATION WITH EXISTING PLANNING MECHANISMS AND PROGRAMS

Effective mitigation is achieved when hazard awareness and risk management approaches and strategies become an integral part of public activities and decision-making. Within the county there are many existing plans and programs that support hazard risk management, and thus it is critical that this hazard mitigation plan integrate and coordinate with, and complement, those existing plans and programs.

The "Capability Assessment" section of Chapter 6 (Mitigation Strategy) 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. Within each jurisdictional annex in Chapter 9, the County and each participating jurisdiction have identified how they have 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").

A further summary of these continued efforts to develop and promote a comprehensive and holistic approach to hazard risk management and mitigation is presented in Section 7.

3.7 CONTINUED PUBLIC INVOLVEMENT

Montgomery County is committed to the continued involvement of the public. Therefore, copies of the HMP update will be made available for review on their HMP public website. Each jurisdiction's main point of contact identified earlier in this section (Table 3-2) shall be responsible for receiving, tracking, and filing public comments regarding this HMP update.

The public will have an opportunity to comment on the HMP update as part of the annual mitigation planning evaluation process and the next five-year mitigation plan update. The HMP Coordinator (currently Mr. William Roehr) is responsible for coordinating the plan evaluation portion of the meeting, soliciting feedback, collecting and reviewing the comments, and ensuring their incorporation in the five-year plan update as appropriate. However, members of the Planning Committee will assist the HMP Coordinator. Additional meetings may also be held as deemed necessary by the Planning Committee. The purpose of these meetings would be to provide the public an opportunity to express concerns, opinions, and ideas about the plan.

Further details regarding continued public involvement are provided in Section 7.

After completion of this HMP update, implementation and ongoing maintenance will continue to be a function of the Planning Committee. The Planning Committee will review the HMP and accept public comment as part of an annual review and as part of five-year mitigation plan updates.

A notice regarding annual updates of the HMP will be publicized annually after the HMP Committee's annual evaluation and posted on the public website.

Mr. William Roehr has been identified as the ongoing County Hazard Mitigation Plan Coordinator (see Section 7), and is responsible for receiving, tracking, and filing public comments regarding this HMP update.

Contact information is:

Mr. William Roehr
Senior Planner
Montgomery County Business Development Center
Old County Courthouse, 9 Park Street, P.O. Box 1500, Fonda, NY 12068
(518) 853-8334
wroehr@co.montgomery.ny.us

SECTION 4. COUNTY PROFILE

Profile information is presented and analyzed to develop an understanding of a study area, including the economic, structural, and population assets at risk and the particular concerns that may be present related to hazards analyzed later in this plan (e.g., low lying areas prone to flooding or a high percentage of vulnerable persons in an area). This profile describes the general information of the County (physical setting, population and demographics, general building stock, and land use and population trends) and critical facilities located within Montgomery County.

4.1 GENERAL INFORMATION

Montgomery County is located within the Central Leatherstocking region of New York State and is bisected by the Mohawk River. The County is one of the eight counties comprising the Mohawk River Region, a place of enormous strategic importance. Prior to settlement of Europeans, Native Americans inhabited the lands throughout the valley named for the Mohawks, one of the six Iroquois tribes. The presence of the river and other abundant resources in the county sustained the Mohawk tribal people. Mohawk villages dotted the River's corridor. Early settlers to Montgomery County were the Dutch and Palatine Germans. The County was the center for intense fighting during the American Revolution. Postwar soldiers and pioneers traveled by the river to settle its fertile banks and migrate into the West (Montgomery County Chamber of Commerce, Date Unknown; U.S. Department of Agriculture, 1978).

The Erie Canal runs through the center of Montgomery County parallel to the New York State Throughway. The original canal ran through several towns and villages during the height of the canal days. After the railroad was built, many parts of the old canal were filled up. The New York State Throughway was added along the same route. Today the Erie Canal and its lock system are used primarily for recreational use. At the time of the canal construction, Montgomery County was the only place in the nation where the canal was able to be built due to the break in the Appalachian Mountains called "The Noses" also known as the gateway to the "West" (Montgomery County Chamber of Commerce, Date Unknown).

Montgomery County is part of the Mohawk Valley Heritage Corridor that stretches 130 miles from Central New York to the Hudson River. The corridor connects eight counties, 203 municipalities, and hundreds of visitor center attractions as the first regional heritage area in the New York State Heritage Area System. The corridor contains seven New York State Historic Sites, two National Park Service sites, the Oneida Indian National, and hundreds of public and privately operated historic attractions. It includes one-third of the Erie Canalway National Heritage Corridor and the northern edge of the Hudson River Valley National Heritage Corridor (Mohawk Valley Heritage Corridor Commission, 2007). The canal is an important waterway that follows the Mohawk River connecting the Hudson River with the Finger Lakes Region of Central New York and the Great Lakes (U.S. Department of Agriculture, 1978).

4.1.1 Physical Setting

This section presents the physical setting of the County, including: location, hydrography and hydrology, topography and geology, climate, and land use/land cover.

Location

Montgomery County is located approximately 33 miles northwest of the City of Albany in the central Leatherstocking region of New York State. The County is bordered to the north by Fulton County, to the south by Schenectady, Schoharie, and Otsego Counties, to the east by Saratoga and Schenectady Counties, and to the west by Herkimer County. Montgomery County covers approximately 409 square miles and is made up

of 10 towns, 10 villages and one city. The City of Amsterdam is the County's urban and economic center and the remainder of the County is predominately rural and agricultural (NY Rising Countywide Resiliency Plan 2014).

Hydrography and Hydrology

Montgomery County is located entirely within the Mohawk River Watershed, which represents one-quarter of the larger Hudson River Watershed (NY Rising Countywide Resiliency Plan 2014). The Mohawk Rivers flows west to east through the center of Montgomery County and receives all of the County's surface water runoff. The Mohawk River is a major tributary of the Hudson River and joins the Hudson River at Cohoes. The Mohawk River drains about 3,456 square miles. Historically, the River has been a hub for transportation and trade by the Native American tribes. The River's flood plain is very fertile and used for agricultural purposes. An extensive network of locks, dams, and canals are located along the River (U.S. Geologic Survey [USGS], 2007).

Numerous tributaries feed the Mohawk River, including the Schoharie, Canajoharie Creek, and the Otsquago Creek, which runs through the Town of Minden joining the Mohawk River after flowing along Route 80 through the central part of the Village of Fort Plain (NY Rising Countywide Resiliency Plan 2014).

The Mohawk River Watershed lies entirely within New York State. The Mohawk River originates in the valley between the western Adirondacks and the Tug Hill Plateau and flows 140 miles to the east where it joins the Hudson River. The Watershed covers 3,460 square miles and contains 4,086 miles of freshwater rivers and streams. There are 135 significant freshwater lakes, ponds, and reservoirs located in the Mohawk River Watershed and include Hinkley Reservoir, Delta Reservoir, Peck Lake, and Schoharie Reservoir (NYSDEC 2014).

Topography and Geology

The total relief of Montgomery County is approximately 1,215 feet. The relief of the inner valley of the Mohawk River does not exceed 500 feet. The highest elevation is 1,600 feet above mean sea level on at Willse Hill in the Town of Minden and the lowest point is about 235 feet along the Mohawk River as it leaves the county. Montgomery County is divisible into the sharply undulating upland area and the alluvial flats and level terraces along the Mohawk River and Schoharie Creek. The Mohawk River flows through a steep-walled valley averaging about 1,000 feet in width. The width of the flood plain on a given side of the river at any place depends upon the position of the river in relation to the valley walls. The flood plain is best developed between Fultonville and Fort Hunter and just west of St. Johnsville. Level terrace surfaces are west of Fonda and in the vicinity of Tribes Hill, Auriesville, and St. Johnsville (Jeffords, 1950).

Away from the river, the surface rises abruptly 250 to 500 feet in less than a mile to the uplands. The topography surrounding the Mohawk River is undulating. The southwestern and southeastern corners of Montgomery County and along Schoharie Creek the ground surface is irregularly rounded hills and steep slopes. The remainder of Montgomery County includes small level areas scattered about an undulating surface. The area around Charleston Four Corners is characterized by parallel elongate ridges (drumlins) that trend east-west (Jeffords, 1950).

Montgomery County is located within the Mohawk Valley physiographic province. A few miles to the north are the foothills of the Adirondack Mountain province and bordering Montgomery County to the south are Southwestern Plateau and Catskill Mountain provinces. The bedrock of the Mohawk Valley is comprised of Cambrian-Ordovician rocks. Schoharie Creek is underlain by Devonian clastic, sedimentary rocks. The carbonate rocks of the Lower Beekmantown Group are the oldest, deposited in a shallow marine environment during the Cambro-Ordovician. The lower Beekmantown Group consists of the Potsdam Formation and the

Galway Formation. The Upper Beekmantown Group contains carbonate rocks of the Tribes Hill Formation and Chucanunda Creek Dolostone. Overlying the Chucanunda Creek Dolostone is the fossiliferous limestone of the Black River Group and the Trenton Group, which were deposited in a shallow marine environment during the Middle to Late Ordovician. Stratigraphically above the limestones of the Trenton Group lies the Utica Shale of the Trenton Group, a black, fossiliferous shale, deposited in a near to deep-marine environment. The Utica Shale thickens to the west. The interbedded sandstone and shale of the Schenectady Formation overlies the Utica Shale (Jeffords, 1950; Greene, 1925).

Bedrock in Montgomery County is mainly of Ordovician age. The southern quarter of the county is the Schenectady Formation of shale and interbedded sandstone and the Frankford Formation of shale. The middle and upper parts of the county are Canajoharie Shale. In the rest of the county, generally in the northern part, are scattered and isolated formations (U.S. Department of Agriculture, 1978).

Several glacial advances and retreats occurred during the Pleistocene ice age in Montgomery County. The glacial ice picked up soil material and pieces of bedrock with each southward movement. These sediments were re-deposited as a mixture of unconsolidated material of various sizes, shapes, and mineralogy. The last advance stripped earlier deposits and laid down the present mantel in which most of the soils formed. The main glacial deposit in Montgomery County is glacial till composed primarily of shale (U.S. Department of Agriculture, 1978).

Other glacial deposits in Montgomery County are in the form as outwash deposits formed as result of material washing out of a melting glacier. The main outwash deposit lies in the Mohawk River Valley. Outwash deposits occur chiefly as scattered shoulders overlying till along both banks of the Mohawk River Valley and extending into some of the tributary valleys. Generally, outwash deposits are of stratified sand and gravel (U.S. Department of Agriculture, 1978).

The prominent northeast-trending ridges of the Mohawk Valley region and the conspicuous constructions of the valley, as at the Noses near Yosts, result from displacement of segments of the rock formations along several high-angle faults. These faults extend 30 miles northward into the Adirondacks. The vertical displacement along the Noses fault, which is one of the largest, is approximately 500 feet. Erosion exposed the resistant Little Falls dolomite in western Montgomery County and the less resistant Canajoharie and Utica shales in the low broad areas in eastern Montgomery County. The faults north of the Mohawk River are marked by high cliffs (Jeffords, 1950).

Climate

The climate of New York State is very similar to most of the Northeast U.S. and is classified as Humid Continental. Differences in latitude, character of topography, and proximity to large bodies of water all have an effect on the climate across New York State. Precipitation during the warm, growing season (April through September) is characterized by convective storms that generally form in advance of an eastward moving cold front or during periods of local atmospheric instability. Occasionally, tropical cyclones will move up from southern coastal areas and produce large quantities of rain. Both types of storms typically are characterized by relatively short periods of intense precipitation that produce large amounts of surface runoff and little recharge (Cornell, Date Unknown).

The cool season (October through March) is characterized by large, low-pressure systems that move northeastward along the Atlantic coast or the western side of the Appalachian Mountains. Storms that form in these systems are characterized by long periods of steady precipitation in the form of rain, snow, or ice, and tend to produce less surface runoff and more recharge than the summer storms because they have a longer duration and occasionally result in snowmelt (Cornell, Date Unknown).

According to monthly average data from The Weather Channel, July tends to be the warmest month in Montgomery County with median high temperatures averaging around 80ºF; in contrast January is the coldest month with low temperatures averaging around 10ºF. Precipitation averages approximately 37.8 inches (rainfall) and 56.7 inches (snowfall).

Severe weather recorded by NOAA for Montgomery County, between January 2006 and April 2013, was related to hail, high winds, thunderstorms, winter weather, cold/wind chill, heavy snow, and flooding. Flooding was the most common severe storm event (NCDC, 2013).

Land Use and Land Cover

Montgomery County's land area is occupied and utilized in several different ways. This includes agricultural land, commercial land, community services, conservation and public parks, industrial land, public services, recreation and entertainment, residential land and vacant property. In 2002, 50.8 percent of the land in Montgomery County was used for agricultural purposes; 23.4 percent was commercial, industrial or residential land; 16.5 percent was vacant or unknown property; 5.8 percent was conservation and public parks; 3.1 percent was for public and community services; and 0.4 percent was for recreation and entertainment. Table 4-1 below shows the land use categories and their total square miles and percentages. Figures 4-1 and 4-2 show the distribution of land use throughout Montgomery County.

Table 4-1. Land Use in Montgomery County

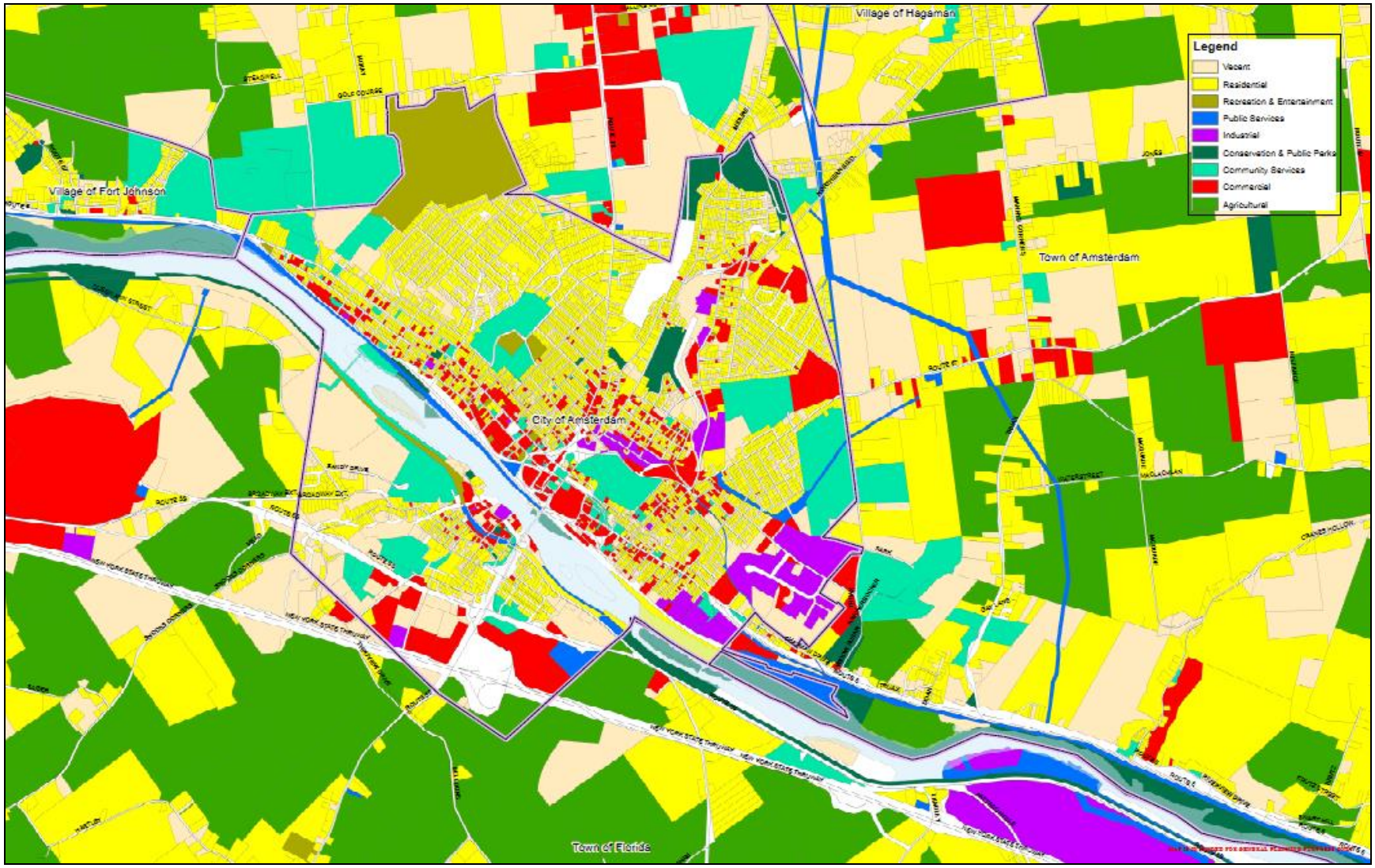
Land Use Category	Number of Parcels	Total Square Miles	Percent (%) of County
Vacant	5,205	51.58	12
Residential	15,815	107.63	26
Recreation & Entertainment	64	1.89	1
Public Services	364	7.13	2
Industrial	126	2.75	1
Conservation & Public Parks	437	23.59	6
Community Services	446	5.75	1
Commercial	1,409	5.34	1
Agriculture	2,531	209.62	50

Source: Montgomery County Department of Economic Development and Planning 2015

Figure 4-1. Distribution of Land Use for Montgomery County

Source: Montgomery County GIS 2015

Figure 4-2. Land Use Distribution for the City of Amsterdam, Montgomery County



Source: Montgomery County GIS 2015

4.2 POPULATION AND DEMOGRAPHICS

According to the 2010 U.S. Census, Montgomery County had a population of 50,219 people. Table 4-2 presents the population statistics for Montgomery County based on the 2010 U.S. Census data. Figure 4-3 through Figure 4-5 show the distribution of the general population density (persons per square mile) by Census block. For the purposes of this plan, data available in HAZUS-MH are used (representing 2000 data); this data is considered appropriate given the relatively small population increase between 2000 and 2010.

DMA 2000 requires that HMPs consider socially vulnerable populations. These populations can be more susceptible to hazard events, based on a number of factors including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. For the purposes of this study, vulnerable populations shall include (1) the elderly (persons aged 65 and over) and (2) those living in low-income households.

Table 4-2. Montgomery County Population Statistics (2010 U.S. Census)

Jurisdiction	Census 2010 Pop. (2010 U.S. Census)[1]	Census Pop. 65+[1]	Percent of Census Pop. 65+	HAZUS-MH Pop. Over 65	Census Pop. Below Poverty*[1]	Percent of Census Pop. Below Poverty	HAZUS-MH Low-Income Pop. **
City of Amsterdam	18,620	2,944	15.8	4,073	3,705	19.9	2,865
Town of Amsterdam	5,566	1,294	23.2	978	492	13.0	372
Village of Fort Johnson	490	69	14.1	69	38	7.8	18
Village of Hagaman	1,292	222	17.2	248	160	12.4	109
Town of Canajoharie	3,730	605	16.2	197	58	4.3	117
Village of Ames	145	32	22.1	23	6	4.1	13
Village of Canajoharie	2,229	346	15.5	407	439	19.7	272
Town of Charleston	1,373	180	13.1	135	209	15.2	71
Town of Florida	2,696	408	15.1	377	226	8.4	149
Town of Glen	2,507	282	11.2	186	57	3.3	62
Village of Fultonville	784	86	11.0	114	81	10.3	46
Town of Minden	4,297	667	15.5	312	214	10.8	231
Village of Fort Plain	2,322	369	15.9	424	701	30.2	329
Town of Mohawk	3,844	575	15.0	409	219	7.2	226
Village of Fonda	795	119	15.0	134	165	20.8	113
Town of Palatine	3,240	571	17.6	313	364	19.1	154
Village of Nelliston	596	99	16.6	103	33	5.5	64
Village of Palatine Bridge	737	235	31.9	129	99	13.4	68
Town of Root	1,715	246	14.3	222	183	10.7	120
Town of St. Johnsville	2,631	557	21.2	190	355	39.5	116
Village of St. Johnsville	1,732	405	23.4	373	416	24.0	217
Montgomery County (Total)	**50,219**	**8,329**	**16.6**	**9,416**	**8,186**	**16.3**	**5,732**

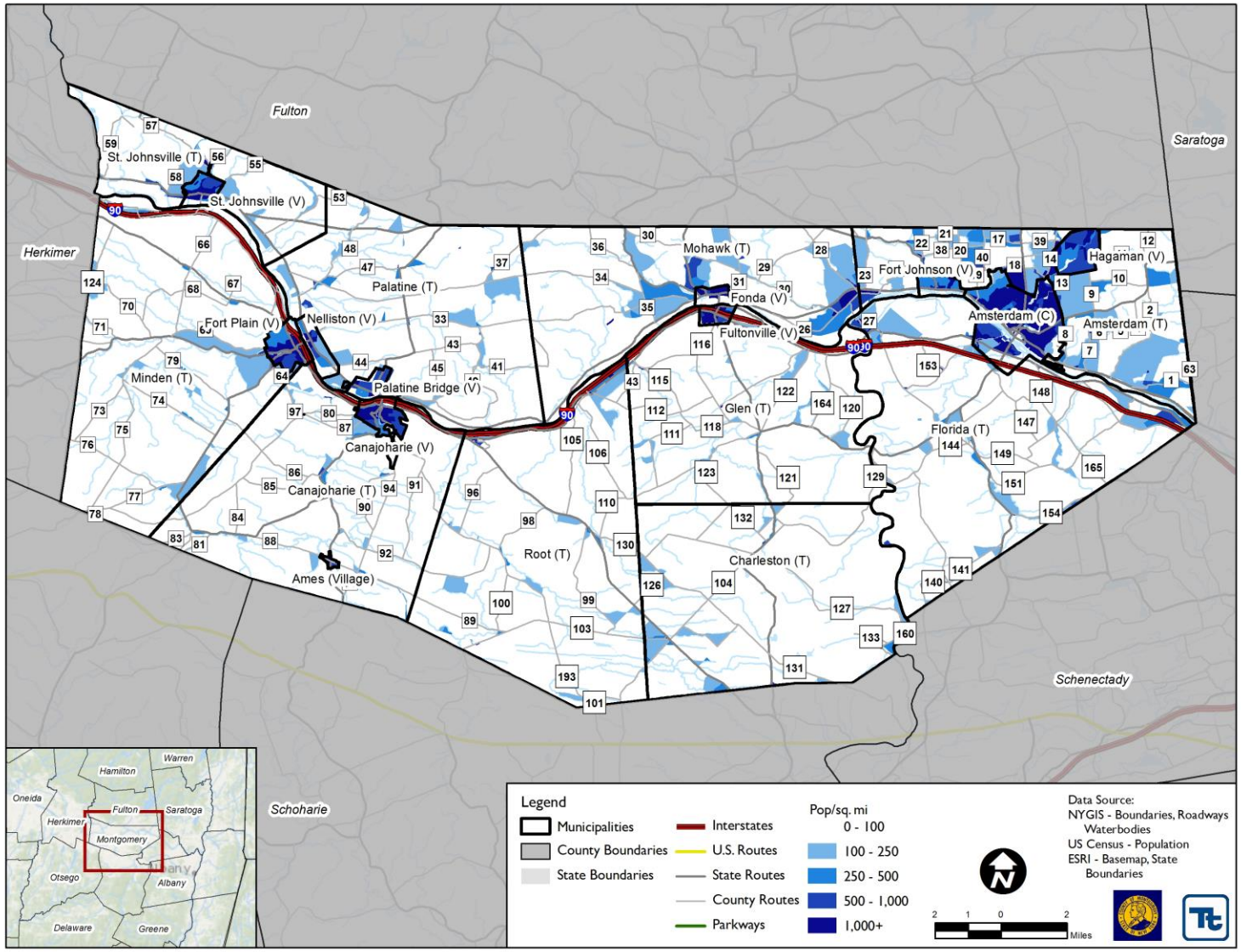
Source(s): Census 2010 (U.S. Census Bureau); U.S. Census Bureau, 2007-2011 American Community Survey; HAZUS-MH MR3, 2007
Note: Pop. = population
1 Populations of the towns do not include the populations of their incorporated villages.
** Individuals below poverty level (Census poverty threshold for a 3-person family unit is approximately $15,000)*
*** Households with an income of less than $20,000*

It is noted that the census data for household income provided in HAZUS-MH includes two ranges ($0-10,000 and $10,000-$20,000/year) that were totaled to provide the "low-income" data used in this study. This does

not correspond exactly with the "poverty" thresholds established by the U.S. Census Bureau, which identifies households with an annual household income below $15,000 per year as "low income" for this region. This difference is not believed to be significant for the purposes of this planning effort.

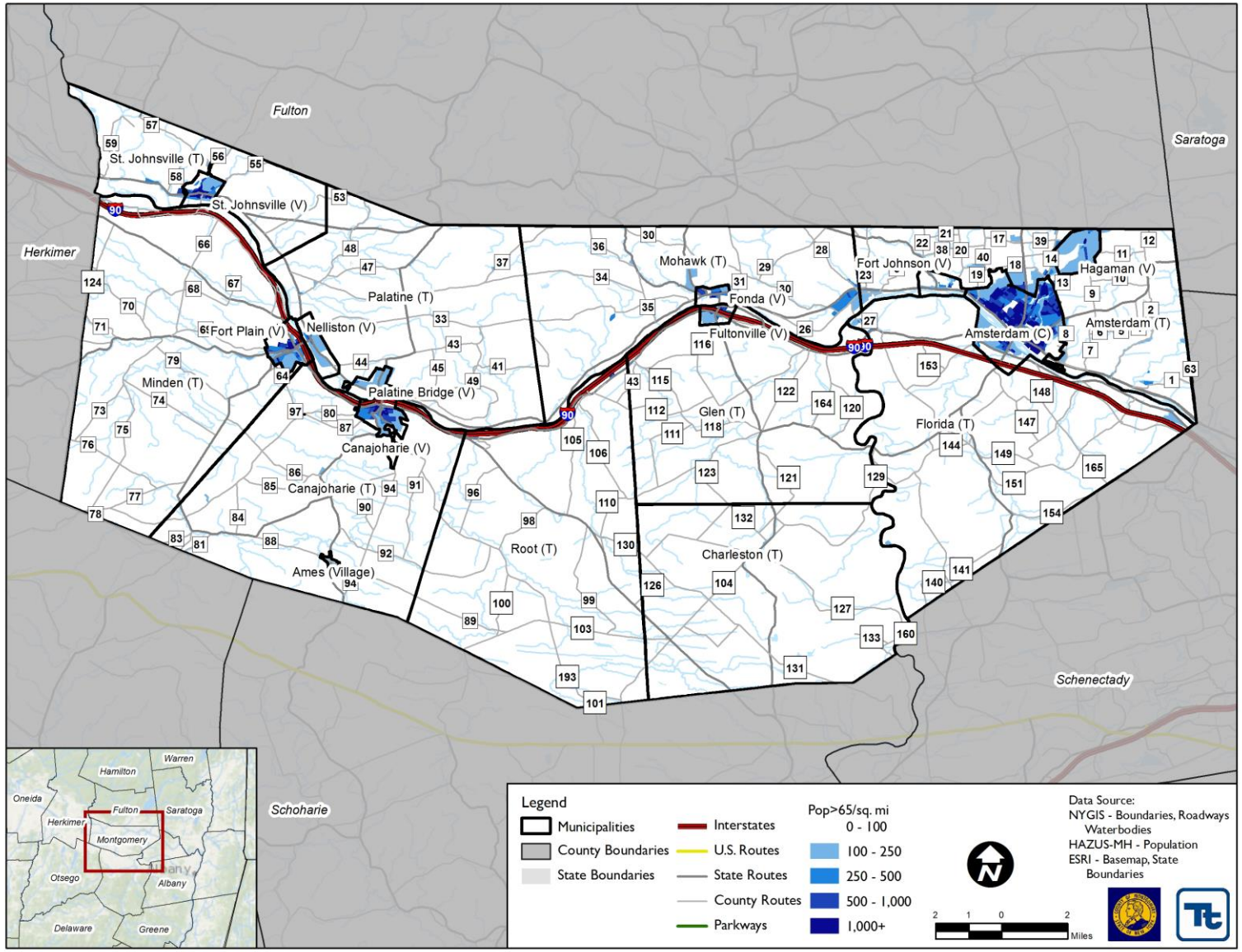
The U.S. Census Bureau, 2007-2011 American Community Survey data identified 2,826 of Montgomery County's 20,059 households and an estimated 8,186 persons (16.3 percent of the population) as having an annual income of less than $15,000 or living below the poverty level. Figures 4-5 through 4-7 shows the distribution of general population, distribution of persons over age 65 in Montgomery County, and low income persons.

Figure 4-3. Distribution of General Population for Montgomery County, New York



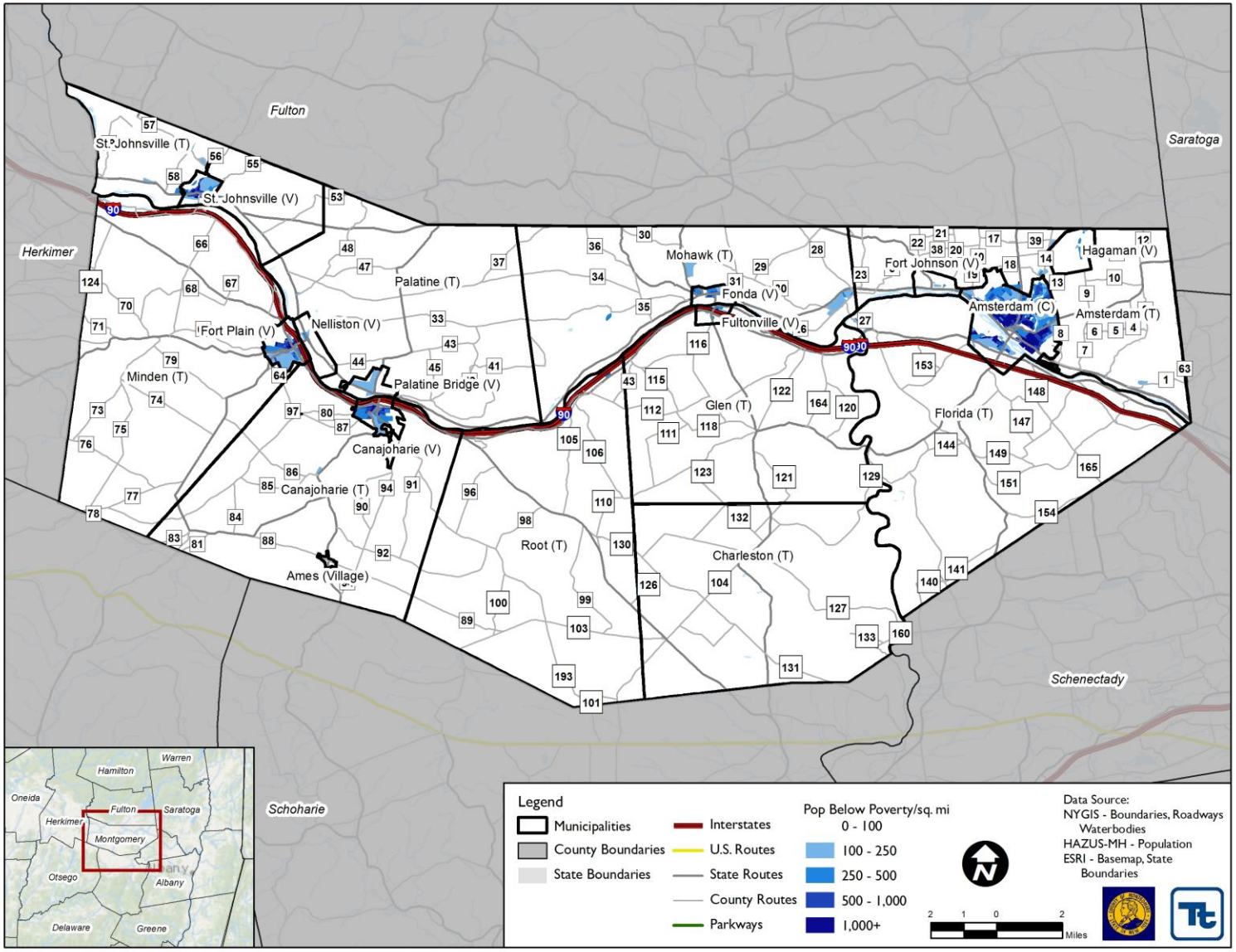
Source: U.S. Census 2010

Figure 4-4. Distribution of Persons over the Age of 65 in Montgomery County, New York



Source: HAZUS-MH

Figure 4-5. Distribution of Low-Income Population in Montgomery County, New York



Source: HAZUS-MH

4.3 GENERAL BUILDING STOCK

The 2010 U.S. Census data identifies 20,272 households in Montgomery County. The U.S. Census data identified 23,063 housing units in Montgomery County in 2010, an increase of 2.4 percent from 2000. U.S. Census defines household as all the persons who occupy a housing unit, and a housing unit as a house, an apartment, a mobile home, a group of rooms, or a single room that is occupied (or if vacant, is intended for occupancy) as separate living quarters. Therefore, you may have more than one household per housing unit. The median price of an owner-occupied housing unit in Montgomery County was estimated at $99,500 in 2010 (U.S. Census, 2010 and 2007-2011 American Community Survey).

The data in HAZUS-MH estimates a total building replacement value (structure and content) of greater than $5.9 billion. Approximately 63-percent of the building stock replacement cost value is associated with residential housing. Table 4-3 presents building stock statistics by occupancy class for Montgomery County, based on HAZUS-MH default data.

Table 4-3. Building Stock Replacement Value by Occupancy Class

Municipality	Total	Residential	Commercial	Industrial
Ames, Village of	$11,930,000	$9,206,000	$722,000	$0
Amsterdam, City of	$2,368,033,000	$1,516,847,000	$471,571,000	$285,385,000
Amsterdam, Town of	$531,119,000	$346,244,000	$60,977,000	$50,564,000
Canajoharie, Town of	$124,320,000	$79,607,000	$7,026,000	$24,203,000
Canajoharie, Village of	$301,298,000	$169,042,000	$49,689,000	$47,304,000
Charleston, Town of	$109,074,000	$88,720,000	$6,474,000	$4,741,000
Florida, Town of	$563,092,000	$206,640,000	$264,344,000	$39,980,000
Fonda, Village of	$196,470,000	$55,576,000	$14,238,000	$106,691,000
Fort Johnson, Village of	$46,590,000	$41,048,000	$1,884,000	$1,214,000
Fort Plain, Village of	$229,997,000	$152,782,000	$46,873,000	$12,616,000
Fultonville, Village of	$68,522,000	$43,604,000	$12,854,000	$8,276,000
Glen, Town of	$154,892,000	$99,870,000	$28,262,000	$13,343,000
Hagaman, Village of	$140,721,000	$112,293,000	$20,160,000	$304,000
Minden, Town of	$125,699,000	$99,846,000	$11,550,000	$2,977,000
Mohawk, Town of	$258,777,000	$211,527,000	$20,549,000	$11,693,000
Nelliston, Village of	$57,696,000	$35,950,000	$15,154,000	$3,492,000
Palatine, Town of	$108,236,000	$78,840,000	$14,590,000	$7,646,000
Palatine Bridge, Village of	$73,437,000	$52,901,000	$17,554,000	$282,000
Root, Town of	$151,981,000	$119,379,000	$16,731,000	$10,487,000
St. Johnsville, Town of	$69,952,000	$53,336,000	$8,484,000	$5,072,000
St. Johnsville, Village of	$221,849,000	$134,229,000	$35,315,000	$41,913,000
Montgomery County (Total)	**$5,913,685,000**	**$3,707,487,000**	**$1,125,001,000**	**$678,183,000**

Source: HAZUS-MH 2.1
Note: Values (both Count and Replacement Value) for Towns do not include the values of their incorporated Villages.

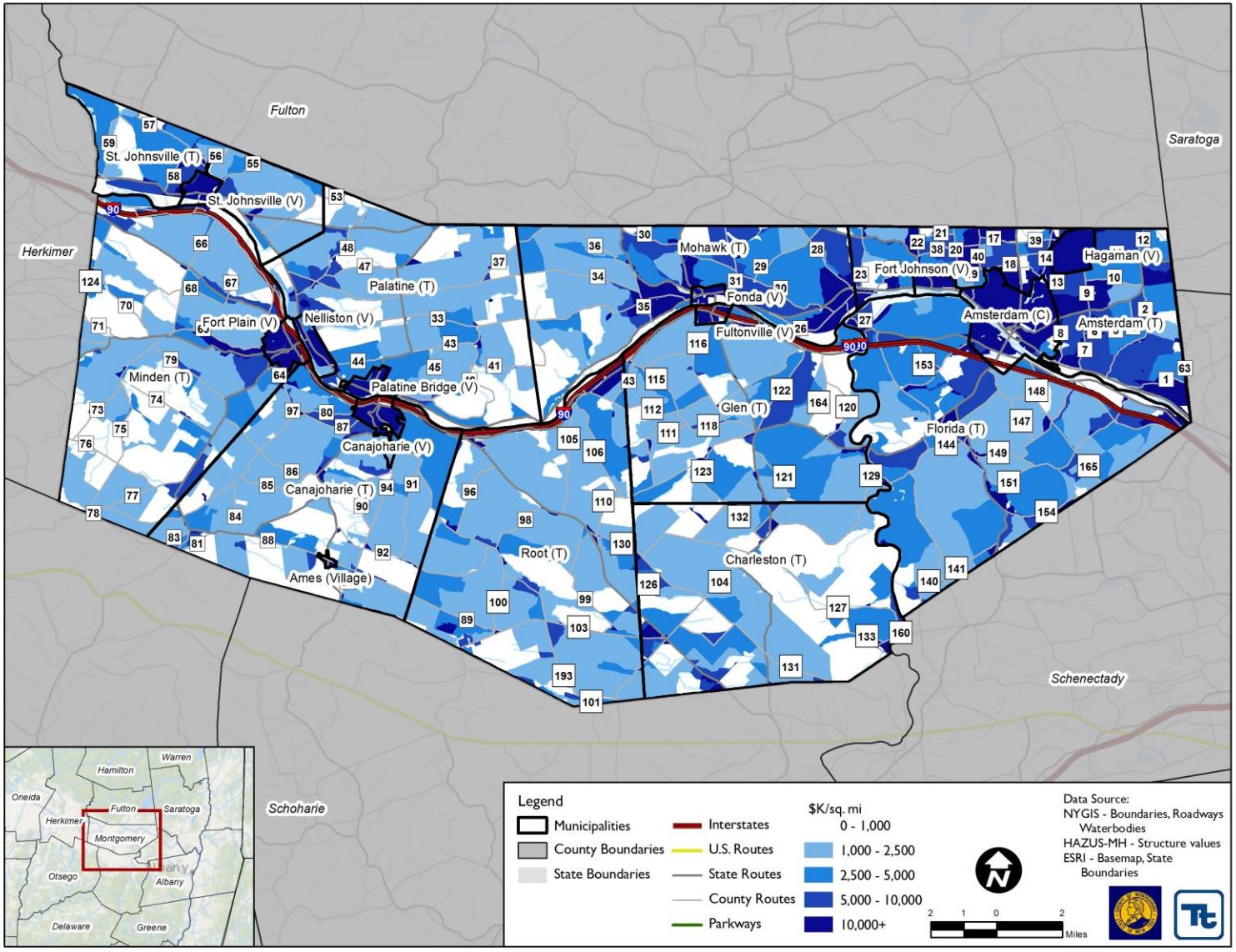
The 2010 Census data identify that the majority of housing units (56.1 percent) in Montgomery County are single-family detached units. The U.S. Census Bureau's 2007 Economic Census data identified 1,234 business establishments employing 18,418[1] people in Montgomery County.

Figure 4-6 and Figure 4-7 show the distribution and exposure density of residential, commercial and industrial buildings in Montgomery County. Exposure density is the dollar value of structures per unit area, including building content value. Generally, contents for residential structures are valued at about 50 percent of the building's value. For commercial facilities, the value of the content is generally about equal to the building's structural value. The densities are shown in units of $1,000 ($K) per square mile.

Viewing exposure distribution maps such as Figure 4-6 and Figure 4-7 can assist communities in visualizing areas of high exposure and in evaluating aspects of the study area in relation to the specific hazard risks.

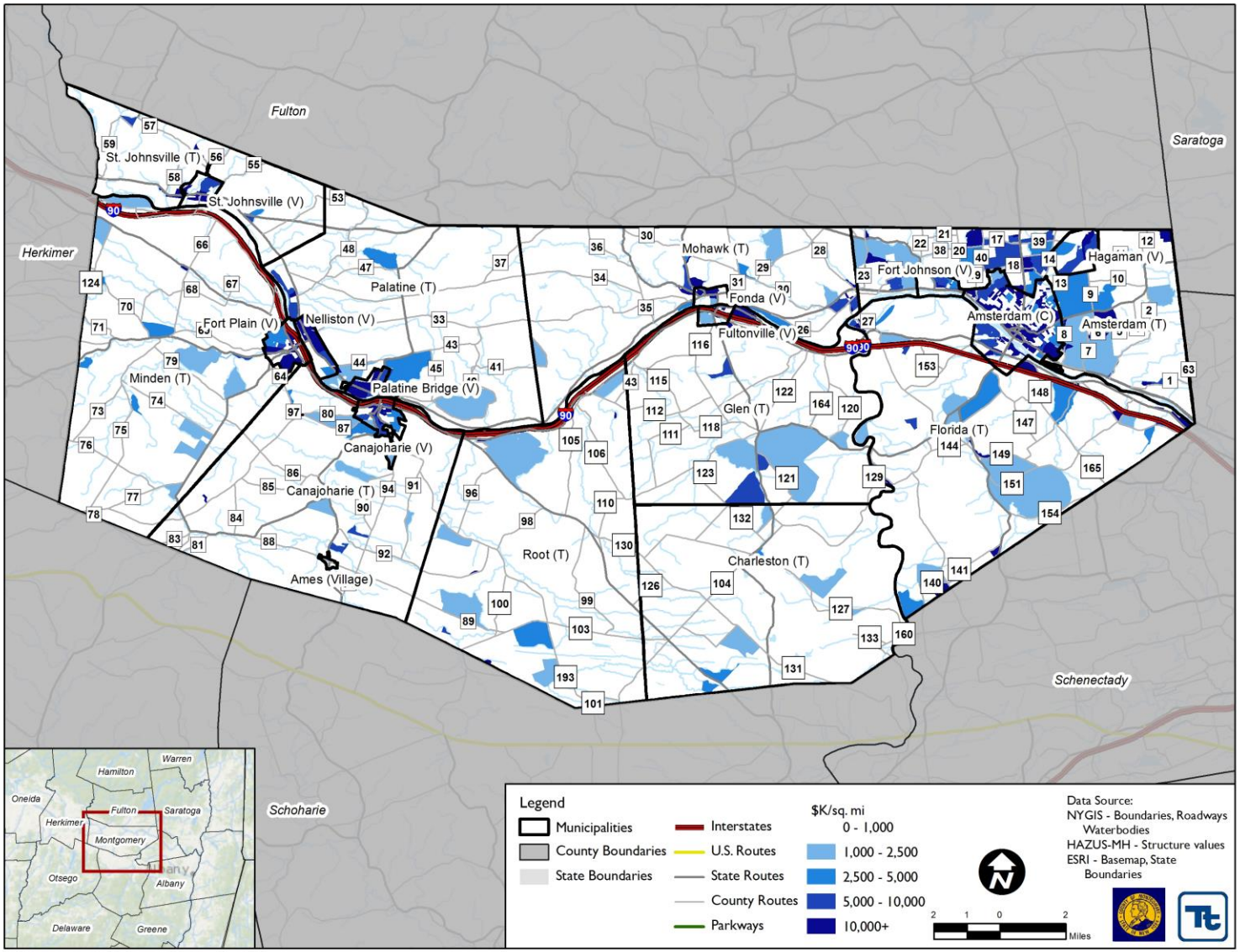
[1] This data comes from separate 2007 Economic Census Industry Series, Geographic Area Series, and Summary Series data files, as well as data files from the 2007 Economic Census of Island Areas and the 2007 Nonemployer Statistics. Data is released on a flow basis from March 2009 through mid-2011.

Figure 4-6. Distribution of Residential Building Stock and Value Density in Montgomery County



Source: HAZUS-MH

Figure 4-7. Distribution of Commercial Building Stock and Exposure Density in Montgomery County



Source: HAZUS-MH

4.4 LAND USE AND POPULATION TRENDS

Land use regulatory authority is vested in New York State's towns, villages, and cities. However, many development and preservation issues transcend location political boundaries. DMA 2000 requires that communities consider land use trends, which can impact the need for, and priority of, mitigation options over time. Land use trends significantly impact exposure and vulnerability to various hazards. For example, significant development in a hazard area increases the building stock and population exposed to that hazard.

This Plan provides a general overview of population and land use and types of development occurring within the study area. An understanding of these development trends can assist in planning for further development and ensuring that appropriate mitigation, planning, and preparedness measures are in place to protect human health and community infrastructure.

4.4.1 Land Use Trends

Agricultural Land

According to the 2012 Census of Agriculture, Montgomery County had 659 farms with 131,386 acres of land in farms. The average size of farms in the County was 199 acres. Market value of products sold in the County was over $86 million, of which over $21 million in crop sales and over $65 million in livestock sales. The leading agricultural products sold in the County was milk from cows (over $49 million), poultry and eggs (over $14 million), and other crops and hay (over $9 million). The Census also indicated that 443 farm operators reported farming as their primary occupation (USDA 2012).

Between 2007 and 2012, the County saw an increase in the number of farms and size of farms in contrast with previous years in which the County has experienced a steady decline in farming. Table 4-4 shows the number of farms and land use in Montgomery County.

Table 4-4. Farms in Montgomery County, New York

Year	Number of Farms	Land in Farms (acres)	Total Cropland (acres)	Permanent Pasture (acres)	Total Woodland (acres)	Other Land (acres)
1940	1,813	209,521	N/A	N/A	21,281	N/A
1950	1,473	204,612	144,395	29,980	22,020	8,217
1959	1074	192,037	127,466	31,300	22,032	11,536
1969	735	161,303	118,122	N/A	18,035	N/A
1978	668	165,573	125,214	12,604	18,232	9,432
1982	657	164,000	122,675	10,532	19,536	11,257
1987	685	169,400	131,600	10,700	18,700	8,400
1992	630	152,600	112,900	9,000	19,300	11,400
1997	650	145,000	110,400	10,000	15,400	9,200
1998	645	144,000	100,700	9,800	15,000	8,500
1999	655	139,800	110,700	9,400	14,700	5,000
2000	640	138,400	N/A	N/A	N/A	N/A
2001	630	139,300	N/A	N/A	N/A	N/A
2002	620	152,000	111,982	10,925	19,532	9,541
2003	620	151,800	N/A	N/A	N/A	N/A
2007	604	124,556	84,091	13,701	17,936	8,819
2012	659	131,386	N/A	N/A	N/A	N/A

Source: U.S. Department of Agriculture, 2012

Economy

The Montgomery County Department of Economic Development and Planning (MCDEDP) was created to administer the Montgomery County Economic Development and Planning Program and is the lead Economic Development Agency in Montgomery County, New York. In addition, the staff acts as the administrative body for the Montgomery County Industrial Development Agency (MCIDA). By joining forces and pooling resources, the County and the MCBDC provide professional economic development assistance to businesses interested in expanding or relocating in Montgomery County (MCDEDP 2014).

In addition to business attraction, MCBDC places a strong focus on retaining and expanding existing businesses to maintain economic stability within Montgomery County. MCBDC works directly with local employers to promote capital investments and job creation, reducing the risk of closure or relocation out of the County. Services delivered by MCBDC include needs assessments, identification of expansion opportunities and securing financial, technical, marketing and training resources. Through the MCBDC, Montgomery County businesses can access loans and grants to assist with acquisition and/or expansion. The MCIDA can provide long-term tax-exempt bond financing with lower interest rates than are available through conventional financing (MCDEDP 2014).

The Fulton and Montgomery Counties region has experienced high unemployment rates and the loss of manufacturing jobs. However, the Counties have experienced success in revitalizing segments of their local economies which have been achieved through planning, investment in economic development, and having a strong inventory of shovel-ready sites (Regional Business Plan 2011).

Montgomery County has achieved economic success with its industrial/business parks. Currently, there are three business parks in the County: Florida Business, Florida Business Expansion, and Glen Canal View which totals 860 acres, of which 735 acres is developed and 125 acres available to develop (Regional Business Plan 2011). Businesses located in these parks are as follows:

- Florida Business –
  - Target Distribution Center
  - Beechnut
- Florida Business Expansion
  - Hill & Markes
- Glen Canal View
  - American Ornamental
  - DAIM Logistics, Inc.

4.4.2 Population Trends

This section discusses population trends to use as a basis for estimating future changes that could result from the seasonal character of the population and significantly change the character of the area. Population trends can provide a basis for making decisions on the type of mitigation approaches to consider and the locations in which these approaches should be applied. This information can also be used to support planning decisions regarding future development in vulnerable areas.

The U.S. Census Bureau estimates Montgomery County's 2010 population to be 50,219 persons, which is a 1.0 percent increase from the 2000 Census population of 49,708. From 1790 to 2010, the County has experienced a fluctuation in its population. The largest increase was seen between the years 1800 to 1810, when the County experienced an 89.9 percent (19,514 persons) population increase. The largest decrease was seen between the years 1790 and 1800, when the County experienced a 24.8 percent (-7,152 persons) population decrease. The smallest increase was seen between the years 1910 and 1920, when Montgomery

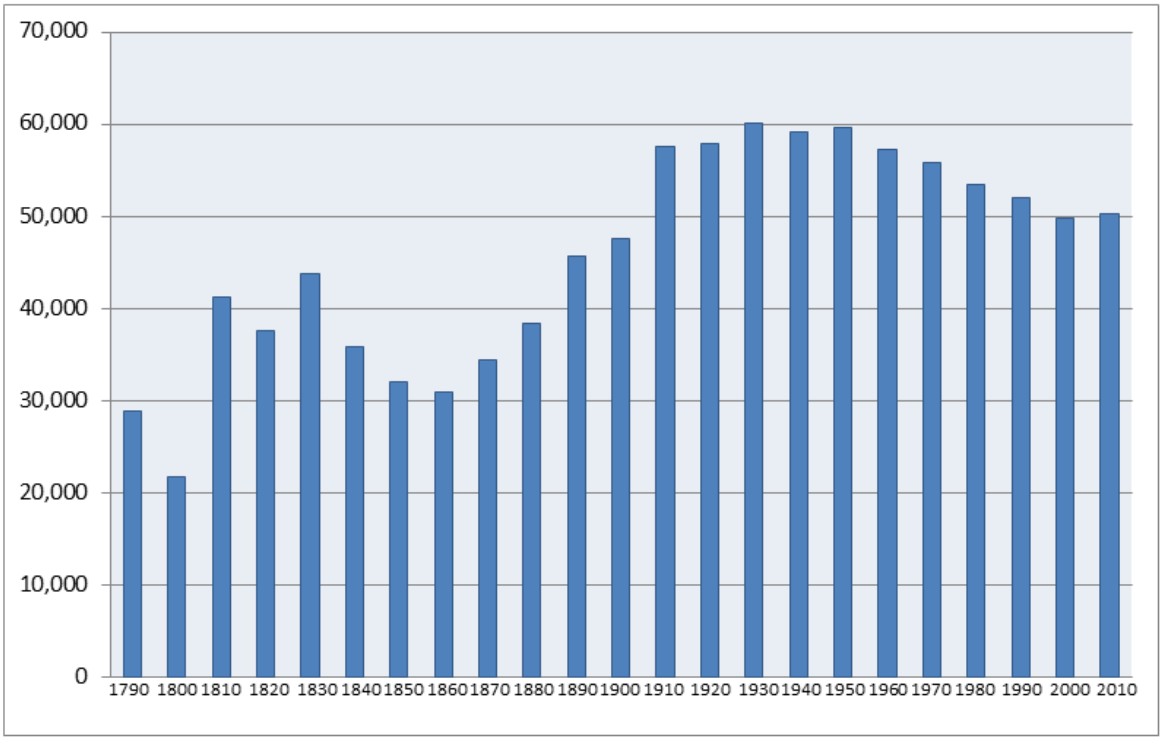
County only experienced a 0.6 percent (361 persons) percent increase. More recently, from 1990 to 2000, Montgomery County experienced a 4.4 percent (-2,273 persons) population decrease. From 2000 to 2010 the County experienced a 1.0 percent (511 persons) population increase. Table 4-5 displays the population and population differences from 1790 to 2010 in Montgomery County. Figure 4-8 depicts the past, current, and projected population statistics/trends for the County.

Table 4-5. Montgomery County Population Trends, 1790 to 2010

Year	Population	Change in Population	Percent Population Change
1790	28,852	—	—
1800	21,700	-7,152	-24.8
1810	41,214	19,514	89.9
1820	37,569	-3,645	-8.8
1830	43,715	6,146	16.4
1840	35,818	-7,897	-18.1
1850	31,992	-3,826	-10.7
1860	30,866	-1,126	-3.5
1870	34,457	3,591	11.6
1880	38,315	3,858	11.2
1890	45,699	7,384	19.3
1900	47,488	1,789	3.9
1910	57,567	10,079	21.2
1920	57,928	361	0.6
1930	60,076	2,148	3.7
1940	59,142	-934	-1.6
1950	59,594	452	0.8
1960	57,240	-2,354	-4.0
1970	55,883	-1,357	-2.4
1980	53,439	-2,444	-4.4
1990	51,981	-1,458	-2.7
2000	49,708	-2,273	-4.4
2010	50,219	511	1.0

Source: U.S. Census Bureau, 1995 and 2010; University of Virginia, 2004
Note: Change in population and percent in population change was calculated from available data

Figure 4-8. Montgomery County Population Trends, 1790 to 2010



Source: U.S. Census Bureau, 1995 and 2007; University of Virginia, 2004

4.4.3 Anticipated Development in Montgomery County

An understanding of population and development trends can assist in planning for future development and ensuring that appropriate mitigation, planning, and preparedness measures are in place to protect human health and community infrastructure. DMA 2000 requires that communities consider land use trends, which can impact the need for, and priority of, mitigation options over time. Land use and development trends significantly impact exposure and vulnerability to various hazards. For example, significant development in a hazard area increases the building stock and population exposed to that hazard.

Local zoning and planning authority is provided for under the New York State General Municipal Law, which gives municipalities zoning and planning authority. Refer to Sections 6 and 9 for further details on the planning and regulatory capabilities for the County and each municipality.

Development is not pervasive in the County but limited to distinct areas. Significant commercial and residential development is primarily limited to locations in the Eastern portion of the County and specifically in the Towns of Amsterdam and Florida. Most development pressure is outside of the floodplain. In the Town of Florida, there is anticipated growth of the Florida Business Park in the vicinity of exit 27 of the NYS Thruway (commercial and residential). In the Town of Amsterdam, commercial and residential growth is expected along the Route 30 corridor with potential construction of new apartment construction outside of the floodplain.

4.5 CRITICAL FACILITIES

A comprehensive inventory of critical facilities in Montgomery County was developed from various sources including HAZUS-MH provided data, Montgomery County Management Information Services Division, and input from the Steering and Planning Committees. For this Plan Update, the Steering and Planning Committees reviewed the information from the previous plan and concluded that the existing data set would provide accurate information for the purpose of this plan update. Therefore, the inventory of critical facilities in this section represents the current state of this effort at the time of publication of the HMP Update.

Critical Facilities are those facilities considered critical to the health and welfare of the population and that are especially important following a hazard. As defined for this HMP, critical facilities include essential facilities, transportation systems, lifeline utility systems, high-potential loss facilities, and hazardous material facilities.

Essential facilities are a subset of critical facilities that include those facilities that are important to ensure a full recovery following the occurrence of a hazard event. For the County risk assessment, this category was defined to include police, fire, EMS, schools/colleges, shelters, senior facilities, and medical facilities.

4.5.1 Essential Facilities

This section provides information on emergency facilities, hospital and medical facilities, shelters, schools, and senior care and living facilities.

Emergency Facilities

For the purposes of this Plan, emergency facilities include emergency operations centers (EOC), police, fire and emergency medical services (EMS). Table 4-6 through Table 4-8 provide an inventory of emergency operations centers, police stations, fire stations and EMS facilities in Montgomery County. **Error! Reference source not found.** displays the location of these facilities based on the HAZUS-MH inventory data and input from the Planning Committee.

Table 4-6. Emergency Operation Centers in Montgomery County

Name	Address	Jurisdiction	Replacement Value *	Bldg. Type *	Backup Power
Amsterdam Public Safety	1 Guy Park Ave	Amsterdam (C)	$15,000,000	Concrete	Yes
Montgomery County Building	TBD	Fonda	$1,000,000	Concrete	TBD

Source: Montgomery County GIS; HAZUS-MH MR3, 2007
Note: The structural value includes the building structure, but not the building content.
** = HAZUS-MH MR3 default data (2007)*

Table 4-7. Police Stations in Montgomery County

Police Facility Name	Address	Jurisdiction	Cost (Structural Value) *	Bldg. Type	Backup Power
Amsterdam Police Department	1 Guy Park Avenue	Amsterdam (C)	$15,000,000	Concrete	Yes
Canajoharie Police Department	75 Erie Boulevard	Canajoharie (V)	$1,652,000	Concrete	Yes
Fort Plain Police Headquarters	168 Canal Street	Fort Plain	$1,652,000	Concrete	Yes
Montgomery County Sherriff	200 Clark Drive	Glen	$1,652,000	Concrete	Yes
St. Johnsville Police Department	16 Washington Street	St. Johnsville (V)	$1,652,000	Concrete	Yes
New York State Police	3003 NY-5S	Fultonville	TBD	TBD	TBD

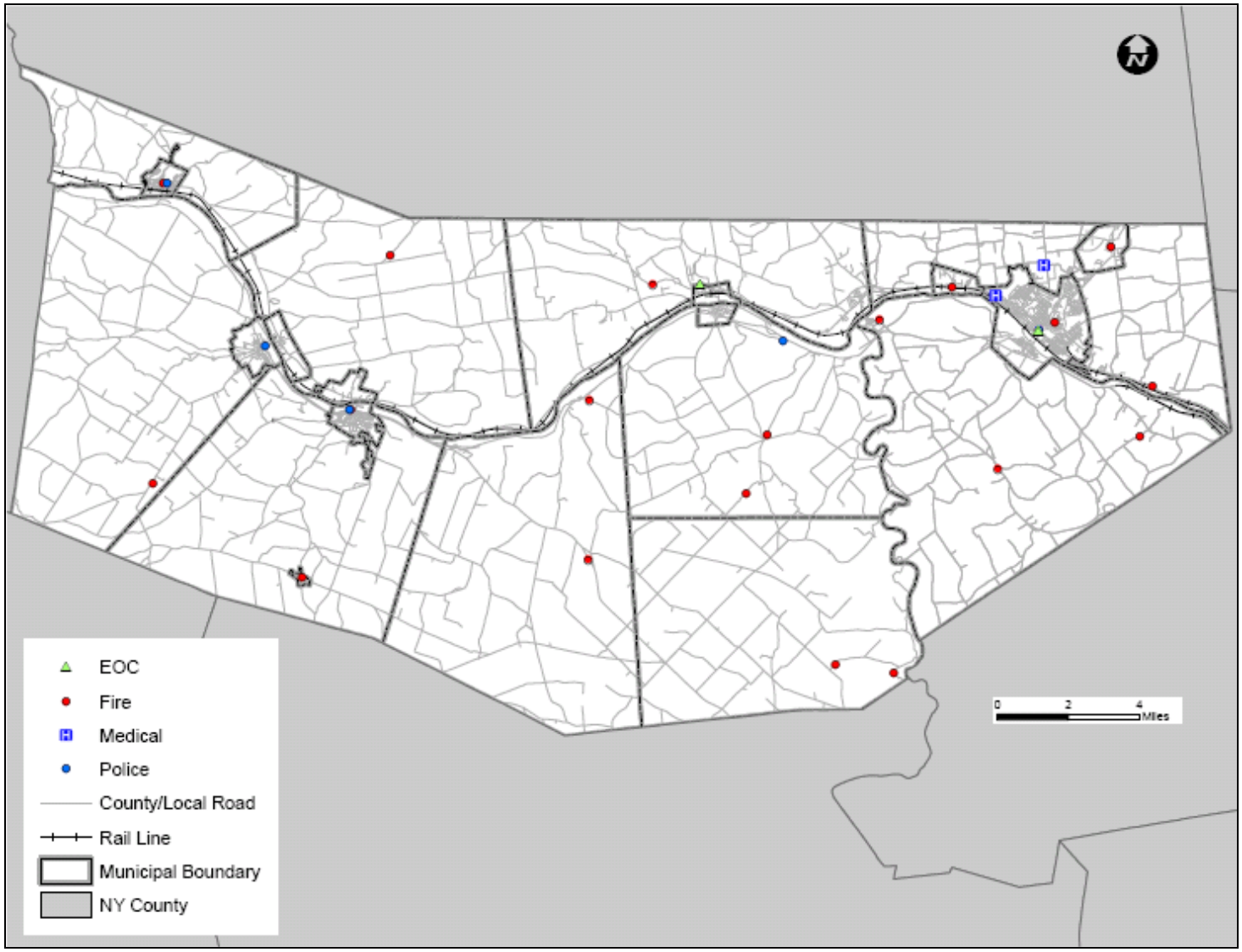
Source: Montgomery County GIS; HAZUS-MH MR3, 2007
Note: The structural value includes the building structure, but not the building content.
** = HAZUS-MH MR3 default data (2007)*

Table 4-8. Fire/EMS in Montgomery County

Fire Dept Name*	Address*	Jurisdiction*	Cost (Structural Value) **	Bldg. Type	Backup Power	EMS Capability		
						Ambul-atory	Non-Trans-porting	Level of Care
Amsterdam Fire Dept	2 Guy Park Ave Ext.	Amsterdam (C)	$15,000,000	Concrete	Yes	TBD	TBD	ALS
Cranesville Fire Dept	167 Riverview Rd	Amsterdam (T)	$708,000	Concrete	TBD	TBD	TBD	BLS
Fort Johnson Fire CO	Golf Course Rd	Amsterdam (C)	$708,000	Concrete	TBD	TBD	TBD	BLS
Ames Fire Dept	595 Latimer Hill Rd	Ames	$708,000	Concrete	TBD	No	TBD	BLS
Canajoharie Fire Dept	75 Erie Blvd	Canajoharie (V)	$708,000	Concrete	Yes	TBD	TBD	BLS
Burtonville Fire Dept	2052 Burtonville Rd	Esperance	$708,000	Concrete	TBD	TBD	TBD	BLS
Charleston Fire Dept	1412 East Lykers Rd	Sprakers	$708,000	Concrete	TBD	TBD	TBD	BLS
Town Of Mohawk Fire District	2553 State Highway 30A	Fonda	$708,000	Concrete	TBD	No	TBD	BLS
Fort Johnson Fire CO	4 Ft Johnson Ave	Fort Johnson	$708,000	Concrete	TBD	TBD	TBD	BLS
Glen Volunteer Fire Dept	134 Auriesville Rd	Glen	$708,000	Concrete	TBD	TBD	TBD	BLS
Hagaman Fire Dept	126 S Pawling St	Hagaman	$708,000	Concrete	TBD	TBD	TBD	BLS
South Minden Fire Dept	1029 State Highway 163	Fort Plain	$708,000	Concrete	TBD	TBD	TBD	BLS
Rural Grove Fire Dept.	1192 State Highway 162	Root	$708,000	Concrete	TBD	TBD	TBD	BLS
St. Johnsville Fire Dept	6 West Main Street	St. Johnsville (V)	$708,000	Concrete	TBD	No	TBD	BLS
Fort Hunter Fire Dept.	351 Main St.	Fort Hunter	$708,000	Concrete	TBD	TBD	TBD	BLS
Fort Plain Fire Dept.	168 Canal St.	Fort Plain	$708,000	Concrete	Yes	TBD	TBD	BLS
Fultonville Fire Dept.	12 Erie St.	Fultonville	$708,000	Concrete	TBD	TBD	TBD	BLS
Town of Florida Fire Dept.	6252 State Highway 30	Amsterdam	$708,000	Concrete	TBD	TBD	TBD	BLS
Tribes Hill Fire Dept.	280 Mohawk Dr.	Tribes Hill	$708,000	Concrete	TBD	TBD	TBD	BLS

Source(s): Montgomery County Planning Committee; HAZUS-MH MR3, 2007
Note: The structural value includes the building structure, but not the building content.
* = *Information provided by Montgomery County OEM*
** = *HAZUS MH MR3 default data (2007)*

Figure 4-9. Emergency Facilities in Montgomery County



Source(s): Montgomery County Planning Committee; HAZUS-MH MR3, 2007

Hospitals and Medical Centers

Table 4-9 provides an inventory of hospitals and major medical facilities in Montgomery County.

Table 4-9. Medical Facilities in Montgomery County

Facility Name	Jurisdiction	# Beds	Cost (Structural Value) *	Bldg. Type	Backup Power
St. Mary's Hospital	Amsterdam (C)	50 - 150	$8,260,000	Concrete	TBD

Source(s): Montgomery County Planning Committee; HAZUS-MH MR3, 2007
Notes: The structural value includes the building structure, but not the building content.
* = *HAZUS-MH MR3 default data (2007)*
Bldg. = *Building*
# = *Number*

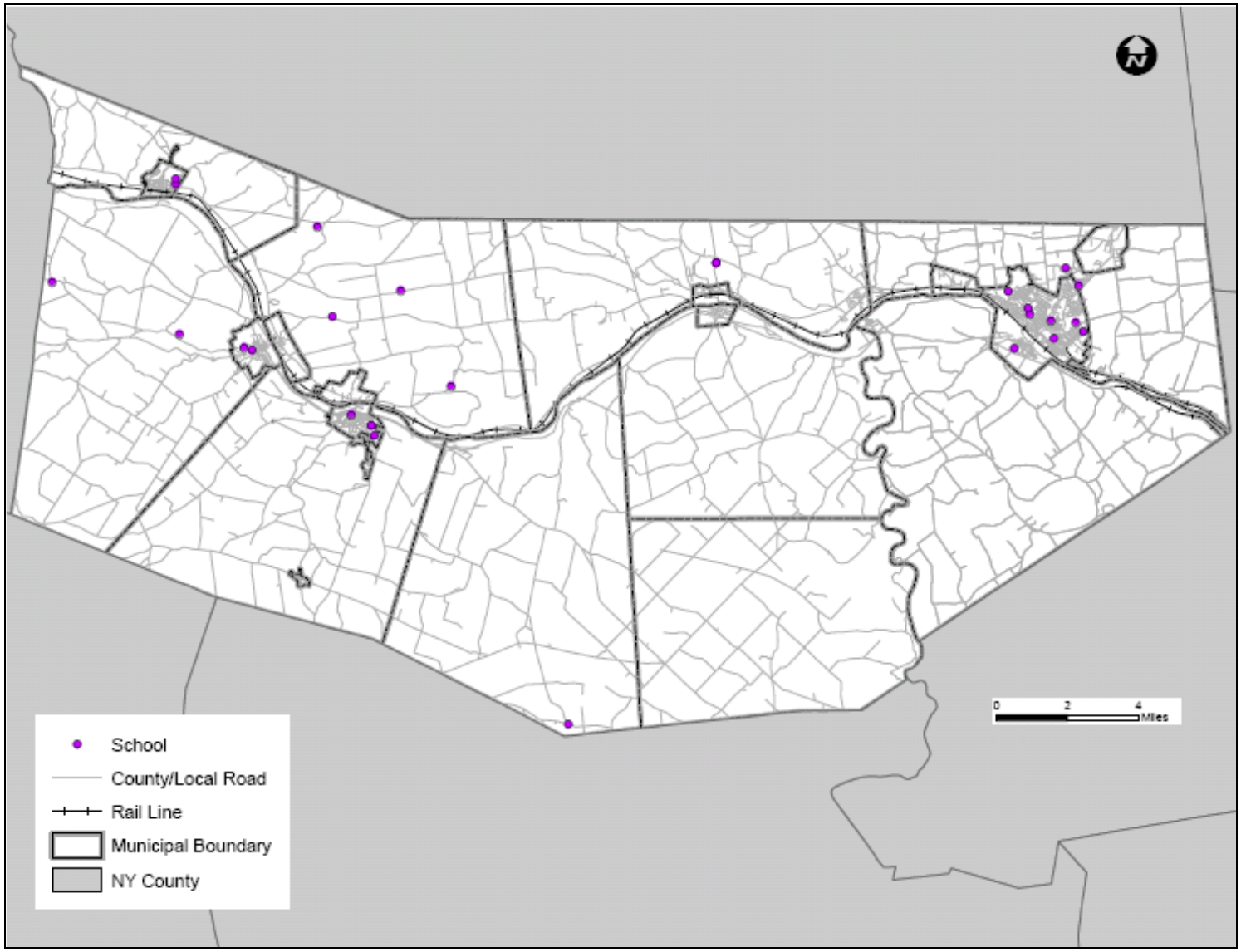
Evacuation and Sheltering

With support and cooperation of the American Red Cross and local jurisdictions, the County references an inventory of suitable shelter locations and can assist with the coordination and communication of shelter availability as necessitated by the execution of local municipal emergency operation plans. All public school districts within the County are identified shelters. Countywide sheltering policies and procedures are documented in the Montgomery County Comprehensive Emergency Management Plan. Refer to the next subsection for details regarding the schools in Montgomery County. For information regarding evacuation plans in the County, refer to the Montgomery County Comprehensive Emergency Management Plan.

Schools

Table 4-10 lists public and private schools and universities in the County. Figure 4-10 displays the location of school facilities based on the HAZUS-MH inventory data and input from the Planning Committee.

Figure 4-10. Schools in Montgomery County



Source(s): Montgomery County Planning Committee; HAZUS-MH MR3, 2007

Table 4-10. Schools in Montgomery County

Facility Name	Address	Jurisdiction	Type of Facility	Enroll	Designated Shelter	Cost (Structural Value) (1)	Bldg. Type (1)	Backup Power
Saint Mary's Institute	10 Kopernick Blvd	Amsterdam (C)	EFS1	351	TBD	$ 590,000	Masonry	TBD
Montessori School of Amsterdam	74 Locust Ave	Amsterdam (C)	EFS1	46	TBD	$ 590,000	Masonry	TBD
Amsterdam High School	140 Saratoga Ave	Amsterdam (T)	EFS1	1145	Yes	$ 590,000	Masonry	Yes
Clara S. Bacon School	40 Henrietta Blvd	Amsterdam (C)	EFS1	250	Yes	$ 590,000	Masonry	TBD
Lynch Middle School	53 Brandt Place	Amsterdam (C)	EFS1	844	Yes	$ 590,000	Masonry	TBD
Marie Curie Middle School	9 Brice St	Amsterdam (C)	EFS1	391	Yes	$ 590,000	Masonry	Yes
Raphael J. McNulty Elementary School	60 Brandt Place	Amsterdam (C)	EFS1	406	Yes	$ 590,000	Masonry	TBD
William B. Tecler Elementary School	210 Northern Blvd	Amsterdam (T)	EFS1	370	Yes	$ 590,000	Masonry	TBD
William Barkley School	66 De Stefano St	Amsterdam (C)	EFS1	211	Yes	$ 590,000	Masonry	Yes
Fulmont Head Start	208 Truax Road	Amsterdam	EFS1	TBD	Yes	$ 590,000	Masonry	Yes
Annex	55 Brandt Place	Amsterdam	EFS1	TBD	TBD	$ 590,000	Masonry	No
CAB	11 Liberty Street	Amsterdam	EFS1	TBD	TBD	$ 590,000	Masonry	No
Canajoharie Senior High School	136 Scholastic Way	Canajoharie (V)	EFS1	404	Yes	$ 590,000	Masonry	No
Canajoharie East Hill / Middle School	25 School District Rd	Canajoharie (V)	EFS1	414	Yes	$ 590,000	Masonry	No
Faith Bible Academy	106 Crosby Road	Sprakers	EFS1	TBD	TBD	$ 590,000	Masonry	No
Twin Mountain Amish School	163 Buel Road	Canajoharie (V)	EFS1	N/A	TBD	$ 590,000	Masonry	No
Sunset View Amish School	184 Blaine Road	Canajoharie (V)	EFS1	N/A	TBD	$ 590,000	Masonry	No
McKinley Crossing Amish School	Corner of McKinley and Oswegatchie Road	Palatine Bridge	EFS1	N/A	TBD	$ 590,000	Masonry	No
Dygert Road Amish School	Dygert Road, near the corner of Gerhartz Road	Palatine Bridge	EFS1	N/A	TBD	$ 590,000	Masonry	No
Fonda-Fultonville Senior High School	112 Old Johnstown Rd	Mohawk	EFS1	556	Yes	$ 590,000	Masonry	Yes
Fonda-Fultonville K-4 School	112 Old Johnstown Rd	Mohawk	EFS1	578	Yes	$ 590,000	Masonry	Yes
Fonda-Fultonville 5-8 School	112 Old Johnstown Rd	Mohawk	EFS1	517	Yes	$ 590,000	Masonry	Yes
Stone Arabia Amish Parochial School	RD #2 Stone Arabia Rd	Minden	EFS1	23	TBD	$ 590,000	Masonry	TBD
Victory Christian Academy	131 Clark Rd	Minden	EFS1	92	TBD	$ 590,000	Masonry	TBD
Harry Hoag School	25 High St	Fort Plain	EFS1	648	Yes	$ 590,000	Masonry	Yes
Fort Plain High School	1 West St	Fort Plain	EFS1	317	TBD	$ 590,000	Masonry	TBD
Amish School 1	McKinley	Palatine	EFS1	N/A	TBD	$ 590,000	Masonry	TBD
Amish School 2	Stone Arabia	Palatine	EFS1	N/A	TBD	$ 590,000	Masonry	TBD
Amish School 3	Hickory Hill	Palatine	EFS1	N/A	TBD	$ 590,000	Masonry	TBD

Facility Name	Address	Jurisdiction	Type of Facility	Enroll	Designated Shelter	Cost (Structural Value) (1)	Bldg. Type (1)	Backup Power
Amish School 4	State Highway 67	Palatine	EFS1	N/A	TBD	$ 590,000	Masonry	TBD
Faith Bible Academy	106 Crosby Rd	Root	EFS1	28	TBD	$ 590,000	Masonry	TBD
Saint Johnsville High School	44 Center St	St. Johnsville (V)	EFS1	228	TBD	$ 590,000	Masonry	TBD

Source(s): Montgomery County Planning Committee; HAZUS-MH MR3, 2007
EFS1 = Grade Schools (Primary and High Schools)
** = HAZUS-MH MR3 default data (2007)*

Senior Care and Senior Living Facilities

Table 4-11 provides an inventory of senior facilities in the County.

Table 4-11. Senior Facilities in Montgomery County

Name	Address	Jurisdiction	Cost (Structural Value) *	Bldg. Type *	Capacity	Backup Power
Capstone	Swart Street	Amsterdam (T	$1,000,000	Masonry	TBD	TBD
Arkell Hall	55 Montgomery St	Canajoharie (V)	$1,000,000	Masonry	TBD	TBD
Palatine Nursing Home	154 Lafayette St	Palantine Bridge	$1,000,000	Masonry	TBD	TBD
Palatine Village Apartments	Mary St	Palatine Bridge	$1,000,000	Masonry	TBD	TBD
St. Johnsville Nursing Home	Timmerman Ave	St. Johnsville (V)	$1,000,000	Masonry	TBD	TBD
Wilkinson Residential Health	4988 NY-30	Amsterdam	TBD	TBD	TBD	TBD

Source(s): Montgomery County Planning Committee; HAZUS-MH MR3, 2007
** = HAZUS-MH MR3 default data (2007)*

4.5.2 Transportation Systems

This section presents available inventory data for roadways, airports, railways and other transportation systems for Montgomery County. Figure 4-11 shows regional transportation lifelines serving Montgomery County.

Highway, Roadways and Associated Systems

The New York State Thruway (Route 90) runs through the center of the County and parallels the Mohawk River. Route 90 connects Montgomery County to Schenectady and Albany. Route 90 intersects with Route I-87 (Adirondack Northway), a major transportation route north to the Adirondacks and with I-88, a major transportation route to southwest New York and Pennsylvania (Montgomery County Chamber of Commerce, Date Unknown).

Airports and Heliports

Table 4-12 lists the airports and helipads in Montgomery County.

Table 4-12. Airports/Helipads in Montgomery County

Name	Jurisdiction (Location)	Cost
Russell	Root	$6,431,000
Canajoharie	Root	$6,431,000
C4C	Charleston	$6,431,000
Hiserts Airpark Inc.	Palatine	$6,431,000
Amsterdam Airfield	Amsterdam (T)	$6,431,000
Nellis Field	Minden	$6,431,000
Di Stefano Airpark	Minden	$6,431,000
O'Riley	Minden	$6,431,000
Hickory Acres	Minden	$6,431,000
Tomcat	Minden	$6,431,000
Lifenet (helipads)	Glen (T)	TBD

Source(s): Montgomery County Planning Committee; HAZUS-MH MR3, 2007

Railway

Rail transportation in Montgomery County includes both passenger and freight service. Amtrak services passenger needs, while CSX provides freight services to major markets in the Northeastern U.S. and Canada. (MCIDA, 2007). Additionally, CSX and Amtrack lines transverse Montgomery County (Planning Committee Input). Table 4-13 summarizes the rail facilities and bridges in Montgomery County.

Table 4-13. Rail Facilities and Bridges in Montgomery County

Name	Jurisdiction (Location)	Class	Replacement Cost (Structural Value)*
Amsterdam	Amsterdam (C)	RDFLT	$2,572,400
Amsterdam, NY (AMS)	Amsterdam (C)	TBD	TBD

Source(s): Montgomery County Planning Committee; HAZUS-MH MR3, 2007
* = *Default HAZUS-MH MR3 Data (2007)*
RDFLT = *Default Rail Facility*
RLB1 = *Steel, Multi-Column Bent, Simple Support Bridge*

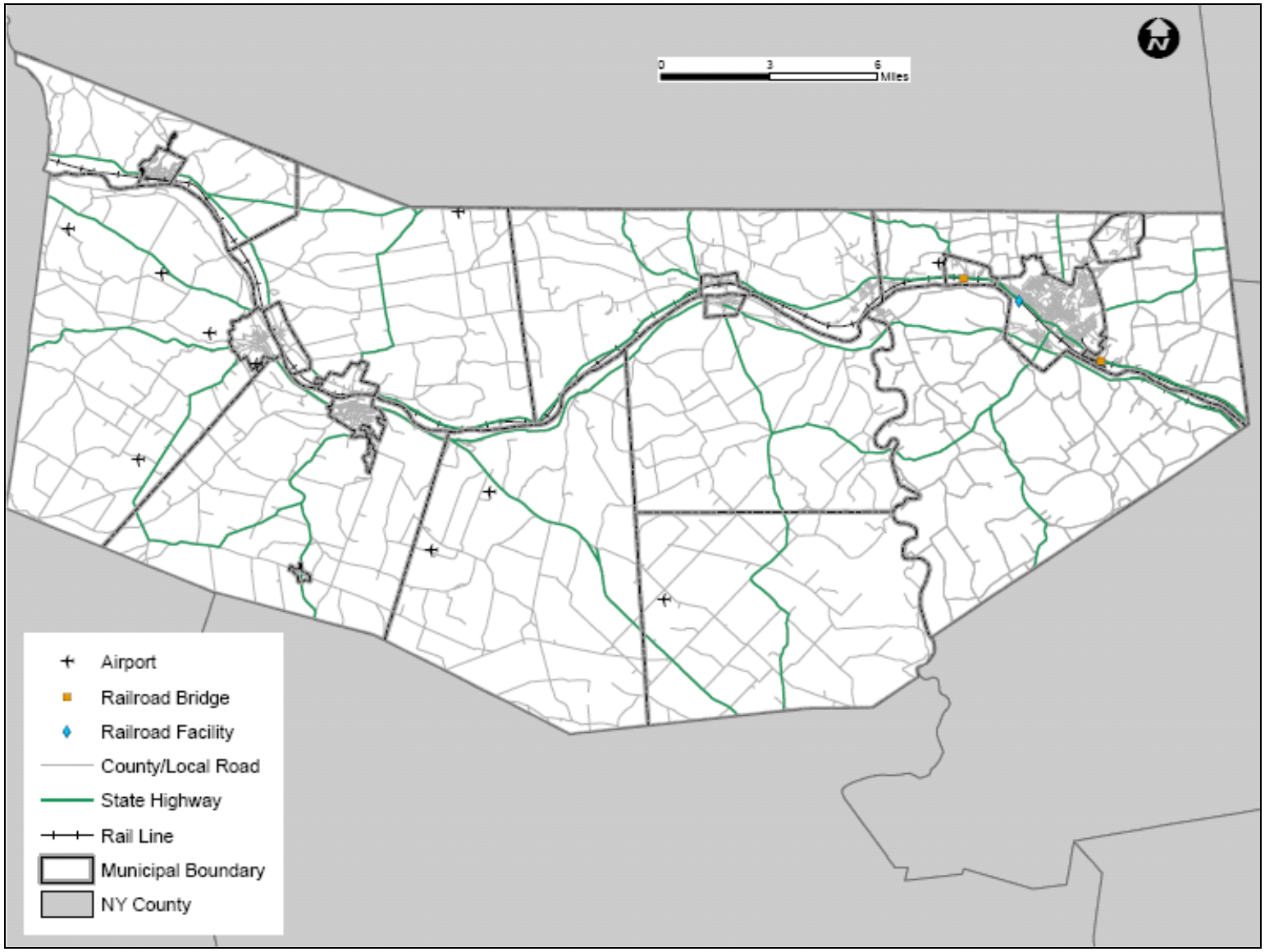
Public Transportation

The Montgomery Area Express ("the MAX") began operating in February 2008, running 2 busses between St. Johnsville and the City of Amsterdam. The Bus operates on a Monday through Friday schedule (MCPD, 2008).

The City of Gloversville operations a bus transportation system. The Gloversville Transit System began in 1979 as a one-route system, within the City of Gloversville utilizing two used buses. In 1981, two new International buses were added to the fleet. An additional route was added in 1982 to service the City of Johnstown. A route to service the Crossroads Industrial Park and Economic Development Zones was established in 1989. In 2008 an Intercounty route to Amsterdam was established to cut Medicaid Transport costs and to service the growing RT. 30 corridor. A paratransit service was initiated in 1994 to service the disabled of the area. This is a curb-to-curb reservation service to provide transportation to appointments, shopping, etc. The paratransit service is available during hours the fixed routes are in operation. Currently Gloversville Transit services the Cities of Gloversville and Amsterdam, the Crossroads and Johnstown Industrial Parks and Fulton-Montgomery Community College (Gloversville Transit System 2015).

Additionally, bus service is provided to students that attend Fulton-Montgomery Community College. Figure 4-11. Transportation Facilities in Montgomery County illustrates the public transportation facilities in Montgomery County.

Figure 4-11. Transportation Facilities in Montgomery County



Source(s): Montgomery County Planning Committee; HAZUS-MH MR3, 2007

4.5.3 Lifeline Utility Systems

This section presents potable water, wastewater, and energy resource utility system data. Due to heightened security concerns, local utility lifeline data sufficient to complete the analysis have only partially been obtained. Utility data are included in HAZUS-MH but are not sufficient to support detailed analyses for this County.

Potable Water Supply

Table 4-14 summarizes all potable water facilities, wells and water tanks within Montgomery County. Figure 4-12 displays these facilities.

Table 4-14. Montgomery County Potable Water Supply

Name	Address	Jurisdiction (Location)	Class	Replacement Cost (Structural Value)*	Backup Power
Potable Water Facilities					
Fort Plain Potable Water Facility	Budnick Road	Fort Plain	PDFL	$39,294,000	No
Canajoharie (V) WTP	Gerhartz Road	Palatine Bridge	PDFL	$39,294,000	No
Lasselville Pump Station	Lasselville Road	St. Johnsonville	PDFL	$39,294,000	No
Amsterdam WTP	Amsterdam (C)	TBD	TBD	TBD	Yes
Potable Water Wells					
St Johnsville Village Well	TBD	St Johnsville	PWE	$400,000	No
Water Tanks					
Clyde Street Water Storage Tank	Clyde Street	Fort Plain	PSTC	$1,500,000	No
Fisk Hill Road Water Storage Tank	Fisk Hill Road	Fort Plain	PSTC	$1,500,000	No

Source (s): Montgomery County Planning Committee; HAZUS-MH MR3, 2007
** = Default HAZUS-MH MR3 Data (2007)*
PDFL = Default Potable Water Facility
PWE = Default Water Well
PSTC = Water Storage Tanks at Grade Concrete

Wastewater Facilities

Table 4-15 summarizes the wastewater treatment facilities in Montgomery County. Table 4-16 summarizes the wastewater pump stations in Montgomery County.

Table 4-15. Montgomery County Wastewater Treatment Facilities

Facility Name	Jurisdiction (Location)	Capacity (mgd)	Cost	Backup Power
Amsterdam Waste Water Treatment Plant	Amsterdam (C)	TBD	$78,588,000	TBD
Canajoharie Waste Water Treatment Plant	Canajoharie (V)	TBD	$78,588,000	TBD
Fonda Fultonville WWTP	Fonda	TBD	$78,588,000	TBD
Montgomery CO SD#1 STP	Nelliston	TBD	$78,588,000	TBD
Private Waste Water Treatment Plant	St Johnsville (V)	TBD	$78,588,000	TBD
St. Johnsville Waste Water Treatment Plant	St. Johnsville (V)	TBD	$78,588,000	TBD

Source(s): Montgomery County Planning Committee; HAZUS-MH MR3, 2007

Table 4-16. Montgomery County Wastewater Pump Stations

Facility Name	Jurisdiction (Location)	Capacity	Backup Power
No Name	Florida	TBD	TBD
No Name	Florida	TBD	TBD
Amsterdam Pump Station No 1	Amsterdam (C)	TBD	Yes
Amsterdam Pump Station No 2	Amsterdam (C)	TBD	Yes
Amsterdam Pump Station No 3	Amsterdam (C)	TBD	Yes
Amsterdam Pump Station No 4	Amsterdam (C)	TBD	Yes
Brant St Waste Water Pump Station	Fort Johnson	TBD	TBD
Fort Johnson Rd Waste Water Pump Station	Fort Johnson	TBD	TBD
Willett St Sewer Pump Station	Fort Plain	TBD	TBD
Rouse St Sewer Pump Station	Fort Plain	TBD	TBD
No Name	Hagaman	TBD	TBD

Source(s): Montgomery County Planning Committee; HAZUS-MH MR3, 2007

Energy Resources

National Grid is the primary electric and gas utility company in Montgomery County. All provided and available utility information was included as part of the risk assessment for this HMP. Table 4-17 summarizes the energy resources in Montgomery County.

Table 4-17. Energy Resources in Montgomery County

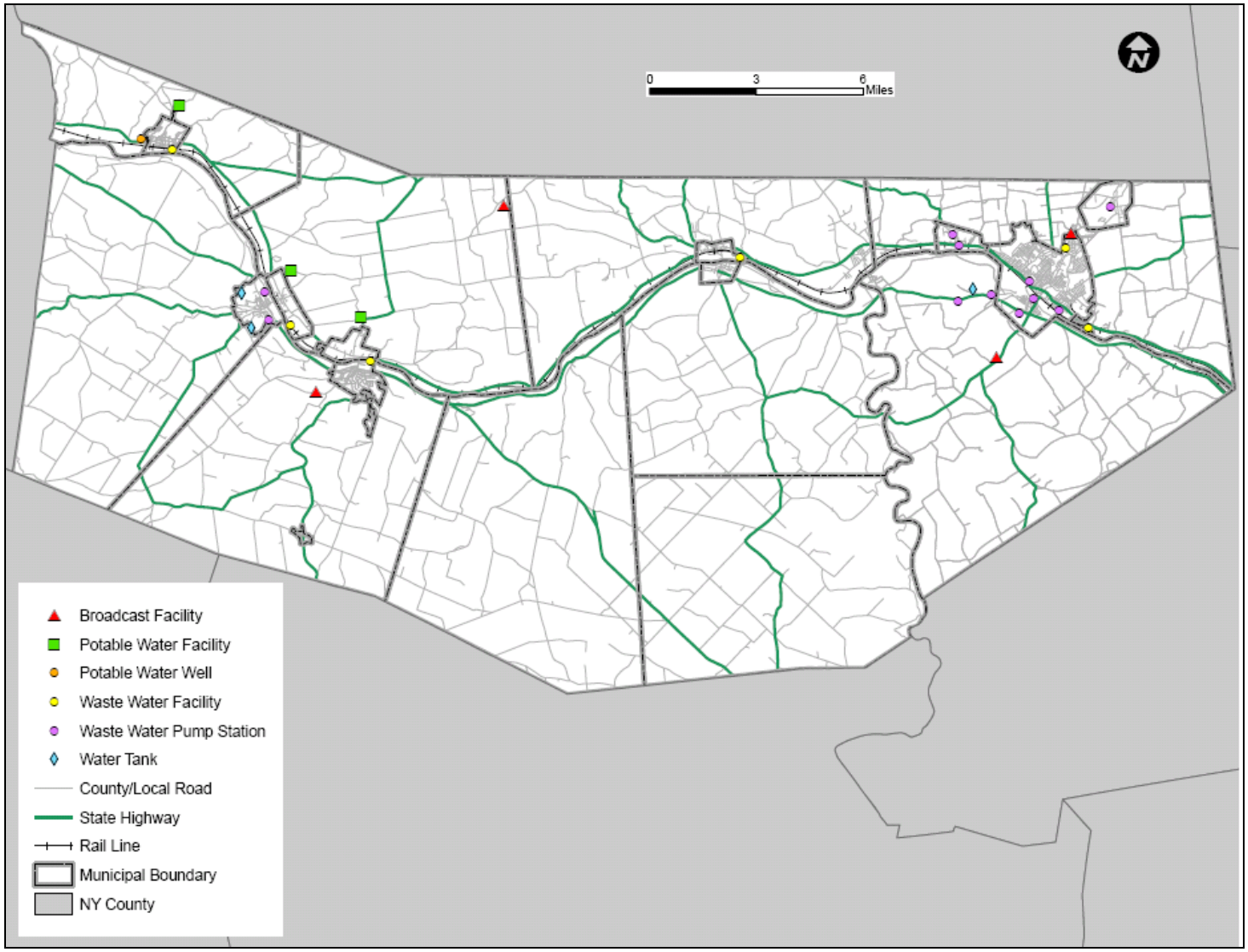
Electric Sub/Switching Station	Location (municipality)
Route 5S	Amsterdam (C)
No Name	Amsterdam (C)
Canajoharie Substation #1	Canajoharie (T)
Canajoharie Substation #2	Canajoharie (T)
Electrical Communication Substation	Mohawk

Source(s): Montgomery County Planning Committee; HAZUS-MH MR3, 2007

Communication Resources

Communications is provided by AT&T, Time-Warner Cable and others. All provided and available communications resources information was included as part of the risk assessment for this HMP. Figure 4-12 shows the communication facilities in Montgomery County.

Figure 4-12. Lifeline Utility System Facilities in Montgomery County



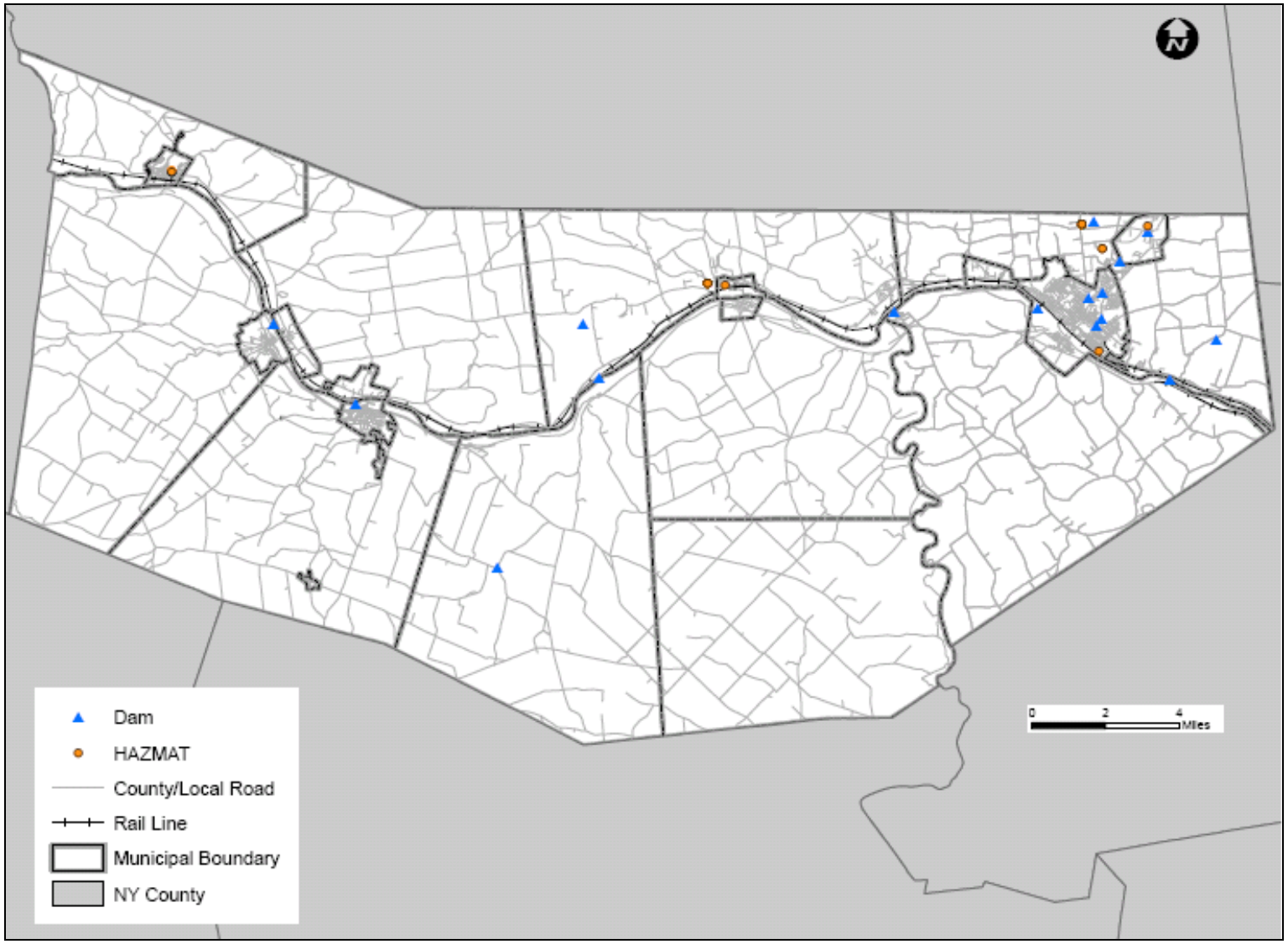
Source(s): Montgomery County Planning Committee; HAZUS-MH MR3, 2007

4.5.4 High-Potential Loss Facilities

High-potential loss facilities include dams, levees, nuclear power plants, military installations and hazardous materials (HAZMAT) facilities. No levees, nuclear power plants or military installations were identified in the County. Figure 4-13 displays the general locations of these facilities in the County. Dams are discussed further below.

According to the U.S. Army Corps of Engineers (USACE) National Inventory of Dams (NID), there are 13 dams located in Montgomery County, two of which are classified with a high-hazard potential.

Figure 4-13. High-Potential Loss Facilities in Montgomery County



Source(s): Montgomery County Planning Committee; HAZUS-MH MR3, 2007

User Defined Facilities

The Planning Committee identified additional facilities as critical to be analyzed on an individual basis as part of the risk assessment for this HMP. Table 4-18 summarizes these facilities.

Table 4-18. User-Defined Facilities Identified in Montgomery County

Name	Address	Jurisdiction (Location)	Replacement Cost *	Building Type *	Backup Power
Florida Dept of Public Works	TBD	Florida	$1,000,000	Concrete	TBD
Root Highway Garage	Carlisle St	Root	$1,000,000	Concrete	TBD
Root Town Hall	Carlisle St	Root	$1,000,000	Concrete	TBD
Montgomery County EOC	64 Broadway	Fonda	$1,000,000	Concrete	Yes
Montgomery County 911 Center	200 Clark Drive	Fultonville	$1,000,000	Concrete	Yes
Montgomery County DPW Garage	6 Park Street	Fonda	$1,000,000	Concrete	TBD
Montgomery County DPW buildings			$1,000,000	Concrete	TBD
City of Amsterdam DPW	1 Park Drive	Amsterdam (C)	$5,000,000	Concrete	Yes

Source: Montgomery County Planning Committee
** = Default HAZUS-MH MR3 Data (2007)*
Note: Previously mentioned Shelter facilities, senior facilities and communication towers are also included in the user-defined facility table, however it is important to note them separately.

SECTION 5. RISK ASSESSMENT

According to FEMA Guidance 386-2, "risk assessment is the process of measuring the potential loss of life, personal injury, economic injury and property damage resulting from natural hazards by assessing the vulnerability of people, buildings and infrastructure to natural hazards." Montgomery County's risk assessment is organized into four sections. Section 5.1 describes the methodology and tools used to support the risk assessment process. Section 5.2 identifies the natural hazards of concern for further profiling and evaluation. In Section 5.3, the identified hazards of concern are ranked for Montgomery County as a whole to describe their probability of occurrence and their impact on population, property (general building stock including critical facilities) and the economy. Lastly, Section 5.4 profiles and assesses vulnerability for each hazard of concern.

5.1 METHODOLOGY AND TOOLS

This section describes the methodology and tools used to support the risk assessment process.

Methodology

The risk assessment process used for this Plan is consistent with the process and steps presented in FEMA 386-2, State and Local Mitigation Planning How-to-Guide, Understanding Your Risks – Identifying Hazards and Estimating Losses (FEMA, 2001). This process identifies and profiles the hazards of concern and assesses the vulnerability of assets (population, structures, critical facilities and the economy) at risk in the community. A risk assessment provides a foundation for the community's decision makers to evaluate mitigation measures that can help reduce the impacts of a hazard when one occurs (Section 6 of this plan).

Step 1: The first step of the risk assessment process is to identify the hazards of concern. FEMA's current regulations only require an evaluation of natural hazards. Natural hazards are natural events that threaten lives, property, and many other assets. Often, natural hazards can be predicted, where they tend to occur repeatedly in the same geographical locations because they are related to weather patterns or physical characteristics of an area.

Step 2: The next step of the risk assessment process is to prepare a profile for each hazard of concern. These profiles assist communities in evaluating and comparing the hazards that can impact their area. Each type of hazard has unique characteristics that vary from event to event. That is, the impacts associated with a specific hazard can vary depending on the magnitude and location of each event (a hazard event is a specific, uninterrupted occurrence of a particular type of hazard). Further, the probability of occurrence of a hazard in a given location impacts the priority assigned to that hazard. Finally, each hazard will impact different communities in different ways; based on geography, local development, population distribution, age of buildings, and mitigation measures already implemented.

Steps 3 and 4: To understand risk, a community must evaluate what assets it possesses and which assets are exposed or vulnerable to the identified hazards of concern. Hazard profile information combined with data regarding population, demographics, general building stock, and critical facilities at risk, located in Section 4, prepares the community to develop risk scenarios and estimate potential damages and losses for each hazard.

Tools

To address the requirements of DMA 2000 and better understand potential vulnerability and losses associated with hazards of concern, Montgomery County used standardized tools, combined with local, state, and federal data and expertise to conduct the risk assessment. Our standardized tools used to support the risk assessment are described below.

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 that 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.

For this HMP update, HAZUS-MH version 2.1 was used to re-assess the flood hazard for Montgomery County. The County and Planning Committee decided that, with the exception of the flood hazard, hazard area delineations have remained the same. In addition, the County has seen very small changes in population and development. Therefore, all other exposure and potential loss estimates generated for the 2009 HMP were carried forward into this HMP update.

The default demographic data and general building stock data, based on Census 2000, within HAZUS-MH were used. The same critical facility inventory (essential facilities, utilities, transportation features, high-potential loss facilities and user-defined facilities) used during the 2009 HMP was also used to update the flood hazard vulnerability assessment.

Flood: The 1-percent annual chance flood event was examined to evaluate Montgomery County's risk and vulnerability to the flood hazard. The base flood and cross-section elevations; 1-percent annual chance floodplain polygons identified in the preliminary Digital Flood Insurance Rate Map (DFIRM); and a 1/3 Arc Second elevation dataset from USGS were used to develop the 1-percent annual chance flood depth grid. For the City of Amsterdam, the depth grid from the 2009 HMP was used for extent and depth of water. As noted earlier in this profile, the City of Amsterdam's preliminary DFIRM is not available at this time. The depth grid was integrated into HAZUS-MH version 2.1 and the model was run to estimate potential losses.

Severe Storm: A Level 1 HAZUS-MH MR3 analysis was performed in 2009 to analyze the wind hazard losses, associated with hurricanes and other severe storm types, for Montgomery County. The 100- and 500-year mean return periods were examined.

Earthquake: A Level 1 HAZUS-MH MR3 analysis was performed in 2009 to analyze the earthquake hazard losses for Montgomery County. A Level 1 analysis is a basic estimate of earthquake losses based on national databases and using the default data in the model. The 100-, 500- and 2,500-year mean return periods were examined.

Other Hazards: For many of the hazards evaluated in this risk assessment, historic data are not adequate to model future losses at this time. For some of the other hazards of concern, areas and inventory susceptible to specific hazards were mapped and exposure was evaluated to help guide mitigation efforts discussed in Section 9. For other hazards, a qualitative analysis was conducted using the best available data and professional judgment.

For this risk assessment, the loss estimates, exposure assessments, and hazard-specific vulnerability evaluations rely on the best available data and methodologies. Uncertainties are inherent in any loss estimation methodology and arise in part from incomplete scientific knowledge concerning natural hazards and their effects on the built environment. Uncertainties also result from the following:

1. Approximations and simplifications necessary to conduct such a study
2. Incomplete or dated inventory, demographic, or economic parameter data
3. The unique nature, geographic extent, and severity of each hazard
4. Mitigation measures already employed by Montgomery County and the amount of advance notice residents have to prepare for a specific hazard event

These factors can result in a range of uncertainty in loss estimates, possibly by a factor of two or more. Therefore, potential exposure and loss estimates are approximate. These results do not predict precise results and should be used to understand relative risk. Over the long term, Montgomery County will collect additional data to assist in developing refined estimates of vulnerabilities to natural hazards.

5.2 IDENTIFICATION OF NATURAL HAZARDS OF CONCERN

Hazards of Concern is defined as those hazards that are considered most likely to impact a community. These are identified using available data and local knowledge.

To provide a strong foundation for mitigation strategies considered in Sections 6 and 9, Montgomery County considered a full range of natural hazards that could impact the area, and then identified and ranked those hazards that presented the greatest concern. The natural hazard of concern identification process incorporated input from the County and participating jurisdictions; review of the 2014 New York State Hazard Mitigation Plan Update (NYS HMP); review of the 2009 Montgomery County Hazard Mitigation Plan and previous hazard identification efforts; research and local, state, and federal information on the frequency, magnitude, and costs associated with the various hazards that have previously, or could feasibly, impact the region; and qualitative or anecdotal information regarding natural hazards and the perceived vulnerability of the study area's assets to them. Table 5.2-1 documents the process of identifying the natural hazards of concern for further profiling and evaluation.

The "Flood" hazard includes riverine, flash, ice jam, saturated land failure, and dam break flooding. Other types of flooding such as coastal or urban drainage do not generally occur within the County; therefore, they were not further considered for inclusion within this HMP. Inclusion of the various forms of flooding under a general "Flood" hazard is consistent with that used in FEMA's "Multi-Hazard Identification and Risk Assessment" guidance.

The "Severe Storm" hazard includes windstorms that often entail a variety of other influencing weather conditions including thunderstorms, hail, lightning and tornadoes. Since tropical disturbances are identified as a type of severe storm event, this hazard also includes tropical cyclone events (hurricanes, tropical storms and tropical depressions). Tropical cyclones were not grouped as a separate hazard, because the County felt that these types of events do not directly impact the County on a frequent basis and that exposure and risk of such events are minimal in comparison to communities along the New York coastline.

The "Severe Winter Storm" hazard includes heavy snowfall, blizzards, freezing rain/sleet, ice storms and extra-tropical cyclones (nor'easters and severe winter low-pressure systems). Extra-tropical events generally occur during winter weather months; therefore, for the purpose of this HMP, all such events are to be grouped within this hazard. Although not all extra-tropical events, such as nor'easters, occur during the winter, they will remain grouped within this hazard category to avoid duplication of events in hazard profiles. This grouping is consistent with that used in the NYS HMP, as well as the "Severe Winter Storm" hazard used in FEMA's "Multi-Hazard Identification and Risk Assessment" guidance.

These groupings do not change the definition of the included specific events/hazards, as defined within FEMA guidance and other risk assessment documents, and does not affect the hazard analysis conducted through the use of HAZUS-MH, either directly or as a risk assessment support tool.

Please note that technological (for example, hazardous material incidents) and human-caused hazards (for example, terrorism) are not being addressed in this planning process. The DMA 2000 regulations do not require consideration of such hazards, and the Steering Committee has elected to focus full attention on the natural hazards, particularly flooding, that clearly pose the greatest risk to the County. Further, the risks of human-caused and technological hazards are generally mitigated and/or managed through other regulatory programs and plans.

Table 5.2-1. Identification of Natural Hazards of Concern for Montgomery County, New York

Hazard	Step 1	Step 2	Step 3	
	Is this a hazard that may occur in Montgomery County ?	If yes, does this hazard pose a significant threat to the County?	Why was this determination made?	Source(s)
Avalanche	No	No	• The NYSHMP does identify avalanche as a hazard of concern for New York State, with occurrences in the back country of the Adirondack Mountains. There have been no occurrences in Montgomery County. • The topography and climate of Montgomery County does not support the occurrence of an avalanche event. • New York State in general has a very low occurrence of avalanche events based on statistics provided by the American Avalanche Association (AAA) between 1950 and 2014. • The Planning Committee did not identify avalanche has a hazard of concern for Montgomery County.	• NYS DHSES • Review of NAC-AAA database between 1998 and 2014. • Planning Committee Input
Coastal Erosion / Coastal Storm	No	No	• The NYS HMP does not identify coastal erosion/coastal storms as a hazard of concern within the vicinity of Montgomery County. • Montgomery County is not bound by coastal waters; therefore, not impacted by coastal storms that result in coastal erosion. Stream bank erosion may occur throughout the county as a result of flooding from coastal storms. • The Planning Committee did not identify coastal erosion or coastal storms as a significant hazard affecting the County.	• NYS DHSES • Planning Committee Input
Drought	Yes	Yes`	• The NYS HMP identifies drought as a hazard of concern for New York State. • Many statewide drought events, resulting in issued NYS DEC drought warnings/watches, have occurred, which impacted all counties, including Montgomery County: o October 1994 o June – September 1995 o June – November 2012 o Drought conditions were also recorded in 1908, 1930, 1931, 1934, 1941, 1942, 1947, 1948, 1964, 1965, 1991, 1993, 1995, 1999, 2005, 2006, 2007 • The Planning Committee identified drought as a hazard affecting the county, both posing a moderately high risk; however, the impacts of these events are relatively minor upon the County.	• NYS DHSES • USGS • NOAA • Drought Reporter • U.S. Drought Monitor • Input from Planning & Steering Committees

Hazard	Step 1 Is this a hazard that may occur in Montgomery County ?	Step 2 If yes, does this hazard pose a significant threat to the County?	Step 3 Why was this determination made?	Source(s)
Earthquake	Yes	Yes	• The NYS HMP identifies earthquake as a hazard of concern for New York State. Areas within the State with a higher seismic risk include; The North and Northeast third (1/3) of the State (The North Country/Adirondack Region including a portion of the Greater Albany-Saratoga region), the Southeast corner (including the greater New York City area and western Long Island), and the Northwest corner (including the City of Buffalo and vicinity) of the State, in that order from higher to lower. • According to the USGS online seismic hazard maps, the peak ground acceleration with a 10% probability of exceedance over 50 years for Montgomery County is between 3 and 5 % g. FEMA guidance recommends earthquakes are evaluated further if an area has a 3% g peak acceleration or more. • The Planning Committee identified the earthquake hazard as posing a low risk to the County.	• NYS DHSES • NYCEM • USGS – Earthquake Hazards Program, Review of USGS Seismic Maps • Input from Planning & Steering Committees
Expansive Soils	No	No	• The NYS HMP identifies expansive soils as a hazard of concern for New York State. • USGS indicated that Montgomery County has generally less than 50% of clay having slight to moderate swelling potential that could result in expansive or swelling soils. • Due to the fact that this hazard has no known historical occurrences, the County decided not to analyze the expansive soils hazard for the purpose of this Plan. The Planning Committee identified the expansive soils hazard as posing a low risk, or no risk, to the County.	• NYS DHSES • Review of USGS 1989 Swelling Clays Map of the Conterminous United States. • Input from Planning & Steering Committees

Extreme Temperature	Yes	Yes	• The NYSHMP identifies extreme temperature as a hazard of concern for New York State.
			• The NOAA-NCDC storm event database indicated that between 2008 and 2014, Montgomery County had 12 extreme temperature events reported.
			• The coldest temperatures recorded in Montgomery County include:
			  ○ -33°F in January 1994
			  ○ -30°F in February 1943
			• The warmest temperatures recorded in Montgomery County include:
			  ○ 101°F in July 1955
			  ○ 100° in September 1953
			• The Planning Committee identified extreme temperature as a hazard of concern for Montgomery County.
				• NYS DHSES
				• NOAA-NCDC Storm Events Database
				• Weather.com
				• Input from Planning & Steering Committees

Flood (Riverine, Flash, Ice Jam and Dam Flooding)	Yes	Yes	• The NYSHMP identified flooding as a hazard of concern for New York State. • The NOAA-NCDC storm event databased indicated that between 1950 and 2014, Montgomery County had 96 flooding events that resulted in two deaths and over $9.2 million in property damage.	• NYS DHSES • NOAA-NCDC Storm Events Database • FEMA

Hazard	Step 1 Is this a hazard that may occur in Montgomery County ?	Step 2 If yes, does this hazard pose a significant threat to the County?	Step 3 Why was this determination made?	Source(s)
			• According to FEMA, between 1954 and 2014, Montgomery County was included in 13 declarations associated with flooding events. o FEMA-DR-792 – 1987 – Flooding o FEMA-DR-1095 – 1996 – Severe storms and flooding o FEMA-DR-1148 – 1996 – Severe storms and flooding o EMA-DR-1335 – 2000 – Severe storms and flooding o FEMA-DR-1486 – 2003 – Severe storms, tornadoes and flooding o FEMA-DR-1589 – 2005 – Severe storms and flooding o FEMA-DR-1650 – 2006 – Severe storms and flooding o FEMA-DR-1670 – 2006 – Severe storms and flooding o FEMA-DR-1692 – 2007 – Severe storms and flooding o FEMA-DR-4020 – 2011 – Flooding (Hurricane Irene) o FEMA-DR-4031 – 2011 – Flooding (remnants of Tropical Storm Lee) o FEMA-EM-3351 – 2012 – Flooding (Hurricane Sandy) o FEMA-DR-4129 – 2013 – Severe storms and flooding • Ice Jams are mentioned separately in this Table but are grouped with the Flood hazard in this plan (see below). • The Planning Committee identified flooding as a hazard of concern for Montgomery County.	• Input from Planning & Steering Committees
Hailstorm	Yes	Yes	Please see Severe Storm	
Hurricane (and other Tropical Cyclones)	Yes	Yes	Please see Severe Storm	
Ice Jams (categorized as a Flood hazard in this HMP)	Yes	Yes	• The NYS HMP identifies ice jam flooding as a hazard of concern for New York State (grouped as a type of flood). New York State ranks 2nd in the Nation for total number of ice jam events, with over 1,500 incidents documented between 1857 and 2010. • According to USACE CRREL Ice Jam Database, between 1928 and 2014, the County has experienced 52 ice jam incidents, mainly on the Mohawk River and Schoharie Creek. • The Planning Committee identified ice jams as a hazard on concern for Montgomery County; however, ice jams will be grouped together with flooding.	• NYS DHSES • USACE CRREL • Input from Planning & Steering Committees
Ice Storm	Yes	Yes	Please see Severe Winter Storm	
Infestation	Yes	No	• The NYS HMP does not identify infestation as a hazard of concern for New York State. • Based on all sources reviewed, no known significant occurrences are reported for Montgomery County.	• NYS DHSES • Input from Planning & Steering Committees

Hazard	Step 1 Is this a hazard that may occur in Montgomery County ?	Step 2 If yes, does this hazard pose a significant threat to the County?	Step 3 Why was this determination made?	Source(s)
			• The Planning Committee did not identify infestation as a hazard of concern for Montgomery County.	
Land Subsidence	Yes	No	• The NYS HMP indicates that New York State is vulnerable to land subsidence; however, this hazard is "extremely localized" and poses a "very low risk to population and property." The NYS HMP does not identify Montgomery County as a community that has experienced land subsidence in the past. • According to USGS, Montgomery County is not made up of unconsolidated aquifer systems, creating the unlikelihood of permanent subsidence and related ground failures. • The Planning Committee did not identify land subsidence as a hazard of concern for Montgomery County.	• NYS DHSES • USGS Fact Sheet 165-00 (Dec. 2000) • Input from Planning & Steering Committees
Landslide	Yes	No	• The NYS HMP does identify landslide as a hazard of concern for New York State; however, the County is located in a low landslide incidence area. • USGS indicates through the National Atlas Map Maker program that a majority of Montgomery County is identified as having a low landslide incidence and susceptibility. • The NYS HMP indicates that Montgomery County has had 13 landslide occurrences. • The Planning Committee identified landslide as posing a low risk to the County; therefore, not identifying landslide as a hazard of concern for Montgomery County.	• NYS DHSES • National Atlas.gov (USGS) • Input from Planning & Steering Committees
Nor'easters (and other extra tropical storms)	Yes	Yes	Please see Severe Winter Storm	
Severe Storm (Windstorms, Thunderstorms, Hail, Lightning, Tornados and Hurricanes)	Yes	Yes	• The NYSHMP identifies severe storm as a hazard of concern for New York State. However, hail, high winds, and hurricanes are all included in separate profiles. For the purpose of this plan update, they will be grouped together in one profile. • NOAA-NCDC Storm Events Database indicated that Montgomery County has experienced over 200 severe storm events (funnel cloud, heavy rain, hail, high wind, hurricane, lightning, strong wind, thunderstorm wind, tropical depression, tropical storm, and tornado) between 1950 and 2014, causing over $27.6 million in property damage and one injury. • According to FEMA, between 1954 and 2014, Montgomery County was included in 14 severe storm events: o FEMA-DR-1095 (January 1996) – Severe Storms and Flooding o FEMA-DR-1148 (November 1996) – Severe Storms and Flooding o FEMA-DR-1335 (May-September 2000) – Severe Storms and Flooding o FEMA-DR-1486 (July-August 2003) – Severe Storms, Tornadoes, Flooding	• NYS DHSES • FEMA • NOAA-NCDC Storm events Database • Input from Planning & Steering Committees

Hazard	Step 1 Is this a hazard that may occur in Montgomery County ?	Step 2 If yes, does this hazard pose a significant threat to the County?	Step 3 Why was this determination made?	Source(s)
			○ FEMA-DR-1534 (May-June 2004) – Severe Storms and Flooding ○ FEMA-DR-1589 (April 2005) – Severe Storm ○ FEMA-DR-1650 (June-July 2006) – Severe Storms/Flooding ○ FEMA-DR-1670 (November 2006) – Severe Storms and Flooding ○ FEMA-DR-1692 (April 2007) – Severe Storms and Inland/Coastal Flooding ○ FEMA-DR-4020 (August 2011) – Hurricane/High Winds ○ FEMA-DR-4031 (September 2011) – Remnants of Tropical Storm Lee ○ FEMA-EM-3351 (October 2012) – Hurricane Sandy ○ FEMA-DR-4129 (June-July 2013) – Severe Storms and Flooding • The Planning Committee identified severe storms as a hazard of concern for Montgomery County.	
Severe Winter Storm (Heavy Snow, Blizzards, Freezing Rain/Sleet, Ice Storms, Nor'Easters)	Yes	Yes	• The NYSHMP identifies severe winter storm as a hazard of concern for New York State. • Annual average snowfall in Montgomery ranges from less than 60 to 220 inches. • According to FEMA, between 1954 and 2014, Montgomery County was included in three declarations associated with severe winter storm events. ○ FEMA EM-3107 (March 1993) Statewide Blizzard ○ FEMA EM-3173 (December 2002 / January 2003) Snowstorm ○ FEMA DR-1692 (April 2007) Nor'Easter/Severe Storm • NOAA-NCDC has indicated that Montgomery County has experienced over 100 winter storm events between 1950 and 2014, causing over $300,000 in property damage. • The Planning Committee identified severe winter storm as a hazard of concern for Montgomery County.	• NYS DHSES • FEMA • NOAA-NCDC Storm Events Database • Input from Planning & Steering Committees
Tornado	Yes	Yes	Please see Severe Storm	
Tsunami	No	No	• The NYSHMP does identify tsunami as a hazard of concern for the State of New York. All low-lying coastal areas in the State have the potential to be struck by a tsunami. • There is no recent history of tsunamis impacting the State. • Montgomery County is not bounded by coastal waters; therefore, the Planning Committee did not identify tsunami as a hazard of concern for the County.	• NYS DHSES • Input from Planning & Steering Committees
Volcano	No	No	• Volcanoes are not identified as a hazard of concern in the NYS HMP, because there are no known volcanoes located in the state. • The Planning Committee identified volcano as the natural hazard posing the lowest risk to the County and did not identify it as a hazard of concern for the County.	• NYS DHSES • Input from Planning & Steering Committees
Wildfire	Yes	No	• The NYS HMP does identify wildfires as hazards of concern for New York State. • Low reported incidences of wildfires within Montgomery County.	• NYS DHSES • USGS

Hazard	Step 1	Step 2	Step 3	
	Is this a hazard that may occur in Montgomery County ?	If yes, does this hazard pose a significant threat to the County?	Why was this determination made?	Source(s)
			• The NWPD indicates that no records of wildfire incidences have been recorded for Montgomery County. • USGS indicates that no wildfires greater than 250 acres were experienced in Montgomery County between 1980 and 2003. • GeoMAC indicates that no wildfires were experienced in Montgomery County between 2001 and 2013. • The Planning Committee concluded that wildfire is not a hazard of concern for the County; therefore, it will not be included in Section 5.4	• GeoMAC • Input from Planning & Steering Committees
Windstorm	Yes	Yes	Please see Severe Storm	

CRREL	*Cold Regions Research and Engineering Laboratory*
DR	*Presidential Disaster Declaration Number*
EM	*Presidential Emergency Declaration*
FEMA	*Federal Emergency Management Agency*
HMP	*Hazard Mitigation Plan*
NCDC	*National Climatic Data Center*
NID	*National Inventory of Dams*
NOAA	*National Oceanic and Atmospheric Administration*
NPDP	*National Performance of Dams Program*
NRMC	*Northeast Regional Climate Center*
NWS	*National Weather Service*
NYCEM	*New York City Area Consortium For Earthquake Loss Mitigation*
NYS	*New York State*
NYSDEC	*New York State Department of Environmental Conservation*
NYS DHSES	*New York State Division of Homeland Security and Emergency Services*
USACE	*U.S. Army Corp of Engineers*
USEPA	*U.S. Environmental Protection Agency*
USGS	*U.S. Geologic Survey*

According to input from the County, and review of all available resources, a total of six natural hazards of concern were identified as significant hazards affecting the entire planning area, to be addressed at the county level in this plan update:

- Drought
- Earthquake
- Extreme Temperature
- Flooding (riverine, flash, ice jam and dam flooding)
- Severe Storm (windstorms, thunderstorms, hail, tornadoes and hurricanes)
- Severe Winter Storm (heavy snow, blizzards, ice storms, Nor'Easters)

Other natural hazards of concern have occurred within Montgomery County, but typically have a low potential to result in significant impacts within the County. The County deemed these hazards as minor in comparison to those bulleted above; therefore, these hazards will not be further addressed within this version of the Plan update. However, if deemed necessary by the County, these hazards may be considered in future versions of the Plan update.

5.3 HAZARD RANKING

After the hazards of concern were identified for Montgomery County, the hazards were ranked to describe their probability of occurrence and their impact on population, property (general building stock including critical facilities) and the economy. Each participating Town or Village may have differing degrees of risk exposure and vulnerability compared to the County as a whole; therefore each Town/Village ranked the degree of risk to each hazard as it pertains to their community using the same methodology as applied to the County-wide ranking. This assures consistency in the overall ranking of risk process. The hazard ranking for each participating Town or Village can be found in their jurisdictional annex in Volume II of this Plan.

For the purpose of this 2015 update, the risk ranking for each hazard has been enhanced. The previous plan ranked flood, severe winter storm, severe storm, wildfire, earthquake and drought. For this update, the following hazards were ranked: drought, earthquake, extreme temperature, flood, severe storm, and severe winter storm. The 2015 HMP update hazard ranking methodology was expanded to include probability of occurrence and impact to population and economy.

5.3.1 Hazard Ranking Methodology

The methodology used to rank the hazards of concern for Montgomery County is described below. Estimates of risk for the County were developed using methodologies promoted by FEMA's hazard mitigation planning guidance and generated by FEMA's HAZUS-MH risk assessment tool.

Probability of Occurrence

The probability of occurrence is an estimate of how often a hazard event occurs. A review of historic events assists with this determination. Each hazard of concern is rated in accordance with the numerical ratings and definitions in Table 5.3-1.

Table 5.3-1. Probability of Occurrence Ranking Factors

Rating	Probability	Definition
1	Rare	Hazard event is not likely to occur within 100 years (>1% chance of occurrence in any given year)
2	Occasional	Hazard event is likely to occur within 100 years (1% chance of occurrence in any given year)
3	Frequent	Hazard event is likely to occur within 25 years (4% chance of occurrence in any given year)

Impact

The impact of each hazard is considered in three categories: impact on population, impact on property (general building stock including critical facilities), and impact on the economy. Based on documented historic losses and a subjective assessment by the Planning Committee, an impact rating of high, medium, or low is assigned with a corresponding numeric value for each hazard of concern. In addition, a weighting factor is assigned to each impact category: three (3) for population, two (2) for property, and one (1) for economy. This gives the impact on population the greatest weight in evaluating the impact of a hazard. Table 5.3-2 presents the numerical rating, weighted factor and description for each impact category

Table 5.3-2. Numerical Values and Definitions for Impacts on Population, Property and Economy

Category	Weighting Factor	Low Impact* (1)	Medium Impact (2)	High Impact (3)

Category	Weighting Factor	Low Impact* (1)	Medium Impact (2)	High Impact (3)
Population	3	14% or less of your population is exposed to a hazard with potential for measurable life safety impact, due to its extent and location	15% to 29% of your population is exposed to a hazard with potential for measurable life safety impact, due to its extent and location	30% or more of your population is exposed to a hazard with potential for measurable life safety impact, due to its extent and location
Property	2	Property exposure is 14% or less of the total replacement cost for your community	Property exposure is 15% to 29% of the total replacement for your community	Property exposure is 30% or more of the total replacement cost for your community
Economy	1	Loss estimate is 9% or less of the total replacement cost for your community	Loss estimate is 10% to 19% of the total replacement cost for your community	Loss estimate is 20% or more of the total replacement cost for your community

Note: A numerical value of zero is assigned if there is no impact.
**For the purposes of this exercise, "impacted" means exposed for population and property and loss for economy.*

Risk Ranking Value

The risk ranking for each hazard is then calculated by multiplying the numerical value for probability of occurrence by the sum of the numerical values for impact. The equation is as follows: Probability of Occurrence Value (1, 2, or 3) X Impact Value (6 to 18) = Hazard Ranking Value. Based on the total for each hazard, a priority ranking is assigned to each hazard of concern (high, medium, or low).

5.3.2 Hazard Ranking Results

Using the process described above, the risk ranking for the identified hazards of concern was determined for Montgomery County. Based on the combined risk values for probability of occurrence and impact to Montgomery County, a priority ranking of "high", "medium" or "low" risk was assigned. The hazard ranking for the Putnam County planning area is detailed in the subsequent tables that present the step-wise process for the ranking. The county–wide risk ranking includes the entire planning area and may not reflect the highest risk indicated for any of the participating jurisdictions. The resulting ranks of each municipality indicate the differing degrees of risk exposure, and vulnerability. The results support the appropriate selection and prioritization of initiatives to reduce the highest levels of risk for each municipality. Both the County and the participating jurisdictions have applied the same methodology to develop the county-wide risk and local rankings to ensure consistency in the overall ranking of risk.

This risk ranking exercise serves two purposes: 1) to describe the probability of occurrence for each hazard, and 2) to describe the impact each would have on the people, property and economy of Montgomery County. Estimates of risk for Montgomery County were developed using methodologies promoted by FEMA's hazard mitigation planning guidance and generated by FEMA's HAZUS-MH risk assessment tool.

Table 5.3-3 shows the probability ranking assigned for likelihood of occurrence for each hazard.

Table 5.3-3. Probability of Occurrence Ranking for Hazards of Concern for Montgomery County

Hazard of Concern	Probability	Numeric Value
Drought	Occasional	2
Earthquake	Rare	1
Extreme Temperature	Frequent	3
Flood (riverine, flash, dam failure, ice jam)	Frequent	3

Hazard of Concern	Probability	Numeric Value
Severe Storm (windstorms, thunderstorms, hail, tornadoes and hurricanes)	Frequent	3
Severe Winter Storm (heavy snow, blizzards, ice storms, Nor'Easters)	Frequent	3

Table 5.3-4 shows the impact evaluation results for each hazard of concern, including impact on property, structures, and the economy. The weighting factor results and a total impact for each hazard also are summarized.

Table 5.3-4. Impact Ranking for Hazards of Concern for Montgomery County

Hazard of Concern	Population			Property			Economy			Total Impact Rating (Population + Property + Economy)
	Impact	Numeric Value	Multiplied by Weighting Factor (3)	Impact	Numeric Value	Multiplied by Weighting Factor (2)	Impact	Numeric Value	Multiplied by Weighting Factor (1)	
Drought	High	3	3 x 3 =9	Low	1	2 x 1 = 2	Medium	2	1 x 2 = 2	13
Earthquake	High	3	3 x 3 = 9	Low	1	2 x 1 = 2	Low	1	1 x 1 = 1	12
Extreme Temperature	Low	1	3 x 1 =3	Low	1	2 x 1 = 2	Low	1	1 x 1 = 1	6
Flood (riverine, flash, dam failure, ice jam)	Medium	2	3 x 2 =6	Medium	2	2 x 2 = 4	Medium	2	1 x 2 = 2	12
Severe Storm (windstorms, thunderstorms, hail, tornadoes and hurricanes)	High	3	3 x 3 =9	High	3	2 x 3 = 6	Low	1	1 x 1 = 1	16
Severe Winter Storm (heavy snow, blizzards, ice storms, Nor'Easters)	High	3	3 x 3 =9	High	3	2 x 3 = 6	Medium	2	1 x 2 = 2	17

Table 5.3-5 presents the total ranking value for each hazard.

Table 5.3-5. Total Risk Ranking Value for Hazards of Concern for Montgomery County

Hazard of Concern	Probability	Impact	Total = (Probability x Impact)
Drought	2	13	26
Earthquake	1	12	12
Extreme Temperature	3	6	18
Flood (riverine, flash, dam failure, ice jam)	3	12	36
Severe Storm (windstorms, thunderstorms, hail, tornadoes and hurricanes)	3	16	48
Severe Winter Storm (heavy snow, blizzards, ice storms, Nor'Easters)	3	17	51

Refer to Section 9 for the hazard ranking category by jurisdiction assigned for each hazard of concern. The ranking categories are determined by an evaluation of the total risk ranking score into three categories (low, medium and high) whereby a score of 14 and below is categorized as low, 15 to 30 is medium, and 31 and over is considered a high risk category.

These rankings have been used as one of the bases for identifying the jurisdictional hazard mitigation strategies included in Section 9 of this plan. The summary rankings for the County reflect the results of the vulnerability analysis for each hazard of concern and vary from the specific results of each jurisdiction. For example the severe storm hazard may be ranked high in one jurisdiction, but due to the exposure and impact county-wide, it is ranked as a medium hazard and is addressed in the county mitigation strategy accordingly

The hazard rankings indicated in this plan update have been adjusted from the 2010 plan due to the improved vulnerability assessment (for flood only) based on structure-specific data available from the County rather than HAZUS default aggregate data as discussed in Section 5.1, Methodology. Any changes to the ranking results therefore do not necessarily reflect significant changes in exposure, but a more refined vulnerability analysis methodology. The summary County level values reflect the vulnerability data on the county level and do not represent an average of jurisdiction ranks or the highest rank indicated in Montgomery County. These designations are an element of the prioritization criteria as detailed in Section 6 of this plan.

5.4 HAZARDS PROFILES AND VULNERABILITY ASSESSMENT

The following sections profile and assess vulnerability for each hazard of concern. For each hazard, the profile includes: the hazard description; its location and extent; previous occurrences and losses; and the probability of future events. The vulnerability assessment for each hazard includes: an overview of vulnerability; the data and methodology used; the impact on life, health and safety; impact on general building stock; impact on critical facilities; impact on the economy; additional data needs and next steps; and the overall vulnerability assessment finding.

5.4.1 DROUGHT

The following section provides the hazard profile (hazard description, location, extent, previous occurrences and losses, probability of future occurrences, and impact of climate change) and vulnerability assessment for the drought hazard in Montgomery County.

5.4.1.1 Hazard Profile

Description

Drought is a period characterized by long durations of below normal precipitation. Drought is a temporary irregularity and differs from aridity since the latter is restricted to low rainfall regions and is a permanent feature of climate. Drought conditions occur in virtually all climatic zones yet its characteristics vary significantly from one region to another, since it is relative to the normal precipitation in that region. Drought can affect agriculture, water supply, aquatic ecology, wildlife, and plant life. There are four different ways that drought can be defined or grouped:

- ***Meteorological*** drought is a measure of departure of precipitation from normal. It is defined solely on the relative degree of dryness. Due to climatic differences, what might be considered a drought in one location of the country may not be a drought in another location.
- ***Agricultural*** drought links various characteristics of meteorological (or hydrological) drought to agricultural impacts, focusing on precipitation shortages, differences between actual and potential evapotranspiration, soil water deficits, reduced ground water or reservoir levels, and other parameters. It occurs when there is not enough water available for a particular crop to grow at a particular time. Agricultural drought is defined in terms of soil moisture deficiencies relative to water demands of plant life, primarily crops.
- ***Hydrological*** drought is associated with the effects of periods of precipitation shortfalls (including snowfall) on surface or subsurface water supply. It occurs when these water supplies are below normal. It is related to the effects of precipitation shortfalls on stream flows and reservoir, lake, and groundwater levels.
- ***Socioeconomic*** drought is associated with the supply and demand of an economic good with elements of meteorological, hydrological, and agricultural drought. This differs from the aforementioned types of drought because its occurrence depends on the time and space processes of supply and demand to identify or classify droughts. The supply of many economic goods depends on weather (for example water, forage, food grains, fish, and hydroelectric power). Socioeconomic drought occurs when the demand for an economic good exceeds supply as a result of a weather-related shortfall in water supply (National Drought Mitigation Center 2014).

Extent

The severity of a drought depends on the degree of moisture deficiency, the duration, and the size and location of the affected area. The longer the duration of the drought and the larger the area impacted, the more severe the potential impacts (NOAA Date Unknown). The New York State Department of Environmental Conservation (NYSDEC) and the New York State Drought Management Task Force identifies droughts in the following four stages:

- ***Normal*** is considered the standard moisture soil levels found throughout New York State
- ***Drought Watch*** is the first stage of drought. This stage is declared by the NYSDEC and is intended to give advance notice of a developing drought. As this stage, the general public is urged to conserve

water. Public water purveyors and industries are urged to update and begin to implement individual drought contingency plans.

- ***Drought Warning*** is the second stage of drought. This stage is also declared by the NYSDEC and is a notice of impending and imminent severe drought conditions. A warning declaration includes stepping up public awareness and increasing voluntary conservation. Public water supply purveyors and industries are urged to continue to implement local drought contingency plans. Federal, state and local water resources agencies are notified to prepare for emergency response measures.
- ***Drought Emergency*** is the third stage of drought. This stage is declared by the NYSDHSES, based upon recommendation of the Task Force. It is a notice of existing severe and persistent drought conditions. An emergency declaration is a notice for local water resources agencies to mandate conservation and implement other emergency response measures. A continuing and worsening drought emergency may result in the New York State governor declaring a drought disaster. It is a notice of the most severe and persistent drought conditions. At this stage, a significant proportion of communities in the impacted area likely are unable to respond adequately.

New York State uses two methodologies to determine the various drought stages. The Palmer Drought Index (PDI) is a commonly used drought indicator and is primarily based on soil conditions. These are typically the first indicators that a moisture deficit is present. These values range from -1 to +5 with positive values indicating wetter conditions and negative values representing drier conditions (NYS DHSES 2014).

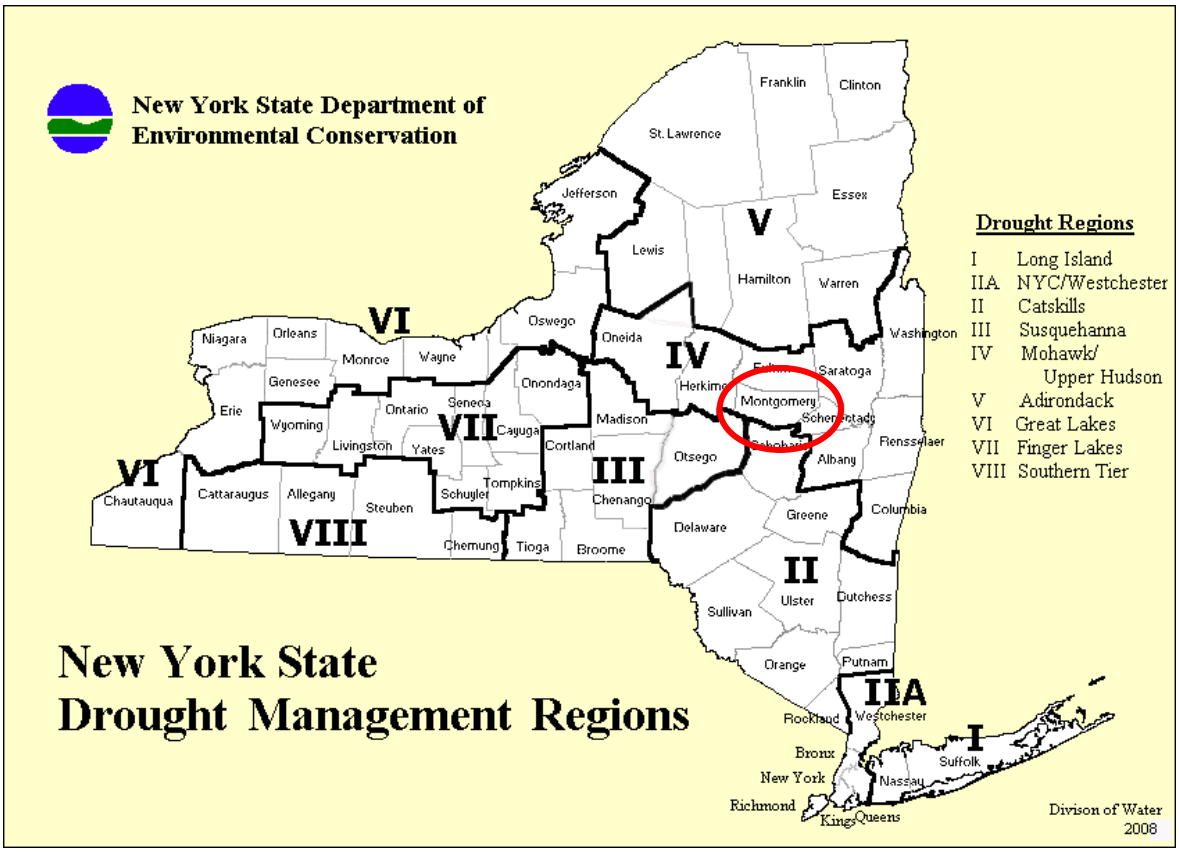
The second methodology used by New York State was developed by the NYSDEC and is referred to as the State Drought Index (SDI). The SDI evaluates drought conditions on a more comprehensive basis by measuring whether numerous indicators reach dire thresholds. The data collected is compared against critical threshold values to show a normal or changeable drought condition. The indicators are weighted on a regional basis to reflect the unique circumstances of each drought management region (NYS DHSES 2014).

Location

Climate divisions are regions within a state that are climatically homogenous. The National Oceanic and Atmospheric Administration (NOAA) has divided the U.S. into 359 climate divisions. The boundaries of these divisions typically coincide with the county boundaries, except in the western U.S., where they are based largely on drainage basins (U.S. Energy Information Administration, Date Unknown). According to NOAA, New York State is made up of 10 climate divisions: Western Plateau, Eastern Plateau, Northern Plateau, Coastal, Hudson Valley, Mohawk Valley, Champlain Valley, St. Lawrence Valley, Great Lakes, and Central Lakes (NOAA 2014). Montgomery County is located in the Mohawk Valley Climate Division.

New York State is divided into nine drought management regions based roughly on drainage basin and county lines. NYSDEC monitors precipitation, lake and reservoir levels, stream flow, and groundwater level at least monthly in each region and more frequently during periods of drought. NYSDEC uses this data to assess the condition of each region, which can range from "normal" to "drought disaster" (NYSDEC 2015). Figure 5.4.1-1 shows the drought regions of New York State with Montgomery County circled. Montgomery County is located within the Mohawk/Upper Hudson Drought Region.

Figure 5.4.1-1. Drought Regions of New York State



Source: NYSDEC 2008
Note: The red circle indicates the location of Montgomery County

Previous Occurrences and Losses

Between 1954 and 2015, New York State experienced one FEMA declared drought-related major declaration (DR) classified as a water shortage. Generally, these disasters cover a wide region of the State; therefore, they may have impacted many counties. Montgomery County was not included in this declaration (FEMA 2015).

Agriculture-related drought disasters are quite common. One-half to two-thirds of the counties in the U.S. have been designated as disaster areas in each of the past several years. The USDA Secretary of Agriculture is authorized to designate counties as disaster areas to make emergency loans to producers suffering losses in those counties and in counties that are contiguous to a designated county. Between 2012 and mid-2015, New York State has been included in 27 USDA declarations. Of those 27 declarations, Montgomery County has been included in six of the declarations; however, only two of them were a result of drought conditions (S3427 and S3441 in 2012).

For this 2015 Plan Update, known drought events, including FEMA and USDA disasters, that have impacted Montgomery County between 2007 and 2015 are identified in Table 5.4.1-1. Fore events prior to 2007, refer to the 2008 Montgomery County Hazard Mitigation Plan. Please note that not all events that have occurred in the County are included due to the extent of documentation and the fact that not all sources may have been identified or researched. Loss and impact information could vary depending on the source. Therefore, the accuracy of monetary figures discussed is based only on the available information identified during research for this HMP Update.

Table 5.4.1-1. Drought Events Between 2007 and 2015

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts	Source(s)
June 26 – November 28, 2012	Drought	NA	NA	Due to prolonged drought across New York State, Montgomery County was declared a primary county for this USDA declared disaster.	USDA

Note (1): This table does not represent all events that may have occurred throughout the County due to a lack of detail and/or their minor impact upon the County.
Note (2): Monetary figures within this table were U.S. Dollar (USD) figures calculated during or within the approximate time of the event. If such an event would occur in the present day, monetary losses would be considerably higher in USDs as a result of increased U.S. Inflation Rates.
FEMA Federal Emergency Management Agency
N/A Not Applicable
USDA U.S. Department of Agriculture

Probability of Future Events

It is estimated that Montgomery County will continue to experience direct and indirect impacts of drought and its impacts on occasion, with the secondary effects causing potential disruption or damage to agricultural activities and creating shortages in water supply within communities.

In Section 5.3, the identified hazards of concern for Montgomery County were ranked. The probability of occurrence, or likelihood of the event, is one parameter used for hazard rankings. Based on historical records and input from the Planning Committee, the probability of occurrence for drought in Montgomery County is considered 'occasional' (likely to occur within 100 years, as presented in Table 5.3-4).

Climate Change Impacts

According to the 2014 New York State HMP update, rising summer temperatures, along with little change in summer rainfall, are projected to increase the frequency of short-term droughts. This scenario will lead to impacts on the natural and managed ecosystems across New York State. Water management and hydrology are also affected (NYS DHSES 2013).

Climate change is beginning to affect both people and resources in New York State, and these impacts are projected to continue growing. Impacts related to increasing temperatures and sea level rise are already being felt in the State. ClimAID: the Integrated Assessment for Effective Climate Change in New York State (ClimAID) was undertaken to provide decision-makers with information on the State's vulnerability to climate change and to facilitate the development of adaptation strategies informed by both local experience and scientific knowledge (New York State Energy Research and Development Authority [NYSERDA], 2011).

Each region in New York State, as defined by ClimAID, has attributes that will be affected by climate change. Montgomery County is part of Region 5, East Hudson and Mohawk River Valleys. Some of the issues in this region, affected by climate change, include: more frequent heat waves and above 90°F days, more heat-related deaths, increased frequency of heavy precipitation and flooding, decline in air quality, etc. (NYSERDA 2014).

Temperatures in New York State are warming, with an average rate of warming over the past century of 0.25° F per decade. Average annual temperatures are projected to increase across New York State by 2° F to 3.4° F by the 2020s, 4.1° F to 6.8° F by the 2050s, and 5.3° F to 10.1° F by the 2080s. By the end of the century, the greatest warming is projected to be in the northern section of the State (NYSERDA 2014).

Regional precipitation across New York State is projected to increase by approximately one to eight-percent by the 2020s, three to 12-percent by the 2050s, and four to 15-percent by the 2080s. By the end of the century, the greatest increases in precipitation are projected to be in the northern areas of the State (NYSERDA 2014).

In Region 5, it is estimated that temperatures will increase by 3.5ºF to 7.1ºF by the 2050s and 4.1ºF to 11.4ºF by the 2080s (baseline of 47.6ºF). Precipitation totals will increase between 2 and 15% by the 2050s and 3 to 17% by the 2080s (baseline of 38.6 inches). **Error! Reference source not found.** displays the projected seasonal precipitation change for the East Hudson and Mohawk River Valleys ClimAID Region (NYSERDA 2014).

Table 5.4.1-2. Projected Seasonal Precipitation Change in Region 5, 2050s (% change)

Winter	Spring	Summer	Fall
5 to +15	-5 to +10	-5 to +5	-5 to +10

Source: NYSERDA, 2011

Annual temperatures in New York State have been rising throughout the State since the start of the 20th century. State-average temperatures have increased by approximately 0.6°F since 1970, with winter warming exceeding 1.1°F per decade. Extreme heat events are likely to increase throughout New York State and short-duration warm season droughts will become more common.

With the increase in temperatures, 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 droughts are projected to increase, affecting water supply, agriculture, ecosystems, and energy projects (NYSERDA 2011).

By the end of the 21st century, the number of droughts is likely to increase, as the effect of higher temperatures on evaporation is likely to outweigh the increase in precipitation. Droughts in the northeast U.S. have been associated with local and remote modes of multi-year ocean-atmosphere variability that are unpredictable and may change with climate change. Changes in the distribution of precipitation throughout the year and the timing of snowmelt could potentially impact the frequency of droughts (occurring more frequently) (NYSERDA 2011).

5.4.1.2 Vulnerability Assessment

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

- Overview of vulnerability
- Data and methodology used for the evaluation
- Impact on: (1) life, health and safety of residents, (2) general building stock, (3) critical facilities, (4) economy, and (5) future growth and development
- Effect of climate change on vulnerability
- Change of vulnerability as compared to that presented in the 2008 Montgomery County Hazard Mitigation Plan
- Further data collections that will assist understanding this hazard over time

Overview of Vulnerability

The entire County is vulnerable to drought. Assets at particular risk would include areas used for agricultural purposes (farms and cropland), any open land or structures located along the wildland/urban interface (WUI) that could become vulnerable to the wildfire hazard due to extended periods of low rain and high heat, usually associated with a drought. In addition, water supply resources could be impacted by extended periods of low rain. Finally, vulnerable populations could be particularly susceptible to the drought hazard and cascading impacts due to age, health conditions, and limited ability to mobilize to shelter, cooling and medical resources.

Potential drought impacts are agricultural, hydrologic and socioeconomic. The sequence of these impacts further emphasizes their differences. When a drought begins, the agricultural sector is typically the first to be affected due to its heavy dependence on store soil water. During dry periods, soil water can be quickly depleted. In precipitation deficiencies continue, then people who depend on other sources of water will begin to feel the impacts of the shortage. Those who rely on surface water (for example, reservoirs and lakes) and subsurface water (for example, groundwater) are usually the last to be affected. A short-term drought that persists for three to six months may have little impact on these sectors, depending on the characteristics of the hydrologic system and the intensity of water use (NYS HMP 2014).

Numerous economic impacts occur in agriculture and related sectors, including forestry, fisheries, and water activities, because of the reliance of these sectors on surface and subsurface water supplies. Droughts are often associated with losses in crop yields and livestock production, increase issues with insect infestations, increase in forest diseases, and reduce growth. Forest and grass fire occurrences also increase substantially during extended drought periods, which in turn place human and wildlife populations, as well as property, at higher levels of risk (NYS HMP 2014).

Loss of income is another factor used when assessing the impacts of drought. Examples of income loss include a reduced income for farmers, along with retailers and others who provide goods and services to farmers. The recreation and tourism industries may also experience a loss of income due to the increase of food, energy and other products prices as supplies are reduced. In some cases, local shortages of certain goods result in the need to import goods from outside the affected region. Reduced water supply impacts the use of rivers and other waterbodies. Hydropower production may also be impacted by drought effects as well (NYS HMP 2014).

Environmental losses from drought include damages to plant and animal species, wildfire habitat, and air and water quality; forest and grass fires; degradation of landscape quality; loss of biodiversity; and soil erosion. Some impacts may be short-term and others may linger for longer periods of time. If changes in climate intensify, environmental impacts and losses may become more intensified. Wildfire habitat may be degraded through the loss of wetlands, lakes, and vegetation. Increased soil erosion can lead to a more permanent loss of biological productivity of landscapes. However, quantifying environmental losses is difficult (NYS HMP 2014).

Social impacts primarily involve public safety, health, conflicts between water users, reduced quality of life, and inequities in the distribution of impacts and disaster relief. Many of the impacts related to economic and environmental have social impacts as well (NYS HMP 2014).

Data and Methodology

Data was collected from HAZUS-MH, USDA, NOAA-NCDC, Montgomery County, and the Planning Committee sources. Insufficient data was available to model the long-term potential impacts of a drought on the County. Over time, additional data will be collected to allow better analysis for this hazard. Available information and a preliminary assessment are provided below.

Impact on Life, Health and Safety

Drought conditions can affect people's health and safety including health problems related to low water flows and poor water quality; and health problems related to dust. Droughts also have the potential to lead to loss of human life (NDMC 2014). Other possible impacts to health due to drought include increased recreational risks; effects on air quality; diminished living conditions related to energy, air quality, and sanitation and hygiene; compromised food and nutrition; and increased incidence of illness and disease. Health implications of drought are numerous. Some drought-related health effects are short-term while others can be long-term (CDC 2012).

The 2014 New York HMP states that between 1960 and 2012, Montgomery County experienced just three drought events that did not cause any fatalities or injuries, with a total of over $38,000 in property damage and over $2 million in crop damage. Between 2010 and 2011, Montgomery County had 50% or more land area experiencing drought for a total of 26 weeks during this time period. The New York State HMP also indicated that Montgomery County has an average of $40,532 in annual drought losses based on data from 1960 to 2012 (NYS HMP 2014).

Impact on General Building Stock

No structures are anticipated to be directly affected by a drought or extreme temperature event. However, drought/extreme heat events contribute to conditions conducive to wildfires. Risk to life and property is greatest in those areas where forested areas adjoin urbanized areas (high density residential, commercial and industrial) or wildland/urban interface (WUI).

Impact on Critical Facilities

Water supply facilities may be affected by short supplies of water. As mentioned, drought events generally do not impact buildings; however, droughts have the potential to impact agriculture-related facilities and critical facilities that are associated with potable water supplies.

Impact on the Economy

When a drought occurs, the agricultural industry is most at risk in terms of economic impact and damage. During droughts, crops do not mature leading to a lessened crop yield, wildlife and livestock are undernourished, land values decrease, and ultimately there is financial loss to the farmer (FEMA, 1997).

A prolonged drought can have serious direct and indirect economic impacts on a community. As noted in the NYS HMP, it is difficult to estimate financial damages as a result of a drought because 'the more removed the impact from the cause, the more complex the link to the cause' (NYS HMP, 2011).

General economic effects from a drought include the following:

- Decreased land prices
- Loss to industries directly dependent on agricultural production (e.g., machinery and
- Fertilizer manufacturers, food processors, dairies, etc.)
- Unemployment from drought-related declines in production
- Strain on financial institutions (foreclosures, more credit risk, capital shortfalls)
- Revenue losses to Federal, State, and Local governments (from reduced tax base)
- Reduction of economic development
- Fewer agricultural producers (due to bankruptcies, new occupations)
- Rural population loss (NYS HMP, 2011).

In 2012, the County's agricultural industry generated over $86.7 million in sales (mainly from milk from cows), with total sales averaging $131,701 per farm. The leading agricultural products sold were milk from cows ($49 million); cattle and calves ($14.1 million); grains, oilseeds, dry beans and dry peas ($10.1 million); and other crops and hay ($9.2 million) (USDA 2012).

A prolonged drought can have a serious economic impact on a community. Increased demand for water and electricity may result in shortages and a higher cost for these resources (FEMA, 2005; New York State, 2004). Industries that rely on water for business may be impacted the hardest (e.g., landscaping businesses). Even though most businesses will still be operational, they may be impacted aesthetically. These aesthetic impacts are most significant to the recreation and tourism industry. In addition, droughts in another area could impact the food supply/price of food for residents in the County.

Future Growth and Development

As discussed in Section 4, areas targeted for future growth and development have been identified across Montgomery County. Future growth could impact the amount of potable water available due to a drain on the available water resources. Other areas that could be impacted include agriculture and recreational facilities such as golf courses, farms, and nurseries. Areas targeted for potential future growth and development in the next five (5) years have been identified across the County at the municipal level. Refer to the jurisdictional annexes in Volume II of this HMP.

Effect of Climate Change on Vulnerability

Refer to the "Climate Change Impacts" section located earlier in this profile.

Change of Vulnerability

When examining the change in the County's vulnerability to drought events from the 2008 original HMP to this update, it is important to look at each entity that is exposed and vulnerable. The total population across the County has minimally changed as shown by the 2000 to 2010 U.S. Census.

In terms of the agricultural industry for Montgomery County, from 2007 to 2012, there was a 9% increase in number of farms (604 farms to 659 farms, respectively). The County also saw an increase in land in farms (124,556 acres to 131,386 acres). However, the County had a 3% decrease in average size of farms (206 acres to 199 acres). Montgomery County also experienced an 8% increase in the average market value of products sold per farm, from over $121,000 in 2002 to over $131,000 in 2012. Therefore, due to the increase in number of farms, land in farms, and total market value of products sold, the County's potential crop loss due to drought may increase overall.

Additional Data and Next Steps

For the Plan Update, any additional information regarding localized concerns and past impacts will be collected and analyzed. This data will be developed to support future revisions to the plan. Mitigation efforts could include building on existing New York State, Montgomery County, and local efforts. The lead State Agency for drought preparedness is the NYSDEC.

5.4.2 EARTHQUAKE

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

5.4.2.1 Hazard Profile

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

Description

An earthquake is the sudden movement of the Earth's surface caused by the release of stress accumulated within or along the edge of the Earth's tectonic plates, a volcanic eruption, or by a manmade explosion (Federal Emergency Management Agency [FEMA] 2001; Shedlock and Pakiser 1997). Most earthquakes occur at the boundaries where the Earth's tectonic plates meet (faults); less than 10% of earthquakes occur within plate interiors. As plates continue to move and plate boundaries change geologically over time, weakened boundary regions become part of the interiors of the plates. These zones of weakness within the continents can cause earthquakes in response to stresses that originate at the edges of the plate or in the deeper crust (Shedlock and Pakiser 1997).

According to the U.S. Geological Society (USGS) Earthquake Hazards Program, an earthquake hazard is any disruption associated with an earthquake that may affect residents' normal activities. This includes surface faulting, ground shaking, landslides, liquefaction, tectonic deformation, tsunamis, and seiches; each of these terms is defined below:

- *Surface faulting*: Displacement that reaches the earth's surface during a slip along a fault. Commonly occurs with shallow earthquakes—those with an epicenter less than 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 a 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 the wet sand near the water at the beach. Earthquake shaking can cause this effect. Liquefaction susceptibility is determined by the geological history, depositional setting, and topographic position of the soil (Stanford 2003). Liquefaction effects may occur along the shorelines of the ocean, rivers, and lakes and they can also happen in low-lying areas away from water bodies in locations where the ground water is near the earth's surface.
- *Tectonic Deformation*: A change in the original shape of a material caused by stress and strain.
- *Tsunami*: A sea wave of local or distant origin that results from large-scale seafloor displacements associated with large earthquakes, major sub-marine slides, or exploding volcanic islands.
- *Seiche*: The sloshing of a closed body of water, such as a lake or bay, from earthquake shaking (USGS 2012a).

Extent

An earthquake's magnitude and intensity are used to describe the size and severity of the event. Magnitude describes the size at the focus of an earthquake and intensity describes the overall felt severity of shaking during the event. The earthquake's magnitude is a measure of the energy released at the source of the earthquake and is expressed by ratings on the Richter scale and/or the moment magnitude scale. The Richter Scale measures magnitude of earthquakes and has no upper limit; however, it is not used to express damage (USGS 2014). Table 5.4.2-1 presents the Richter scale magnitudes and corresponding earthquake effects. The

moment magnitude scale (MMS) is used to describe the size of an earthquake. It is based on the seismic moment and is applicable to all sizes of earthquakes (USGS 2012). The Richter Scale is not commonly used anymore, as it has been replaced by the MMS which is a more accurate measure of the earthquake size (USGS 2014). The MMS is described below.

Table 5.4.2-1. Richter Magnitude Scale

Richter Magnitude	Earthquake Effects
2.5 or less	Usually not felt, but can be recorded by seismograph
2.5 to 5.4	Often felt, but causes only minor damage
5.5 to 6.0	Slight damage to buildings and other structures
6.1 to 6.9	May cause a lot of damage in very populated areas
7.0 to 7.9	Major earthquake; serious damage
8.0 or greater	Great earthquake; can totally destroy communities near the epicenter

Source: Michigan Tech University Date Unknown

The intensity of an earthquake is based on the observed effects of ground shaking on people, buildings, and natural features, and varies with location. The Modified Mercalli (MMI) scale expresses intensity of an earthquake and describes how strong a shock was felt at a particular location in values. Table 5.4.2-2 summarizes earthquake intensity as expressed by the Modified Mercalli scale. Table 5.4.2-3 displays the MMI scale and its relationship to the areas peak ground acceleration.

Table 5.4.2-2. Modified Mercalli Intensity Scale

Mercalli Intensity	Shaking	Description
I	Not Felt	Not felt except by a very few under especially favorable conditions.
II	Weak	Felt only by a few persons at rest, especially on upper floors of buildings.
III	Weak	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV	Light	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Moderate	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Strong	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Very Strong	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII	Severe	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Violent	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Extreme	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.

Source: USGS 2014

Table 5.4.2-3. Modified Mercalli Intensity and PGA Equivalents

Modified Mercalli Intensity	Acceleration (%g) (PGA)	Perceived Shaking	Potential Damage
I	< .17	Not Felt	None
II	.17 – 1.4	Weak	None

Modified Mercalli Intensity	Acceleration (%g) (PGA)	Perceived Shaking	Potential Damage
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

Source: Freeman et al. (Purdue University) 2004

Note: PGA Peak Ground Acceleration

PGA expresses the severity of an earthquake and is a measure of how hard the earth shakes, or accelerates, in a given geographic area. PGA is expressed as a percent acceleration force of gravity (%g). For example, 1.0%g PGA in an earthquake (an extremely strong ground motion) means that objects accelerate sideways at the same rate as if they had been dropped from the ceiling. 10%g PGA means that the ground acceleration is 10% that of gravity (NJOEM 2011). Damage levels experienced in an earthquake vary with the intensity of ground shaking and with the seismic capacity of structures, as noted in Table 5.4.2-4.

Table 5.4.2-4. Damage Levels Experienced in Earthquakes

Ground Motion Percentage	Explanation of Damages
1-2%g	Motions are widely felt by people; hanging plants and lamps swing strongly, but damage levels, if any, are usually very low.
Below 10%g	Usually causes only slight damage, except in unusually vulnerable facilities.
10 - 20%g	May cause minor-to-moderate damage in well-designed buildings, with higher levels of damage in poorly designed buildings. At this level of ground shaking, only unusually poor buildings would be subject to potential collapse.
20 - 50%g	May cause significant damage in some modern buildings and very high levels of damage (including collapse) in poorly designed buildings.
≥50%g	May causes higher levels of damage in many buildings, even those designed to resist seismic forces.

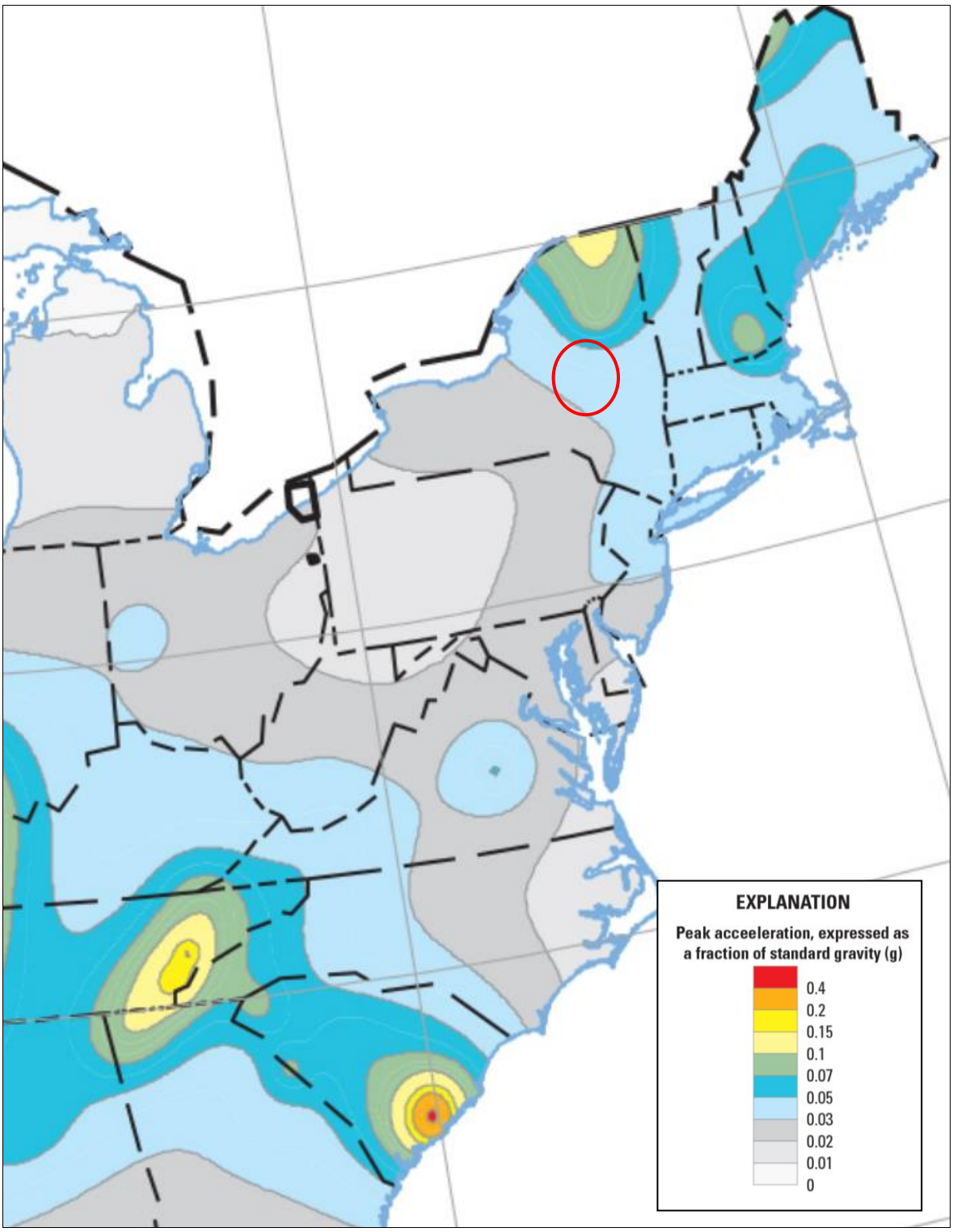
Source: NJOEM 2011

Note: %g Peak Ground Acceleration

National maps of earthquake shaking hazards have been produced since 1948. They provide information essential to creating and updating the seismic design requirements for building codes, insurance rate structures, earthquake loss studies, retrofit priorities and land use planning used in the U.S. Scientists frequently revise these maps to reflect new information and knowledge. Buildings, bridges, highways and utilities built to meet modern seismic design requirements are typically able to withstand earthquakes better, with less damages and disruption. After thorough review of the studies, professional organizations of engineers update the seismic-risk maps and seismic design requirements contained in building codes (Brown et al., 2001).

The USGS updated the National Seismic Hazard Maps in 2014, which superceded the 2008 maps. New seismic, geologic, and geodetic information on earthquake rates and associated ground shaking were incorporated into these revised maps. The 2014 map represents the best available data as determined by the USGS (Petersen, et. al. 2014).

Figure 5.4.2-1. Peak Acceleration (%g) with 10% Probability of Exceedance in 50 Years (2014)



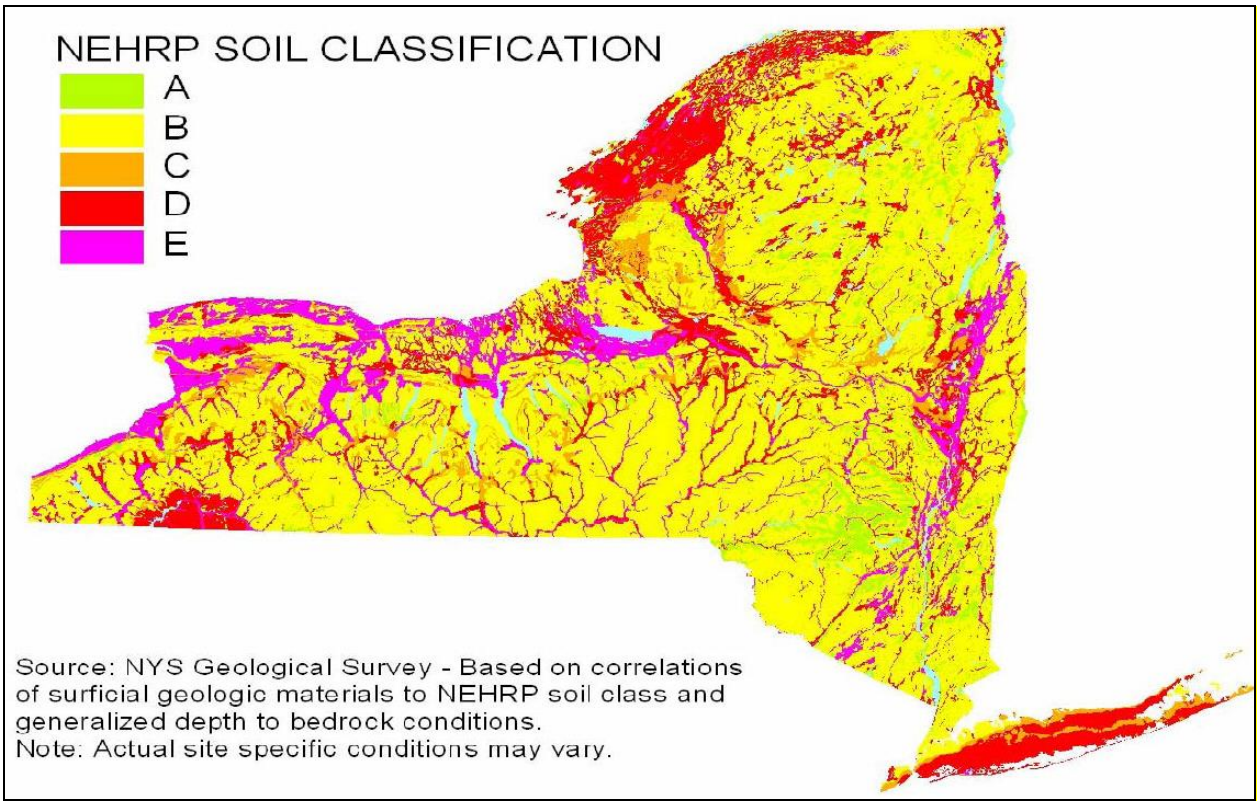
Source: Petersen, et. al. 2014

Note: The red circle indicates the approximate location of Montgomery County. The figure indicates that the County has a PGA between 3%g and 5%g.

The 2014 Seismic Hazard Map shows that Montgomery County has a PGA between 3 and 5% (Figure 5.4.2-1). This map is based on peak ground acceleration (%g) with 10% probability of exceedance in 50 years.

The New York State Geological Survey conducted seismic shear-wave tests of the State's surficial geology (glacial deposits). Based on these test results, the surficial geologic materials of New York State were categorized according to the National Earthquake Hazard Reduction Program's (NEHRP) Soil Site Classifications (Figure 5.4.2-2). The NEHRP developed five soil classifications that impact the severity of an earthquake. The soil classification system ranges from A to E, where A represents hard rock that reduces ground motions from an earthquake and E represents soft soils that amplify and magnify ground shaking and increase building damage and losses. Table 5.4.2-5 summarizes the NEHRP soil classifications shown on Figure 5.4.2-2.

Figure 5.4.2-2. NEHRP Soils in New York



Source: NYS DHSES, 2013

Table 5.4.2-5. NEHRP Soil Classifications

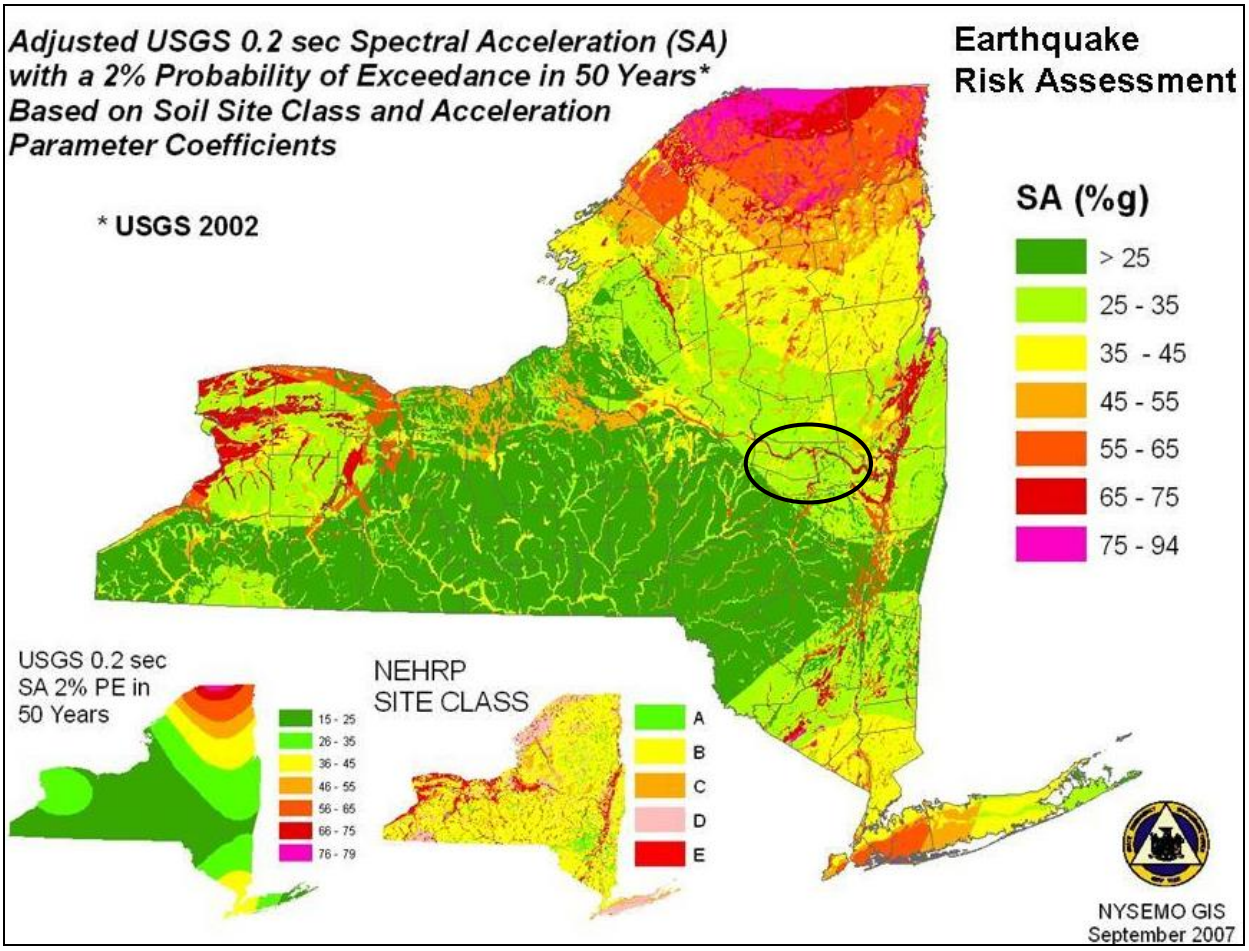
Soil Classification	Description
A	Very hard rock (e.g., granite, gneisses)
B	Sedimentary rock or firm ground
C	Stiff clay

D	Soft to medium clays or sands
E	Soft soil including fill, loose sand, waterfront, lake bed clays

Source: NYS DHSES, 2013

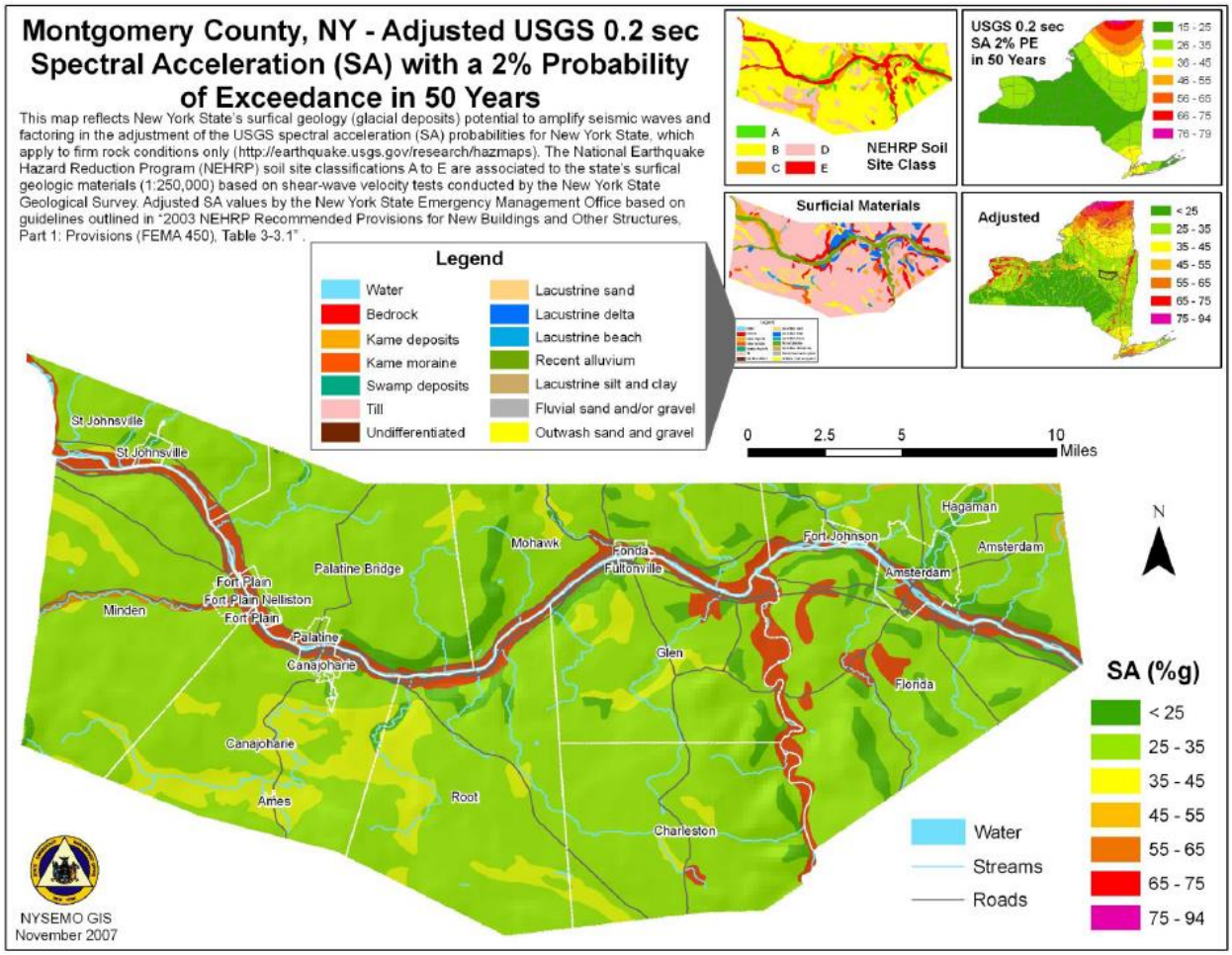
The NEHRP soil classification for the State has enabled the effect of soils to be factored with the 2002 USGS seismic hazard maps. Figure 5.4.2-3 and Figure 5.4.2-4 illustrate the State and Montgomery County's earthquake hazard with local soil types factored in, respectively.

Figure 5.4.2-3. Spectral Acceleration with 2% Probability of Exceedance in 50 Years (2002) for New York State



Source: NYS DHSES, 2013
Note: The black oval indicates the approximate location of Montgomery County.

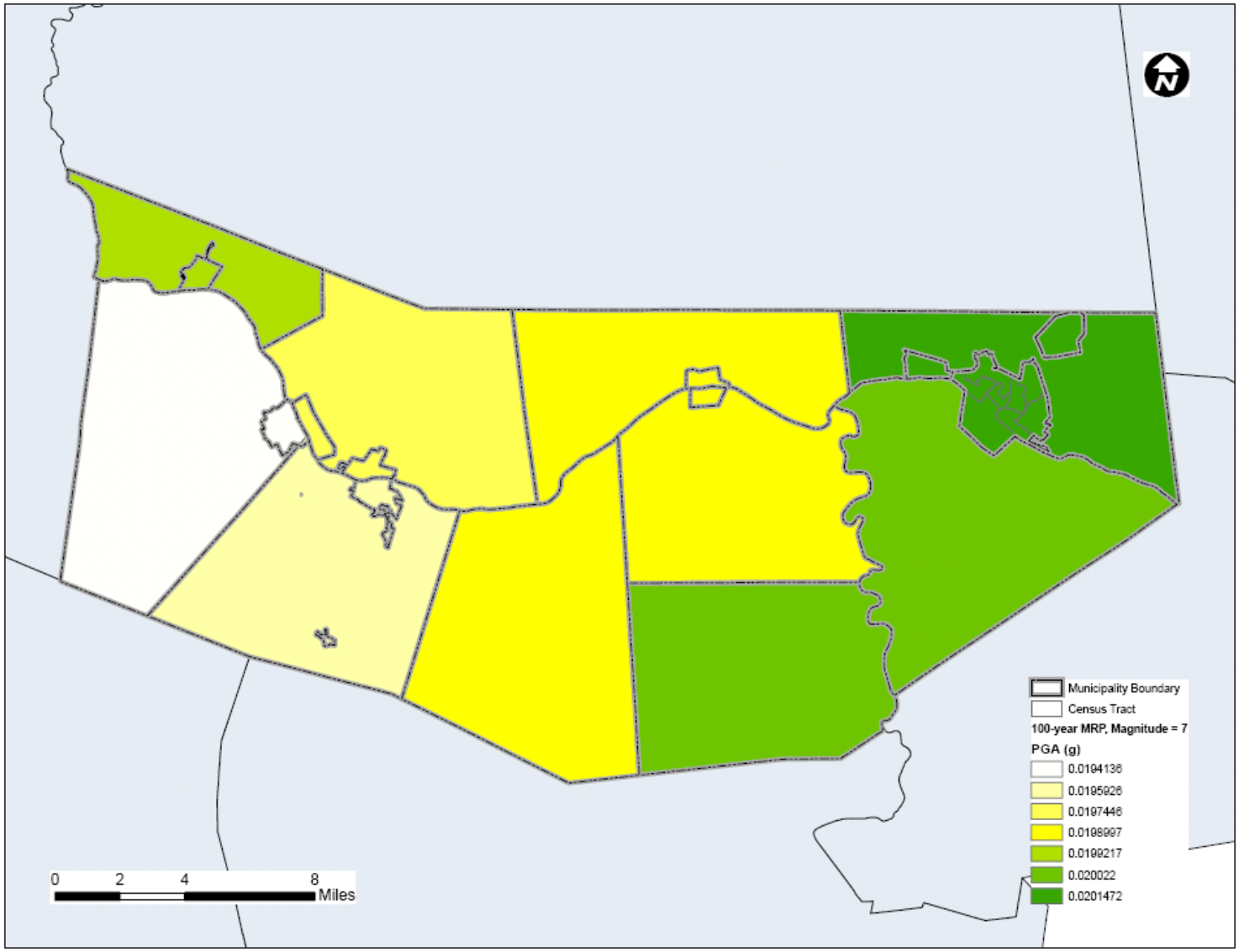
Figure 5.4.2-4. Earthquake Hazard: Combined Seismic Risk/Soils for Montgomery County



Source: NYS HMP, 2013

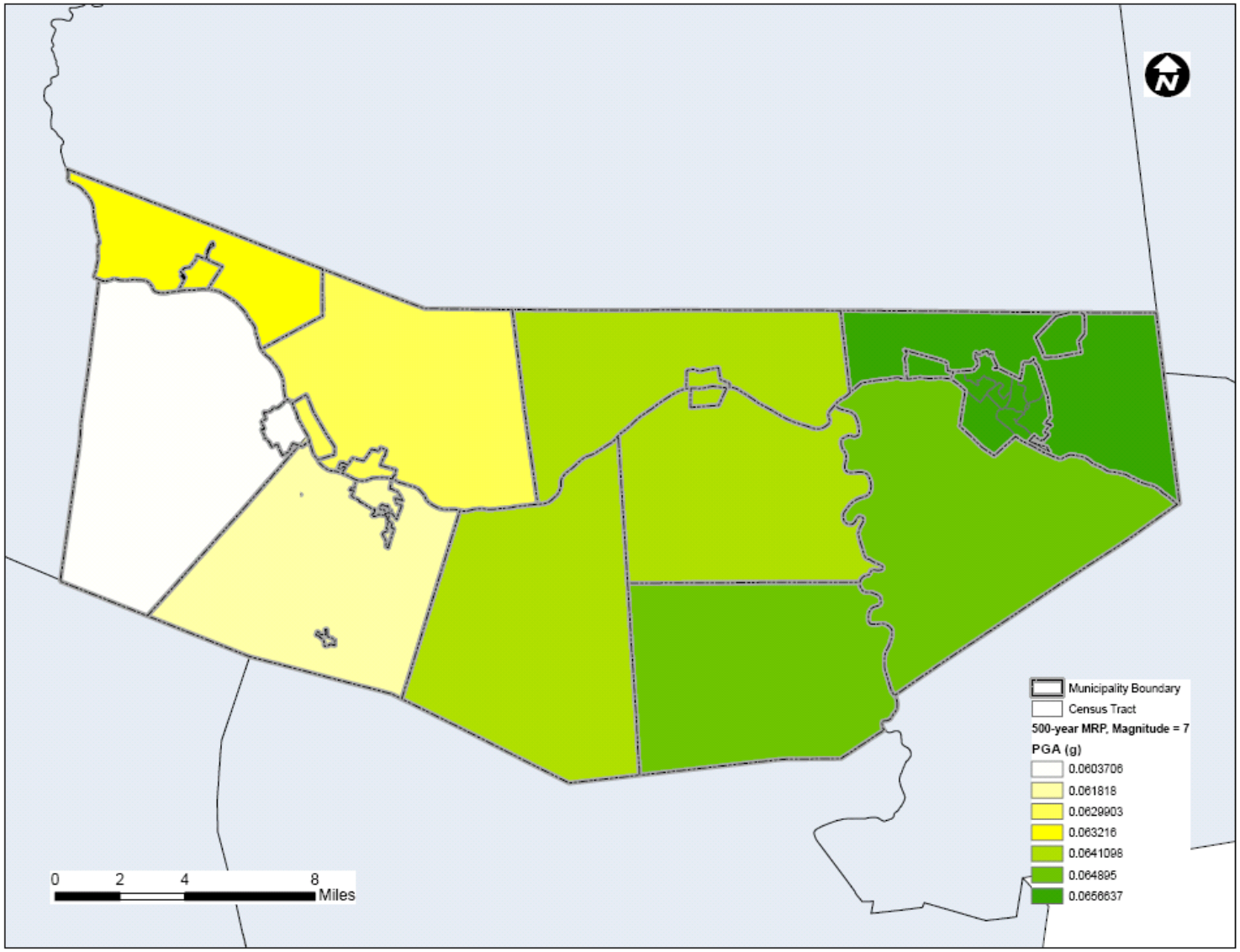
A probabilistic assessment was conducted for the 100-, 500- and 2,500-year mean return periods (MRP) through a Level 1 analysis in HAZUS-MH MR3 to analyze the earthquake hazard for Montgomery County. The HAZUS-MH MR3 analysis evaluates the statistical likelihood that a specific event will occur and what consequences will occur. A 100-year MRP event is an earthquake with a 1% chance that the mapped ground motion levels (PGA) will be exceeded in any given year. For a 500-year MRP, there is a 0.2% chance the mapped PGA will be exceeded in any given year. For a 2,500-year MRP, there is a 0.04% chance the mapped PGA will be exceeded in any given year. Figure 5.4.2-5 through Figure 5.4.2-7 illustrate the geographic distribution of PGA (*g*) across Montgomery County for 100-, 500- and 2,500-year MRP events at the Census Tract level.

Figure 5.4.2-5. Peak Ground Acceleration Modified Mercalli Scale for a 100-Year MRP Earthquake Event



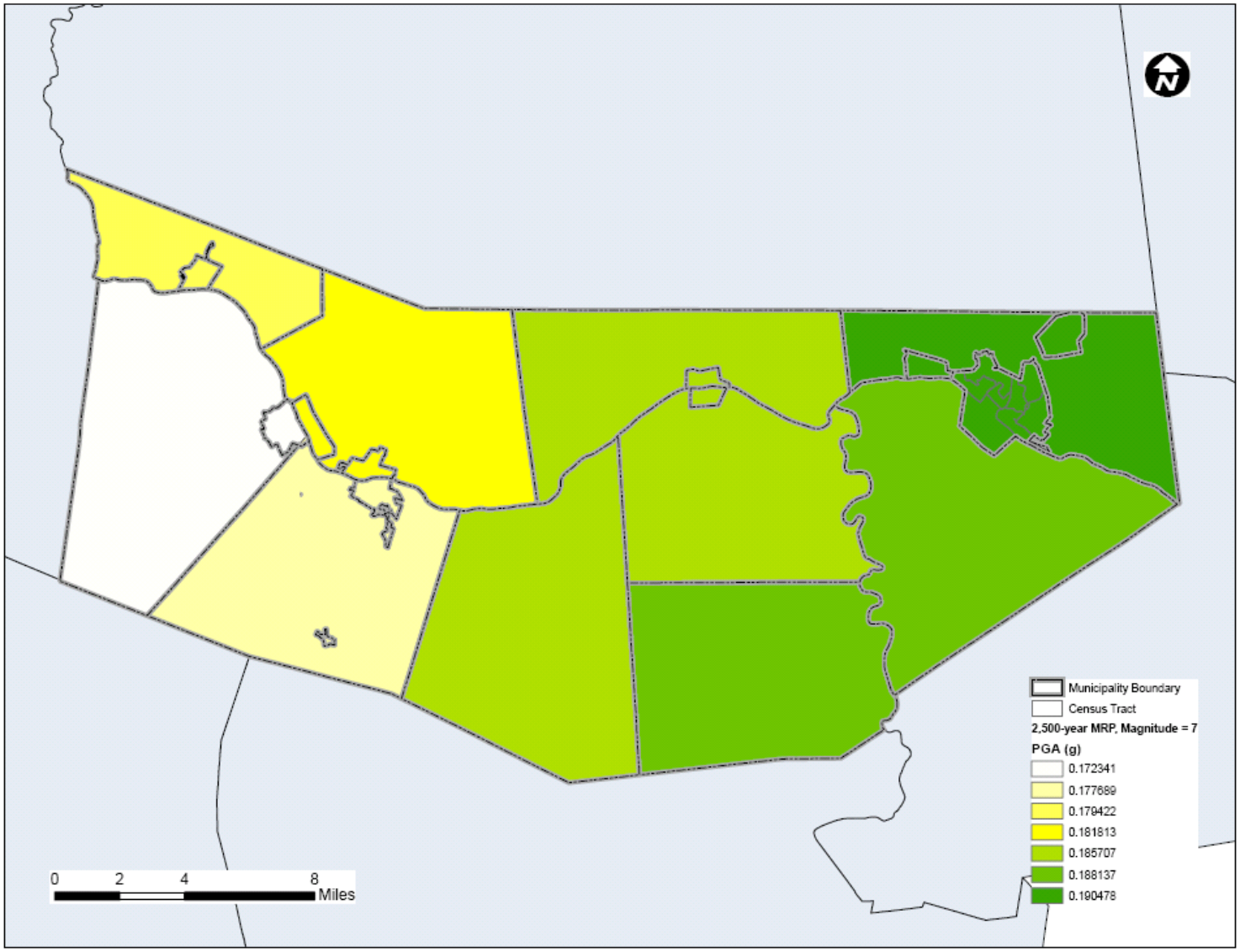
Source: HAZUS-MH MR3, 2007
Note: The peak ground acceleration for the 100-year MRP is between 0.01% and 0.02%

Figure 5.4.2-6. Peak Ground Acceleration Modified Mercalli Scale for a 500-Year MRP Earthquake Event



Source: HAZUS-MH MR3, 2007
Note: The peak ground acceleration for the 500-year MRP is 0.06-0.07%g

Figure 5.4.2-7. Peak Ground Acceleration Modified Mercalli Scale for a 2,500-Year MRP Earthquake Event



Source: HAZUS-MH MR3, 2007
Note: The peak ground acceleration for the 2,500-year MRP is 0.17 to 0.19 %g.

Location

As noted in the NYS HMP, the importance of the earthquake hazard in New York State is often underestimated because other natural hazards (for example, hurricanes and floods) occur more frequently and because major floods and hurricanes have occurred more recently than a major earthquake event (NYS DHSES, 2013). Typically areas east of the Rocky Mountains experience fewer and generally smaller earthquakes than the western U.S. However, the potential for earthquakes exists across all of New York State and the entire northeastern U.S. The New York City Area Consortium for Earthquake Loss Mitigation (NYCEM) ranks New York State as having the third highest earthquake activity level east of the Mississippi River (Tantala et al., 2003).

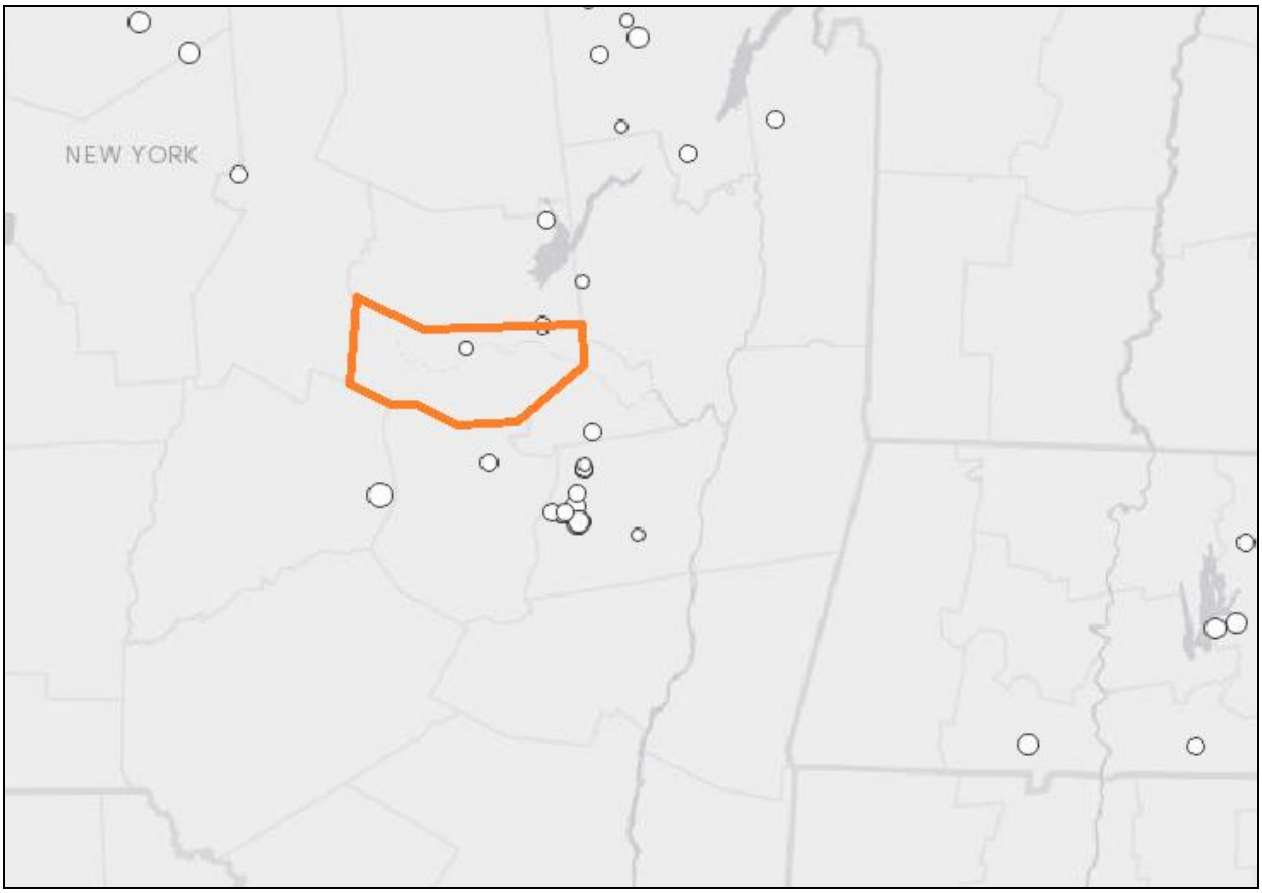
The closest plate boundary to the East Coast is the Mid-Atlantic Ridge, which is approximately 2,000 miles east of Pennsylvania. Over 200 million years ago, when the continent Pangaea rifted apart forming the Atlantic Ocean, the Northeast coast of America was a plate boundary. Being at the plate boundary, many faults were formed in the region. Although these faults are geologically old and are contained in a passive margin, they act as pre-existing planes of weakness and concentrated strain. When a strain exceeds the strength of the ancient fault, it ruptures causing an earthquake (Lehigh Earth Observatory, 2006).

The Lamont-Doherty Cooperative Seismographic Network (LCSN) monitors earthquakes that occur primarily in the northeastern United States. The goal of the project is to compile a complete earthquake catalog for this region, to assess the earthquake hazards, and to study the causes of the earthquakes in the region. The LCSN operates 40 seismographic stations in the following seven states: Connecticut, Delaware, Maryland, New Jersey, New York, Pennsylvania, and Vermont. There are no seismic stations in Montgomery County; however, there are two within the vicinity of the County. The network of stations is composed of broadband and short-period seismographic stations (LCSN 2012).

In addition to the Lamont-Doherty Seismic Stations, the USGS operates a global network of seismic stations to monitor seismic activity. While no seismic stations are located in New York State, nearby stations are positioned in State College, Pennsylvania and Oak Ridge, Massachusetts.

Figure 5.4.2-8 illustrates historic earthquake epicenters across eastern New York State between 1950 and 2015. There have been multiple earthquakes originating outside New York's borders that have been felt within the State. These quakes have come from Quebec, Canada and Massachusetts. According to the NYS HMP, such events are considered significant for hazard mitigation planning because they could produce damage within the State in certain situations. The figure shows that Montgomery County has had two earthquakes with their epicenter in the County.

Figure 5.4.2-8. Earthquake Epicenters in Eastern New York State, 1950 to 2015



Source: USGS 2015
Note: Montgomery County is outlined.

There are three general regions in New York State that have a higher seismic risk compared to other parts of the State. These regions are: 1) the north and northeast third of the State, which includes the North Country/Adirondack region and a portion of the greater Albany-Saratoga region; 2) the southeast corner, which includes the greater New York City area and western Long Island; and 3) the northwest corner, which includes Buffalo and its surrounding area. Overall, these three regions are the most seismically active areas of the State, with the north-northeast portion having the higher seismic risk and the northwest corner of the State has the lower seismic risk (NYS DHSES, 2013).

Previous Occurrences and Losses

Many sources provided historical information regarding previous occurrences and losses associated with earthquakes throughout New York and Montgomery County. Therefore, with so many sources reviewed for the purpose of this HMP, loss and impact information for many events could vary depending on the sources. According to the New York State 2014 HMP update, between 1973 and 2012, 189 earthquakes were epicentered in New York State. Of those 189 earthquakes, none was reported in Montgomery County.

Between 1954 and 2015, New York State was included in one earthquake-related major disaster (DR) or emergency (EM) declaration. Generally, these disasters cover a wide region of the State; therefore, they may have impacted many counties. However, not all counties were included in the disaster declaration. Montgomery County was not included in any DRs or EMs (FEMA, 2013).

Table 5.4.2-6. Earthquake Events Impacted Montgomery County, 2007 to 2015

Event Date / Name	Location	Size / General Magnitude	Losses / Impacts	Source(s)
Earthquake August 23, 2014	Fonda, NY	1.8	No damages and/or impacts within the County were identified.	USGS

Source: USGS 2015

Earthquakes in Montgomery County are not common, with documented information on earthquake events and their location is being relatively scarce. According to County officials, there is no record of earthquake occurrences within the County. However, depending on magnitude, the impacts of earthquake events can be far-reaching; therefore, reported incidences within the surrounding counties or states could have created indirect impacts upon the County. The following events described below may or may not have created indirect impacts upon Montgomery County.

Probability of Future Events

Earthquake hazard maps illustrate the distribution of earthquake shaking levels that have a certain probability of occurring over a given time period. Figure 5.4.X-1 illustrates that Montgomery County has a PGA of 3-5% of gravity for earthquakes with a 10% probability of occurring within 50 years. Moderate shaking and very light damage is generally associated with a 3-4%g earthquake.

The NYSDPC indicates that the earthquake hazard in New York State is often understated because other natural hazards occur more frequently (for example: hurricanes, tornadoes and flooding) and are much more visible. However, the potential for earthquakes does exists across the entire northeastern U.S. (NYSDPC, 2008), and New York State is no exception.

Earlier in this section (Section 5.3), the identified hazards of concern for Montgomery County were ranked. NYSEMO conducts a similar ranking process for hazards that affect the State. The probability of occurrence, or likelihood of the event, is one parameter used for ranking hazards. Based on historical records and input from the Planning Committee, the probability of occurrence for earthquakes in Montgomery County is considered "occassional" (hazard event is likely to occur within 100 years, as presented in Table 5.3-4). Although no reported incidences have occurred within the County, it is anticipated that Montgomery County and all of its jurisdictions, will continue to experience indirect impacts from earthquakes that may affect the general building stock, local economy and may induce secondary hazards such ignite fires and cause utility failure.

Climate Change

The impacts of global climate change on earthquake probability are unknown. Some scientists say that melting glaciers could induce tectonic activity. As ice melts and water runs off, tremendous amounts of weight are shifted on the earth's crust. As newly freed crust returns to its original, pre-glacier shape, it could cause seismic plates to slip and stimulate volcanic activity according to research into prehistoric earthquakes and volcanic activity. NASA and USGS scientists found that retreating glaciers in southern Alaska may be opening the way for future earthquakes (NASA, 2004).

Secondary impacts of earthquakes could be magnified by climate change. Soils saturated by repetitive storms could experience liquefaction during seismic activity due to the increased saturation. Dams storing increased volumes of water due to changes in the hydrograph could fail during seismic events. There are currently no models available to estimate these impacts.

5.4.2.2 Vulnerability Assessment

To understand risk, a community must evaluate what assets are exposed or vulnerable in the identified hazard area. For the earthquake hazard, the entire County has been identified as the exposed hazard area. Therefore, all assets in Montgomery County (population, structures, critical facilities and lifelines), as described in the County Profile (Section 4), are vulnerable. The following section includes an evaluation and estimation of the potential impact of the earthquake hazard on Montgomery County including the following:

- Overview of vulnerability
- Data and methodology used for the evaluation
- Impact on: (1) life, safety and health of County residents, (2) general building stock, (3) critical facilities, (4) economy and (5) future growth and development
- Change in vulnerability since the 2009 Montgomery County Hazard Mitigation Plan
- Further data collections that will assist understanding of this hazard over time
- Overall vulnerability conclusion

Overview of Vulnerability

Earthquakes usually occur without warning and can impact areas a great distance from their point of origin. The extent of damage depends on the density of population and building and infrastructure construction in the area shaken by the quake. Some areas may be more vulnerable than others based on soil type, the age of the buildings and building codes in place. Compounding the potential for damage – historically, Building Officials Code Administration (BOCA) used in the Northeast were developed to address local concerns including heavy snow loads and wind; seismic requirements for design criteria are not as stringent compared to the west coast's reliance on the more seismically-focused Uniform Building Code). As such, a smaller earthquake in the Northeast can cause more structural damage than if it occurred out west.

The entire population and general building stock inventory of the County is at risk of being damaged or experiencing losses due to impacts of an earthquake. Potential losses associated with the earth shaking were calculated for Montgomery County for three probabilistic earthquake events, the 100-year, 500- and 2,500-year mean return periods (MRP). The impacts on population, existing structures, critical facilities and the economy are presented below, following a summary of the data and methodology used.

Data and Methodology

After reviewing the historic data, a probabilistic assessment was conducted for the 100-, 500- and 2,500-year mean return periods (MRP) through a Level 1 analysis in HAZUS-MH MR3 to analyze the earthquake hazard and provide a range of loss estimates for Montgomery County. The probabilistic method uses information from historic earthquakes and inferred faults, locations and magnitudes, and computes the probable ground shaking levels that may be experienced during a recurrence period by Census Tract. According to NYCEM, probabilistic estimates are best for urban planning, land use, zoning and seismic building code regulations (NYCEM, 2003). The default assumption is a magnitude 7 earthquake for all return periods.

A 100-year MRP means there is 1% chance that the mapped ground motion levels (PGA) will be exceeded in any given year, or the PGA has a 50-percent chance of occurrence in 50 years. For a 500-year MRP, there is a 0.2% chance the mapped PGA will be exceeded in any given year, or the PGA has a 10-percent chance of occurring in 50 years. For a 2,500-year MRP, there is a 0.04% chance the mapped PGA will be exceeded in any given year (Figure 5.4.2-5 through Figure 5.4.2-7).

As previously discussed, a Level 1 analysis is a basic estimate of earthquake losses based on national databases and using the default data in the model. Default soil data (NEHRP soil class 'D'), demographic and general

building stock data in HAZUS-MH MR3 was used for the earthquake analysis. However, critical facilities (essential facilities, transportation features, utilities and user-defined facilities) were updated and used in place of the HAZUS-MH MR3 defaults. Please note, according to the HAZUS-MH MR3 technical manual, there is considerable uncertainty related to the characteristics of ground motion in the eastern U.S. Therefore, loss estimates may be overestimated.

Data used to assess this hazard include data available in the HAZUS-MH MR3 earthquake model, USGS data, data provided by NYS DHSES, professional knowledge, and information provided by the County's Planning Committee. The results of this assessment are discussed below.

Impact on Life, Health and Safety

Overall, the entire population of 49,708 in Montgomery County, based on the 2000 U.S. Census, is exposed to the earthquake hazard event. The impact of earthquakes on life, health and safety is dependent upon the severity of the event. Risk to public safety and loss of life from an earthquake in Montgomery County is minimal with higher risk occurring in buildings as a result of damage to the structure, or people walking below building ornamentation and chimneys that may be shaken loose and fall as a result of the quake.

Populations considered most vulnerable include the elderly (persons over the age of 65) and individuals living below the Census poverty threshold. These socially vulnerable populations are most susceptible, based on a number of factors including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. Table 5.4.2-7 summarizes the County population over the age of 65 and individuals living below the Census poverty threshold.

Table 5.4.2-7. Vulnerable Population to Earthquake Events in Montgomery County

Population Category	Number of Persons Exposed	Percent of Total County Population (1)
Elderly (Over 65 years of age)	9,537	19.2
Persons living below Census poverty threshold*	4,094	8.2
Elderly (Over 65 years of age) living below Census poverty threshold	869	1.7

Source: U.S. Census 2000
*Notes: * Individuals below poverty level (Census poverty threshold for a 3-person family unit is approximately $15,000)*

Residents may be displaced or require temporary to long-term sheltering due to the event. For the 100-year MRP, HAZUS-MH estimates that zero households will be displaced and zero people will seek temporary shelter. For the 500-year MRP, HAZUS-MH estimates 22 households will be displaced and of these, 16 people will seek temporary shelter. For the 2,500-year MRP, HAZUS-MH estimates 253 households will be displaced due to the earthquake event and of these, 173 people will seek temporary shelter in public shelters. Table 5.4.2-8 summarizes the population HAZUS-MH estimates will be displaced or will require short-term sheltering as a result of 500- and 2,500-year MRP earthquake events by jurisdiction. In HAZUS-MH, estimated sheltering needs are summarized at the Census Tract level; therefore, a total is reported for multiple jurisdictions. The number of people requiring shelter is generally less than the number displaced as some displaced persons use hotels or stay with family or friends following a disaster event.

Table 5.4.2-8. Estimated Sheltering Needs for the 500- and 2,500-year MRP Earthquake Events for Montgomery County

Jurisdiction	500-Year MRP	2,500-Year MRP

	Displaced House-holds	People Requiring Short-Term Shelter	Displaced House-holds	People Requiring Short-Term Shelter
City of Amsterdam	16	11	173	120
Town of Amsterdam Village of Fort Johnson Village of Hagaman	1	1	16	10
Town of Canajoharie Village of Ames Village of Canajoharie	1	1	14	9
Town of Charleston Town of Florida	0	0	5	3
Town of Minden Village of Fort Plain	1	1	14	10
Town of Mohawk Village of Fonda	1	1	9	6
Town of Palatine Village of Nelliston Village of Palatine Bridge	1	0	6	4
Town of Root Town of Glen Village of Fultonville	0	0	6	4
Town of St. Johnsville Village of St. Johnsville	1	1	10	7
Montgomery County (Total)	21	16	253	173

Source: HAZUS-MH MR3, 2007
Note: Calculated on a Census-tract level

HAZUS-MH estimates the number of people that may potentially be injured and/or killed by an earthquake depending upon the time of day the event occurs. There are no injuries or casualties estimated as a result of a 100-year MRP event. For the 500-year event, HAZUS-MH estimates five to six people may incur injuries and seek medical attention and one person may require hospitalization. For the 2,500-year event, HAZUS-MH estimates 45 to 54 people may incur injuries and seek medical attention, 10 to 11 people may require hospitalization and there may be 2 casualties.

Earthquakes can cause secondary hazard events such as fires. No fires are anticipated as a result of a 100-or 500-year MRP event. For the 2,500-year MRP event, the HAZUS-MH model estimates that there will be two (2) ignitions that will burn about 0.02 square miles. The model also estimates that the fires will displace approximately 2 people.

Impact on General Building Stock

After considering the population exposed to the earthquake hazard, the value of general building stock exposed to and damaged by 100-, 500- and 2,500-year MRP earthquake events was evaluated. The entire study area's general building stock is considered at risk and exposed to this hazard. The HAZUS-MH model estimates the value of the exposed building stock and the loss (in terms of damage to the exposed stock). Refer to Table 4-3 in the County Profile (Section 4) for general building stock data replacement value statistics (structure and contents) for each jurisdiction.

According to the New York City Area Consortium for Earthquake Loss Mitigation (NYCEM), where earthquake risks and mitigation were evaluated in the New York, New Jersey and Connecticut region, most damage and loss caused by an earthquake is directly or indirectly the result of ground shaking (NYCEM, 2003). NYCEM indicates there is a strong correlation between PGA and the damage a building might

experience. The HAZUS-MH M3 model is based on the best available earthquake science and aligns with these statements. HAZUS-MH MR3 methodology and model were used to analyze the earthquake hazard for the general building stock for Montgomery County. Figure 5.4.2-5 through Figure 5.4.2-7 earlier in this profile illustrates the geographic distribution of PGA (g) across Montgomery County for 100-, 500- and 2,500-year MRP events at the Census-Tract level.

According to NYCEM, a building's construction determines how well it can withstand the force of an earthquake. The NYCEM report indicates that un-reinforced masonry buildings are most at risk during an earthquake because the walls are prone to collapse outward, whereas steel and wood buildings absorb more of the earthquake's energy. Additional attributes that contribute to a building's capability to withstand an earthquake's force include its age, number of stories and quality of construction. HAZUS-MH considers building contruction and the age of buildings as part of the analysis. Because the default general building stock was used for this Level 1 HAZUS-MH analysis, the default building ages and building types already incorporated into the inventory were used.

Potential building damage was evaluated by HAZUS-MH MR3 across the following damage categories (none, slight, moderate, extensive and complete). Table 5.4.2-9 provides definitions of these five categories of damage for a light wood-framed building; definitions for other building types are included in HAZUS-MH technical manual documentation. General building stock damage for these damage categories by occupancy class and building type on a County-wide basis is summarized for the 100-, 500- and 2,500-year events in Table 5.4.2-10 through Table 5.4.2-12.

Table 5.4.2-9. Example of Structural Damage State Definitions for a Light Wood-Framed Building

Damage Category	Description
Slight	Small plaster or gypsum-board cracks at corners of door and window openings and wall-ceiling intersections; small cracks in masonry chimneys and masonry veneer.
Moderate	Large plaster or gypsum-board cracks at corners of door and window openings; small diagonal cracks across shear wall panels exhibited by small cracks in stucco and gypsum wall panels; large cracks in brick chimneys; toppling of tall masonry chimneys.
Extensive	Large diagonal cracks across shear wall panels or large cracks at plywood joints; permanent lateral movement of floors and roof; toppling of most brick chimneys; cracks in foundations; splitting of wood sill plates and/or slippage of structure over foundations; partial collapse of room-over-garage or other soft-story configurations.
Complete	Structure may have large permanent lateral displacement, may collapse, or be in imminent danger of collapse due to cripple wall failure or the failure of the lateral load resisting system; some structures may slip and fall off the foundations; large foundation cracks.

Source: HAZUS-MH MR3 Technical Manual

HAZUS-MH estimates minimal damage to Montgomery County's general building stock as a result of a 100-year MRP event. Table 5.4.2-10 and Table 5.4.2-11 summarizes the damage estimated for the 500- and 2,500-year MRP earthquake events (rounded to the nearest thousand dollars) by Census tract. Damage loss estimates include structural and non-structural damage to the building and loss of contents.

Table 5.4.2-10. Estimated Number of Buildings Damaged by General Occupancy for 100-year, 500-year and 2,500-year MRP Earthquake Events

	Average Damage State														
	100-Year MRP					500-Year MRP					2,500-Year MRP				
Category	None	Slight	Moderate	Extensive	Complete	None	Slight	Moderate	Extensive	Complete	None	Slight	Moderate	Extensive	Complete
Residential (Single and Multi-Family Dwellings)	20,946	62	16	1	0	19,680	937	364	41	4	14,262	4,016	2,163	513	72
Commercial	1,038	5	1	0	0	941	69	30	5	0	516	237	216	66	10
Industrial	317	1	0	0	0	287	21	9	1	0	155	68	70	23	3
Education, Government, Religious and Agricultural	352	1	0	0	0	320	22	10	1	0	186	80	65	19	3
TOTAL	22,653	70	17	1	0	21,228	1,049	413	48	4	15,119	4,401	2,513	621	89

Source: HAZUS-MH MR3, 2007

Table 5.4.2-11. Estimated Number of Buildings Damaged by Building Type for 100-year, 500-year and 2,500-year MRP Earthquake Events

	Average Damage State														
	100-Year MRP					500-Year MRP					2,500-Year MRP				
Category	None	Slight	Moderate	Extensive	Complete	None	Slight	Moderate	Extensive	Complete	None	Slight	Moderate	Extensive	Complete
Wood	14,704	12	1	0	0	14,405	279	32	2	0	11,334	2,648	676	56	3
Steel	940	3	1	0	0	857	59	25	2	0	448	189	228	68	11
Concrete	544	2	0	0	0	489	39	17	2	0	234	114	144	50	6
Reinforced Masonry	704	3	1	0	0	653	32	19	3	0	410	106	135	56	2
Un-reinforced Masonry	3,425	35	11	1	0	2,911	351	173	34	4	1,844	768	603	209	50
Mobile Homes	2,335	14	3	0	0	1,912	287	147	6	0	850	576	728	181	17
TOTAL	22,653	70	17	1	0	22,228	1,048	413	48	4	15,119	4,401	2,513	620	89

Source: HAZUS-MH MR3, 2007

Table 5.4.2-12. Estimated Building Value (Building and Contents) Damaged by Jurisdiction for the 500- and 2,500-Year MRP Earthquake Events

Jurisdiction	Estimated Total Damage *		Percent of Total Building and Contents RV		Estimated Residential Damage		Estimated Commercial Damage		Estimated Industrial Damage	
	500 Yr	2,500 Yr	500 Yr	2,500 Yr	500 Yr	2,500 Yr	500 Yr	2,500 Yr	500 Yr	2,500 Yr
City of Amsterdam	$3,970,448	$56,491,883	0.17	2.38	$1,999,427	$33,695,062	$1,118,639	$13,094,227	$638,554	$7,204,261
Town of Amsterdam Village of Fort Johnson Village of Hagaman	$1,025,593	$15,325,877	0.14	2.14	$642,649	$10,865,340	$203,902	$2,401,418	$114,237	$1,283,325
Town of Canajoharie Village of Ames Village of Canajoharie	$931,708	$9,175,810	0.21	2.09	$518,053	$4,765,272	$141,716	$1,505,578	$151,613	$1,643,581
Town of Charleston Town of Florida	$1,556,053	$15,909,134	0.23	2.36	$651,329	$5,875,267	$658,966	$7,302,117	$99,669	$1,107,460
Town of Minden Village of Fort Plain	$747,230	$7,209,302	0.21	2.02	$512,940	$4,701,434	$136,668	$1,469,658	$31,370	$344,370
Town of Mohawk Village of Fonda	$1,153,887	$11,415,783	0.25	2.51	$572,492	$5,186,646	$90,556	$961,416	$258,439	$2,801,891
Town of Palatine Village of Nelliston Village of Palatine Bridge	$560,309	$5,418,962	0.23	2.26	$380,865	$3,507,496	$121,775	$1,295,370	$26,010	$278,932
Town of Root Town of Glen Village of Fultonville	$863,504	$8,272,932	0.23	2.20	$584,957	$5,300,906	$151,510	$1,610,462	$71,950	$780,490
Town of St. Johnsville Village of St. Johnsville	$680,826	$6,586,426	0.23	2.25	$429,180	$3,942,934	$112,741	$1,180,771	$105,294	$1,112,836
Montogmery County (Total)	$11,489,558	$135,806,109	0.19	2.29	$6,291,890	$77,840,356	$2,736,472	$30,821,017	$1,497,135	$16,557,145

Source: HAZUS-MH MR3, 2007

Notes: All values are rounded to the nearest thousand. RV = Replacement Value.

** = Total is sum of damages of all occupancy classes (residential, commercial, industrial, agricultural, educational, religious and government).*

It is estimated that there would be nearly $11.5 million in building damages during a 500-year earthquake event. This includes structural damage, non-structural damage and loss of contents, representing approximately 0.19 percent of the total replacement value for general building stock in Montgomery County. For a 2,500-year MRP earthquake event, the estimated total building damage is nearly than $136 million or greater than 2 percent of the total general building stock replacement value. Residential buildings account for most of the damage for earthquake events. This is likely because they comprise the majority of the building inventory.

Impact on Critical Facilities

After considering the general building stock exposed to, and damaged by, 100-, 500- and 2,500-year MRP earthquake events, critical facilities were evaluated. All critical facilities (essential facilities, transportation systems, lifeline utility systems, high-potential loss facilities and user-defined facilities) in Montgomery County are considered exposed and vulnerable to the earthquake hazard. Refer to subsection "Critical Facilities" in Section 4 (County Profile) of this Plan for a complete inventory of critical facilities in the County.

HAZUS-MH estimates the probability that critical facilities may sustain damage as a result of 100-, 500- and 2,500-year MRP earthquake events. Additionally, HAZUS-MH estimates percent functionality for each facility days after the event. For the 100-Year MRP event, HAZUS-MH estimates it is greater than 95% probable that emergency facilities (police, fire, EMS and medical facilities), schools and specific facilities identified by Montgomery County as critical (i.e., user-defined facilities such as senior centers, shelters, municipal buildings and Departments of Public Works) will not experience any structural damage. These facilities are estimated to be nearly 100% functional on day one of the 100-year MRP earthquake event. Therefore, the impact to critical facilities is not significant for the 100-year event.

Table 5.4.2-13 and Table 5.4.2-14 list the probability of critical facilities sustaining the damage category as defined by the column heading and percent functionality after the event for the 500-year and 2,500-year MRP earthquake events.

Table 5.4.2-13. Estimated Damage and Loss of Functionality for Critical Facilities in Montgomery County for the 500-Year MRP Earthquake Event

500-year MRP Event									
			Percent Probability of Sustaining Damage					Percent Functionality	
Name	Town	Type	None	Slight	Moderate	Extensive	Complete	Day 1	Day 7
Amsterdam Public Safety	City of Amsterdam	EOC	89.4	7.3	2.9	0.4	0	89.3	96.5
Amsterdam Fire Dept	City of Amsterdam	Fire	89.4	7.3	2.9	0.4	0	89.3	96.5
Fort Johnson Fire CO	City of Amsterdam	Fire	89.4	7.3	2.9	0.4	0	89.3	96.5
St. Mayr's Hospital	City of Amsterdam	Medical	80.8	11.7	6.1	1.3	0.2	80.7	92.1
Amsterdam Police Dept	City of Amsterdam	Police	80.8	11.7	6.1	1.3	0.2	80.7	92.1
Montessori School of Amsterdam	City of Amsterdam	School	89.4	7.3	2.9	0.4	0	89.3	96.5
St Stanislaus School	City of Amsterdam	School	89.4	7.3	2.9	0.4	0	89.3	96.5
St Mary's Institute	City of Amsterdam	School	89.4	7.3	2.9	0.4	0	89.3	96.5
Clara S. Bacon School	City of Amsterdam	School	89.4	7.3	2.9	0.4	0	89.3	96.5
Lynch MS	City of Amsterdam	School	89.4	7.3	2.9	0.4	0	89.3	96.5
Marie Curie ES	City of Amsterdam	School	89.4	7.3	2.9	0.4	0	89.3	96.5
Raphael J. McNulty ES	City of Amsterdam	School	89.4	7.3	2.9	0.4	0	89.3	96.5
William Barkley School	City of Amsterdam	School	89.4	7.3	2.9	0.4	0	89.3	96.5
Centro Civico of Amsterdam, Inc.	City of Amsterdam	Shelter	89.4	7.3	2.9	0.4	0	89.3	96.6
Our Lady of Mount Carmel	City of Amsterdam	Shelter	89.4	7.3	2.9	0.4	0	89.3	96.6
St. Luke's Lutheran Church	City of Amsterdam	Shelter	89.4	7.3	2.9	0.4	0	89.3	96.6
St. Stanislaus Church	City of Amsterdam	Shelter	89.4	7.3	2.9	0.4	0	89.3	96.6
Cranesville Fire Dept	Town of Amsterdam	Fire	89.3	7.3	2.9	0.4	0	89.3	96.4
Amsterdam Memorial Hospital	Town of Amsterdam	Medical	80.8	11.7	6.1	1.3	0.2	80.7	92.1
William B. Tecler ES	Town of Amsterdam	School	89.4	7.3	2.9	0.4	0	89.3	96.5
Amsterdam HS	Town of Amsterdam	School	89.4	7.3	2.9	0.4	0	89.3	96.5
Amsterdam HS	Town of Amsterdam	Shelter	89.4	7.3	2.9	0.4	0	89.3	96.6
Burtonville Fire Dept	Town of Charleston	Fire	90	6.9	2.7	0.4	0	90	96.7
Esperance Fire Dept	Town of Charleston	Fire	90	6.9	2.7	0.4	0	90	96.7
No Name	Town of Florida	Fire	89.4	7.3	2.9	0.4	0	89.3	96.5
No Name	Town of Florida	Fire	89.5	7.2	2.8	0.4	0	89.5	96.5
No Name	Town of Florida	Fire	89.3	7.3	2.9	0.4	0	89.3	96.4
Florida Dept of Public Works	Town of Florida	User-Defined	89.4	7.3	2.9	0.4	0	89.3	96.6
Glen Volunteer Fire Dept	Town of Glen	Fire	89.5	7.2	2.8	0.4	0	89.5	96.5

500-year MRP Event									
			Percent Probability of Sustaining Damage					Percent Functionality	
Name	Town	Type	None	Slight	Moderate	Extensive	Complete	Day 1	Day 7
Charleston Volunteer Fire Dept	Town of Glen	Fire	89.7	7.1	2.8	0.4	0	89.6	96.6
Montgomery County Sheriff	Town of Glen	Police	80.9	11.6	6	1.3	0.2	80.9	92.2
South Minden Fire Dept	Town of Minden	Fire	90.3	6.8	2.6	0.4	0	90.2	96.8
Stone Arabia Amish Parochial School	Town of Minden	School	90.3	6.8	2.6	0.4	0	90.2	96.8
Victory Christian Academy	Town of Minden	School	89.8	7.1	2.7	0.4	0	89.7	96.6
Town Of Mohawk Fire District	Town of Mohawk	Fire	89.7	7.1	2.8	0.4	0	89.6	96.6
Fonda-Fultonville K-4 School	Town of Mohawk	School	89.7	7.1	2.8	0.4	0	89.6	96.6
Fonda-Fultonville 5-8 School	Town of Mohawk	School	89.7	7.1	2.8	0.4	0	89.6	96.6
Fonda-Fultonville SHS	Town of Mohawk	School	89.7	7.1	2.8	0.4	0	89.6	96.6
Tribes Hill Presbyterian Chuch	Town of Mohawk	Shelter	89.5	7.2	2.8	0.4	0	89.5	96.6
No Name- Cell Phone Tower 2	Town of Mohawk	User-Defined	89.5	7.2	2.8	0.4	0	89.5	96.6
Fonda Fultonville School	Town of Mohawk	User-Defined	89.7	7.1	2.8	0.4	0	89.6	96.7
No Name- Cell Phone Tower 1	Town of Mohawk	User-Defined	89.5	7.2	2.8	0.4	0	89.5	96.6
Ephratah Volunteer Fire Dept	Town of Palatine	Fire	89.6	7.2	2.8	0.4	0	89.5	96.5
Amish School No 4	Town of Palatine	School	89.6	7.2	2.8	0.4	0	89.5	96.5
Amish School No 3	Town of Palatine	School	90	6.9	2.7	0.4	0	90	96.7
Amish School No 2	Town of Palatine	School	89.6	7.2	2.8	0.4	0	89.5	96.5
Amish School No 1	Town of Palatine	School	89.8	7	2.7	0.4	0	89.8	96.6
Fire Dept Rural Grove #2	Town of Root	Fire	89.7	7.1	2.8	0.4	0	89.6	96.6
Fire Dept Rural Grove #1	Town of Root	Fire	90.1	6.8	2.6	0.4	0	90.1	96.8
Faith Bible Academy	Town of Root	School	90.3	6.7	2.6	0.4	0	90.3	96.8
Root Town Hall	Town of Root	User-Defined	90.3	6.7	2.6	0.4	0	90.3	97
Root Highway Garage	Town of Root	User-Defined	90.3	6.7	2.6	0.4	0	90.3	97
Ames Fire Dept	Village of Ames	Fire	90	6.9	2.7	0.4	0	90	96.7
Firemen Club Rooms	Village of Canajoharie	Fire	90	6.9	2.7	0.4	0	90	96.7
Canajoharie Police Dept	Village of Canajoharie	Police	81.6	11.3	5.8	1.2	0.2	81.6	92.5
Canajoharie SHS	Village of Canajoharie	School	90	6.9	2.7	0.4	0	90	96.7
East Hill School	Village of Canajoharie	School	90	6.9	2.7	0.4	0	90	96.7
Canajoharie MS	Village of Canajoharie	School	90	6.9	2.7	0.4	0	90	96.7
West Hill ES	Village of Canajoharie	School	90	6.9	2.7	0.4	0	90	96.7
St. Jn & St. Mk Lutheran Church	Village of Canajoharie	Shelter	90	6.9	2.7	0.4	0	90	96.8

500-year MRP Event									
			Percent Probability of Sustaining Damage					Percent Functionality	
Name	Town	Type	None	Slight	Moderate	Extensive	Complete	Day 1	Day 7
East Hill School	Village of Canajoharie	Shelter	90	6.9	2.7	0.4	0	90	96.8
Canajoharie Senior High School	Village of Canajoharie	Shelter	90	6.9	2.7	0.4	0	90	96.8
Arkell Hall	Village of Canajoharie	User-Defined	90	6.9	2.7	0.4	0	90	96.8
Montgomery County Building	Village of Fonda	EOC	89.7	7.1	2.8	0.4	0	89.6	96.6
Fort Johnson Fire CO	Village of Fort Johnson	Fire	89.4	7.3	2.9	0.4	0	89.3	96.5
Fort Plain Police Hdqrs	Village of Fort Plain	Police	81.6	11.3	5.8	1.2	0.2	81.6	92.5
Harry Hoag School	Village of Fort Plain	School	90	6.9	2.7	0.4	0	90	96.7
Fort Plain HS	Village of Fort Plain	School	90	6.9	2.7	0.4	0	90	96.7
Harry Hoag ES	Village of Fort Plain	Shelter	90	6.9	2.7	0.4	0	90	96.8
Fultonville Reformed Chruch	Village of Fultonville	Shelter	89.7	7.1	2.8	0.4	0	89.6	96.7
Hagaman Volunteer Fire Dept	Village of Hagaman	Fire	89.4	7.3	2.9	0.4	0	89.3	96.5
Palatine Village Apartments	Village of Palatine Bridge	User-Defined	90	6.9	2.7	0.4	0	90	96.8
Palatine Limited Partnership	Village of Palatine Bridge	User-Defined	90	6.9	2.7	0.4	0	90	96.8
Main Street Fire Dept	Village of St. Johnsville	Fire	89.8	7.1	2.7	0.4	0	89.7	96.6
St Johnsville Police Dept	Village of St. Johnsville	Police	81.3	11.4	5.9	1.2	0.2	81.2	92.4
David H. Robbins ES	Village of St. Johnsville	School	89.8	7.1	2.7	0.4	0	89.7	96.6
St Johnsville JSHS	Village of St. Johnsville	School	89.8	7.1	2.7	0.4	0	89.7	96.6
House of Bread-Seeker's Fellowship	Village of St. Johnsville	Shelter	89.8	7.1	2.7	0.4	0	89.7	96.8
St Johnsville Nursing Home	Village of St. Johnsville	User-Defined	89.8	7.1	2.7	0.4	0	89.7	96.8

Source: HAZUS-MH MR3
Notes:
User Defined = The Planning Committee identified additional facilities as critical including municipal buildings and Department of Public Works facilities.

Table 5.4.2-14. Estimated Damage and Loss of Functionality for Critical Facilities in Montgomery County for the 2,500-Year MRP Earthquake Event

2,500-year MRP Event										
			Percent Probability of Sustaining Damage					Percent Functionality		
Name	Town	Type	None	Slight	Moderate	Extensive	Complete	Day 1	Day 14	Day 30
Amsterdam Public Safety	City of Amsterdam	EOC	59.2	21.6	14.6	4	0.7	59.2	80.8	95.3
Fort Johnson Fire CO	City of Amsterdam	Fire	59.2	21.6	14.6	4	0.7	59.2	80.8	95.3
Amsterdam Fire Dept	City of Amsterdam	Fire	59.2	21.6	14.6	4	0.7	59.2	80.8	95.3
St. Mary's Hospital	City of Amsterdam	Medical	49.1	22.6	19.1	7.3	1.9	49.1	71.7	90.8
Amsterdam Police Dept	City of Amsterdam	Police	49.1	22.6	19.1	7.3	1.9	49.1	71.7	90.8
St Mary's Institute	City of Amsterdam	School	59.2	21.6	14.6	4	0.7	59.2	80.8	95.3
St Stanislaus School	City of Amsterdam	School	59.2	21.6	14.6	4	0.7	59.2	80.8	95.3
Marie Curie ES	City of Amsterdam	School	59.2	21.6	14.6	4	0.7	59.2	80.8	95.3
Lynch MS	City of Amsterdam	School	59.2	21.6	14.6	4	0.7	59.2	80.8	95.3
Montessori School of Amsterdam	City of Amsterdam	School	59.2	21.6	14.6	4	0.7	59.2	80.8	95.3
William Barkley School	City of Amsterdam	School	59.2	21.6	14.6	4	0.7	59.2	80.8	95.3
Raphael J. McNulty ES	City of Amsterdam	School	59.2	21.6	14.6	4	0.7	59.2	80.8	95.3
Clara S. Bacon School	City of Amsterdam	School	59.2	21.6	14.6	4	0.7	59.2	80.8	95.3
St. Luke's Lutheran Church	City of Amsterdam	Shelter	59.2	21.6	14.6	4	0.7	59.2	80.8	95.3
Our Lady of Mount Carmel	City of Amsterdam	Shelter	59.2	21.6	14.6	4	0.7	59.2	80.8	95.3
Centro Civico of Amsterdam, Inc.	City of Amsterdam	Shelter	59.2	21.6	14.6	4	0.7	59.2	80.8	95.3
St. Stanislaus Church	City of Amsterdam	Shelter	59.2	21.6	14.6	4	0.7	59.2	80.8	95.3
Cranesville Fire Dept	Town of Amsterdam	Fire	59.1	21.6	14.6	4	0.7	59.1	80.7	95.3
Amsterdam Memorial Hospital	Town of Amsterdam	Medical	49.1	22.6	19.1	7.3	1.9	49.1	71.7	90.8
Amsterdam HS	Town of Amsterdam	School	59.2	21.6	14.6	4	0.7	59.2	80.8	95.3
William B. Tecler ES	Town of Amsterdam	School	59.2	21.6	14.6	4	0.7	59.2	80.8	95.3
Amsterdam HS	Town of Amsterdam	Shelter	59.2	21.6	14.6	4	0.7	59.2	80.8	95.3
Burtonville Fire Dept	Town of Charleston	Fire	60.4	21.2	14	3.8	0.6	60.4	81.6	95.6
Esperance Fire Dept	Town of Charleston	Fire	60.4	21.2	14	3.8	0.6	60.4	81.6	95.6
No Name	Town of Florida	Fire	59.2	21.6	14.6	4	0.7	59.2	80.8	95.3
No Name	Town of Florida	Fire	59.6	21.5	14.4	3.9	0.7	59.5	81	95.4
No Name	Town of Florida	Fire	59.1	21.6	14.6	4	0.7	59.1	80.7	95.3
Florida Dept of Public Works	Town of Florida	User-Defined	59.2	21.6	14.6	4	0.7	59.2	80.8	95.3

2,500-year MRP Event										
			Percent Probability of Sustaining Damage					Percent Functionality		
Name	Town	Type	None	Slight	Moderate	Extensive	Complete	Day 1	Day 14	Day 30
Glen Volunteer Fire Dept	Town of Glen	Fire	59.6	21.5	14.4	3.9	0.7	59.5	81	95.4
Charleston Volunteer Fire Dept	Town of Glen	Fire	59.9	21.4	14.3	3.9	0.6	59.8	81.2	95.5
Montgomery County Sheriff	Town of Glen	Police	49.5	22.5	18.9	7.1	1.9	49.5	72	90.9
South Minden Fire Dept	Town of Minden	Fire	61.3	20.9	13.7	3.6	0.6	61.2	82.1	95.8
Stone Arabia Amish Parochial School	Town of Minden	School	61.3	20.9	13.7	3.6	0.6	61.2	82.1	95.8
Victory Christian Academy	Town of Minden	School	60.4	21.2	14	3.8	0.6	60.4	81.6	95.6
Town Of Mohawk Fire District	Town of Mohawk	Fire	59.9	21.4	14.3	3.9	0.6	59.8	81.2	95.5
Fonda-Fultonville SHS	Town of Mohawk	School	59.9	21.4	14.3	3.9	0.6	59.8	81.2	95.5
Fonda-Fultonville 5-8 School	Town of Mohawk	School	59.9	21.4	14.3	3.9	0.6	59.8	81.2	95.5
Fonda-Fultonville K-4 School	Town of Mohawk	School	59.9	21.4	14.3	3.9	0.6	59.8	81.2	95.5
Tribes Hill Presbyterian Chuch	Town of Mohawk	Shelter	59.6	21.5	14.4	3.9	0.7	59.5	81	95.4
No Name- Cell Phone Tower 1	Town of Mohawk	User-Defined	59.6	21.5	14.4	3.9	0.7	59.5	81	95.4
No Name- Cell Phone Tower 2	Town of Mohawk	User-Defined	59.6	21.5	14.4	3.9	0.7	59.5	81	95.4
Fonda Fultonville School	Town of Mohawk	User-Defined	59.9	21.4	14.3	3.9	0.6	59.8	81.2	95.5
Ephratah Volunteer Fire Dept	Town of Palatine	Fire	59.9	21.3	14.3	3.9	0.6	59.9	81.2	95.5
Amish School No 3	Town of Palatine	School	60.7	21.1	13.9	3.7	0.6	60.7	81.8	95.6
Amish School No 2	Town of Palatine	School	59.9	21.3	14.3	3.9	0.6	59.9	81.2	95.5
Amish School No 4	Town of Palatine	School	59.9	21.3	14.3	3.9	0.6	59.9	81.2	95.5
Amish School No 1	Town of Palatine	School	60.3	21.2	14.1	3.8	0.6	60.3	81.5	95.5
Fire Dept Rural Grove #2	Town of Root	Fire	59.9	21.4	14.3	3.9	0.6	59.8	81.2	95.5
Fire Dept Rural Grove #1	Town of Root	Fire	60.7	21.1	13.9	3.7	0.6	60.7	81.8	95.6
Faith Bible Academy	Town of Root	School	61.2	20.9	13.7	3.6	0.6	61.1	82	95.7
Root Highway Garage	Town of Root	User-Defined	61.2	20.9	13.7	3.6	0.6	61.1	82	95.7
Root Town Hall	Town of Root	User-Defined	61.2	20.9	13.7	3.6	0.6	61.1	82	95.7
Ames Fire Dept	Village of Ames	Fire	60.7	21.1	13.9	3.7	0.6	60.7	81.8	95.6
Firemen Club Rooms	Village of Canajoharie	Fire	60.7	21.1	13.9	3.7	0.6	60.7	81.8	95.6
Canajoharie Police Dept	Village of Canajoharie	Police	51.3	22.2	18.2	6.7	1.7	51.2	73.4	91.6
Canajoharie SHS	Village of Canajoharie	School	60.7	21.1	13.9	3.7	0.6	60.7	81.8	95.6
East Hill School	Village of Canajoharie	School	60.7	21.1	13.9	3.7	0.6	60.7	81.8	95.6
West Hill ES	Village of Canajoharie	School	60.7	21.1	13.9	3.7	0.6	60.7	81.8	95.6
Canajoharie MS	Village of Canajoharie	School	60.7	21.1	13.9	3.7	0.6	60.7	81.8	95.6

2,500-year MRP Event										
			Percent Probability of Sustaining Damage					Percent Functionality		
Name	Town	Type	None	Slight	Moderate	Extensive	Complete	Day 1	Day 14	Day 30
St. Jn & St. Mk Lutheran Church	Village of Canajoharie	Shelter	60.7	21.1	13.9	3.7	0.6	60.7	81.8	95.6
East Hill School	Village of Canajoharie	Shelter	60.7	21.1	13.9	3.7	0.6	60.7	81.8	95.6
Canajoharie Senior High School	Village of Canajoharie	Shelter	60.7	21.1	13.9	3.7	0.6	60.7	81.8	95.6
Arkell Hall	Village of Canajoharie	User-Defined	60.7	21.1	13.9	3.7	0.6	60.7	81.8	95.6
Montgomery County Building	Village of Fonda	EOC	59.9	21.4	14.3	3.9	0.6	59.8	81.2	95.5
Fort Johnson Fire CO	Village of Fort Johnson	Fire	59.2	21.6	14.6	4	0.7	59.2	80.8	95.3
Fort Plain Police Hdqrs	Village of Fort Plain	Police	51.3	22.2	18.2	6.7	1.7	51.2	73.4	91.6
Harry Hoag School	Village of Fort Plain	School	60.7	21.1	13.9	3.7	0.6	60.7	81.8	95.6
Fort Plain HS	Village of Fort Plain	School	60.7	21.1	13.9	3.7	0.6	60.7	81.8	95.6
Harry Hoag ES	Village of Fort Plain	Shelter	60.7	21.1	13.9	3.7	0.6	60.7	81.8	95.6
Fultonville Reformed Chruch	Village of Fultonville	Shelter	59.9	21.4	14.3	3.9	0.6	59.8	81.2	95.5
Hagaman Volunteer Fire Dept	Village of Hagaman	Fire	59.2	21.6	14.6	4	0.7	59.2	80.8	95.3
Palatine Limited Partnership	Village of Palatine Bridge	User-Defined	60.7	21.1	13.9	3.7	0.6	60.7	81.8	95.6
Palatine Village Apartments	Village of Palatine Bridge	User-Defined	60.7	21.1	13.9	3.7	0.6	60.7	81.8	95.6
Main Street Fire Dept	Village of St. Johnsville	Fire	60.4	21.2	14	3.8	0.6	60.4	81.6	95.6
St Johnsville Police Dept	Village of St. Johnsville	Police	50.8	22.3	18.4	6.8	1.7	50.8	73	91.4
St Johnsville JSHS	Village of St. Johnsville	School	60.4	21.2	14	3.8	0.6	60.4	81.6	95.6
David H. Robbins ES	Village of St. Johnsville	School	60.4	21.2	14	3.8	0.6	60.4	81.6	95.6
House of Bread-Seeker's Fellowship	Village of St. Johnsville	Shelter	60.4	21.2	14	3.8	0.6	60.4	81.5	95.6
St Johnsville Nursing Home	Village of St. Johnsville	User-Defined	60.4	21.2	14	3.8	0.6	60.4	81.5	95.6

Source: HAZUS-MH MR3
Notes:
User Defined = The Planning Committee identified additional facilities as critical including municipal buildings and Department of Public Works facilities.

Impact on Economy

Earthquakes also have impacts on the economy, including: loss of business function, damage to inventory, relocation costs, wage loss and rental loss due to the repair/replacement of buildings. A Level 1 HAZUS-MH analysis estimates the total economic loss associated with each earthquake scenario, which includes building- and lifeline-related losses (transportation and utility losses) based on the available inventory [facility (or GIS point) data only]. Direct building losses are the estimated costs to repair or replace the damage caused to the building. This is reported in the "Impact on General Building Stock" section discussed earlier. Lifeline-related losses include the direct repair cost to transportation and utility systems and are reported in terms of the probability of reaching or exceeding a specified level of damage when subjected to a given level of ground motion. These losses are discussed below.

For the 100-year MRP event, in terms of utilities, HAZUS-MH estimates each potable water facility, wastewater facility, electric transfer/substation and communication facility will be fully functional day one of the event. Damage results are not considered to be significant as a result of a 100-year event; therefore, utility loss estimates are not discussed further in this assessment for this MRP.

Table 5.4.2-15 and Table 5.4.2-16 summarize the HAZUS-MH MR3 estimated probability of damage that each utility may sustain (as defined by the column heading) and estimated loss of use in days a result of a 500-year and 2,500-year MRP earthquake event, respectively. Damage categories are related to the damage ratio (defined as ratio of repair to replacement cost) for evaluation of direct economic loss. Refer to the HAZUS-MH MR3 Earthquake Technical Manual for a description of the damage categories for each utility feature.

A Level 1 HAZUS-MH analysis does not compute damage estimates for roadway segments and railroad tracks. However, it is assumed these features will experience damage due to ground failure and regional transportation and distribution of these materials will be interrupted as a result of an earthquake event. Losses to the community that result from damages to lifelines can be much greater than the cost of repair (HAZUS-MH MR3 Earthquake User Manual, 2005).

For the 100-year MRP event, HAZUS-MH estimates all highway and railway bridges in Montgomery County will be fully functional day one of the event. For the 500-year MRP event, HAZUS-MH estimates highway and railway bridges will 99-100% functional day one of the event. For the 2,500-year MRP event, HAZUS-MH estimates highway and railway bridges will be approximately 80-99-percentfunctional day one of the event. HAZUS-MH estimates the rail facility in the City of Amsterdam will be nearly 90-percent functional on day one of a 2,500-year MRP event. Table 5.4.2-17 and Table 5.4.2-18 summarize the estimated damages and functionality of airports in Montgomery County for 500- and 2,500-year MRP events.

Table 5.4.2-15. Estimated Utility Impacts in Montgomery County from the 500-year MRP Earthquake Event

500-year MRP Event									
			Percent Probability of Sustaining Damage					Percent Functionality	
Name	Town	Type	None	Slight	Moderate	Extensive	Complete	Day 1	Day 7
No Name	City of Amsterdam	Electric Facility	96	3.1	0.9	0	0	97.6	99.9
No Name	City of Amsterdam	Electric Facility	96	3.1	0.9	0	0	97.6	99.9
Amsterdam Pump Station 4	City of Amsterdam	WW Facility	96	3.1	0.9	0	0	97.1	99.9
Amsterdam WWTP	City of Amsterdam	WW Facility	96	3.1	0.9	0	0	97.1	99.8
Amsterdam WTP	City of Amsterdam	WW Facility	96	3.1	0.9	0	0	97.1	99.8
Amsterdam Pump Station 1	City of Amsterdam	WW Facility	96	3.1	0.9	0	0	97.1	99.9
Amsterdam Pump Station 3	City of Amsterdam	WW Facility	96	3.1	0.9	0	0	97.1	99.9
Amsterdam Pump Station 2	City of Amsterdam	WW Facility	96	3.1	0.9	0	0	97.1	99.9
WCSS 1490	Town of Amsterdam	Communication	91.6	7.9	0.6	0	0	99.6	99.9
WCAN CH 227	Town of Canajoharie	Communication	93	6.6	0.4	0	0	99.7	99.9
Canajoharie Substation 2	Town of Canajoharie	Electric Facility	96	3.1	0.9	0	0	97.6	99.9
Canajoharie Substation 1	Town of Canajoharie	Electric Facility	96	3.1	0.9	0	0	97.6	99.9
WBUG 1570	Town of Florida	Communication	91.6	7.9	0.6	0	0	99.6	99.9
No Name	Town of Florida	Potable Water Facility	96	3.1	0.9	0	0	97.1	99.8
No Name	Town of Florida	WW Facility	96	3.1	0.9	0	0	97.1	99.9
No Name	Town of Florida	WW Facility	96	3.1	0.9	0	0	97.1	99.9
Fisk Hilkl Road Water Tank	Town of Minden	Potable Water Facility	96	3.1	0.9	0	0	97.1	99.8
Electrical Communication Substation	Town of Mohawk	Electric Facility	95.9	3.1	0.9	0	0	97.5	99.9
WQBJ CH 278	Town of Palatine	Communication	92.6	6.9	0.5	0	0	99.7	99.9
Fort Plain PWF	Town of Palatine	Potable Water Facility	96	3.1	0.9	0	0	98.1	99.9
Canajoharie WTP	Town of Palatine	Potable Water Facility	96	3.1	0.9	0	0	98.1	99.9
St Johnsville Village Well	Town of St. Johnsville	Potable Water Facility	96.3	2.9	0.8	0	0	98.9	99.9
Canajoharie WWTP	Village of Canajoharie	WW Facility	96	3.1	0.9	0	0	97	99.8
Fonda Fultonville WWTP	Village of Fonda	WW Facility	96.2	2.9	0.8	0	0	97.2	99.8
Brant Street Waste Water Pump Station	Village of Fort Johnson	WW Facility	96	3.1	0.9	0	0	97.1	99.9
Ft Johnson Road WW Pump Station	Village of Fort Johnson	WW Facility	96	3.1	0.9	0	0	97.1	99.9
Clyde Street Water Tank	Village of Fort Plain	Potable Water Facility	96	3.1	0.9	0	0	97.1	99.8
Rouse Street Sewer Pump Station	Village of Fort Plain	WW Facility	96	3.1	0.9	0	0	97.1	99.9
Willett Street Sewer Pump Station	Village of Fort Plain	WW Facility	96	3.1	0.9	0	0	97.1	99.9

500-year MRP Event									
Name	Town	Type	Percent Probability of Sustaining Damage					Percent Functionality	
			None	Slight	Moderate	Extensive	Complete	Day 1	Day 7
Sherriff Substation	Village of Hagaman	Electric Facility	96	3.1	0.9	0	0	97.6	99.9
No Name	Village of Hagaman	WW Facility	96	3.1	0.9	0	0	97.1	99.9
Montgomery CO SD#1 STP	Village of Nelliston	WW Facility	96	3.1	0.9	0	0	97	99.8
Lasselville Pump Station	Village of St. Johnsville	Potable Water Facility	96.3	2.9	0.8	0	0	98.3	99.9
St Johnsville WWTP	Village of St. Johnsville	WW Facility	96.3	2.9	0.8	0	0	97.3	99.8
Private Waste Water Treatment Plant	Village of St. Johnsville	WW Facility	96.3	2.9	0.8	0	0	97.3	99.8

Source: HAZUS-MH MR3
Notes:
WW = Waste Water

Table 5.4.2-16. Estimated Utility Impacts in Montgomery County from the 2,500-year MRP Earthquake Event

2,500-year MRP Event										
			Percent Probability of Sustaining Damage					Percent Functionality		
Name	Town	Type	None	Slight	Moderate	Extensive	Complete	Day 1	Day 14	Day 30
No Name	City of Amsterdam	Electric Facility	64.2	17.6	16	1.8	0.4	74.5	99.6	99.7
No Name	City of Amsterdam	Electric Facility	64.2	17.6	16	1.8	0.4	74.5	99.6	99.7
Amsterdam Pump Station 4	City of Amsterdam	WW Facility	64.2	17.6	16	1.8	0.4	71.5	98.2	99.2
Amsterdam WWTP	City of Amsterdam	WW Facility	64.2	17.6	16	1.8	0.4	72	97.8	98
Amsterdam WTP	City of Amsterdam	WW Facility	64.2	17.6	16	1.8	0.4	72	97.8	98
Amsterdam Pump Station 1	City of Amsterdam	WW Facility	64.2	17.6	16	1.8	0.4	71.5	98.2	99.2
Amsterdam Pump Station 3	City of Amsterdam	WW Facility	64.2	17.6	16	1.8	0.4	71.5	98.2	99.2
Amsterdam Pump Station 2	City of Amsterdam	WW Facility	64.2	17.6	16	1.8	0.4	71.5	98.2	99.2
WCSS 1490	Town of Amsterdam	Communication	34.5	43	19.7	2.6	0.2	87.6	99.4	99.8
WCAN CH 227	Town of Canajoharie	Communication	38.9	42	17	2	0.1	89.4	99.5	99.8
Canajoharie Substation 2	Town of Canajoharie	Electric Facility	65.8	17.2	15.1	1.6	0.3	75.8	99.6	99.8
Canajoharie Substation 1	Town of Canajoharie	Electric Facility	65.8	17.2	15.1	1.6	0.3	75.8	99.6	99.8
WBUG 1570	Town of Florida	Communication	34.5	43	19.7	2.6	0.2	87.6	99.4	99.8
No Name	Town of Florida	Potable Water Facility	64.2	17.6	16	1.8	0.4	73.3	98.1	98.2
No Name	Town of Florida	WW Facility	64.2	17.6	16	1.8	0.4	71.5	98.2	99.2
No Name	Town of Florida	WW Facility	64.2	17.6	16	1.8	0.4	71.5	98.2	99.2
Fisk Hilkl Road Water Tank	Town of Minden	Potable Water Facility	65.8	17.2	15.1	1.6	0.3	74.6	98.3	98.4
Electrical Communication Substation	Town of Mohawk	Electric Facility	65.3	17.3	15.3	1.7	0.4	75.4	99.6	99.8
WQBJ CH 278	Town of Palatine	Communication	37.4	42.4	17.9	2.2	0.2	88.8	99.5	99.8
Fort Plain PWF	Town of Palatine	Potable Water Facility	65.8	17.2	15.1	1.6	0.3	80.2	98.5	98.8
Canajoharie WTP	Town of Palatine	Potable Water Facility	65.8	17.2	15.1	1.6	0.3	80.2	98.5	98.8
St Johnsville Village Well	Town of St. Johnsville	Potable Water Facility	65.2	17.3	15.4	1.7	0.4	85.1	99.1	99.8
Canajoharie WWTP	Village of Canajoharie	WW Facility	65.8	17.2	15.1	1.6	0.3	73.3	98	98.2
Fonda Fultonville WWTP	Village of Fonda	WW Facility	64.9	17.4	15.6	1.7	0.4	72.5	97.9	98.1
Brant Street Waste Water Pump Station	Village of Fort Johnson	WW Facility	64.2	17.6	16	1.8	0.4	71.5	98.2	99.2
Ft Johnson Road WW Pump Station	Village of Fort Johnson	WW Facility	64.2	17.6	16	1.8	0.4	71.5	98.2	99.2
Clyde Street Water Tank	Village of Fort Plain	Potable Water Facility	65.8	17.2	15.1	1.6	0.3	74.6	98.3	98.4
Rouse Street Sewer Pump Station	Village of Fort Plain	WW Facility	65.8	17.2	15.1	1.6	0.3	72.9	98.4	99.2
Willett Street Sewer Pump Station	Village of Fort Plain	WW Facility	65.8	17.2	15.1	1.6	0.3	72.9	98.4	99.2

2,500-year MRP Event										
			Percent Probability of Sustaining Damage					Percent Functionality		
Name	Town	Type	None	Slight	Moderate	Extensive	Complete	Day 1	Day 14	Day 30
Sherriff Substation	Village of Hagaman	Electric Facility	64.2	17.6	16	1.8	0.4	74.5	99.6	99.7
No Name	Village of Hagaman	WW Facility	64.2	17.6	16	1.8	0.4	71.5	98.2	99.2
Montgomery CO SD#1 STP	Village of Nelliston	WW Facility	65.8	17.2	15.1	1.6	0.3	73.3	98	98.2
Lasselville Pump Station	Village of St. Johnsville	Potable Water Facility	65.2	17.3	15.4	1.7	0.4	79.9	98.4	98.7
St Johnsville WWTP	Village of St. Johnsville	WW Facility	65.2	17.3	15.4	1.7	0.4	72.8	98	98.2
Private Waste Water Treatment Plant	Village of St. Johnsville	WW Facility	65.2	17.3	15.4	1.7	0.4	72.8	98	98.2

Source: HAZUS-MH MR3
Notes:
WW = Waste Water

Table 5.4.2-17. Estimated Impacts to Airports in Montgomery County from the 500-year MRP Earthquake Event

500-year MRP Event								
Name	Town	Percent Probability of Sustaining Damage					Percent Functionality	
		None	Slight	Moderate	Extensive	Complete	Day 1	Day 7
Amsterdam Airfield	Town of Amsterdam	73.2	26.4	0.4	0	0	99.7	99.9
C4C	Town of Charleston	75.8	23.8	0.3	0	0	99.7	99.9
Nellis Field	Town of Minden	74.4	25.2	0.4	0	0	99.7	99.9
Di Stefano Airpark	Town of Minden	75.4	24.2	0.4	0	0	99.6	99.9
O'Riley	Town of Minden	74.4	25.2	0.4	0	0	99.6	99.9
Hickory Acres	Town of Minden	76.4	23.2	0.3	0	0	99.7	99.9
Tomcat	Town of Minden	76.4	23.2	0.3	0	0	99.7	99.9
Hiserts Airpark Inc	Town of Palatine	73.4	26.2	0.4	0	0	99.7	99.9
Russell	Town of Root	74.5	25	0.4	0	0	99.7	99.9
Canajoharie	Town of Root	76.6	23	0.3	0	0	99.7	99.9

Source: HAZUS-MH MR3

Table 5.4.2-18. Estimated Impacts to Airports in Montgomery County from the 2,500-year MRP Earthquake Event

2,500-year MRP Event								
Name	Town	Percent Probability of Sustaining Damage					Percent Functionality	
		None	Slight	Moderate	Extensive	Complete	Day 1	Day 7
Amsterdam Airfield	Town of Amsterdam	18.3	67.6	11	2.6	0.4	91.2	97.7
C4C	Town of Charleston	20.3	67.2	9.9	2.2	0.3	92	98
Nellis Field	Town of Minden	20.2	67.2	10	2.3	0.3	91.5	97.8
Di Stefano Airpark	Town of Minden	20.6	67.1	9.8	2.2	0.3	90.9	97.6
O'Riley	Town of Minden	20.2	67.2	10	2.3	0.3	90.4	97.5
Hickory Acres	Town of Minden	21.8	66.7	9.2	2	0.3	91.4	97.8
Tomcat	Town of Minden	21.8	66.7	9.2	2	0.3	91.6	97.9
Hiserts Airpark Inc	Town of Palatine	19.1	67.5	10.6	2.5	0.4	91.4	97.8
Russell	Town of Root	19.7	67.3	10.3	2.4	0.4	92.2	98.1
Canajoharie	Town of Root	21.3	66.9	9.5	2.1	0.3	92.2	98.1

Source: HAZUS-MH MR3

HAZUS-MH also estimates the volume of debris that may be generated as a result of an earthquake event to enable the study region to prepare and rapidly and efficiently manage debris removal and disposal. Debris estimates are divided into two categories: (1) reinforced concrete and steel that require special equipment to break it up before it can be transported, and (2) brick, wood and other debris that can be loaded directly onto trucks with bulldozers (HAZUS-MH Earthquake User's Manual). For the 100-year MRP event, HAZUS-MH estimates approximately 620 tons of debris will be generated (490 tons of brick/wood debris and 130 tons of reinforced concrete/steel debris). For the 500-year MRP event, HAZUS-MH estimates approximately 10,500 tons of debris will be generated (approximately 7,200 tons of brick/wood debris and 3,300 tons of reinforced concrete/steel debris). For the 2,500-year MRP event, HAZUS-MH estimates more than 84,000 tons of debris will be generated (approximately 41,000 tons of brick/wood debris and 43,000 tons reinforced concrete/steel debris).

Future Growth and Development

As discussed in Section 4 and in each community's annex (Volume II, Section 9), areas targeted for future growth and development have been identified across the County. It is anticipated that the human exposure and vulnerability to earthquake impacts in newly developed areas will be similar to those that currently exist within the County. Current building codes require seismic provisions that should render new construction less vulnerable to seismic impacts than older, exisiting construction that may have been built to lower construction standards.

Additional Data and Next Steps

A Level 1 HAZUS-MH earthquake analysis was conducted for Montgomery County using the default model data, with the exception of the updated critical facility inventory which included user-defined data. For future plan updates, a Level 2 HAZUS analysis can be conducted. A Level 2 analysis provides more accurate loss estimates by replacing the national default inventories with more accurate local inventories. Additional data needed to conduct a Level 2 HAZUS-MH analysis would include: (1) local soil type data to replace the default assumption (soil type "D"); (2) updated demographic and building stock data to refine/update the default data for all jurisdictions; and (3) soil liquefaction data. In terms of general building stock data, updated building age, construction type and current replacement value would further support the refined analysis. Additionally, the County and participating jurisdictions can identify un-reinforced masonry critical facilities and privately-owned buildings (i.e., residences) using local knowledge and/or pictometry/orthophotos. These buildings may not withstand earthquakes of certain magnitudes and plans to provide emergency response/recovery efforts for these properties can be set in place.

Overall Vulnerability Assessment

Earthquakes are occasional events in the study area causing impacts and losses mainly to the County's structures and facilities. Existing and future mitigation efforts should continue to be developed and employed that will enable the study area to be prepared for these events when they occur.

5.4.3 Extreme Temperature

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

5.4.3.1 Hazard Profile

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

Description

Extreme temperature includes both heat and cold events, which can have a significant impact to human health, commercial/agricultural businesses and primary and secondary effects on infrastructure (e.g., burst pipes and power failure). What constitutes "extreme cold" or "extreme heat" can vary across different areas of the country, based on what the population is accustomed to.

Extreme Cold

Extreme cold events are when temperatures drop well below normal in an area. In regions relatively unaccustomed to winter weather, near freezing temperatures are considered "extreme cold." Extreme cold temperatures are characterized by the ambient air temperature dropping to approximately 0 degrees Fahrenheit (ºF) or below (National Weather Service [NWS] 2013). Extensive exposure to extreme cold temperatures can cause frostbite or hypothermia and can become life-threatening. Infants and the elderly are most susceptible to the effects of extreme changes in temperatures. Extreme cold also can cause emergencies in susceptible populations, such as those without shelter, those who are stranded, or those who live in a home that is poorly insulated or without heat (such as mobile homes). Infants and the elderly are particularly at risk, but anyone can be affected (Centers of Disease Control and Prevention [CDC] 2009). In New York State, extreme cold days are defined to reflect the State's regional climate variations. Extreme cold days in the State are individual days with minimum temperatures at or below 32° F or 0° F (NYSERDA 2014).

There are several health hazards related to extreme cold temperatures and include wind chill, frostbite, and hypothermia.

- *Wind chill* is not the actual temperature but rather how wind and cold feel on exposed skin. As the wind increases, heat is carried away from the body at an accelerated rate, driving down the body temperature.
- *Frostbite* is damage to body tissue caused by extreme cold. A wind chill of -20°F will cause frostbite in just 30 minutes. Frostbite can cause a loss of feeling and a white or pale appearance in extremities.
- *Hypothermia* is a condition brought on when the body temperature drops to less than 95°F and it can be deadly. Warning signs of hypothermia include uncontrollable shivering, memory loss, disorientation, incoherence, slurred speech, drowsiness and apparent exhaustion.

Extreme Heat

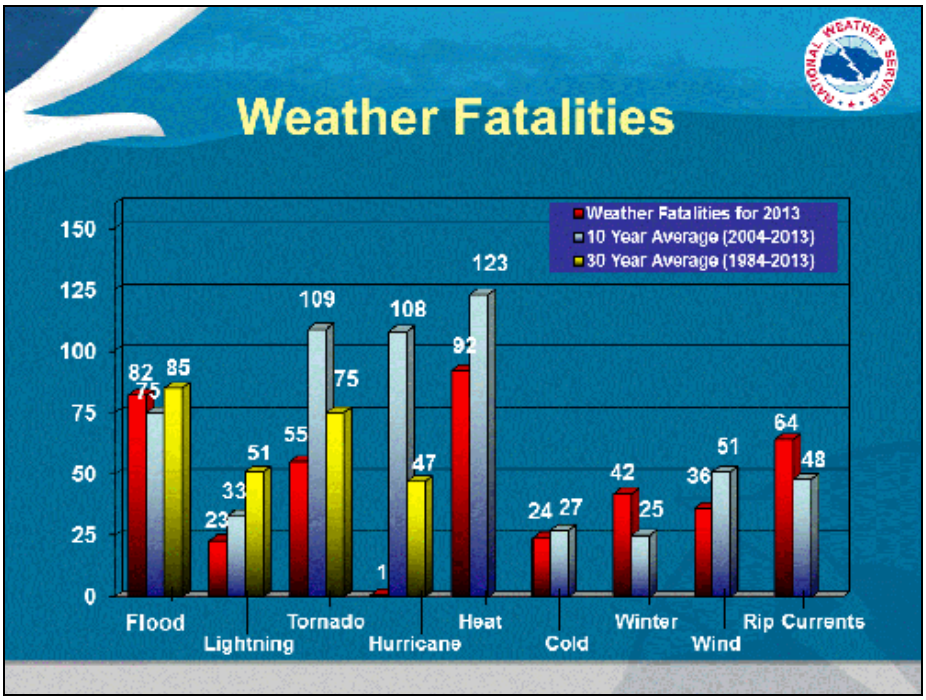
Extreme heat is defined as temperatures which hover 10 degrees or more above the average high temperature for a region and that last for several weeks (CDC 2009). Humid or muggy conditions occur when a 'dome' of high atmospheric pressure traps hazy, damp air near the ground. An extended period of extreme heat of three or more consecutive days is typically called a heat wave and is often accompanied by high humidity (NWS 2013). In New York State, high temperatures and heat waves are defined in several ways to reflect the diversity of conditions experienced across the State. Extreme hot days in New York State are defined as

individual days with maximum temperatures at or above 90° F or at or above 95° F. Heat waves are defined as three consecutive days with maximum temperatures above 90° F (NYSERDA 2014).

Depending on severity, duration and location; extreme heat events can create or provoke secondary hazards including, but not limited to, dust storms, droughts, wildfires, water shortages and power outages (CDC 2009). This could result in a broad and far-reaching set of impacts throughout a local area or entire region. Impacts could include significant loss of life and illness; economic costs in transportation, agriculture, production, energy and infrastructure; and losses of ecosystems, wildlife habitats and water resources (Adams Date Unknown; Meehl and Tebaldi 2004; CDC 2009; NYS DHSES 2014).

Extreme heat is the number one weather-related cause of death in the U.S. On average; more than 120 people die each year from excessive heat. In 2013, New York State reported 10 heat-related fatalities (NWS 2014). Figure 5.4.3-1 shows the number of weather fatalities based on a 10 year average and 30 year average. Heat has the highest average of weather related fatalities between 2004 and 2013.

Figure 5.4.3-1. Average Number of Weather Related Fatalities in the U.S.



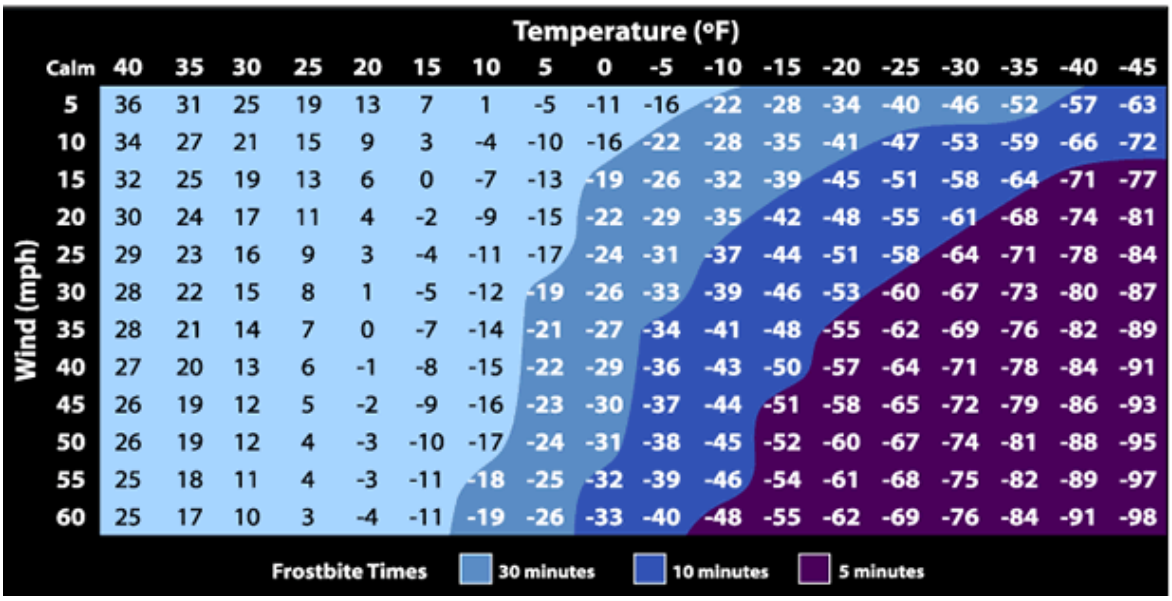
Source: NWS 2014

Extent

Extreme Cold

The extent (severity or magnitude) of extreme cold temperatures are generally measured through the Wind Chill Temperature (WCT) Index. The Index uses advances in science, technology, and computer modeling to provide an accurate, understandable, and useful formula for calculating the dangers from wind chill. For details regarding the WCT, refer to: http://www.nws.noaa.gov/om/winter/windchill.shtml. The WCT is presented in Figure 5.4.3-2.

Figure 5.4.3-2. NWS Wind Chill Index

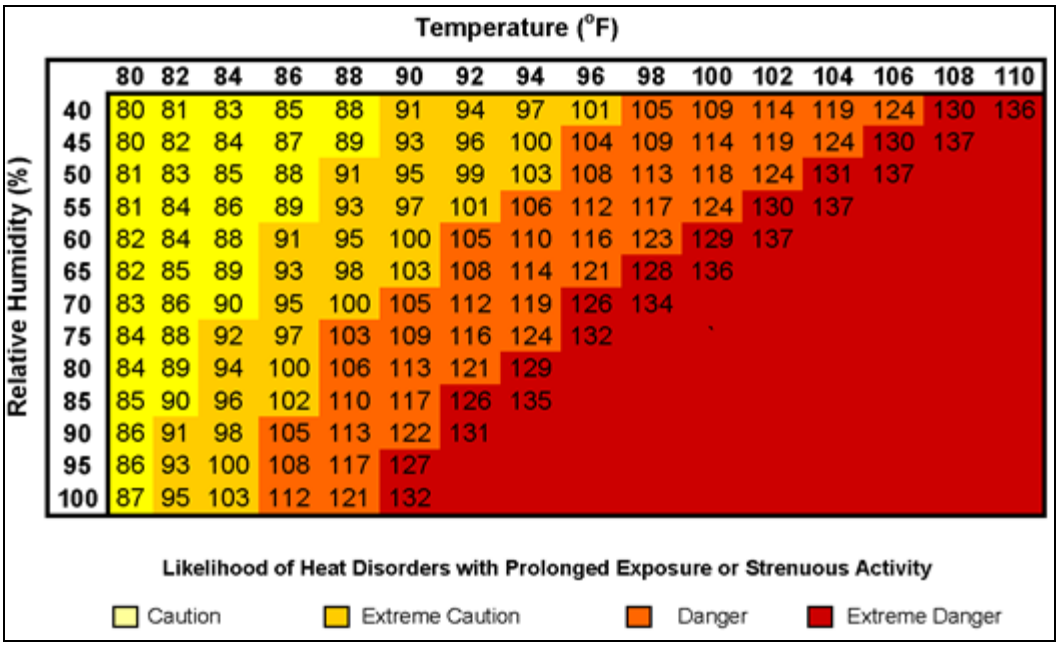


Source: NWS 2009

Extreme Heat

The extent of extreme heat temperatures are generally measured through the Heat Index, identified in Table 5.4.3-1. Created by the NWS, the Heat Index is a chart which accurately measures apparent temperature of the air as it increases with the relative humidity. To determine the Heat Index, the temperature and relative humidity are needed. Once both values have been identified, the Heat Index is the corresponding number of both the values (as seen in Table 5.4.3-1). This provides a measure of how temperatures actually feel; however, the values are devised for shady, light wind conditions. Exposure to full sun can increase the Index by up to 15 degrees (NYS DHSES 2014).

Table 5.4.3-1. Heat Index Chart



Source: NWS 2013

Table 5.4.3-2 describes the adverse effects that prolonged exposure to heat and humidity can have on an individual.

Table 5.4.3-2. Adverse Effects of Prolonged Exposures to Heat on Individuals

Category	Heat Index	Health Hazards
Extreme Danger	130 °F – Higher	Heat Stroke / Sunstroke is likely with continued exposure.
Danger	105 °F – 129 °F	Sunstroke, muscle cramps, and/or heat exhaustion possible with prolonged exposure and/or physical activity.
Extreme Caution	90 °F – 105 °F	Sunstroke, muscle cramps, and/or heat exhaustions possible with prolonged exposure and/or physical activity.
Caution	80 °F – 90 °F	Fatigue possible with prolonged exposure and/or physical activity.

Source: NYS DHSES 2014

The National Weather Service (NWS) provides alerts when Heat Indices approach hazardous levels. Table 5.4.3-3 explains these alerts. In the event of an extreme heat advisory, the NWS does the following:

- Includes Heat Index values and city forecasts
- Issues special weather statements including who is most at risk, safety rules for reducing risk, and the extent of the hazard and Heat Index values
- Provides assistance to state/local health officials in preparing Civil Emergency Messages in severe heat waves (NYS DHSES 2014).

Table 5.4.3-3. National Weather Service Alerts

Alert	Criteria
Heat Advisory	Issues 12-24 hours before the onset of the following conditions: heat index of at least 100°F but less than 105°F for at least two hours per day
Excessive Heat Watch	Issued by the NWS when heat indices of 105°F or greater are forecast in the next 24 to 72 hours
Excessive Heat Warning	Issued within 12 hours of the onset of the following criteria: heat index of at least 105°F

Alert	Criteria
	for more than three hours per day for two consecutive days, or heat index more than 115°F for any period of time

Source: NYS DHSES 2014

Location

According to the New York State Hazard Mitigation Plan 2014 Update, the location of New York State and the typical air masses, combined with the atmospheric circulation, provides general climatic controls for the region, making the entire State susceptible to extreme temperatures. Changes in land elevations, the landscape, and its close proximity to large bodies of water play a significant role in the temperatures of New York State. Extended periods of either extreme cold or warm temperatures are a result from movement of great high pressure systems into and through the eastern United States (NYS DHSES 2014).

Extreme cold temperatures occur throughout most of the winter season and generally accompany most winter storm events throughout the State. The NYSC Office of Cornell University indicates that cold temperatures prevail over the State whenever arctic air masses, under high barometric pressure, flow southward from central Canada or from Hudson Bay (Cornell University, Date Unknown). Extreme heat temperatures of varying degrees are existent throughout the State for most of the summer season, except for areas with high altitudes.

Previous Occurrences and Losses

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

The Midwest Regional Climate Center (MRCC) operates the MRCC's Application Tools Environment (cli-MATE) which provides access to climate data and value-added tools. This application can be used to look up information that includes raw climate data, rankings of climate information, thresholds, growing season tool, maps, graphs, etc. For the purpose of this hazard profile, the maximum and minimum temperatures and the maximum average and minimum average for the stations in Montgomery County were queried for information between January 1, 2007 and August 4, 2015. Based on the cli-MATE application, there is only one station in Montgomery County. Based on the data provided by MRCC, Table 5.4.3-4 presents the extreme cold (minimum) and hot (maximum) temperature records for Montgomery County from 2007 to 2015.

Table 5.4.3-4. MRCC Temperature Extremes – Montgomery County

Name	Begin	End	Max (°F)	Max Date	Min (°F)	Min Date	Avg Max (°F)	Avg Min (°F)
Ft Plain	1/1/2007	8/4/2015	95	7/8/2010	-20	1/23/2014	62	38

Source: MRCC 2015
Notes: Begin Year is when the data collection began; End Year is when the data collection stopped.

Between 1954 and 2015, New York State has not been included in any major disaster (DR) or emergency (EM) declarations due to extreme temperatures. Agriculture-related disasters are quite common. The Secretary of Agriculture from the U.S. Department of Agriculture (USDA) is authorized to designate counties as disaster areas to make emergency loans to producers suffering losses in those counties and in counties that are contiguous to a designated county. Between 2012 and 2015, Montgomery County was included in two USDA declarations involving extreme temperatures. Table 5.4.3-5 presents USDA declared drought, excessive heat, frosts and freeze events impacting Montgomery County.

Table 5.4.3-5. USDA Declared Disasters

Incidence Period	Event Type	USDA Designation Number	County Designated?*	Losses / Impacts
March 2012	Frost, Freeze	S3249	Yes	
June 26 to November 28, 2012	Drought	S36057	Yes - Primary	Production losses were attributed to drought

Source: USDA, 2012
**Disaster event occurred within the county.*
M *Presidential Major Disaster Declaration*
N *Administrative Physical Loss Notification*
S *Secretarial National Disaster Determination*
USDA *United States Department of Agriculture*

Information regarding specific details of temperature extremes in Montgomery County is scarce; therefore, previous occurrences and losses associated with extreme temperature events are limited. TABLE includes extreme temperature events that impacted Montgomery between 2007 and 2015. For events prior to 2007, refer to the 2009 Montgomery County HMP.

Table 5.4.3-6. Extreme Temperature Events between 2007 and 2015

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts	Source(s)
January 25-26, 2007	Cold Temperatures	N/A	N/A	An arctic airmass moved into east-central New York State, bringing low temperatures of between 0°F and -10°F with some temperatures as low as -15°F across higher elevations. In addition, northwest winds of 10 to 15 mph produced wind chills as low as -25 to -30°F. The coldest temperatures in Montgomery County was -5°F in Palatine Bridge.	NOAA-NCDC
July 21-22, 2011	Heat	NA	NA	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. 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.	NCDC
February 23-24, 2015	Cold Temperatures	N/A	N/A	Northwest winds in the area brought cold wind chill temperatures of -10°F and -30°F to the area, including Montgomery County.	NOAA-NCDC

Note (1): Monetary figures within this table were U.S. Dollar (USD) figures calculated during or within the approximate time of the event. If such an event would occur in the present day, monetary losses would be considerably higher in USDs as a result of increased U.S. Inflation Rates.

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

Probability of Future Events

Several extreme temperature events occur each year throughout Montgomery County. It is estimated that the county will continue to experience extreme temperatures annually that may induce secondary hazards such potential snow, hail, ice or wind storms, thunderstorms, drought, human health impacts, utility failure and transportation accidents as well as many other anticipated impacts.

Montgomery County will continue to experience direct and indirect impacts of extreme temperatures approximately every two years. Table 5.4.3-7 summarizes the occurrences of extreme temperature events and their annual occurrence (on average).

Table 5.4.3-7. Occurrences of Extreme Temperature Events in Montgomery County, 1897 - 2013

Event Type	Total Number of Occurrences	Annual Number of Events (average)
Extreme Heat	31	0.26
Extreme Cold	35	0.30
Total:	66	0.56

Source: NOAA-NCDC, 2013; SHELDUS, 2013, MRCC

Based on historical records and input from the Planning Committee, the probability of occurrence for extreme temperatures in Montgomery County is considered "frequent" (likely to occur within 25 years) (see Section 5.3, Table 5.3-3).

Climate Change Impacts

Please refer to the Drought and Winter Storm Profiles for information regarding Climate Change and its effects on extreme temperatures.

5.4.3.2 Vulnerability Assessment

To understand risk, a community must evaluate what assets are exposed or vulnerable in the identified hazard area. For the extreme temperature events, the entire County has been identified as the hazard area. Therefore, all assets in the County (population, structures, critical facilities and lifelines), as described in the County Profile (Section 4), are vulnerable. The following text evaluates and estimates the potential impact of extreme temperatures on Montgomery County including:

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

Overview of Vulnerability

Extreme temperatures generally occur for a short period of time but can cause a range of impacts, particularly to vulnerable populations that may not have access to adequate cooling or heating. This natural hazard can also cause impacts to agriculture (crops and animals), infrastructure (e.g., through pipe bursts associated with freezing, power failure) and the economy.

Data and Methodology

Data was collected from HAZUS-MH, USDA, NOAA-NCDC, Montgomery County, and the Planning Committee sources. Insufficient data was available to model the long-term potential impacts of extreme temperature on the County. Over time, additional data will be collected to allow better analysis for this hazard. Available information and a preliminary assessment are provided below.

Impact on Life, Health and Safety

For the purposes of this HMP, the entire population of Montgomery County is exposed to extreme temperature events. Refer to Section 4 for a summary of population statistics for the County.

Extreme temperature events have potential health impacts including injury and death. According to the Centers for Disease Control and Prevention, populations most at risk to extreme cold and heat events include the following: 1) the elderly, who are less able to withstand temperatures extremes due to their age, health conditions and limited mobility to access shelters; 2) infants and children up to four years of age; 3) individuals who are physically ill (e.g., heart disease or high blood pressure), 4) low-income persons that cannot afford proper heating and cooling; and 5) the general public who may overexert during work or exercise during extreme heat events or experience hypothermia during extreme cold events (CDC, 2006).

Meteorologists can accurately forecast extreme heat event development and the severity of the associated conditions with several days of lead time. These forecasts provide an opportunity for public health and other officials to notify vulnerable populations, implement short-term emergency response actions and focus on surveillance and relief efforts on those at greatest risk. Adhering to extreme temperature warnings can significantly reduce the risk of temperature-related deaths.

Impact on General Building Stock

All of the building stock in the County is exposed to the extreme temperature hazard. Refer to Section 4 which summarizes the building inventory in Montgomery County. Extreme heat generally does not impact buildings.

Losses may be associated with the overheating of heating, ventilation, and air conditioning (HVAC) systems. Extreme cold temperature events can damage buildings through freezing/bursting pipes and freeze/thaw cycles. Additionally, manufactured homes (mobile homes) and antiquated or poorly constructed facilities may have inadequate capabilities to withstand extreme temperatures.

Impact on Critical Facilities

All critical facilities in the County are exposed to the extreme temperature hazard. Impacts to critical facilities are the same as described for general building stock. Additionally, it is essential that critical facilities remain operational during natural hazard events. Extreme heat events can sometimes cause short periods of utility failures commonly referred to as "brown-outs", due to increased usage from air conditioners, appliances, etc. Similarly, heavy snowfall and ice storms, associated with extreme cold temperature events, can cause power interruption as well. Backup power is recommended for critical facilities and infrastructure.

Impact on Economy

Extreme temperature events also have impacts on the economy, including loss of business function and damage/loss of inventory. Business-owners may be faced with increased financial burdens due to unexpected repairs caused to the building (e.g., pipes bursting), higher than normal utility bills or business interruption due to power failure (i.e., loss of electricity, telecommunications).

The agricultural industry is most at risk in terms of economic impact and damage due to extreme temperature events. Extreme heat events can result in drought and dry conditions and directly impact livestock and crop production. Based on the 2012 Census of Agriculture, there were 659 farms in Montgomery County, with a total of 131,386 acres of land in farms. The average farm size was 199 acres. Montgomery County's farms had a total market value of products sold of over $86.7 million, averaging over $131,000 per farm. The Census indicated that 443 of farm operators reported farming as their primary occupation (USDA 2012).

An extreme heat event could result in drought conditions and have a serious impact on a community. During an extreme temperature event, there may be an increased demand for water and electricity which may lead to shortages and a higher cost for these resources.

Future Growth and Development

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

Effect of Climate Change on Vulnerability

Refer to Section 5.4.1 (Drought) and Section 5.4.5 (Severe Storms) for details regarding the impacts of climate change on temperatures.

Additional Data and Next Steps

For future plan updates, the County can track data on extreme temperature events, obtain additional information on past and future events, particularly in terms of any injuries, deaths, shelter needs, pipe freeze, agricultural losses and other impacts. This will help to identify any concerns or trends for which mitigation measures should be developed or refined. In time, quantitative modeling of estimated extreme heat and cold events may be feasible as data is gathered and improved.

5.4.4 FLOOD

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

5.4.4.1 Hazard Profile

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

Description

Floods are one of the most common natural hazards in the U.S. They can develop slowly over a period of days or develop quickly, with disastrous effects that can be local (impacting a neighborhood or community) or regional (affecting entire river basins, coastlines and multiple counties or states) (Federal Emergency Management Agency [FEMA], 2008). Most communities in the U.S. have experienced some kind of flooding, after spring rains, heavy thunderstorms, coastal storms, or winter snow thaws (George Washington University, 2001).

Floods are the most frequent and costly natural hazards in New York State in terms of human hardship and economic loss, particularly to communities that lie within flood prone areas or flood plains of a major water source. As defined in the NYS HMP (NYS DHSES, 2014), flooding is a general and temporary condition of partial or complete inundation on normally dry land from the following:

- Riverine overbank flooding;
- Flash floods;
- Alluvial fan floods;
- Mudflows or debris floods;
- Dam- and levee-break floods;
- Local draining or high groundwater levels;
- Fluctuating lake levels;
- Ice-jams; and
- Coastal flooding

Many floods fall into three categories: riverine, coastal and shallow (FEMA, 2005). Other types of floods may include ice-jam floods, alluvial fan floods, dam failure floods, and floods associated with local drainage or high groundwater (as indicated in the previous flood definition). For the purpose of this HMP and as deemed appropriate by the Montgomery County Planning Committee, dam failure, ice jam, and riverine/flash flooding are the main flood types of concern for the County. These types of flood or further discussed below.

Riverine/Flash Flooding

Riverine floods are the most common flood type. They occur along a channel and include overbank and flash flooding. Channels are defined, ground features that carry water through and out of a watershed. They may be called rivers, creeks, streams, or ditches. When a channel receives too much water, the excess water flows over its banks and inundates low-lying areas (FEMA 2008; The Illinois Association for Floodplain and Stormwater Management 2006).

Flash floods are "a rapid and extreme flow of high water into a normally dry area, or a rapid water level rise in a stream or creek above a predetermined flood level, beginning within six hours of the causative event (e.g., intense rainfall, dam failure, ice jam). However, the actual time threshold may vary in different parts of the country. Ongoing flooding can intensify to flash flooding in cases where intense rainfall results in a rapid surge of rising flood waters" (National Weather Service [NWS] 2009).

Stormwater flooding described below is due to local drainage issues and high groundwater levels. Locally, heavy precipitation may produce flooding in areas other than delineated floodplains or along recognizable

channels. If local conditions cannot accommodate intense precipitation through a combination of infiltration and surface runoff, water may accumulate and cause flooding problems. During winter and spring, frozen ground and snow accumulations may contribute to inadequate drainage and localized ponding. Flooding issues of this nature generally occur in areas with flat gradients and generally increase with urbanization which speeds the accumulation of floodwaters because of impervious areas. Shallow street flooding can occur unless channels have been improved to account for increased flows (FEMA 1997).

High groundwater levels can be a concern and cause problems even where there is no surface flooding. Basements are susceptible to high groundwater levels. Seasonally high groundwater is common in many areas, while elsewhere high groundwater occurs only after a long periods of above-average precipitation (FEMA 1997).

Urban drainage flooding is caused by increased water runoff due to urban development and drainage systems. Drainage systems are designed to remove surface water from developed areas as quickly as possible to prevent localized flooding on streets and other urban areas. They make use of a closed conveyance system that channels water away from an urban area to surrounding streams. This bypasses the natural processes of water filtration through the ground, containment, and evaporation of excess water. Since drainage systems reduce the amount of time the surface water takes to reach surrounding streams, flooding in those streams can occur more quickly and reach greater depths than prior to development in that area (FEMA 2008).

Dam Failure Flooding

A dam is an artificial barrier that has the ability to impound water, wastewater, or any liquid-borne material for the purpose of storage or control of water (FEMA, 2010). Dams are man-made structures built across a stream or river that impound water and reduce the flow downstream (FEMA, 2003). They are built for the purpose of power production, agriculture, water supply, recreation, and flood protection. Dam failure is any malfunction or abnormality outside of the design that adversely affect a dam's primary function of impounding water (FEMA, 2011). Dams can fail for one or a combination of the following reasons:

- Overtopping caused by floods that exceed the capacity of the dam (inadequate spillway capacity);
- Prolonged periods of rainfall and flooding;
- Deliberate acts of sabotage (terrorism);
- Structural failure of materials used in dam construction;
- Movement and/or failure of the foundation supporting the dam;
- Settlement and cracking of concrete or embankment dams;
- Piping and internal erosion of soil in embankment dams;
- Inadequate or negligent operation, maintenance and upkeep;
- Failure of upstream dams on the same waterway; or
- Earthquake (liquefaction / landslides) (FEMA, 2010).

A break in a dam can produce extremely dangerous flood situations because of the high velocities and large volumes of water released by such a break. Sometimes they can occur with little to no warning. Breaching of dams often occurs within hours after the first visible sign of dam failure, leaving little or no time for evacuation (FEMA 2006).

According to the NYSDEC Division of Water Bureau of Flood Protection and Dam Safety, the hazard classification of a dam is assigned according to the potential impacts of a dam failure pursuant to 6 NYCRR Part 673.3 (NYSDEC, 2009). Dams are classified in terms of potential for downstream damage if the dam were to fail. These hazard classifications are identified and defined below:

- *Low Hazard (Class A)* is a dam located in an area where failure will damage nothing more than isolated buildings, undeveloped lands, or township or county roads and/or will cause no significant economic loss or serious environmental damage. Failure or mis-operation would result in no probable loss of human life. Losses are principally limited to the owner's property
- *Intermediate Hazard (Class B)* is a dam located in an area where failure may damage isolated homes, main highways, minor railroads, interrupt the use of relatively important public utilities, and/or will cause significant economic loss or serious environmental damage. Failure or mis-operation would result in no probable loss of human life, but can cause economic loss, environment damage, disruption of lifeline facilities, or impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.
- *High Hazard (Class C)* is a dam located in an area where failure may cause loss of human life, serious damage to homes, industrial or commercial buildings, important public utilities, main highways or railroads and/or will cause extensive economic loss. This is a downstream hazard classification for dams in which excessive economic loss (urban area including extensive community, industry, agriculture, or outstanding natural resources) would occur as a direct result of dam failure.
- *Negligible or No Hazard (Class D)* is a dam that has been breached or removed, or has failed or otherwise no longer materially impounds waters, or a dam that was planned but never constructed. Class "D" dams are considered to be defunct dams posing negligible or no hazard. The department may retain pertinent records regarding such dams.

Ice Jam Flooding

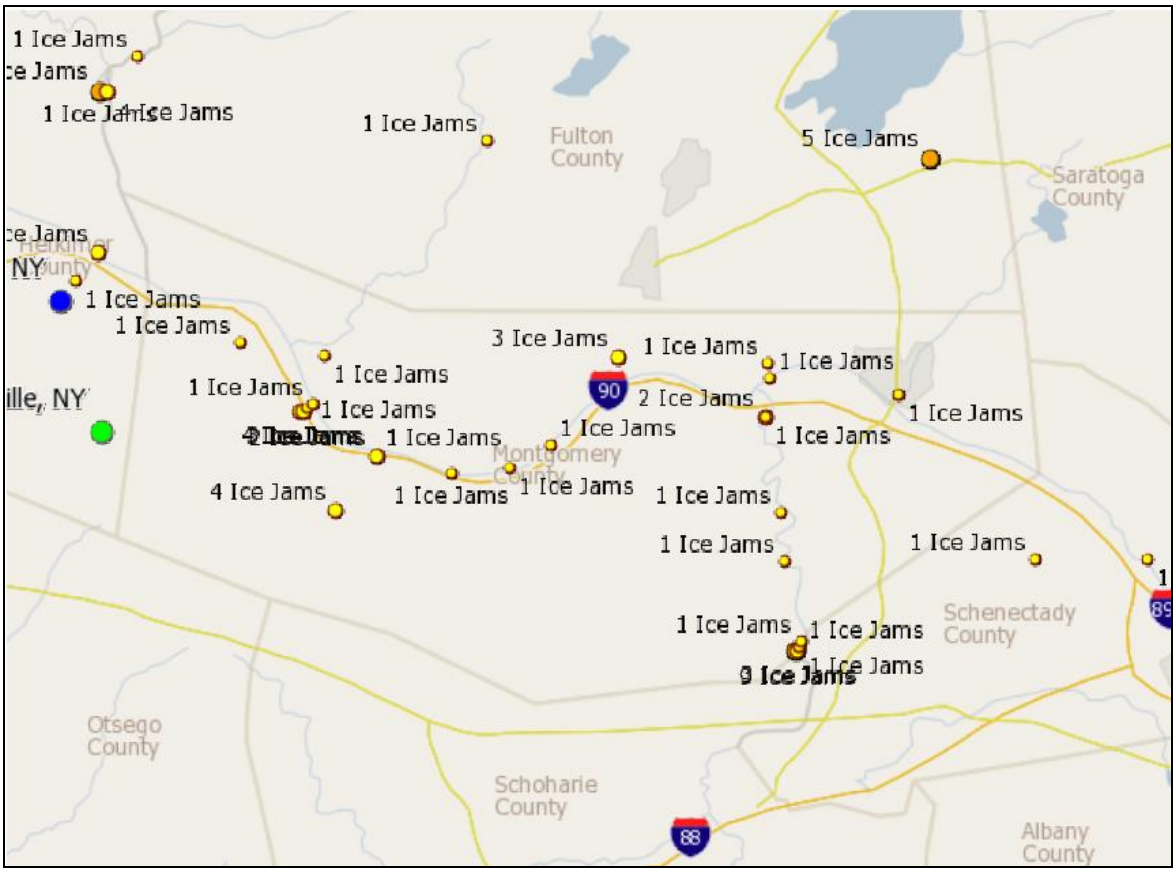
An ice jam occurs when pieces of floating ice are carried with a stream's current and accumulate behind any obstruction to the stream flow. Obstructions may include river bends, mouths of tributaries, points where the river slope decreases, as well as dams and bridges. The water held back by this obstruction can cause flooding upstream, and if the obstruction suddenly breaks, flash flooding can occur as well (NOAA 2011). The formation of ice jams depends on the weather and physical condition of the river and stream channels. They are most likely to occur where the channel slope naturally decreases, in culverts, and along shallows where channels may freeze solid. Ice jams and resulting floods can occur during at different times of the year: fall freeze-up from the formation of frazil ice; mid-winter periods when stream channels freeze solid, forming anchor ice; and spring breakup when rising water levels from snowmelt or rainfall break existing ice cover into pieces that accumulate at bridges or other types of obstructions (NYS DHSES 2014).

There are two main types of ice jams: freeze-up and breakup. Freeze-up jams occur when floating ice may slow or stop due to a change in water slope as it reaches an obstruction to movement. Breakup jams occur during periods of thaw, generally in late winter and early spring. The ice cover breakup is usually associated with a rapid increase in runoff and corresponding river discharge due to a heavy rainfall, snowmelt or warmer temperatures (USACE 2002; NYS DHSES 2014).

Ice jams are common in the northeast U.S. and New York is not an exception. In fact, according to the USACE, New York State ranks second in the U.S. for total number of ice jam events, with over 1,500 incidents documented between 1848 and 2010. Areas of New York State that include characteristics lending to ice jam flooding include the northern counties of the Finger Lakes region and far western New York, the Mohawk Valley of central and eastern New York State, and the North Country (NYS DHSES, 2013).

Figure 5.4.4-1 identifies the location of ice jams in Montgomery County and surrounding areas. A majority of the ice jams in the County have occurred along the Mohawk River and Schoharie Creek. Other ice jams have occurred along the Canajoharie Creek, Caroga Creek, Fulmer Creek, Quaker Creek, and Otsquago Creek. Historical events are further mentioned in the "Previous Occurrences" section of this hazard profile.

Figure 5.4.4-1. Number of Ice Jam Incidents in Montgomery County (1848 – 2014)



Source: *CRREL 2014*
Note (1): *This map displays the number of instances a river was referenced as being the location for an ice jam in the USACE Cold Regions Research and Engineering Laboratory (CRREL) database.*
Note (2): *Multiple instances of ice jams can be associated to a single point location.*

Extent

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

- Minor Flooding - minimal or no property damage, but possibly some public threat or inconvenience.
- Moderate Flooding - some inundation of structures and roads near streams. Some evacuations of people and/or transfer of property to higher elevations are necessary.
- Major Flooding - extensive inundation of structures and roads. Significant evacuations of people and/or transfer of property to higher elevations (NWS, 2011).

The severity of a flood depends not only on the amount of water that accumulates in a period of time, but also on the land's ability to manage this water. One element is the size of rivers and streams in an area; but an equally important factor is the land's absorbency. When it rains, soil acts as a sponge. When the land is saturated or frozen, infiltration into the ground slows and any more water that accumulates must flow as runoff (Harris, 2001).

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

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

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

Location

Flooding is the primary natural hazard in New York State because the State exhibits a unique blend of climatological and meteorological features that influence the potential for flooding. These factors include topography, elevations, latitude and water bodies and waterways. Flooding is the primary natural hazard in New York State and they occur in every part of the State. Some areas are more flood-prone than others, but no area is exempt, including Montgomery County.

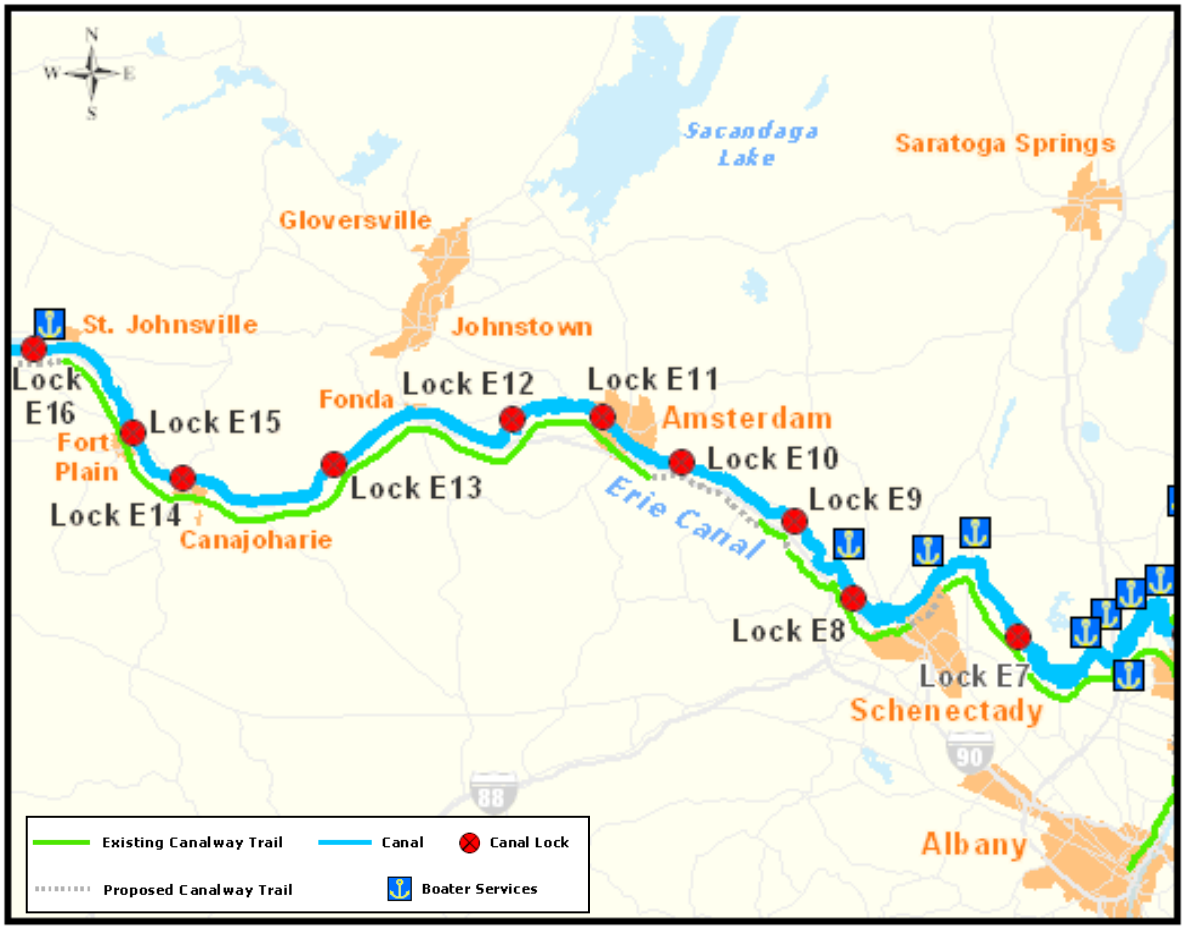
Riverine flooding problems are most severe in the Delaware, Susquehanna, Chemung, Erie-Niagara, Genesse, Allegany, Hudson and Mohawk River Basins (NYS DHSES, 2011). Please refer to Section 4 (County Profile) for detailed information regarding the river basins and the hydrography/hydrology of the County.

Flash flooding can occur throughout any region of New York State; however, the distinctive flash flood event that is characterized by fast moving water and damaging impacts requires a steep topography. Areas of steep topography are found in the Allegany-Catskill plateau, which runs the entire width of New York State's Southern Tier, and the Adirondack Mountains to the north (NYS DHSES, 2014).

Montgomery County is part of the Mohawk River Basin. The County falls within the Mohawk River Basin, with the Mohawk River and its tributaries extending directly from west to east through the County. Main tributaries include Canajoharie Creek, Schoharie Creek, Carogo Creek, North Chuctanunda Creek and Otsquago Creek. Flooding of the Mohawk River has been a common occurrence almost every year for the inhabitants living within its drainage basin since settlement. Flooding in this river basin is associated with two main types, "Free water" flood events and "break-up" events. "Free-water" flood events commonly occur in late summer and early fall, during the peak of hurricane season and are associated with large amounts of precipitation. "Break-up" events are associated with the break-up of river ice, resulting from rising temperatures, melting snow, and heavy rains and commonly occur during winter and early spring. Break-up events are exacerbated by the formation of ice jams and account for the majority of the large scale flooding events (< 15') (Environmental Science and Policy Program-Union College, Date Unknown; Scheller, et al., 2001).

Also, portions of the Mohawk River and its tributaries within the County have been incorporated into the Erie Canal System, which extends parallel to the southern side of the Mohawk River throughout the County (Locks 10 [Cranesville] through 16 [St. Johnsville]) (Figure 5.4.1-2). This creates an additional source for flooding in the event of heavy rain or severe storm. Locks within the Erie Canal also suffer extensive flood damage during many flooding events.

Figure 5.4.4-2. The Erie Canal in Montgomery County (Locks 10 through 16)



Source: New York State Canal System, Date Unknown

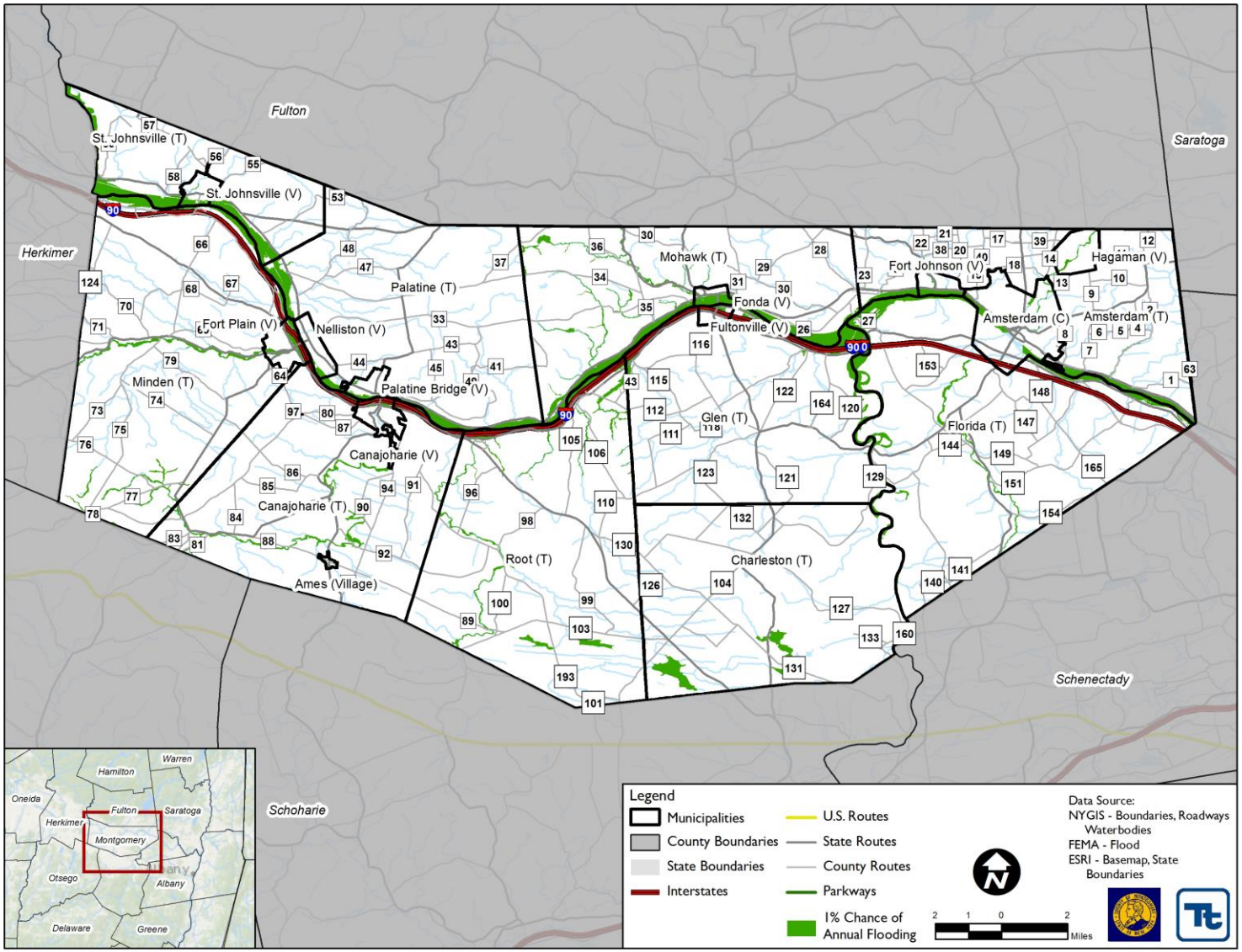
After Tropical Storm Irene and Lee, flooding devastated the Mohawk River and the canal system. The canal was closed from Vischer Ferry to Amsterdam and needed approximately $50 million worth of repairs. In May 2014, Governor Cuomo announced $40 million in construction work was underway for Lock E-11 on the Erie Canal. Work to the lock included modifying the capabilities of the locks movable dam, implementing a state-of-the-art flood warning system, and restoring the historic Guy Park Manor and surrounding grounds in the City of Amsterdam. The same improvements were also made on the other seven movable dams at every lock between Scotia and Fort Plain. The movable dams are made with new steel and other components which allows them to be safely raised out of the water in anticipation of a major flood event. This lowers 100-year peak water levels and help prevents the back-up of debris at the dams.

A floodplain is defined as the land adjoining the channel of a river, stream, ocean, lake, or other watercourse or water body that becomes inundated with water during a flood. Most often floodplains are referred to as 100-year floodplains. A 100-year floodplain is not a flood that will occur once every 100 years, rather it is a flood that has a 1% chance of being equaled or exceeded each year. Thus, the 100-year flood could occur more than once in a relatively short period of time. Due to this misleading term, FEMA has properly defined it as the 1% annual chance flood. This 1% annual chance flood is now the standard used by most federal and state agencies and by the NFIP (FEMA 2002). In Montgomery County, floodplains line the rivers and streams of the County. The boundaries of the floodplains are altered as a result of changes in land use, the amount of impervious surface, placement of obstructing structures in floodways, changes in precipitation and runoff patterns,

improvements in technology for measuring topographic features, and utilization of different hydrologic modeling techniques. The floodplains most susceptible to severe damaged caused by flooding are found along the Mohawk River, Canajoharie Creek, Cobbleskill Creek, and Fly Creek. Figure 5.4.4-3 illustrates the FEMA flood hazard zones in Montgomery County. According to this figure, the 1% annual chance of flood hazard zones are located along the bodies of water located throughout the County.

Please refer to Section 9 (Jurisdictional Annexes) for information regarding specific areas of flooding for each participating municipality in Montgomery County.

Figure 5.4.4-3. Flood Hazard Areas in Montgomery County



Source: FEMA, NYGIS

Previous Occurrences and Losses

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

Between 1954 and 2015, FEMA included New York State in 54 flood-related major disaster (DR) or emergency (EM) declarations classified as one or a combination of the following disaster types: severe storms, flooding, hurricane, tropical depression, heavy rains, landslides, ice storm, high tides, Nor'Easter, tornado, snowstorm, severe winter storm, and inland/coastal flooding. Generally, these disasters cover a wide region of the State; therefore, they may have impacted many counties. Montgomery County was included in 11 of these flood-related declarations.

For this 2015 Plan update, flood events were summarized from 2007 to 2015 and summarized in Table 5.4.4-1. For events that occurred prior to 2007, refer to the 2009 Montgomery County HMP. Please note that not all events that have occurred in Montgomery County are included due to the extent of documentation and the fact that not all sources may have been identified or researched. Loss and impact information could vary depending on the source. Therefore, the accuracy of monetary figures discussed is based only on the available information identified during research for this HMP Update. Please see Section 9 for detailed information regarding impacts and losses to each municipality.

Table 5.4.4-1. Flooding Events between 2007 and 2015

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts	Source(s)
March 14, 2007	Ice Jam at Canajoharie Creek	NA	NA	Montgomery County Emergency Management reported two ice jams on the Canajoharie Creek. One jam was in the vicinity of Route 10 and McEwan Rd. The other jam was further upstream near Sprout Brook. Both jams are causing water to back up, causing minor flooding of farmland.	LinkJam, 2007
March 15, 2007	Ice Jam at Mohawk River	NA	NA	Mohawk River / Ice jams were reported on the Mohawk River at Fort Plain, Canajoharie, Sprakers, and Amsterdam. Flooding was reported in Fort Plain from ice jam.	CRREL, NYS DHSES, 2011
March 15, 2007	Flood	NA	NA	A combination of snowmelt, runoff from moderate rainfall, and ice jams on the Mohawk River led to flooding in portions of Montgomery county on March 15th. Flooding was reported in Fort Plain, at a Curtis Lumber Store, and also along the Canajoharie Creek near Marshville due to local runoff. Loss information was not provided.	NOAA-NCDC
April 14-17, 2007*	Severe Storms / Inland and Coastal Flooding (also identified as a Nor'easter)	DR-1692	Yes	New York State experienced approximately $12.76 million in eligible damages (NYS DPC). However, more than $61 million in disaster aid has been approved for the State. Losses in Montgomery County are unknown; however, public assistance to Montgomery County totaled $55,000 as of July 10, 2007. The Schoharie Creek at Burtonsville crested to 8.95 feet (2.95 feet above 6-foot flood stage).	FEMA
July 23, 2008	Flash Flooding	NA	NA	Flash flooding resulted in the closure of eastbound lanes of the New York State Thruway, Interstate 90, at mile marker 169, with at least 2 to 3 feet of water on the road. In addition, the westbound lanes were accumulating significant amounts of water as well. Numerous roads were washed out across the county. In the town of Amsterdam, some of the flooded roads which sustained damage included Truax Road, Cranes Hollow Road, Chapman Drive, Widow Susan Road, and Swarts Hill Road. In addition, properties along the South Chuctanunda Creek near Amsterdam also experienced flooding. In the town of Florida, Peck and Mckinney Roads were closed due to washed out culverts, with some bridges damaged and needing further inspection, including a bridge on Hartley Road. Over $300,000 in property damage was reported.	SHELDUS, NOAA-NCDC
August 11, 2008	Flash Flooding	NA	NA	Several roads were closed across Montgomery County due to flash flooding from very heavy rainfall. Some of the roads that were closed included, but were not limited to, Logtown Road and Van Epps Road near Glen. In addition, a minor mud slide occurred at the intersection of Route 5 and Switzer Hill Road just east of Fonda, after a culvert underneath Route 5 was inundated. Over $5,000 was reported in property damages.	SHELDUS

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts	Source(s)
December 27, 2008	Ice Jam at Mohawk River	NA	NA	Mohawk River / Ice jams were reported on the Mohawk River at Schenectady	NYS DHSES, 2011
January 15, 2009	Ice Jam at Mohawk River	NA	NA	Mohawk River / Ice jams were reported on the Mohawk River Lock 12 at Tribes Hill.	NYS DHSES, 2011
February 8, 2009	Ice Jam at Mohawk River	NA	NA	Mohawk River / Ice jams were reported on the Mohawk River at Schenectady	NYS DHSES, 2011
February 12, 2009	Ice Jam at Schoharie Creek	NA	NA	Ice jam on the Schoharie Creek near Fort Hunter, a hamlet in the town of Florida, NY.	NYS DHSES, 2011
March 8, 2009	Flood	NA	NA	Several roads were closed due to flooding in the vicinity of Saint Johnsville. In addition, the Canajoharie Creek reached moderate flood stage at 1330 LST on March 8th.	NOAA-NCDC
June 30, 2009	Flash Flood	NA	NA	State Route 10 near Palatine Bridge was closed due to flash flooding. In addition, rushing floodwaters blasted out the basement windows of the United Methodist Church on Main Street in Canajoharie, inundating the basement with at least 8 inches of water. Flood water also filled sewers that carry a steam line between the Beech Nut plant on Church Street and the Richardson Brands buildings on both sides of Erie Boulevard, which resulted in a minor rupture of a pipe at the Richardson Brands plant. Furthermore, a small creek overflowed its banks along Happy Hollow Road near Fort Plain, resulting in the erosion of nearly 4 feet of earth from beneath the foundation of a garage.	NOAA-NCDC
October 28, 2009	Flash Flood	NA	NA	Part of the Mohawk Erie Canal was shut down due to high water resulting in delays of some commercial barge traffic.	NOAA-NCDC
January 25, 2010	Flash Flood	NA	NA	The combination of strong low pressure, a slow moving cold front, warm temperatures and deep moisture produced a period of heavy rainfall Monday, January 25th across east central New York. In addition, the warm temperatures caused some melting of the snow pack, adding to the runoff. Widespread flash flooding and river flooding occurred as the heavy rain fell on frozen ground. In addition, some ice jam flooding was reported as well as some mud and rock slides. The rain was heaviest in the Catskill Mountains where 3 to 5 inches fell. Elsewhere, across east central New York, 1 to around 2 inches of rainfall was reported. Streams were reported out of their banks in Fonda.	NOAA-NCDC
August 22-23, 2010	Flood	NA	NA	The Otsquago Creek overflowed its banks and flooded portions of the Village of Fort Plain. Route 80 was closed due to flooding with 3 feet water on it. Some streets in the village had up to 5 feet of water on them. Nearly 60 homes near the creek were evacuated for the night. Severe erosion occurred along the creek bank. A state of emergency was declared in Fort Plain. On August 23rd, the Erie Canal was shut	NOAA-NCDC

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts	Source(s)
				down due to high water and debris in the water along its length from Lock 2 (Waterford, NY) to Lock 21 (Rome, NY). Basement flooding was also reported in the Village of Canajoharie.	
October 1, 2010	Flood	NA	NA	Flood-prone areas of the city of Amsterdam experienced flooding beginning early Friday morning, with the worst flooding occurring in the West Main Street and Locust Avenue areas. Also, a mudslide resulted in the closure of Chapman Drive for a short period. Heavy rains and the Mohawk River topping the flood wall at the New York State Canal Corporation facility on Route 30A in Fonda flooded part of the track and infield at the Fonda Speedway.	NOAA-NCDC
August 28-30, 2011	Flooding (Hurricane Irene)	DR-4020	Yes	Record flooding occurred along the Schoharie Creek in Montgomery County. Several homes on Colyer Road in Burtonsville were destroyed. On August 28th, Route 5S over the Schoharie Creek was closed and the New York State Thruway, I-90, was closed westbound at Exit 27 (Amsterdam-Route 5) and eastbound at Exit 28 (Fultonville-Fonda) due to severe flooding on the Schoharie Creek. On the morning of August 29th at approximately 8:45 am EST, a 72 year old man drowned when his truck was swept away from Route 5S by the Schoharie Creek in the Town of Glen. It was reported that at least 20 farmers lost crops and sustained damage to farmland in the Schoharie and Mohawk valleys in Montgomery County.| |The Burtonsville river gage on the Schoharie Creek, which is located on the right bank 0.4 miles south of Burtonsville, 2.7 miles north of Esperance, exceeded its 6 foot flood stage at 11:01 am EST on August 28th, its 8 foot moderate flood stage at 1:45 pm, its 10 foot major flood stage at 6:12 pm, and dropped below flood stage at 8:25 pm on August 30th. A record crest occurred but the time and reading were unknown, since the gage was damaged during the flooding. Initially started out as flash flooding then transitioned to river flooding	NOAA-NCDC, FEMA
September 6-11, 2011	Flooding (Remnants of Tropical Storm Lee)	DR-4031 / EM-3341	Yes	Flooding occurred along the Mohawk River resulting in the closure of the following roads: Route 5 from Palatine Bridge to Fort Johnson and Route 5S from Route 80 in Fort Plain to Route 30A in Fultonville. The following off-ramps for the New York State Thruway, Interstate 90, were closed during the day September 8th: Exit 27 (Amsterdam), Exit 28 (Fultonville-Fonda) and Exit 29 (Canajoharie-Sharon Springs). Canajoharie's Waterfront Park was submerged in flood waters. In Fonda, flood waters inundated the fairgrounds, homes along Park Street and the Mongomery County Department of Public Works. New York State Erie Canal Locks E-12 (Tribes Hill) and E-10 (Cransville) were damage beyond what happened as a result of Tropical Storm Irene. At Lock E-12, the lower approach wall was breached and	NOAA-NCDC, FEMA; City & Town of Amsterdam and Town of Florida Planning Committee

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts	Source(s)
				undermined. At Lock E-10, the south end of dam was breached by the river. Guy Park Manor and Canal Lock 11 in the City of Amsterdam were severely damaged. The hamlet of Lost Valley in the Town of Florida was mostly destroyed. The Little Falls river gage located on left bank 1,800 feet downstream from Fivemile Dam, 2.0 miles upstream from East Canada Creek, and 4.5 miles southeast of city of Little Falls Herkimer County exceeded its 15 foot flood stage at 9:07 pm EST September 7th, its 17 foot moderate flood stage at 12:42 am September 8th, its 18 foot major flood stage at 3 am, it crested at 18.20 feet at 4:30 am, and dropped below flood stage at 4:08 pm September 8th. Major flooding occurred on the Canajoharie Creek in Montgomery County. The Canajoharie river gage located on the right bank 10 feet upstream from the bridge on McEwan Road and 2.3 miles southwest of Canajoharie exceeded its 8 foot flood stage at 2:47 pm EST September 7th, its 9 foot moderate flood stage at 12:18 am September 8th, its 10 foot major flood stage at 3:24 am, it crested at a record 10.23 feet at 5:45 pm and dropped below flood stage at 3:22 pm September 8th.	
May 8, 2012	Flood	NA	NA	More than 100-mile stretch of the New York State Erie Canal System from Lock E-2 Waterford to Lock E-22 New London was closed due to high water and excessive flow	NOAA-NCDC
October 27-28, 2012	Flooding (Hurricane Sandy)	EM-3351	Yes	In preparation for the imminent landfall of Hurricane Sandy, New York counties including Montgomery received federal aid. Though rain feel heavy at times over the Mohawk Valley, the brunt of the storm hit in the southeastern part of the state.	FEMA
July 12, 2013	Severe Storms / Flooding	DR-4129	Yes	Persistent rains damaged houses, closed roads and forced people to flee their homes in the Mohawk Valley. Widespread flooding was experienced throughout Montgomery County.	FEMA, The Daily Gazette
August 20-22, 2014	Heavy Rain and Flash Flood	N/A	N/A	Slow moving thunderstorms produced two to four inches of rain across the Mohawk Valley and Sacandaga Region on August 20th. Another batch of thunderstorms on August 21st brought several inches of rain across the central Mohawk Valley, causing small streams to overflow their banks. This led to flash flooding across parts of west-central Montgomery County and northern Schoharie County. At least 15 roads were closed in Montgomery County, including an onramp for the New York State Thruway. A state of emergency was issued due to the flooding. The flooding caused sewage treatment plants to be inundated and a boil water advisory was issued for several days. In some parts of the County, residents had to evacuate their homes. Rainfall totals in the County ranged from 2.41 inches in Hessville to 4.35 inches in Fonda.	NOAA-NCDC, NWS

Note (1): This table does not represent all events that may have occurred throughout the County. Monetary figures within this table were U.S. Dollar (USD) figures calculated during or within the approximate time of the event. If such an event would occur in the present day, monetary losses would be considerably higher in USDs as a result of increased U.S. Inflation Rates.

** According to many sources, these event were known as Nor'easters, therefore, only the flood impact of these events (if applicable) is briefly discussed further in this hazard profile and are further mentioned in Section 5.4.6 (Severe Winter Storms).*

CRREL	*Cold Regions Research and Engineering Laboratory*
DR	*Federal Disaster Declaration*
EM	*Federal Emergency Declaration*
FEMA	*Federal Emergency Management Agency*
HMP	*Hazard Mitigation Plan*
NA	*Not Available*
NCDC	*National Climate Data Center*
NOAA	*National Oceanic Atmospheric Administration*
NRCC	*Northeast Regional Climate Center*
NWS	*National Weather Service*
NYS	*New York State*
NYSDHSES	*New York State Division of Homeland Security and Emergency Services*
SHELDUS	*Spatial Hazard Events and Losses Database for the U.S.*

Agriculture-related flood disasters are quite common. One-half to two-thirds of the counties in the U.S. have been designated as disaster areas in each of the past several years. The Secretary of Agriculture is authorized to designate counties as disaster areas to make emergency loans (EM) to producers suffering losses in those counties and in counties that are contiguous to a designated county. Table 5.4.4-2 summarizes the USDA disaster designations for flood-related events.

Table 5.4.4-2. USDA Disaster Designations

Incidence Period	Event Type	USDA Declaration Number	County Designated?*	Losses / Impacts
May 1, 2013 - ongoing	Flood	S3593	Yes	Production losses were attributed to excessive rain, hail, high wind, and flooding,

Source: USDA, 2013
**Disaster event occurred within the county.*
M Presidential Major Disaster Declaration
N Administrative Physical Loss Notification
S Secretarial National Disaster Determination
USDA United States Department of Agriculture

Probability of Future Events

Given the history of flood events that have impacted Montgomery County, it is apparent that future flooding of varying degrees will occur. The fact that the elements required for flooding exist and that major flooding has occurred throughout the county in the past suggests that many people and properties are at risk from the flood hazard in the future.

It is estimated that Montgomery County will continue to experience direct and indirect impacts of floods annually. Table 5.4.4-3 summarizes the occurrences of flood events and their annual occurrence (on average).

Table 5.4.4-3. Occurrences of Flood Events in Montgomery County, 2007 - 2015

Event Type	Total Number of Occurrences	Annual Number of Events (average)
Flash Flood	29	0.64
Flood	16	0.35
Total:	**45**	**0.18**

Source: NOAA-NCDC, 2013
Note: On average, Montgomery County experiences 1.5 flood events each year.

In Section 5.3, the identified hazards of concern for Montgomery County were ranked. The probability of occurrence, or likelihood of the event, is one parameter used for hazard rankings. Based on historical records and input from the Planning Committee, the probability of occurrence for flood in the County is considered 'Frequent' (likely to occur within 25 years, as presented in Table 5.3-6).

Climate Change Impacts

The climate of Montgomery County is already changing, and will continue to change in the future. Climate change is beginning to affect both people and resources of the State and County and the impacts of climate change will continue. Impacts related to increasing temperatures and sea level rise are already being felt in the County. ClimAID: the Integrated Assessment for Effective Climate Change in New York State (ClimAID) was undertaken to provide decision-makers with information on the State's vulnerability to climate change and to facilitate the development of adaptation strategies informed by both local experience and scientific knowledge (New York State Energy Research and Development Authority [NYSERDA] 2011).

Each region in New York State, as defined by ClimAID, has attributes that will be affected by climate change. Montgomery County is part of Region 5, East Hudson and Mohawk River Valleys. Some of the issues in this region, affected by climate change, include: more frequent heat waves and above 90°F days, more heat-related deaths, increased frequency of heavy precipitation and flooding, decline in air quality, etc. (NYSERDA 2014).

Temperatures in New York State are warming, with an average rate of warming over the past century of 0.25° F per decade. Average annual temperatures are projected to increase across New York State by 2° F to 3.4° F by the 2020s, 4.1° F to 6.8° F by the 2050s, and 5.3° F to 10.1° F by the 2080s. By the end of the century, the greatest warming is projected to be in the northern section of the State (NYSERDA 2014).

Regional precipitation across New York State is projected to increase by approximately one to eight-percent by the 2020s, three to 12-percent by the 2050s, and four to 15-percent by the 2080s. By the end of the century, the greatest increases in precipitation are projected to be in the northern areas of the State (NYSERDA 2014).

In Region 5, it is estimated that temperatures will increase by 3.5ºF to 7.1ºF by the 2050s and 4.1ºF to 11.4ºF by the 2080s (baseline of 47.6ºF). Precipitation totals will increase between 2 and 15% by the 2050s and 3 to 17% by the 2080s (baseline of 38.6 inches). Table 5.4.4-4 displays the projected seasonal precipitation change for the East Hudson and Mohawk River Valleys ClimAID Region (NYSERDA 2014).

Table 5.4.4-4. Projected Seasonal Precipitation Change in Region 5, 2050s (% change)

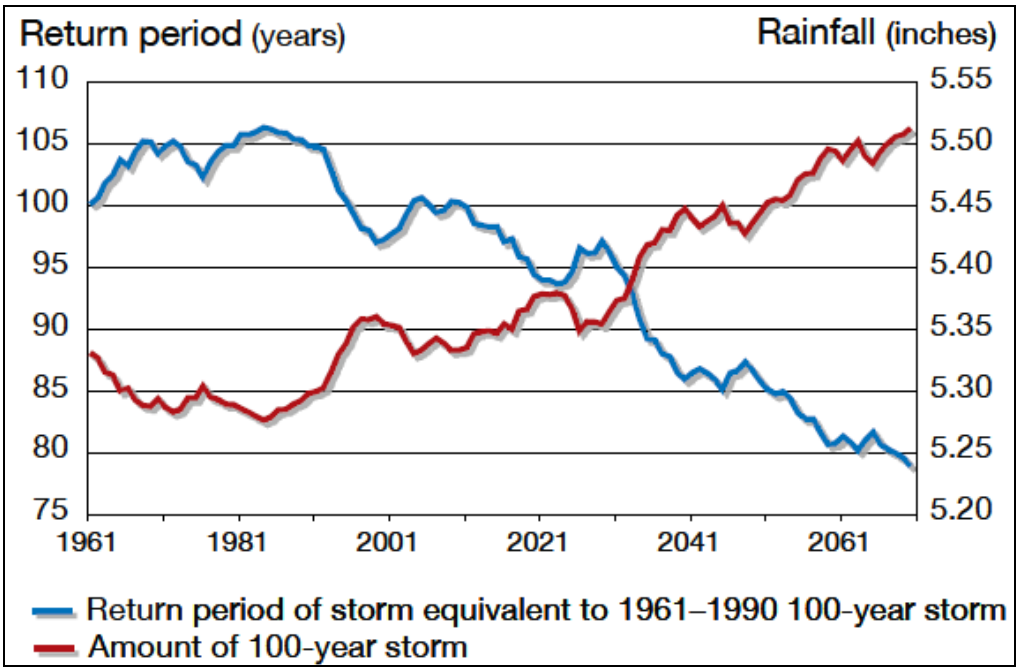
Winter	Spring	Summer	Fall
5 to +15	-5 to +10	-5 to +5	-5 to +10

Source: NYSERDA, 2011

The projected increase in precipitation is expected to fall in heavy downpours and less in light rains. The increase in heavy downpours has the potential to affect drinking water; heighten the risk of riverine flooding; flood key rail lines, roadways and transportation hugs; and increase delays and hazards related to extreme weather events (NYSERDA, 2011).

Increasing air temperatures intensify the water cycle by increasing evaporation and precipitation. This can cause an increase in rain totals during events with longer dry periods in between those events. These changes can have a variety of effects on the State's water resources (NYSERDA 2011). Figure 5.4.4-4 displays the project rainfall and frequency of extreme storms in New York State. The amount of rain fall in a 100-year event is projected to increase, while the number of years between such storms (return period) is projected to decrease. Rainstorms will become more severe and more frequent (NYSERDA 2011).

Figure 5.4.4-4. Projected Rainfall and Frequency of Extreme Storms



Source: NYSERDA, 2011

Total precipitation amounts have slightly increased in the Northeast U.S., by approximately 3.3 inches over the last 100 years. There has also been an increase in the number of two-inch rainfall events over a 48-hour period since the 1950s (a 67-percent increase). The number and intensity of extreme precipitation events are increasing in New York State as well. More rain heightens the danger of localized flash flooding, streambank erosion and storm damage (Cornell University College of Agriculture and Life Sciences, 2011).

5.4.4.2 Vulnerability Assessment

To understand risk, a community must evaluate what assets are exposed and/or vulnerable in the identified hazard area. For the flood hazard, areas identified as hazard areas include the 1-percent and 0.2-percent annual chance flood zones. The following text evaluates and estimates the potential impact of flooding in the County including:

- Overview of vulnerability
- Data and methodology used for the evaluation
- Impact, including: (1) impact on life, safety and health of County residents, (2) general building stock, (3) critical facilities and infrastructure, (4) economy and (5) future growth and development
- Effect of climate change on vulnerability
- Change of vulnerability as compared to that presented in the 2009 Montgomery County Hazard Mitigation Plan
- Further data collections that will assist understanding of this hazard over time

Overview of Vulnerability

Flood is a significant concern for Montgomery County. To assess vulnerability, potential losses were calculated for the County for 1-percent annual chance (100-year) flood event. The flood hazard exposure and loss estimate analysis is presented below.

New York Rising Community Reconstruction Program

Montgomery County was selected to participate in the statewide competitive program, New York Rising Community Reconstruction Program. Projects addressing flooding vulnerabilities of infrastructure, homes, and the continuity of utilities in the communities that participated in the New York Rising program. Please refer to Section 9 for additional information regarding this program.

Data and Methodology

The 1-percent annual chance flood event was examined to evaluate Montgomery County's risk and vulnerability to the flood hazard. The base flood elevations and 1-percent annual chance floodplain polygons identified in the preliminary Digital Flood Insurance Rate Map (DFIRM) and a 1/3 Arc Second elevation dataset from USGS were used to develop the 1-percent annual chance flood depth grid. As noted earlier in this profile, a portion of the City of Amsterdam's preliminary DFIRM is not available at this time. Therefore, the depth grid from the 2009 HMP was used for extent and depth of water for the portions of the City not covered by the preliminary DFIRM.

The HAZUS-MH model uses 2000 U.S. Census demographic data. This data was not updated for this analysis. From 2000 to 2010, there was only a 1-percent change in population in the County (refer to Section 4). The 2010 U.S. Census data was used to estimate population exposure to provide the best available output. Figure 5.4.4-3 earlier in this section illustrates the flood boundaries used for this vulnerability assessment.

Ice jam formation causes a rapid rise of water at the dam and extending upstream. HAZUS-MH does not estimate impacts on population, general building stock, critical facilities and the economy due to flooding upstream associated with ice jams.

The NID identifies three dams in Montgomery County with a high hazard potential (East Canada Lake Dam, Brookside Reservoir Dam and Harrower Pond Dam) and 11 dams with a significant hazard potential. Dams assigned the significant and high hazard potential classifications are those dams where failure or mis-operation

can cause economic loss, environment damage, and/or disruption of lifeline facilities. Additionally, dams assigned the high hazard classification are those that if breached, will probably cause loss of life.

As stated earlier, Montgomery County is also concerned about Gilboa Dam, located outside of County borders. The Gilboa Dam, along the Schoharie Creek in Gilboa, New York (Schoharie County) is 182 feet high and 2,000 feet in length. It holds back up to nearly 20 billion gallons of the Schoharie Creek Reservoir, which provides drinking water to nearly 9 million residents (16–percent) of New York City. In some locations, the Schoharie Creek Reservoir is 5.8 miles long and 150 deep (Pytlovany, 2006; Dam Safety Coalition, 2006). In the event of a failure of Gilboa Dam, a direct impact of floodwaters would not occur within Montgomery County. However, sources have estimated that floodwaters would reach the County line within approximately 5 to 6 hours of a failure occurring and would result in inundation of various communities along the Creek within the County (Montgomery County, 2006). Exposure and loss estimates are not quantified for a failure of Gilboa Dam.

In general, dam breach inundation areas are likely to be larger than the base floodplain. Due to limited historical loss information and electronic dam breach inundation maps for dams located in Montgomery County, exposure and loss estimates were not completed at this time.

For ice jam events, impacts and losses can be expected to be similar to flood events. Additional impacts may include physical damage to property and structures caused by moving ice floes. Flash floods caused by dam failures, have caused great loss of life and property damage due to their unexpected nature and high velocity floodwater. For dam failures, inundation areas are likely to be similar to the 500-year floodplain.

Impact on Life, Health and Safety

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

To estimate the population exposed to the 1-percent flood event, the FEMA preliminary DFIRM floodplain boundaries were overlaid upon the 2010 Census population data in GIS (U.S. Census 2010). Census blocks do not follow the boundaries of the floodplain. The 2010 Census blocks with their centroid the flood boundaries were used to calculate the estimated population exposed to this hazard. Using this approach, it is estimated that 2,427 people are within the 1-percent annual chance floodplain or 4.8% of the total County population. Table 5.4.4-5 lists the estimated population located within the 1-percent annual chance flood zone by municipality.

Table 5.4.4-5. Estimated Montgomery County Population Vulnerable to the 1-Percent Flood Hazard (2010 Census)

Municipality	Total Population	1-Percent Annual Chance Event	
		Population in SFHA	Percent Population in Boundary
Ames, Village of	145	34	23.4%
Amsterdam, City of	18,620	389	2.1%
Amsterdam, Town of	3,784	2	0.1%

Municipality	Total Population	1-Percent Annual Chance Event	
		Population in SFHA	Percent Population in Boundary
Canajoharie, Town of	1,353	31	2.3%
Canajoharie, Village of	2,229	16	0.7%
Charleston, Town of	1,373	19	1.4%
Florida, Town of	2,696	42	1.6%
Fonda, Village of	795	243	30.6%
Fort Johnson, Village of	490	48	9.8%
Fort Plain, Village of	2,322	748	32.2%
Fultonville, Village of	784	310	39.5%
Glen, Town of	1,723	75	4.4%
Hagaman, Village of	1,292	15	1.2%
Minden, Town of	1,978	37	1.9%
Mohawk, Town of	3,049	79	2.6%
Nelliston, Village of	596	0	0.0%
Palatine, Town of	1,910	47	2.5%
Palatine Bridge, Village of	734	60	8.2%
Root, Town of	1,715	107	6.2%
St. Johnsville, Town of	899	83	9.2%
St. Johnsville, Village of	1,732	42	2.4%
Montgomery County (Total)	**50,219**	**2,427**	**4.8%**

Source: U.S. Census, 2010
Notes: SFHA = Special Flood Hazard Area

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

Using 2000 U.S. Census data, HAZUS-MH 2.1 estimates the potential sheltering needs as a result of a 1-percent chance flood event. For the 1-percent flood event, HAZUS-MH 2.1 estimates 2,486 households will be displaced and 1,271 people will seek short-term sheltering, representing less than 5% of the Montgomery County population seeking short-term shelter. These statistics, by municipality, are presented in Table 5.4.4-6.

Table 5.4.4-6. Estimated Population Displaced or Seeking Short-Term Shelter from the 1-Percent Annual Chance Flood Event

Municipality	Total Population (2010 Population)	1-Percent Annual Chance Event	
		Displaced Households	Persons Seeking Short-Term Sheltering
Ames, Village of	145	20	2
Amsterdam, City of	18,620	510	301
Amsterdam, Town of	3,784	34	2
Canajoharie, Town of	1,353	35	0
Canajoharie, Village of	2,229	111	72

Municipality	Total Population (2010 Population)	1-Percent Annual Chance Event	
		Displaced Households	Persons Seeking Short-Term Sheltering
Charleston, Town of	1,373	29	1
Florida, Town of	2,696	108	16
Fonda, Village of	795	254	187
Fort Johnson, Village of	490	44	10
Fort Plain, Village of	2,322	479	364
Fultonville, Village of	784	271	195
Glen, Town of	1,723	64	9
Hagaman, Village of	1,292	57	31
Minden, Town of	1,978	107	26
Mohawk, Town of	3,049	98	9
Nelliston, Village of	596	0	0
Palatine, Town of	1,910	35	5
Palatine Bridge, Village of	734	33	5
Root, Town of	1,715	111	17
St. Johnsville, Town of	899	30	4
St. Johnsville, Village of	1,732	56	15
Montgomery County (Total)	**50,219**	**2,486**	**1,271**

Source: HAZUS-MH 2.1; U.S. Census, 2010
Note: The population displaced and seeking shelter was calculated using the 2000 U.S. Census data (HAZUS-MH 2.1 default demographic data).

The total number of injuries and casualties resulting from typical riverine flooding is generally limited based on advance weather forecasting, blockades and warnings. Therefore, injuries and deaths generally are not anticipated if proper warning and precautions are in place. Ongoing mitigation efforts should help to avoid the most likely cause of injury, which results from persons trying to cross flooded roadways or channels during a flood. Mitigation action items addressing this issue are included in Sections 6 and 9 (Mitigation Strategies) of this plan.

All population in a dam failure inundation zone is considered exposed and vulnerable. Similar to riverine flooding, of the population exposed to dam failure and flash flooding, the most vulnerable include the economically disadvantaged and the population over the age of 65.

There is often limited warning time for dam failure and flash flooding. These events are frequently associated with other natural hazard events such as earthquakes, landslides or severe weather, which limits their predictability and compounds the hazard. Populations without adequate warning of the event are highly vulnerable to this hazard. Ongoing mitigation efforts including dissemination and early warning systems are noted in Sections 6 and 9 (Mitigation Strategies) of this plan should help to avoid the most likely cause of injury, which results from persons trying to cross flooded roadways or channels during a flood.

Impact on General Building Stock

After considering the population exposed and vulnerable to the flood hazard, the built environment was evaluated. Exposure in the flood zone includes those buildings located in the flood zone. Potential damage is the modeled loss that could occur to the exposed inventory, including structural and content value.

Using the default general building stock in HAZUS-MH, the replacement cost values of the Census blocks with their centroid in the floodplain were totaled. There is approximately $504 Million of building/contents exposed to the 1-percent annual chance flood in Montgomery County. This represents approximately 9.4% of

the County's total general building stock replacement value inventory ($5.9 billion). The limitations of this analysis are recognized; Census blocks do not follow floodplain boundaries.

The potential damage estimated to the general building stock inventory associated with the 1-percent annual chance flood is greater than $311 million.

Table 5.4.4-7. Estimated General Building Stock Exposure to the 1-Percent Annual Chance Flood Event

Municipality	Total RCV**	1% Annual Chance Flood Boundary	
		RCV**	% of Total
Ames (V)	$11,930,000	$1,789,000	15.0%
Amsterdam (C)	$2,368,033,000	$74,710,000	3.2%
Amsterdam (T)	$531,119,000	$903,000	0.2%
Canajoharie (T)	$124,320,000	$3,038,000	2.4%
Canajoharie (V)	$301,298,000	$71,488,000	23.7%
Charleston (T)	$109,074,000	$2,194,000	2.0%
Florida (T)	$563,092,000	$16,601,000	2.9%
Fonda (V)	$196,470,000	$115,991,000	59.0%
Fort Johnson (V)	$46,590,000	$4,700,000	10.1%
Fort Plain (V)	$229,997,000	$75,184,000	32.7%
Fultonville (V)	$68,522,000	$37,688,000	55.0%
Glen (T)	$154,892,000	$14,768,000	9.5%
Hagaman (V)	$140,721,000	$3,757,000	2.7%
Minden (T)	$125,699,000	$7,243,000	5.8%
Mohawk (T)	$258,777,000	$7,159,000	2.8%
Nelliston (V)	$57,696,000	$448,000	0.8%
Palatine (T)	$108,236,000	$3,766,000	3.5%
Palatine Bridge (V)	$73,437,000	$0	0.0%
Root (T)	$151,981,000	$8,722,000	5.7%
St. Johnsville (T)	$69,952,000	$4,391,000	6.3%
St. Johnsville (V)	$221,849,000	$49,316,000	22.2%
Montgomery County (Total)	**$5,913,685,000**	**$503,856,000**	**9.4%**

Source: *HAZUS-MH v2.1*
Notes: *% = Percent; RCV = Replacement cost value (structure and contents)*
** *Based upon the HAZUS-MH v2.1 default general building stock inventory.*

Table 5.4.4-8. Estimated General Building Stock Potential Loss to the 1-Percent Annual Chance Flood Event

Municipality	Total RCV	1% Annual Chance Flood Boundary	
		RCV	% of Total
Ames, Village of	$11,930,000	$295,000	2.5
Amsterdam, City of	$2,368,033,000	$62,654,000	2.6
Amsterdam, Town of	$531,119,000	$2,229,000	0.4
Canajoharie, Town of	$124,320,000	$2,078,000	1.7
Canajoharie, Village of	$301,298,000	$46,939,000	15.6
Charleston, Town of	$109,074,000	$1,267,000	1.2
Florida, Town of	$563,092,000	$13,029,000	2.3
Fonda, Village of	$196,470,000	$75,350,000	38.4
Fort Johnson, Village of	$46,590,000	$2,326,000	5.0
Fort Plain, Village of	$229,997,000	$33,345,000	14.5
Fultonville, Village of	$68,522,000	$20,427,000	29.8
Glen, Town of	$154,892,000	$9,661,000	6.2
Hagaman, Village of	$140,721,000	$3,815,000	2.7
Minden, Town of	$125,699,000	$4,537,000	3.6
Mohawk, Town of	$258,777,000	$5,320,000	2.1
Nelliston, Village of	$57,696,000	$176,000	0.3
Palatine, Town of	$108,236,000	$1,471,000	1.4
Palatine Bridge, Village of	$73,437,000	$4,043,000	5.5
Root, Town of	$151,981,000	$6,317,000	4.2
St. Johnsville, Town of	$69,952,000	$1,461,000	2.1
St. Johnsville, Village of	$221,849,000	$15,210,000	6.9
Montgomery County (Total)	**$5,913,685,000**	**$311,950,000**	**5.3**

Source: *HAZUS-MH v2.1*
Notes: *% = Percent; RCV = Replacement cost value*

In addition to total building stock modeling, individual data available on flood policies, claims, Repetitive Loss Properties (RLP) and severe RLP (SRLs) were analyzed. FEMA Region 2 provided a list of residential properties with NFIP policies, past claims and multiple claims (RLPs). According to the metadata provided: "The (*sic* National Flood Insurance Program) NFIP Repetitive Loss File contains losses reported from individuals who have flood insurance through the Federal Government. A property is considered a repetitive loss property when there are two or more losses reported which were paid more than $1,000 for each loss. The two losses must be within 10 years of each other & be as least 10 days apart. Only losses from (*sic* since) 1/1/1978 that are closed are considered."

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

- Has at least four NFIP claim payments (including building and contents) over $5,000 each, and the cumulative amount of such claims payments exceeds $20,000; or
- For which at least two separate claims payments (building payments only) have been made with the cumulative amount of the building portion of such claims exceeding the market value of the building.
- For both of the above, at least two of the referenced claims must have occurred within any 10- year period, and must be greater than 10 days apart.

As of May 31, 2013, there are 273 NFIP policies in Montgomery County. Of those policies in Montgomery County, 25 are considered repetitive loss (RL) and 1 is considered severe repetitive loss (SRL). To be eligible for the NFIP, certain criteria must be met and claim payments must have occurred within 10 years of each other. If there are multiple losses at the same location within 10 days of each other, these claims are counted within one loss. NFIP information for Montgomery County, as of May 31, 2013 (FEMA, 2013), is shown in Tables 5.4.4-10 and 5.4.4-11.

According to FEMA, Table 5.4.4-11 summarizes the occupancy classes of the repetitive loss and severe repetitive loss properties in Westchester County. The majority of the repetitive loss occupancy class is single family residences (68%). The majority of severe repetitive loss occupancy class is also single family residences (100%) (FEMA Region 2, 2013). This information is current as of May 31st, 2013.

Table 5.4.4-9. Occupancy Class of Repetitive Loss Structures in Montgomery County

Occupancy Class	Repetitive Loss Properties	Severe Repetitive Loss Properties	Total
Single Family	17	1	18
Condo	2	0	2
2-4 Family	2	0	2
Other Residential	0	0	0
Non-Residential	4	0	4
Montgomery County	**25**	**1**	**26**

Source: FEMA Region 2, 2013
(1) Policies, claims, repetitive loss and severe repetitive loss statistics provided by FEMA Region 2, and are current as of May 31, 2013.

Table 5.4.4-10. Occupancy Class of Repetitive Loss Structures in Montgomery County, by Jurisdiction

Municipality	Repetitive Loss Properties					Severe Repetitive Loss Properties				
	2-4 Family	Assumed Condo	Non Residential	Other Residential	Single Family	2-4 Family	Assumed Condo	Non Residential	Other Residential	Single Family
Ames, Village of	0	0	0	0	0	0	0	0	0	0
Amsterdam, City of	0	0	0	0	0	0	0	0	0	0
Amsterdam, Town of	0	0	0	0	1	0	0	0	0	0
Canajoharie, Town of	0	0	0	0	1	0	0	0	0	0
Canajoharie, Village of	0	0	0	0	0	0	0	0	0	0
Charleston, Town of	0	0	0	0	1	0	0	0	0	1
Florida, Town of	0	0	0	0	1	0	0	0	0	0
Fonda, Village of	0	1	1	0	8	0	0	0	0	0
Fort Johnson, Village of	0	0	0	0	0	0	0	0	0	0
Fort Plain, Village of	0	1	2	0	1	0	0	0	0	0
Fultonville, Village of	1	0	1	0	3	0	0	0	0	0
Glen, Town of	0	0	0	0	0	0	0	0	0	0
Hagaman, Village of	0	0	0	0	0	0	0	0	0	0
Minden, Town of	0	0	0	0	1	0	0	0	0	0
Mohawk, Town of	1	0	0	0	0	0	0	0	0	0
Nelliston, Village of	0	0	0	0	0	0	0	0	0	0
Palatine, Town of	0	0	0	0	0	0	0	0	0	0
Palatine Bridge, Village of	0	0	0	0	0	0	0	0	0	0
Root, Town of	0	0	0	0	0	0	0	0	0	0
St. Johnsville, Town of	0	0	0	0	0	0	0	0	0	0
St. Johnsville, Village of	0	0	0	0	0	0	0	0	0	0
Montgomery County (Total)	**2**	**2**	**4**	**0**	**17**	**0**	**0**	**0**	**0**	**1**

Source: FEMA, 2013
Note (1): Policies, claims, repetitive loss and severe repetitive loss statistics provided by FEMA Region 2, and are current as of May 31, 2013.
Note (2): The statistics were summarized using the Community Name provided by FEMA Region 2.

Table 5.4.4-11. NFIP Policies, Claims and Repetitive Loss Statistics

Municipality	# Policies (1)	# Claims (Losses) (1)	Total Loss Payments (2)	# Rep. Loss Prop. (1)	# Severe Rep. Loss Prop. (1)	# Policies in the 1% Flood Boundary (3)
Ames, Village of	0	0	$0.00	0	0	0
Amsterdam, City of	23	9	$245,181.71	0	0	3
Amsterdam, Town of	8	7	$111,478.60	1	0	2
Canajoharie, Town of	7	6	$27,310.49	1	0	6
Canajoharie, Village of	10	3	$403,735.52	0	0	7
Charleston, Town of	3	10	$167,456.23	1	1	0
Florida, Town of	12	6	$64,402.62	1	0	0
Fonda, Village of	31	38	$1,548,668.45	10	0	29
Fort Johnson, Village of	14	11	$50,938.86	0	0	7
Fort Plain, Village of	60	46	$2,042,214.74	4	0	47
Fultonville, Village of	12	19	$1,156,810.63	5	0	10
Glen, Town of	10	6	$343,610.22	0	0	3
Hagaman, Village of	3	4	$38,263.54	0	0	0
Minden, Town of	11	4	$26,605.17	1	0	7
Mohawk, Town of	11	38	$1,548,668.45	1	0	4
Nelliston, Village of	0	0	$0.00	0	0	0
Palatine, Town of	4	0	$0.00	0	0	0
Palatine Bridge, Village of	0	0	$0.00	0	0	0
Root, Town of	3	8	$28,284.39	0	0	0
St. Johnsville, Town of	45	21	$409,949.23	0	0	2
St. Johnsville, Village of	6	2	$17,699.41	0	0	0
Montgomery County (Total)	**273**	**200**	**$6,682,609.81**	**25**	**1**	**127**

Source: FEMA Region 3, 2013

(1) Policies, claims, repetitive loss and severe repetitive loss statistics provided by FEMA Region 3, and are current as of May 31, 2013.
Please note the total number of repetitive loss properties includes the severe repetitive loss properties. The number of claims represents claims closed by 5/31/2013.

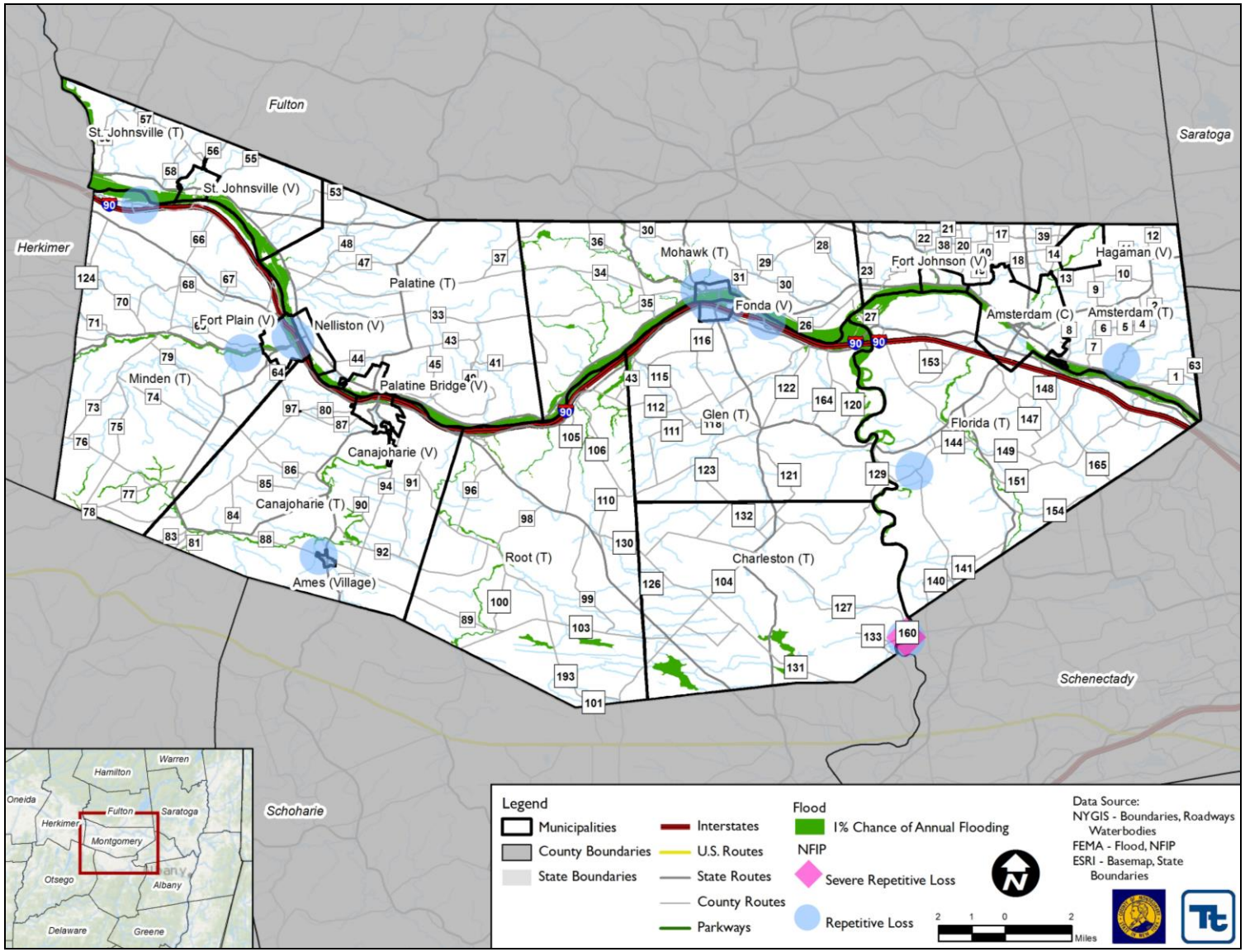
(2) Total building and content losses from the claims file provided by FEMA Region 2.

(3) The policies inside and outside of the flood zones is based on the latitude and longitude provided by FEMA Region 2 in the policy file.

Notes: FEMA noted that where there is more than one entry for a property, there may be more than one policy in force or more than one GIS possibility.
A zero percentage denotes less than 1/100th percentage and not zero damages or vulnerability as may be the case.

The location of the properties with policies, claims and repetitive and severe repetitive flooding were geocoded by FEMA with the understanding that there are varying tolerances between how closely the longitude and latitude coordinates correspond to the location of the property address, or that the indication of some locations are more accurate than others. Figure 5.4.4-5 indicates the repetitive loss areas within the County.

Figure 5.4.4-5. NFIP Repetitive Loss and Severe Repetitive Loss Areas



Source: FEMA, 2013

Impact on Critical Facilities

In addition to considering general building stock at risk, the risk of flood to critical facilities, utilities and user-defined facilities was evaluated. The preliminary DFIRM was used to estimate the exposure of the critical facility inventory. As noted earlier in this profile, the City of Amsterdam's preliminary DFIRM is not available at this time. Therefore, the regulatory DFIRM was used.

HAZUS-MH was used to estimate the flood loss potential to critical facilities exposed to the flood risk. Using depth/damage function curves, HAZUS estimates the percent of damage to the building and contents of critical facilities. Table 5.4.4-12 lists the critical facilities and utilities located in the FEMA flood zones and the percent damage HAZUS-MH 2.1 estimates to the facility as a result of the 1-percent annual chance event.

In cases where short-term functionality is impacted by a hazard, other facilities of neighboring municipalities may need to increase support response functions during a disaster event. Mitigation planning should consider means to reduce impact to critical facilities and ensure sufficient emergency and school services remain when a significant event occurs. Actions addressing shared services agreements are included in Section 9 (Mitigation Strategies) of this plan.

Table 5.4.4-12. Critical Facilities Located in the 1-Percent Annual Chance Flood Boundary and Estimated Potential Damage

Name	Municipality	Type	Exposure	Potential Loss from 1% Flood Event		
			1% Event	Percent Structure Damage	Percent Content Damage	Days to 100-Percent[2]
Florida Avenue	Amsterdam, City of	Highway Bridge	X	-	-	-
RTE 5	Amsterdam, City of	Highway Bridge	X	-	-	-
RTE 30	Amsterdam, City of	Highway Bridge	X	-	-	-
Amsterdam Pump Station 3	Amsterdam, City of	WW Pump	-	40	NA	NF
CRESCENT AVENUE	Amsterdam, Town of	Highway Bridge	X	-	-	-
PROSPECT STREET	Amsterdam, Town of	Highway Bridge	X	<1%	-	-
Amsterdam Pump Station 1	Amsterdam, Town of	WW Pump	X	-	-	-
SHUNK ROAD	Canajoharie, Town of	Highway Bridge	X	-	-	-
Canajoharie Police Dept	Canajoharie, Village of	Fire Station	X	41	100	900
INCINERATOR ROAD	Canajoharie, Village of	Highway Bridge	X	-	-	-
90IX	Canajoharie, Village of	Highway Bridge	X	-	-	-
CANAJOHARIE WASTE WATER TREATMENT PLANT	Canajoharie, Village of	Police Station	X	40	NA	NF
Canajoharie Fire Department	Canajoharie, Village of	Fire Station	X	24	88	-
BRAMAN CORNERS R	Charleston, Town of	Highway Bridge	X	-	-	-
CR160 BURTNVIL R	Charleston, Town of	Highway Bridge	X	<1%	-	-
RTE 161	Florida, Town of	Highway Bridge	X	-	-	-
RTE 161	Florida, Town of	Highway Bridge	X	-	-	-
HARTLEY ROAD	Florida, Town of	Highway Bridge	X	-	-	-
CEMETERY DRIVE	Florida, Town of	Highway Bridge	X	-	-	-
RTE 90	Florida, Town of	Highway Bridge	X	-	-	-
FONDA FULTONVILLE WWTP	Fonda, Village of	WWTP	X	-	-	-
Montgomery County DPW Garage	Fonda, Village of	DPW	X	23	98	-
Fort Johnson Fire CO	Fort Johnson, Village of	Fire Station	X	22	95	630
RTE 5	Fort Johnson, Village of	Highway Bridge	X	-	-	-

Name	Municipality	Type	Exposure	Potential Loss from 1% Flood Event		
			1% Event	Percent Structure Damage	Percent Content Damage	Days to 100-Percent[2]
Fort Johnson Railroad Bridge	Fort Johnson, Village of	Rail Bridge	X	-	-	-
Brant Street Waste Water Pump Station	Fort Johnson, Village of	WW Pump	X	40	NA	NF
Fort Johnson Road Waste Water Pump Station	Fort Johnson, Village of	WW Pump	X	40	NA	NF
Fort Plain Police Hdqrs	Fort Plain, Village of	Police	X	14	64	630
RTE 80	Fort Plain, Village of	Highway Bridge	X	-	-	-
90IX	Fort Plain, Village of	Police Station	X	-	-	-
Willett Street Sewer Pump Station	Fort Plain, Village of	WW Pump	X	40	NA	NF
Fort Plain Fire Dept	Fort Plain, Village of	Fire Station	X	11	70	-
RTE 30A	Fultonville, Village of	Highway Bridge	X	-	-	-
RTE 5S	Glen, Town of	Highway Bridge	X	-	-	-
90I @ MP 177.38	Glen, Town of	Highway Bridge	X	-	-	-
RTE 90	Glen, Town of	Highway Bridge	X	-	-	-
RIVERSDDR	Glen, Town of	Highway Bridge	X	-	-	-
FULTONVILLE INT.	Glen, Town of	Highway Bridge	X	-	-	-
CR73BROOKMANS CO	Minden, Town of	Highway Bridge	X	-	-	-
SPRING STREET	Minden, Town of	Highway Bridge	X	<1%	-	-
CR6C BRIDGE ST	Minden, Town of	Highway Bridge	X	-	-	-
CO RD 26	Mohawk, Town of	Highway Bridge	X	-	-	-
COUNTY ROUTE 27	Mohawk, Town of	Highway Bridge	X	-	-	-
RTE 10	Palatine Bridge, Village of	Highway Bridge	X	-	-	-
Palatine Village Apartments	Palatine Bridge, Village of	Senior	X	77	100	-
RTE 5S	Root, Town of	Highway Bridge	X	<1%	-	-
RTE 5S	Root, Town of	Highway Bridge	X	<1%	-	-
SPRAKERS RD.	Root, Town of	Highway Bridge	X	-	-	-
RAPPA RD	Root, Town of	Highway Bridge	X	-	-	-
CR93CARLISLE ROA	Root, Town of	Highway Bridge	X	-	-	-

Name	Municipality	Type	Exposure	Potential Loss from 1% Flood Event		
			1% Event	Percent Structure Damage	Percent Content Damage	Days to 100-Percent[2]
90IX	Root, Town of	Highway Bridge	X	-	-	-
SAINT JOHNSVILLE WASTE WATER TREATMENT P	St. Johnsville, Village of	WWTP	X	30	NA	NF

Source: *HAZUS-MH 2.1*
Note: *NP = Not provided by HAZUS*
x *= Facility located within the DFIRM boundary.*
- *= No loss calculated by HAZUS*
NA *= Not calculated in HAZUS*
NF *=HAZUS estimate the facility will not be functional*
WW Pump – Wastewater Pump Station
WWTP – Wastewater Treatment Plant
Please note it is assumed the wells have electrical equipment and openings are three-feet above grade.
(1) *HAZUS-MH 2.1 provides a general indication of the maximum restoration time for 100% operations. Clearly, a great deal of effort is needed to quickly restore essential facilities to full functionality; therefore this will be an indication of the maximum downtime (HAZUS-MH 2.1 User Manual).*
(2) *In some cases, a facility may be located in the DFIRM flood hazard boundary; however HAZUS did not calculate potential loss. This may be because the depth of flooding does not amount to any damages to the structure according to the depth damage function used in HAZUS for that facility type.*
(3) *Dams located in the floodplain are not listed in the table above. HAZUS does not calculate potential losses to a dam as a result of a flood event.*

Impact on the Economy

When a flood occurs, the agricultural industry is at risk in terms of economic impact and damage (i.e., damaged crop, financial loss to the farmer). In 2012, the market value of agricultural products sold from Montgomery County totaled over $86.7 million, with total sales averaging $131,701 per farm. The leading agricultural products sold were milk from cows; cattle and calves; grains, oilseeds, dry beans and peas; and other crops and hay (USDA 2012). Table 5.4.4-13 shows the number of farms, total acres, and bushels of harvested crops in the County that would be exposed to the flood hazard.

Table 5.4.4-13. Acreage, Yield and Production of Crops in Montgomery County for 2012

Crop Type	Farms	Acres	Bushels
Corn for grain	68	28,482	3,865,715
Corn of silage or greenchop	25	2,133	38,889
Wheat for grain	44	7,080	440,707

Source: USDA 2012 (

The USDA estimates that 20 upstate New York counties suffered $40 million in total damages to crops, livestock, structures and land as a result of the June 2006 flood. According to the County Executive Director of the federal Farm Service Agency (FSA), over 400 County farms suffered an estimated $3 million in crop losses in Montgomery County. The flooding damaged 8,000 acres of corn, 2,400 acres of hay, and 2,100 acres of soybeans on 422 of Montgomery County's 600 farms (Durr, 2006).

Table 5.4.4-14 shows 40-percent and 60-percent loss estimates for hay, corn, oats and wheat based on 2003 production. Given professional knowledge and historic loss information available, these are considered conservative estimates of potential losses for this hazard.

Table 5.4.4-14. Estimated Losses to Crops in Montgomery County

Crop Type	Total Production (2003)	40% Loss Estimate**	60% Loss Estimate**
Hay (alfalfa and other)	113,200 tons	45,280 tons	67,920 tons
Corn (grain)	986,100 bushels	394,440 bushels	591,660 bushels
Corn (silage)	250,300 tons	100,120 tons	150,180 tons
Oats	55,500 bushels	22,200 bushels	33,300 bushels
Wheat*	20,200 bushels	8,080 bushels	12,120 bushels

Source: USDA NASS, 2005
Note: * Data from 2002

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

Flooding can cause extensive damage to public utilities and disruptions to the delivery of services. Loss of power and communications may occur; and drinking water and wastewater treatment facilities may be temporarily out of operation. Flooded streets and road blocks make it difficult for emergency vehicles to respond to calls for service. Floodwaters can wash out sections of roadway and bridges (Foster, Date Unknown).

Direct building losses are the estimated costs to repair or replace the damage caused to the building. The potential damage estimated to the general building stock inventory associated with the 1-percent flood is approximately $317 million which represents 6-percent of the County's overall total general building stock inventory. These dollar value losses to the County's total building inventory replacement value, in addition to damages to roadways and infrastructure, would greatly impact the local economy.

HAZUS-MH estimates the amount of debris generated from the flood events as a result of 1- and 0.2-percent events. The model breaks down debris into three categories: 1) finishes (dry wall, insulation, etc.); 2) structural (wood, brick, etc.) and 3) foundations (concrete slab and block, rebar, etc.). The distinction is made because of the different types of equipment needed to handle the debris. Table 5.4.4-15 summarizes the debris HAZUS-MH 2.1 estimates for these events.

Table 5.4.4-15. Estimated Debris Generated from the 1-Percent Flood Event

Municipality	1% Flood Event			
	Total (tons)	Finish (tons)	Structure (tons)	Foundation (tons)
Ames (V)	93	30	32	30
Amsterdam (C)	21,020	3,165	9,237	8,618
Amsterdam (T)	715	140	311	264
Canajoharie (T)	629	142	261	226
Canajoharie (V)	5,399	811	2,562	2,026
Charleston (T)	413	106	132	175
Florida (T)	3,688	673	1,572	1,443
Fonda (V)	2,709	770	1,010	929
Fort Johnson (V)	782	163	326	292
Fort Plain (V)	8,605	1,804	3,687	3,114
Fultonville (V)	7,348	1,293	3,518	2,537
Glen (T)	4,652	659	2,536	1,457
Hagaman (V)	1,089	231	465	393
Minden (T)	1,732	386	633	712
Mohawk (T)	1,869	355	735	779
Nelliston (V)	57	4	31	22
Palatine (T)	525	102	228	194
Palatine Bridge (V)	1,636	191	815	630
Root (T)	1,580	294	619	667
St. Johnsville (T)	497	124	171	202
St. Johnsville (V)	597	218	197	182
Montgomery County (Total)	**65,635**	**11,662**	**29,077**	**24,895**

Source: HAZUS-MH 2.1

Effect of Climate Change on Vulnerability

Refer to the "Climate Change Impacts" section discussed earlier in this profile.

Change of Vulnerability

Montgomery County and its municipalities continue to be vulnerable to the flood hazard. In 2008, there were 7 repetitive loss properties in the County. As of May 2013, there are 25 repetitive loss properties and now one severe repetitive loss property. The DFIRM was not available or used for the 2008 HMP vulnerability

assessment. Differences in exposure and potential losses estimated from the 2008 HMP and this update is mainly due to the difference in these hazard areas, as well the release of the 2010 U.S. Census statistics.

Future Growth and Development

As discussed in Section 4, areas targeted for future growth and development have been identified across the County. Any areas of growth could be potentially impacted by the flood hazard if located within the identified hazard areas. It is the intention of the County to discourage development in vulnerable areas or to encourage higher regulatory standards on the local level.

Additional Data and Next Steps

A HAZUS-MH riverine flood analysis was conducted for Montgomery County using the most current and best available data including critical facility inventories and FEMA preliminary DFIRM. For future plan updates, more accurate exposure and loss estimates can be produced by replacing the national default demographic inventory with 2010 U.S. Census data when it becomes available in the HAZUS-MH model, and update the default general building stock inventory in HAZUS-MH and conduct the loss estimates at the structure level. In addition, a more accurate depth grid may be generated when the City of Amsterdam's updated DFIRM is released. Specific mitigation actions addressing improved data collection and further vulnerability analysis is included in Section 9 of this plan update.

5.4.5 Severe Storm

The following section provides the hazard profile (hazard description, location, extent, previous occurrences and losses, probability of future occurrences, and impact of climate change) and vulnerability assessment for the severe weather hazard in Montgomery County.

5.4.5.1 Profile

Hazard Description

For the purpose of this HMP and as deemed appropriated by Montgomery County, the severe storm hazard includes hailstorms, windstorms, lightning, thunderstorms, tornadoes, and tropical cyclones [which include tropical depressions, tropical storms, and hurricanes], which are defined below. Since most northeasters, (or Nor'Easters) a type of an extra-tropical cyclone, generally take place during the winter weather months, Nor'Easters have been grouped as a type of severe winter weather storm, further discussed in Section 5.4.6 (Severe Winter Storms).

Hailstorm

Hail forms inside a thunderstorm where there are strong updrafts of warm air and downdrafts of cold water. If a water droplet is picked up by the updrafts, it can be carried well above the freezing level. Water droplets freeze when temperatures reach 32°F or colder. As the frozen droplet begins to fall, it may thaw as it moves into warmer air toward the bottom of the thunderstorm. However, the droplet may be picked up again by another updraft and carried back into the cold air and re-freeze. With each trip above and below the freezing level, the frozen droplet adds another layer of ice. The frozen droplet, with many layers of ice, falls to the ground as hail. Most hail is small and typically less than two inches in diameter (NWS 2010).

High Winds / Windstorms

High winds, other than tornadoes, are experienced in all parts of the United States. Areas that experience the highest wind speeds are coastal regions from Texas to Maine, and the Alaskan coast; however, exposed mountain areas experience winds at least as high as those along the coast (FEMA 1997; Robinson 2013). Wind begins with differences in air pressures. It is rough horizontal movement of air caused by uneven heating of the earth's surface. Wind occurs at all scales, from local breezes lasting a few minutes to global winds resulting from solar heating of the earth (Ilicak 2005). High winds have the potential to down trees, tree limbs and power lines which lead to widespread power outages and damaging residential and commercial structures throughout Montgomery County. High winds are often associated by other severe weather events such as thunderstorms, tornadoes, hurricanes and tropical storms (all discussed further in this section). The following table provides the descriptions of winds used by the NWS.

Table 5.4.5-1. NWS Wind Descriptions

Descriptive Term	Sustained Wind Speed (mph)
Strong, dangerous, or damaging	≥40
Very Windy	30-40
Windy	20-30
Breezy, brisk, or blustery	15-25
None	5-15 or 10-20
Light or light and variable wind	0-5

Source: NWS 2010
mph miles per hour

Tornadoes

Tornadoes are nature's most violent storms and can cause fatalities and devastate neighborhoods in seconds. A tornado appears as a rotating, funnel-shaped cloud that extends from a thunderstorm to the ground with whirling winds that can reach 250 mph. Damage paths can be greater than one mile in width and 50 miles in length. Tornadoes typically develop from either a severe thunderstorm or hurricane as cool air rapidly overrides a layer of warm air. Tornadoes typically move at speeds between 30 and 125 mph and can generate internal winds exceeding 300 mph. The lifespan of a tornado rarely is longer than 30 minutes (FEMA 1997).

Thunderstorms

A thunderstorm is a local storm produced by a cumulonimbus cloud and accompanied by lightning and thunder (NWS 2009d). A thunderstorm forms from a combination of moisture, rapidly rising warm air, and a force capable of lifting air such as a warm and cold front, a sea breeze, or a mountain. Thunderstorms form from the equator to as far north as Alaska. Although thunderstorms generally affect a small area when they occur, they have the potential to become dangerous due to their ability in generating tornadoes, hailstorms, strong winds, flash flooding, and lightning. The NWS considers a thunderstorm severe only if it produces damaging wind gusts of 58 mph or higher or large hail one-inch (quarter size) in diameter or larger or tornadoes (NWS 2010).

Lighting is a bright flash of electrical energy produced by a thunderstorm. The resulting clap of thunder is the result of a shock wave created by the rapid heating and cooling of the air in the lightning channel. All thunderstorms produce lightning and are very dangerous. It ranks as one of the top weather killers in the United States and kills approximately 50 people and injures hundreds each year. Lightning can occur anywhere there is a thunderstorm.

Thunderstorms can lead to flooding, landslides, strong winds, and lightning. Roads may become impassable from flooding, downed trees or power lines, or a landslide. Downed power lines can lead to utility losses, such as water, phone and electricity. Lightning can damage homes and injure people. In the U.S., an average of 300 people are injured and 80 people are killed by lightning each year. Typical thunderstorms are 15 miles in diameter and last an average of 30 minutes. An estimated 100,000 thunderstorms occur each year in the U.S., with approximately 10% of them classified as severe. During the warm season, thunderstorms are responsible for most of the rainfall.

Hurricanes and Tropical Storms

A hurricane is a tropical storm that attains hurricane status when its wind speed reaches 74 or more miles an hour. Tropical systems may develop in the Atlantic between the Lesser Antilles and the African coast, or may develop in the warm tropical waters of the Caribbean and Gulf of Mexico. These storms may move up the Atlantic coast of the United States and impact the eastern seaboard, or move into the United States through the states along the Gulf Coast, bringing wind and rain as far north as New England before moving offshore and heading east.

A tropical storm system is characterized by a low-pressure center and numerous thunderstorms that produce strong winds and heavy rain (winds are at a lower speed than hurricane-force winds, thus gaining its status as tropical storm versus hurricane). Tropical storms strengthen when water evaporated from the ocean is released as the saturated air rises, resulting in condensation of water vapor contained in the moist air. They are fueled by a different heat mechanism than other cyclonic windstorms such as Nor'Easters and polar lows. The characteristic that separates tropical cyclones from other cyclonic systems is that at any height in the atmosphere, the center of a tropical cyclone will be warmer than its surroundings; a phenomenon called "warm core" storm systems (NOAA 1999).

The National Weather Service (NWS) issues hurricane and tropical storm watches and warnings. These watches and warnings are issued or will remain in effect after a tropical cyclone becomes post-tropical, when such a storm poses a significant threat to life and property. The NWS allows the National Hurricane Center (NHC) to issue advisories during the post-tropical stage. The following are the definitions of the watches and warnings:

- *Hurricane/Typhoon Warning* is issued when sustained winds of 74 mph or higher are expected somewhere within the specified area in association with a tropical, subtropical, or post-tropical cyclone. Because hurricane preparedness activities become difficult once winds reach tropical storm force, the warning is issued 36 hours in advance of the anticipated onset of tropical storm force winds (24 hours in the western north Pacific). The warning can remain in effect when dangerously high water or combination of dangerously high water and waves continue, even though winds may be less than hurricane force.
- *Hurricane Watch* is issued when sustained winds of 74 mph or higher are possible within the specified area in association with a tropical, subtropical, or post-tropical cyclone. Because hurricane preparedness activities become difficult once winds reach tropical storm force, the hurricane watch is issued 48 hours prior to the anticipated onset of tropical storm force winds.
- *Tropical Storm Warning* is issued when sustained winds of 39 to 73 mph are expected somewhere within the specified area within 36 hours (24 hours for the western north Pacific) in association with a tropical, subtropical, or post-tropical storm.
- *Tropical Storm Watch* is issued when sustained winds of 39 to 73 mph are possible within the specified area within 48 hours in association with a tropical, sub-tropical, or post-tropical storm (NWS 2013).

Storm Surge

Storm surges inundate coastal floodplains by dune overwash, tidal elevation rise in inland bays and harbors, and backwater flooding through coastal river mouths. Strong winds can increase tide levels and water-surface elevations. Storm systems generate large waves that run up and flood coastal beaches. The combined effects create storm surges that affect the beach, dunes, and adjacent low-lying floodplains. Shallow, offshore depths can cause storm-driven waves and tides to pile up against the shoreline and inside bays.

Based on an area's topography, a storm surge may inundate only a small area (along sections of the northeast or southeast coasts) or storm surge may inundate coastal lands for a mile or more inland from the shoreline.

Extent

Hailstorms

The severity of hail is measured by duration, hail size, and geographic extent. All of these factors are directly related to thunderstorms, which creates hail. There is wide potential variation in these severity components. The most significant impact of hail is damage to crops. Hail also has the potential to damage structures and vehicles during hailstorms.

Hail can be produced from many different types of storms. Typically, hail occurs with thunderstorm events. The size of hail is estimated by comparing it to a known object. Most hailstorms are made up of a variety of sizes, and only the very largest hail stones pose serious risk to people, when exposed. Table 5.4.5-2 shows the different sizes of hail and the comparison to real-world objects.

Table 5.4.5-2. Hail Size

Size	Inches in Diameter
Pea	0.25 inch
Marble/mothball	0.50 inch
Dime/Penny	0.75 inch
Nickel	0.875 inch
Quarter	1.0 inch
Ping-Pong Ball	1.5 inches
Golf Ball	1.75 inches
Tennis Ball	2.5 inches
Baseball	2.75 inches
Tea Cup	3.0 inches
Grapefruit	4.0 inches
Softball	4.5 inches

Source: NOAA 2012; NYS DHSES 2014

High Winds

The following table provides the descriptions of winds used by the NWS during wind-producing events.

Table 5.4.5-3. NWS Wind Descriptions

Descriptive Term	Sustained Wind Speed (mph)
Strong, dangerous, or damaging	≥40
Very Windy	30-40
Windy	20-30
Breezy, brisk, or blustery	15-25
None	5-15 or 10-20
Light or light and variable wind	0-5

Source: NWS 2010
mph miles per hour

The NWS issues advisories and warnings for winds. Issuance is normally site-specific. High wind advisories, watches and warnings are products issued by the NWS when wind speeds may pose a hazard or is life threatening. The criterion for each of these varies from state to state. Wind warnings and advisories for New York State are as follows:

- High Wind Warnings are issued when sustained wind speeds of 40 mph or greater lasting for one hour or longer or for winds of 58 mph or greater for any duration or widespread damage are possible.
- Wind Advisories are issues when sustained winds of 30 to 39 mph are forecast for one hour or longer, or wind gusts of 46 to 57 mph for any duration (NWS 2015).

Tornadoes

The magnitude or severity of a tornado was originally categorized using the Fujita Scale (F-Scale) or Pearson Fujita Scale introduced in 1971. This used to be the standard measurement for rating the strength of a tornado. The F-Scale categorized tornadoes by intensity and area and was divided into six categories, F0 (gale) to F5 (incredible). Table 5.4.5-4 explains each of the six F-Scale categories.

Table 5.4.5-4. Fujita Damage Scale

Scale	Wind Estimate (mph)	Typical Damage

Scale	Wind Estimate (mph)	Typical Damage
F0	< 73	Light damage. Some damage to chimneys; branches broken off trees; shallow-rooted trees pushed over; sign boards damaged.
F1	73-112	Moderate damage. Peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos blown off roads.
F2	113-157	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars overturned; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
F3	158-206	Severe damage. Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; heavy cars lifted off the ground and thrown.
F4	207-260	Devastating damage. Well-constructed houses leveled; structures with weak foundations blown away some distance; cars thrown and large missiles generated.
F5	261-318	Incredible damage. Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 meters (109 yards); trees debarked; incredible phenomena occur.

Source: Storm Prediction Center (SPC) Date Unknown
mph miles per hour

The Enhanced Fujita Scale (EF-Scale) is now the standard used to measure the strength of a tornado. It is used to assign tornadoes a 'rating' based on estimated wind speeds and related damage. When tornado-related damage is surveyed, it is compared to a list of Damage Indicators (DI) and Degree of Damage (DOD), which help better estimate the range of wind speeds produced by the tornado. From that, a rating is assigned, similar to that of the F-Scale, with six categories from EF0 to EF5, representing increasing degrees of damage. The EF-Scale was revised from the original F-Scale to reflect better examinations of tornado damage surveys. This new scale considers how most structures are designed (NOAA 2008). Table 5.4.5-5 displays the EF-Scale and each of its six categories.

Table 5.4.5-5. Enhanced Fujita Damage Scale

EF-Scale Number	Intensity Phrase	Wind Speed (mph)	Type of Damage Done
EF0	Light tornado	65–85	**Light damage**. Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over.
EF1	Moderate tornado	86-110	**Moderate damage**. Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
EF2	Significant tornado	111-135	**Considerable damage**. Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
EF3	Severe tornado	136-165	**Severe damage**. Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.
EF4	Devastating tornado	166-200	**Devastating damage**. Well-constructed houses and whole frame houses completely leveled; cars thrown and small missiles generated.
EF5	Incredible tornado	>200	**Incredible damage**. Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 meters (109 yards); high-rise buildings have significant structural deformation; incredible phenomena occur.

Source: SPC Date Unknown
EF-Scale Enhanced Fujita Scale
mph miles per hour

Tornado watches and warning are issued by the local NWS office. A tornado watch is released when tornadoes are possible in an area. A tornado warning means a tornado has been sighted or indicated by weather radar. The current average lead time for tornado warnings is 13 minutes. Occasionally, tornadoes develop so rapidly, that little, if any, advance warning is possible (NOAA 2013; FEMA 2013).

Thunderstorms

Severe thunderstorm watches and warnings are issued by the local NWS office and SPC. The NWS and SPC will update the watches and warnings and will notify the public when they are no longer in effect. Watches and warnings for tornadoes in New York State are as follows:

- Severe Thunderstorm Warnings are issued when there is evidence based on radar or a reliable spotter report that a thunderstorm is producing, or forecast to produce, wind gusts of 58 mph or greater, structural wind damage, and/or hail one-inch in diameter or greater. A warning will include where the storm was located, what municipalities will be impacted, and the primary threat associated with the severe thunderstorm warning. After it has been issued, the NWS office will follow up periodically with Severe Weather Statements which contain updated information on the severe thunderstorm and will let the public know when the warning is no longer in effect (NWS 2009; NWS 2010).
- Severe Thunderstorm Watches are issued by the SPC when conditions are favorable for the development of severe thunderstorms over a larger-scale region for a duration of at least three hours. Tornadoes are not expected in such situations, but isolated tornado development may also occur. Watches are normally issued well in advance of the actual occurrence of severe weather. During the watch, the NWS will keep the public informed on what is happening in the watch area and also let the public know when the watch has expired or been cancelled (NWS 2009; NWS 2010).
- Special Weather State for Near Severe Thunderstorms are issued for strong thunderstorms that are below severe levels, but still may have some adverse impacts. Usually, they are issued for the threat of wind gusts of 40 to 58 mph or small hail less than one-inch in diameter (NWS 2010).

Hurricanes and Tropical Storms

The term used to identify a tropical cyclone is based on the strength of its winds. Hurricanes are further categorized. The extent of a hurricane is categorized by the Saffir-Simpson Hurricane Scale. The Saffir-Simpson Hurricane Wind Scale is a 1 to 5 rating based on a hurricane's sustained wind speed. This scale estimates potential property damage. Hurricanes reaching Category 3 and higher are considered major hurricanes because of their potential for significant loss of life and damage. Category 1 and 2 storms are still dangerous and require preventative measures (NHC, 2013). Table 5.4.5-6 presents this scale, which is used to estimate the potential property damage and flooding expected when a hurricane makes land fall.

Table 5.4.5-6. The Saffir-Simpson Scale

Category	Wind Speed (mph)	Storm Surge (feet)	Expected Damage
1	74-95 mph	3 to 5 feet	Very dangerous winds will produce some damage: Homes with well-constructed frames could have damage to roof, shingles, vinyl siding, and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
2	96-110 mph	6 to 8 feet	Extremely dangerous winds will cause extensive damage: Homes with well-constructed frames could sustain major roof and siding damage.

Table 5.4.5-6. The Saffir-Simpson Scale

Category	Wind Speed (mph)	Storm Surge (feet)	Expected Damage
			Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
3 (major)	111-129 mph	9 to 12 feet	Devastating damage will occur: Homes with well-built frames may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.
4 (major)	130-156 mph	13 to 18 feet	Catastrophic damage will occur: Homes with well-built frames can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
5 (major)	>157 mph	19+ feet	Catastrophic damage will occur: A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.

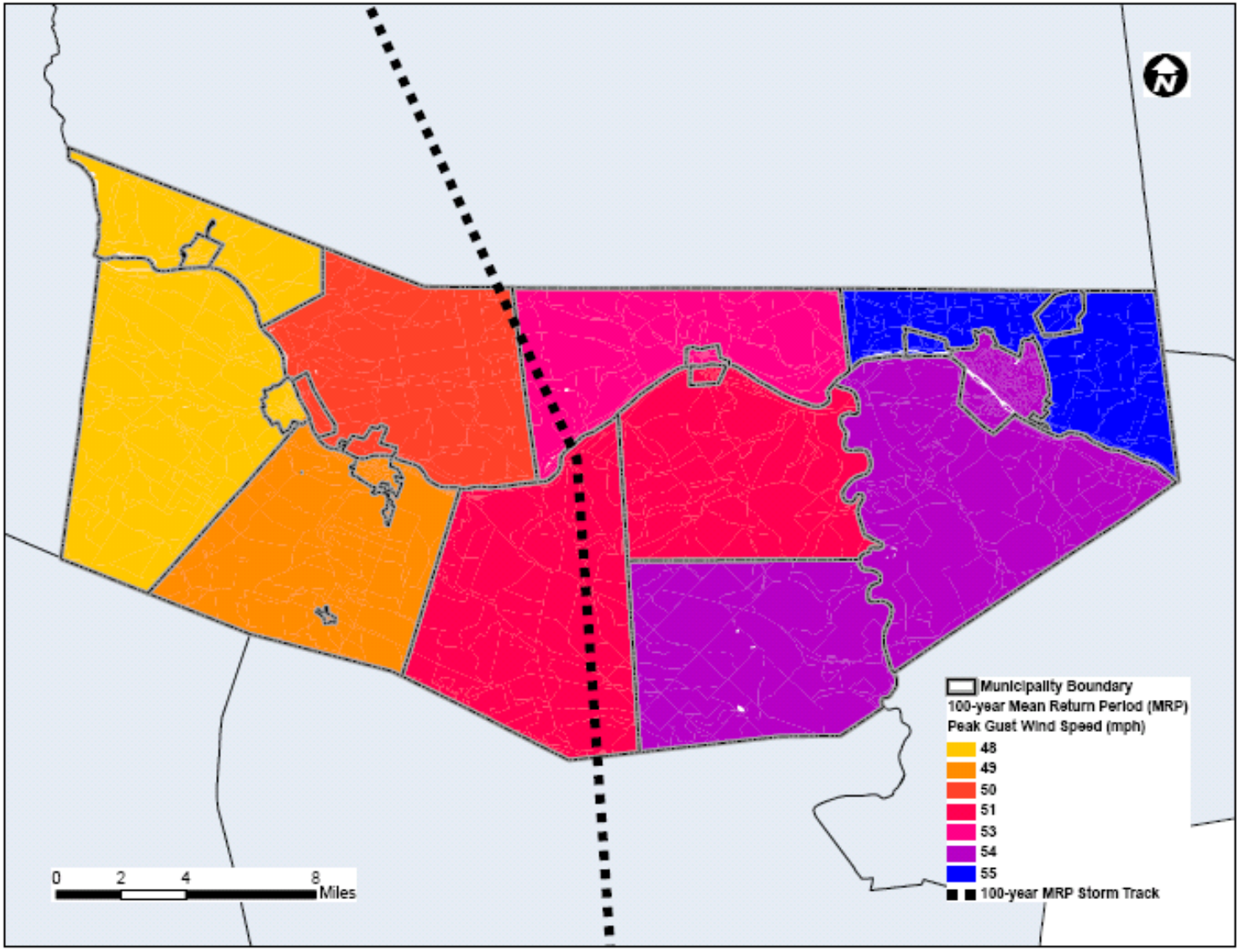
Source: NHC, 2013; NASA 2003
mph = Miles per hour
> = Greater than

Mean Return Period

In evaluating the potential for hazard events of a given magnitude, a mean return period (MRP) is often used. The MRP provides an estimate of the magnitude of an event that may occur within any given year based on past recorded events. MRP is the average period of time, in years, between occurrences of a particular hazard event, equal to the inverse of the annual frequency of exceedance (Dinicola 2009).

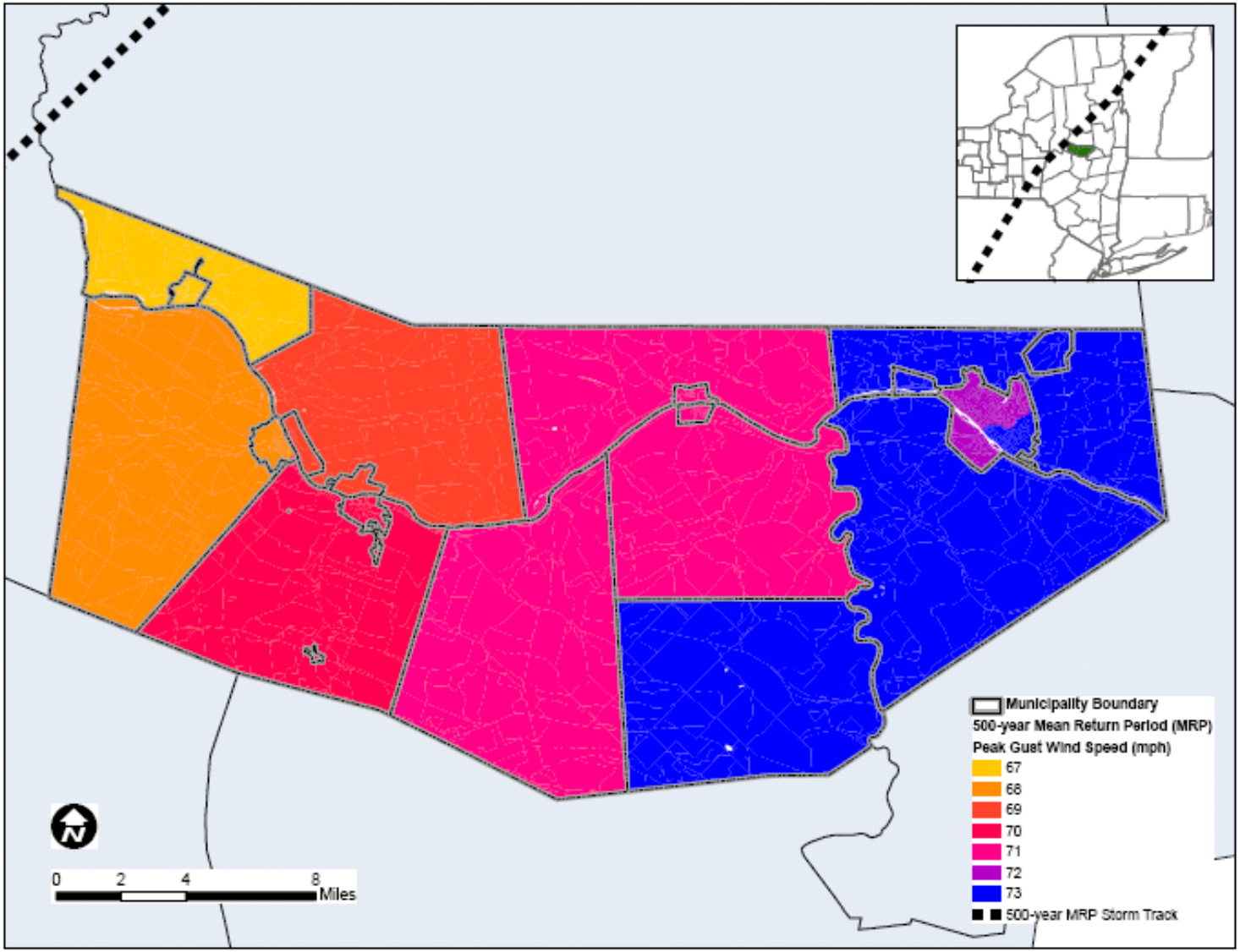
Figures 5.4.5-1 and 5.4.5-2 show the estimated maximum 3-second gust wind speeds that can be anticipated in the study area associated with the 100- and 500-year MRP events. These peak wind speed projections were generated using Hazards U.S. Multi-Hazard (HAZUS-MH) model runs. The estimated hurricane track used for the 100- and 500-year event is also shown. The maximum 3-second gust wind speeds for Morris County range from 68 to 75 mph for the 100-year MRP event. The maximum 3-second gust wind speeds for Morris County range from 83 to 98 for the 500-year MRP event. The associated impacts and losses from these 100-year and 500-year MRP hurricane event model runs are reported in the Vulnerability Assessment.

Figure 5.4.5-1. Peak Wind Speeds for 100-year Hurricane Severe Storm Event (Wind) in Montgomery County



Source: HAZUS-MH MR3

Figure 5.4.5-2. Peak Wind Speeds for 500-year Hurricane Severe Storm Event (Wind) in Montgomery County



Source: HAZUS-MH MR3

Location

Hailstorms

Hailstorms are most frequent in the southern and central plains states in the United States, where warm moist air off of the Gulf of Mexico and cold dry air from Canada collide, and thereby spawning violent thunderstorms. This area of the United States is known as hail alley and lies within the states of Texas, Oklahoma, Colorado, Kansas, Nebraska, and Wyoming. In New York State, hailstorms can occur anywhere within the State independently or during a tornado, thunderstorm or lightning event.

High Winds

All of Montgomery County is subject to high winds from thunderstorms, hurricanes/tropical storms, tornadoes, and other severe weather events. According to the FEMA Winds Zones of the United States map, Montgomery County is located in Wind Zone II, where wind speeds can reach up to 160 mph. The County is also located in the Hurricane Susceptible Region, which extends along the entire east coast from Maine to Florida, the Gulf Coast, and Hawaii. This figure indicates how the frequency and strength of windstorms impacts the United States and the general location of the most wind activity. This is based on 40 years of tornado data and 100 years of hurricane data, collected by FEMA.

Tornadoes

Tornadoes have been documented in every state in the United States, and on every continent with the exception of Antarctica. Approximately 1,200 tornadoes occur in the United States each year, with the central portion of the country experiencing the most. Tornadoes can occur at any time of the year, with peak seasons at different times for different states (NSSL 2014). New York State has a definite vulnerability to tornadoes. Since 1952, over 350 tornadoes ranging from F0 to F4 have occurred throughout the State (NYS DHSES 2014). Based on statistics from 1991 to 2010, New York State has experienced an average of 10 tornadoes annually (NCDC 2013). For Montgomery County, between 1950 and 2014, the County experienced eight tornadoes, which averages approximately 0.125 tornadoes each year (SPC 2014).

Thunderstorms

Thunderstorms affect relatively small localized areas, rather than large regions like winter storms and hurricane events. Thunderstorms can strike in all regions of the United States; however, they are most common in the central and southern states. The atmospheric conditions in these regions of the country are ideal for generating these powerful storms. It is estimated that there are as many as 40,000 thunderstorms each day worldwide. The most thunderstorms are seen in the southeast United States, with Florida having the highest incidences (80 to over 100 thunderstorm days each year). According to NOAA, Montgomery County can experience between 20 and 30 thunderstorms each year (NOAA 2012).

Hurricanes and Tropical Storms

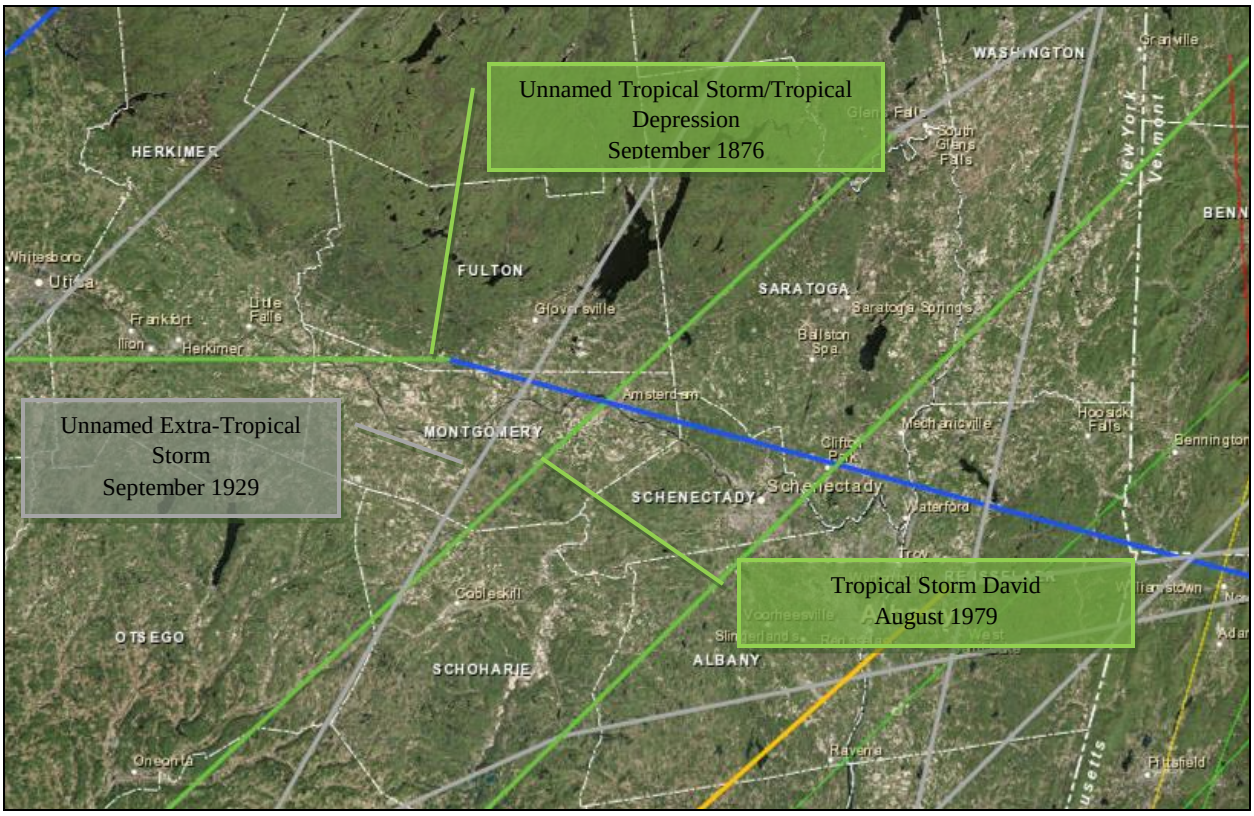
Hurricanes and tropical storms can impact New York State from June to November, the official eastern U.S. hurricane season. However, late July to early October is the period hurricanes and tropical storms are most likely to impact New York State, due to the coolness of the North Atlantic Ocean waters (NYS DHSES 2014).

The entire Montgomery County Planning Area is vulnerable to hurricanes and tropical storms. It all depends on the storm's track. Inland areas, like those within Montgomery County, are at risk for flooding due to the heavy rain and winds produced by hurricanes and tropical storms. The majority of damage from these events

often results from residual wind damage and inland flooding, most recently experienced during Hurricane Irene in August, 2011.

NOAA's Historical Hurricane Tracks tool is a public interactive mapping application that displays Atlantic Basin and East-Central Pacific Basin tropical cyclone data. This interactive tool catalogs tropical cyclones that have occurred from 1842 to 2014 (latest date available from data source). Between 1990 and 2014, there were no tropical cyclones tracked within 65 nautical miles of Montgomery County. Figure 5.4.5-3 displays tropical cyclone tracks for Montgomery County that tracked with 65 nautical miles between 1842 and 2014. Please note that the figure does not show Hurricane Sandy passing within 65 nautical miles of the County. Even though this storm did not pass near the County, the impacts from Sandy in the County were devastating, which included extensive power outages, downed trees and power lines, and closed roadways due to wind damage.

Figure 5.4.5-3. Historical Tropical Storm and Hurricane Tracks 1842 to 2014



Source: *NOAA, 2015*
Note: *Storm Tracks with dates only are unnamed events.*

Previous Occurrences and Losses

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

Between 1954 and 2015, New York State was included in 54 FEMA declared severe storm-related disasters (DR) or emergencies (EM) classified as one or a combination of the following hazards: flooding, hurricane, tropical storm, tornadoes, straight-line winds, tropical depression, Nor'Easter, severe thunderstorms, high tides,

heavy rain, ice storm, landslides, and wave action. Generally, these disasters cover a wide region of the State; therefore, they may have impacted many counties. Of those declarations, Montgomery County has been included in 13 declarations (FEMA 2015).

For this 2015 Plan Update, known severe storm events, including FEMA disaster declarations, which have impacted Montgomery County between 2007 and 2015 are identified in Table 5.4.5-7. For information on events that occurred prior to 2007, please refer to the 2009 Montgomery County HMP. For detailed information on damages and impacts to each municipal, refer to Section 9 (jurisdictional annexes). Please note that not all events that have occurred in Montgomery County are included due to the extent of documentation and the fact that not all sources may have been identified or researched. Loss and impact information could vary depending on the source. Therefore, the accuracy of monetary figures discussed is based only on the available information identified during research for this HMP Update.

Table 5.4.5-7. Severe Storm Events between 2007 and 2015

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts	Source(s)
April 14-17, 2007*	Severe Storms / Inland and Coastal Flooding (also identified as a Nor'easter)	DR-1692	Yes	New York State experienced approximately $12.76 M in eligible damages (NYS DPC). However, more than $61 M in disaster aid has been approved for the State.. Losses in Montgomery County are unknown; however, public assistance to Montgomery County totaled $55 K as of July 10, 2007.	FEMA
June 10, 2008	Severe Storms / Lightning	NA	NA	Lightning from a severe thunderstorm struck a structure near Mindenville causing it to catch fire, property damage from this storm was estimated around $20,000.	NOAA - NCDC
July 22, 2008	Severe Storms / High Winds	NA	NA	A severe thunderstorm with gusty winds sustained around 50 knots uprooted several trees in Root.	NOAA-NCDC
July 26, 2008	Thunderstorm / High Winds	NA	NA	A severe thunderstorm with gusty winds sustained around 50 knots uprooted several trees and knocked out power to several properties in Canajoharie.	NOAA-NCDC
August 10, 2008	Thunderstorm / Hail	NA	NA	Quarter sized hail was reported in Ames and Canajoharie during a severe thunderstorm.	NOAA-NCDC
August 15, 2008	Thunderstorm	NA	NA	Power poles were knocked down along State Route 10 near Palatine Bridge as a result of strong thunderstorm winds. The power poles closed a portion of Route 10, between Groff Road and Dillenbeck Road.	NOAA-NCDC
July 7, 2009	Thunderstorm / Hail	NA	NA	Quarter to ping pong ball size hail reported in St. Johnsville and Young Corners during a thunderstorm.	NOAA-NCDC
July 16, 2009	Thunderstorms / Hail / High Winds	NA	NA	Hail ranging in size from a penny to a golf ball was reported in Nelliston, Locke 16 of the Erie Canal, Canajoharie and Palatine Bridge. The hail damaged windows and crops. Trees were also reported down from strong winds associated with the storm.	NOAA-NCDC
August 3, 2010	Tornado	NA	NA	A tornado briefly touched down near Fonda with damage confined to snapped and uprooted trees. Maximum estimated wind speed were 90 mph. A tornado also briefly touched down mainly on the grounds of the Auriesville Shrine, with damage confined mostly to snapped and uprooted trees. Maximum estimated wind were 100 mph.	NOAA-NCDC
May 26, 2011	Severe Storms	NA	NA	A nearly stationary frontal boundary was draped across western and northern New York State as several waves of low pressure moved easterly along the boundary. In addition, a warm front lifted northeastward across the east central New York during the morning hours. The passage of the warm front ushered in a warm, humid and unstable airmass. Two rounds of severe thunderstorms occurred across east central New York during the afternoon and evening hours of Thursday, May 26th. The first round occurred during the mid to late	NOAA-NCDC

Table 5.4.5-7. Severe Storm Events between 2007 and 2015

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts	Source(s)
				afternoon hours, in which embedded supercellular development occurred, especially across the southern and western Adirondacks with reports of large hail. The second round of severe weather occurred during the late evening hours. A large bowing segment of thunderstorms tracked east from the Catskills and Schoharie Valley into western New England causing wind damage and power outages. Power was not restored in some areas until Friday night, May 27th. Trees and wires were reported down in Canajoharie due to strong thunderstorm winds.	
May 27, 2011	Thunderstorm / Hail	NA	NA	Quarter to golf ball sized hail was reported in the Fort Plain area. The hail lasted 10 to 15 minutes.	NOAA-NCDC
June 8-9, 2011	Thunderstorms	NA	NA	Severe storms pounded the region over two days producing quarter to ping pong ball sized hail and strong winds. Tress and wires were reported down from the storm.	NOAA-NCDC
July 6, 2011	Thunderstorms / High Winds	NA	NA	Numerous trees and wires were reported down throughout the County from high winds. Sustained winds were around 50 mph.	NOAA-NCDC
August 28, 2011	Hurricane / High Winds	DR-4020	Yes	Numerous trees and power lines were reported down due to Hurricane Irene's strong winds across Montgomery County resulting in power outages and road closures including, but not limited to the following: in Fonda, Route 5 between Hickory Hill Road and Reservoir Road, and in Fultonville, Route 30A between Ingersol Road and Auriesville Road. In Palatine Bridge, an observer for WeatherNet 6 (WRGB-CBS6) reported a measured wind gust of 43 mph at 9:25 am EST. In Hessville, an observer for WeatherNet 6 (WRGB-CBS6) reported a measured wind gust of 40 mph at 2:47 pm EST.	NOAA-NCDC, FEMA, SHELDUS
September 4, 2011	Severe Storms / Tornado	NA	NA	A tornado touched down in the Town of Florida in Montgomery County. It moved northeast to the western end of Glenville in Schenectady County. Damage was extensive along the entire path length, with the worst damage in the Town of Cranesville in Montgomery County. Damage included numerous trees snapped off and uprooted, broken windows to homes, shingles stripped off roof tops, and some houses which had parts of their roofs torn off. Numerous sheds and out buildings were destroyed. The tornado was caught on video from the Mohawk Travel Plaza rest area on the New York State Thruway.	NOAA-NCDC
September 6-11, 2011	Remnants of Tropical Storm Lee	DR-4031, EM-3341	Yes	Flooding occurred along the Mohawk River resulting in the closure of the following roads: Route 5 from Palatine Bridge to Fort Johnson and Route 5S from Route 80 in Fort Plain to Route 30A in Fultonville. The following off-ramps for the New York State Thruway, Interstate 90, were closed during the day September 8th: Exit 27 (Amsterdam), Exit 28 (Fultonville-Fonda) and Exit 29 (Canajoharie-Sharon Springs). Canajoharie's Waterfront Park was submerged	FEMA; City & Town of Amsterdam and Town of Florida Planning Committee

Table 5.4.5-7. Severe Storm Events between 2007 and 2015

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts	Source(s)
				in flood waters. In Fonda, flood waters inundated the fairgrounds, homes along Park Street and the Mongomery County Department of Public Works. New York State Erie Canal Locks E-12 (Tribes Hill) and E-10 (Cransville) were damage beyond what happened as a result of Tropical Storm Irene. At Lock E-12, the lower approach wall was breached and undermined. At Lock E-10, the south end of dam was breached by the river. The hamlet of Lost Valley in the Town of Florida was mostly destroyed. The Little Falls river gage located on left bank 1,800 feet downstream from Fivemile Dam, 2.0 miles upstream from East Canada Creek, and 4.5 miles southeast of city of Little Falls Herkimer County exceeded its 15 foot flood stage at 9:07 pm EST September 7th, its 17 foot moderate flood stage at 12:42 am September 8th, its 18 foot major flood stage at 3 am, it crested at 18.20 feet at 4:30 am, and dropped below flood stage at 4:08 pm September 8th. Major flooding occurred on the Canajoharie Creek in Montgomery County. The Canajoharie river gage located on the right bank 10 feet upstream from the bridge on McEwan Road and 2.3 miles southwest of Canajoharie exceeded its 8 foot flood stage at 2:47 pm EST September 7th, its 9 foot moderate flood stage at 12:18 am September 8th, its 10 foot major flood stage at 3:24 am, it crested at a record 10.23 feet at 5:45 pm and dropped below flood stage at 3:22 pm September 8th.	
September 22, 2011	Tornado	NA	NA	A National Weather Service Storm Survey team confirmed a weak tornado touched down in the Town of Glen. The tornado downed some small hardwood trees and broke off some large branches. Damage extended from just west of Noeltner Road to near Ripley Road. There was video and photo evidence.	NOAA-NCDC
May 29, 2012	Thunderstorm / High Wind	NA	NA	Trees were reported down throughout the County, blocking roads and knocking out power.	NOAA-NCDC
July 23, 2012	Thunderstorm / Hail	NA	NA	Nickel to tennis ball sized hail was reported throughout the County.	NOAA-NCDC
September 8, 2012	Thunderstorm / High Winds	NA	NA	Numerous trees were reported down throughout the County. Wind gusts were reported to be around 50 knots.	NOAA-NCDC
October 27-28, 2012	Hurricane Sandy	EM-3351	Yes	In preparation for the imminent landfall of Hurricane Sandy, New York counties including Montgomery received federal aid. Though rain feel heavy at times over the Mohawk Valley, the brunt of the storm hit in the southeastern part of the state.	FEMA
June 28 – July 4, 2013	Severe Storms/ Flooding	DR-4129	Yes	Persistent rains damaged houses, closed roads and forced people to flee their homes in the Mohawk Valley. Widespread flooding was experienced throughout Montgomery County.	FEMA, The Daily Gazette

Table 5.4.5-7. Severe Storm Events between 2007 and 2015

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts	Source(s)
May 22, 2014	Severe Storms	N/A	N/A	A large supercell thunderstorm developed over the southern Adirondacks and eastern Mohawk Valley. It produced large hail as large as four inches in diameter in the Amsterdam (Montgomery County) area. In addition, a tornado was produced by this storm near the Capital Region.	NWS, NOAA-NCDC
June 3, 2014	Thunderstorms	N/A	N/A	Slow moving showers and thunderstorms developed in eastern New York State with some of the storms producing very heavy rain in a short period of time. This led to flash flooding, especially in urban and poor drainage areas. A few storms produced strong wind gusts which damaged trees and power lines. In Montgomery County, the storms resulted in lightning strikes which downed a tree in Fonda. Damages were approximately $1,000.	NOAA-NCDC
June 17-18, 2014	Thunderstorms	N/A	N/A	A line of severe thunderstorms impacted the area producing significant wind damage across eastern New York State. In Montgomery County, trees were reported down in Canajoharie as a result of the winds. Trees were also reported down in Palatine Bridge and Fultonville. Rainfall totals in the County ranged from 0.68 inches in Palatine Bridge and 1.44 inches in Amsterdam.	NOAA-NCDC, NWS
July 2, 2014	Thunderstorms	N/A	N/A	Thunderstorms developed across upstate New York, with some becoming severe and produced wind damage to trees and power lines. Some of the storms produced heavy rainfall which led to flash flooding in the Capital Region. In Montgomery County, there wires down in Mindenville. Rainfall totals ranged from 0.10 inches to 0.75 inches.	NOAA-NCDC, NWS
July 8, 2014	Thunderstorms	N/A	N/A	A line of thunderstorms moved across eastern New York State, producing strong winds and a tornado. Damage was reported across the Adirondacks and Mohawk Valley and into the Saratoga, Capital Region and the Hudson Valley areas. Winds from the storms downed trees and power lines in these areas. In Montgomery County, the winds downed tree limbs and power lines throughout.	NOAA-NCDC, NWS

Note (1): Monetary figures within this table were U.S. Dollar (USD) figures calculated during or within the approximate time of the event. If such an event would occur in the present day, monetary losses would be considerably higher in USDs as a result of increased U.S. Inflation Rates.

** According to many sources, these events were known as Nor'easters, therefore, they are not discussed further in this hazard profile and are further mentioned in Section 5.4.5- (Severe Winter Storms) and the flooding impact of the events are mentioned in Section 5.4.5- (Floods)*

DR *Federal Disaster Declaration*
EM *Federal Emergency Declaration*
EO *Executive Order*
F *Fujita Scale (F0 – F5)*
FEMA *Federal Emergency Management Agency*
K *Thousand ($)*
M *Million ($)*
NCDC *National Climate Data Center*
NOAA *National Oceanic Atmospheric Administration*
NWS *National Weather Service*
NYS *New York State*
OEM *Office of Emergency Management*
SHELDUS *Spatial Hazard Events and Losses Database for the U.S.*
TSTM *Thunderstorm*
U.S. *United States*

Probability of Future Events

Predicting future severe storm events in a constantly changing climate has proven to be a difficult task. Predicting extremes in New York State is particularly difficult because of the region's geographic location. It is positioned roughly halfway between the equator and the North Pole and is exposed to both cold and dry airstreams from the south. The interaction between these opposing air masses often leads to turbulent weather across the region (Keim, 1997).

It is estimated that Montgomery County will continue to experience direct and indirect impacts of severe storms hazards annually that may induce secondary hazards such as flooding, extreme wind, infrastructure deterioration or failure, utility failures, power outages, water quality and supply concerns, and transportation delays, accidents, and inconveniences.

In Section 5.3, the identified hazards of concern for Montgomery County were ranked. The probability of occurrence, or likelihood of the event, is one parameter used for hazard rankings. Based on historical records and input from the Planning Committee, the probability of occurrence for coastal hazards in the county is considered "frequent" (likely to occur within 25 years, as presented in Table 5.3-3).

Climate Change Impacts

Providing projections of future climate change for a specific region is challenging. Shorter term projections are more closely tied to existing trends making longer term projections even more challenging. The further out a prediction reaches the more subject to changing dynamics it becomes. As the climate changes, temperatures and the amount of moisture in the air will both increase, thus leading to an increase in the severity of thunderstorms which can lead to derechos and tornadoes. Studies have shown that an increase in greenhouse gases in the atmosphere would significantly increase the number of days that severe thunderstorms occur in the southern and eastern United States (NASA 2013). Additionally, climate change may lead to stronger, more intense severe weather events.

Climate change is beginning to affect both people and resources in New York State, and these impacts are projected to continue growing. Impacts related to increasing temperatures and sea level rise are already being felt in the State. ClimAID: the Integrated Assessment for Effective Climate Change in New York State (ClimAID) was undertaken to provide decision-makers with information on the State's vulnerability to climate change and to facilitate the development of adaptation strategies informed by both local experience and scientific knowledge (New York State Energy Research and Development Authority [NYSERDA], 2011).

Each region in New York State, as defined by ClimAID, has attributes that will be affected by climate change. Montgomery County is part of Region 5, East Hudson and Mohawk River Valleys. Some of the issues in this region, affected by climate change, include: more frequent heat waves and above 90°F days, more heat-related deaths, increased frequency of heavy precipitation and flooding, decline in air quality, etc. (NYSERDA 2014).

Temperatures in New York State are warming, with an average rate of warming over the past century of 0.25° F per decade. Average annual temperatures are projected to increase across New York State by 2° F to 3.4° F by the 2020s, 4.1° F to 6.8° F by the 2050s, and 5.3° F to 10.1° F by the 2080s. By the end of the century, the greatest warming is projected to be in the northern section of the State (NYSERDA 2014).

Regional precipitation across New York State is projected to increase by approximately one to eight-percent by the 2020s, three to 12-percent by the 2050s, and four to 15-percent by the 2080s. By the end of the century, the greatest increases in precipitation are projected to be in the northern areas of the State (NYSERDA 2014).

In Region 5, it is estimated that temperatures will increase by 3.5ºF to 7.1ºF by the 2050s and 4.1ºF to 11.4ºF by the 2080s (baseline of 47.6ºF). Precipitation totals will increase between 2 and 15% by the 2050s and 3 to 17% by the 2080s (baseline of 38.6 inches). Table 5.4.5-8 displays the projected seasonal precipitation change for the East Hudson and Mohawk River Valleys ClimAID Region (NYSERDA 2014).

Table 5.4.5-8. Projected Seasonal Precipitation Change in Region 5, 2050s (% change)

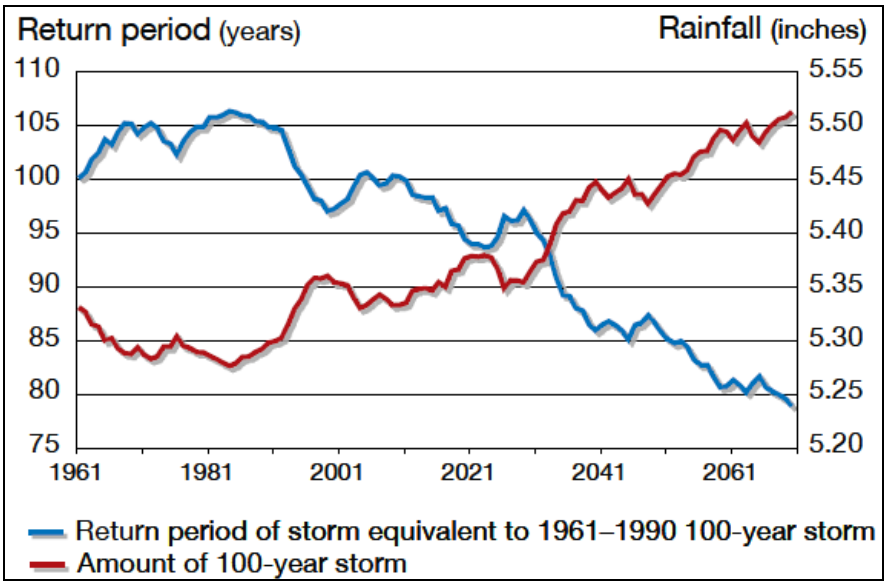
Winter	Spring	Summer	Fall
5 to +15	-5 to +10	-5 to +5	-5 to +10

Source: NYSERDA, 2011

The projected increase in precipitation is expected to fall in heavy downpours and less in light rains. The increase in heavy downpours has the potential to affect drinking water; heighten the risk of riverine flooding; flood key rail lines, roadways and transportation hugs; and increase delays and hazards related to extreme weather events (NYSERDA, 2011). Less frequent rainfall during the summer months may impact the ability of water supply systems. Increasing water temperatures in rivers and streams will affect aquatic health and reduce the capacity of streams to assimilate effluent wastewater treatment plants (NYSERDA, 2011).

Figure 5.4.5-4 displays the project rainfall and frequency of extreme storms in New York State. The amount of rain fall in a 100-year event is projected to increase, while the number of years between such storms (return period) is projected to decrease. Rainstorms will become more severe and more frequent (NYSERDA, 2011).

Figure 5.4.5-4. Projected Rainfall and Frequency of Extreme Storms



Source: NYSERDA, 2011

Total precipitation amounts have slightly increased in the Northeast U.S., by approximately 3.3 inches over the last 100 years. There has also been an increase in the number of two-inch rainfall events over a 48-hour period since the 1950s (a 67-percent increase). The number and intensity of extreme precipitation events are increasing in New York State as well. More rain heightens the danger of localized flash flooding, streambank erosion and storm damage (Cornell University College of Agriculture and Life Sciences, 2011).

5.4.5.2 Vulnerability Assessment

To understand risk, a community must evaluate what assets are exposed or vulnerable in the identified hazard area. For severe storms, all of Montgomery County has been identified as exposed. Therefore, all assets in the County (population, structures, critical facilities and lifelines), as described in the County Profile section (Section 4), are exposed and potentially vulnerable. The following text evaluates and estimates the potential impact of severe storms on the County, including:

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

Overview of Vulnerability

Severe storms include high winds and air speeds that result in power outages, disruptions to transportation corridors and equipment, loss of workplace access, significant property damage, injuries and loss of life, and the need to shelter and care for individuals impacted by the events. A large amount of damage can be inflicted by trees, branches, and other objects that fall onto power lines, buildings, roads, vehicles, and, in some cases, people. The risk assessment for severe storm evaluates available data for a range of storms included in this hazard category.

Due to the County's inland location, the loss associated with hurricanes is primarily associated with severe thunderstorm or hurricane-related rains (see flooding discussion in Section 5.4.4 Flood) and severe winds. Secondary flooding associated with the torrential downpours during hurricanes/tropical storms is also a primary concern in the County. The County has experienced flooding in association with severe storms in the past.

Winds associated with a hurricane event are similar to a severe wind storm and therefore, can support analysis of the severe storm event for this study area. The entire inventory of the County is at risk of being damaged or lost due to impacts of severe wind. Certain areas, infrastructure, and types of building are at greater risk than others due to proximity to falling hazards and/or their manner of construction.

Potential losses associated with high wind events were calculated for the County for two probabilistic events, the 100-year and 500-year MRP events. The impacts on population, existing structures, critical facilities and the economy are presented below, following a summary of the data and methodology used.

Data and Methodology

The HAZUS-MH MR3 (HAZUS-MH) hurricane model analyzes damage associated with significant winds. Such wind impacts could also occur as a result of other types of severe wind storms (e.g., tornadoes) and therefore, are considered relevant to the severe storm hazard. Rain is often associated with severe storms and may also cause flooding. Flooding is addressed under the flood hazard (Section 5.4.4). After reviewing historic data, the HAZUS-MH methodology and model were used to analyze the severe storm hazard for Montgomery County. Data used to assess this hazard include data available in the HAZUS-MH hurricane model, NOAA NCDC data, professional knowledge, information provided by the Planning Committee, and public input.

HAZUS-MH contains data on historic hurricane events and wind speeds. It also includes surface roughness and vegetation (tree coverage) maps for the area. Surface roughness and vegetation data support the modeling of wind force across various types of land surfaces. Hurricane and inventory data available in HAZUS-MH were used to evaluate potential losses from probabilistic 100- and 500-year MRP wind events (severe wind impacts). Locally available inventory data were reviewed to determine their appropriateness for inclusion. Other than data for critical facilities, the default data in HAZUS-MH was the best available for use in this evaluation. The 11 residential and 10 commercial occupancy classes available in HAZUS-MH were condensed into the following occupancy classes (residential, commercial, industrial, agricultural, religious, government, and educational) to facilitate the analysis and the presentation of results. Residential loss estimates address both multi-family and single family dwellings. In addition, impacts to critical facilities were evaluated for the 100-year and 500-year MRP events.

Impact on Life, Health and Safety

The impact of severe storms on life, health and safety is dependent upon the severity of the storm event. Residents may be displaced or require temporary to long-term sheltering. In addition, downed trees, damaged buildings and debris carried by high winds can lead to injury or loss of life. It is assumed that the entire County population is exposed to the severe storm hazard. Socially vulnerable populations are most susceptible, based on a number of factors including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. Table 5.4.5-9 summarizes the population over the age of 65 and individuals living below the Census poverty threshold. Additionally, residents living in mobile homes are particularly vulnerable to wind events due to the construction of their housing. The "Impact on General Building Stock" subsection below discusses mobile homes in the County further.

Table 5.4.5-9. Vulnerable Population Exposed to Severe Storm in Montgomery County

Population Category	Number of Persons Exposed	Percent of Total County Population
Elderly (Over 65 years of age)	9,537	19.2
Persons living below Census poverty threshold*	4,094	8.2
Elderly (Over 65 years of age) living below Census poverty threshold	869	1.7
Persons living in manufactured housing/mobile homes**	5,692	11.5

Source: U.S. Census 2000
*Notes: * Individuals below poverty level (Census poverty threshold for a 3-person family unit is approximately $15,000)*
*** The number of persons in a household according to the U.S. Census (2.42) for Montgomery County multiplied by the number of manufactured housing/mobile home units identified by HAZUS-MH MR3 (2,352).*

For a 100-year MRP event, HAZUS-MH estimates that zero households will be displaced and zero households will require temporary shelter. HAZUS-MH estimates that no debris will be generated as a result of a 100-year MRP event.

For the 500-year MRP event, HAZUS-MH estimates that zero households will be displaced and zero households will require temporary shelter in public shelters. Additionally, HAZUS-MH estimates that a total of 20,442 tons of debris will be generated for the 500-year MRP event. Of the total amount, brick/wood debris comprises 2% of the total and trees comprise the remainder. Please note that the HAZUS-MH Hurricane Model Technical Manual and User Manual recommend that the estimated debris volumes be treated as low estimates. There may be other sources of vegetative and non-vegetative debris (i.e., flooding) not being modeled in HAZUS-MH in combination with the wind. Therefore, these are likely conservative estimates and may be higher if multiple impacts occur.

Impact on General Building Stock

After considering the population exposed to the severe storm hazard, the value of general building stock exposed to and damaged by 100- and 500-year MRP events was evaluated. Potential damage is the modeled loss that could occur to the exposed inventory. HAZUS-MH estimates there are 22,742 structures in Montgomery County with a total building replacement value (structure only) of nearly $3.5 billion. Approximately 92% of the buildings and 71% of the building stock structural value are associated with residential housing. The analysis below uses the default general building stock data as reported in HAZUS-MH, generated using 2000 U.S. Census data.

Table 5.4.5-10 presents the total exposure value for general building stock by occupancy class for the County.

Table 5.4.5-10. Building Stock Count and Replacement Value (Structure Only) by Occupancy Class

Jurisdiction	Total		Residential		Commercial		Industrial	
	Count	Value (x $1,000)	Count	Value (x $1,000)	Count	Value (x $1,000)	Count	Value (x $1,000)
City of Amsterdam	6,779	$1,391,862	6,225	$1,011,034	374	$218,858	109	$115,236
Town of Amsterdam	1,921	$319,161	1,796	$231,722	79	$29,811	22	$20,961
Town of Canajoharie	874	$75,235	822	$53,025	21	$3,513	12	$11,955
Town of Charleston	703	$68,699	668	$59,411	19	$3,237	9	$2,102
Town of Florida	1,587	$298,524	1,411	$138,252	108	$119,562	29	$16,955
Town of Glen	769	$92,786	706	$66,971	36	$14,131	13	$5,682
Town of Minden	963	$79,663	901	$66,933	30	$5,775	7	$1,292
Town of Mohawk	1,367	$164,082	1,279	$141,254	50	$10,200	20	$5,124
Town of Palatine	988	$67,571	930	$53,404	23	$7,295	15	$3,313
Town of Root	940	$95,196	884	$79,847	28	$8,287	11	$4,370
Town of St. Johnsville	577	$43,180	543	$35,327	19	$4,242	5	$2,081
Village of Ames	84	$7,496	80	$6,134	1	$361	0	$0
Village of Canajoharie	994	$172,844	906	$113,195	57	$24,228	13	$19,194
Village of Fonda	440	$96,446	383	$37,036	26	$6,969	18	$42,810
Village of Fort Johnson	255	$30,221	240	$27,450	7	$942	3	$607
Village of Fort Plain	1,074	$138,976	984	$101,852	61	$23,096	12	$5,165
Village of Fultonville	363	$40,629	333	$29,111	18	$6,298	6	$3,326
Village of Hagaman	589	$89,018	564	$74,911	16	$9,994	1	$152
Village of Nelliston	336	$34,611	303	$23,977	21	$7,577	4	$1,507
Village of Palatine Bridge	306	$45,060	288	$34,792	14	$8,777	1	$141
Village of St. Johnsville	833	$129,105	779	$89,825	37	$17,297	9	$16,787
Montgomery County Total	22,742	$3,480,365	21,025	$2,475,463	1,045	$530,450	319	$278,760

Source: HAZUS-MH MR3

Notes: Replacement value reflects the building structure and does not include building contents. The valuation of general building stock and the loss estimates determined in Montgomery County were based on the default general building stock database provided in the HAZUS-MH MR3 hurricane model. The general building stock valuations provided in HAZUS-MH MR3 are Replacement Cost Value from R.S. Means as of 2006. Note: All building counts and replacement value totals for Towns do not include the totals for their incorporated Villages.

The entire study area is considered at risk for the severe storm hazard. Historic storms' wind and flood waters have caused up to $1 to $2 million in property damages from a single event (e.g., August 2001). Expected building damage was evaluated by HAZUS-MH across the following damage categories: no damage/very minor damage, minor damage, moderate damage, severe damage, and total destruction. Table 5.4.5-11 summarizes the definition of the damage categories.

Table 5.4.5-11. Description of Damage Categories

Qualitative Damage Description	Roof Cover Failure	Window Door Failures	Roof Deck	Missile Impacts on Walls	Roof Structure Failure	Wall Structure Failure
No Damage or Very Minor Damage Little or no visible damage from the outside. No broken windows, or failed roof deck. Minimal loss of roof over, with no or very Limited water penetration.	≤2%	No	No	No	No	No
Minor Damage Maximum of one broken window, door or garage door. Moderate roof cover loss that can be Covered to prevent additional water Entering the building. Marks or dents on walls requiring painting or patching for repair.	>2% and ≤15%	One window, door, or garage door failure	No	<5 impacts	No	No
Moderate Damage Major roof cover damage, moderate window breakage. Minor roof sheathing failure. Some resulting damage to interior of building from water.	>15% and ≤50%	> one and ≤ the larger of 20% & 3	1 to 3 panels	Typically 5 to 10 impacts	No	No
Severe Damage Major window damage or roof sheathing loss. Major roof cover loss. Extensive damage to interior from water.	>50%	> the larger of 20% & 3 and ≤50%	>3 and ≤25%	Typically 10 to 20 impacts	No	No
Destruction Complete roof failure and/or, failure of wall frame. Loss of more than 50% of roof sheathing.	Typically >50%	>50%	>25%	Typically >20 impacts	Yes	Yes

Source: HAZUS-MH MR3 Hurricane Technical Manual

The estimated expected building damage by general occupancy type of various severities for the wind-only analysis is summarized for the entire County HAZUS-MH run for the 100- and 500-year events in Table 5.4.5-12.

Table 5.4.5-12. Estimated Building Damage by Occupancy Class for 100- and 500-Year Wind Events for Montgomery County

Occupancy Class	Severity of Expected Damage	100-year		500-year	
		Building Count	Percent Buildings in Occupancy Class	Building Count	Percent Buildings in Occupancy Class
Residential Exposure (Single and Multi-Family Dwellings)	None	21,018	99.97	20,935	99.57
	Minor	7	0.03	86	0.41
	Moderate	0	0	4	0.02
	Severe	0	0	0	0
	Complete Destruction	0	0	0	0
Commercial Buildings	None	1,043	99.82	1,038	99.44
	Minor	2	0.18	7	0.65
	Moderate	0	0	0	0.01
	Severe	0	0	0	0
	Complete Destruction	0	0	0	0

Occupancy Class	Severity of Expected Damage	100-year		500-year	
		Building Count	Percent Buildings in Occupancy Class	Building Count	Percent Buildings in Occupancy Class
Industrial Buildings	None	318	99.79	317	99.28
	Minor	1	0.21	2	0.72
	Moderate	0	0	0	0
	Severe	0	0	0	0
	Complete Destruction	0	0	0	0

Source: HAZUS-MH MR3

HAZUS-MH estimates no buildings in Montgomery County will be moderately damaged in a 100-year wind-only event. Wind speeds associated with a 100-year event, as described earlier in this profile, equate to a tropical storm (48 to 55 mph).

For the 500-year MRP wind event, HAZUS-MH estimates four (4) residential buildings in Montgomery County will be at least moderately damaged and no buildings will be completed destroyed. Additionally, HAZUS-MH estimates 97 buildings will experience minor damage, 86 of which are residential. The 500-year MRP wind speeds equate to a tropical storm (67 to 73 mph), just one mile per hour less than what is categorized as a Category 1 hurricane on the Saffir-Simpson scale. Residential buildings comprise the majority of the building inventory and are estimated to experience the majority of building damage.

Table 5.4.5-13 summarizes the estimated general building stock damage in dollar losses for the 100- and 500-year MRP wind events (rounded to the nearest thousand dollar) for the County as a whole. General building stock damages for the 100-year MRP event are not deemed significant ($3,713 total). Therefore, Table 5.4.5-14 summarizes the estimated general building stock damage for the 500-year MRP event only, for each participating jurisdiction. The data shown in both tables indicate total losses associated with wind damage to building structure only. The damage estimates include buildings damaged at all severity levels from minor damage to total destruction and the total dollar damage reflects the overall impact to buildings at an aggregate level.

Table 5.4.5-13. Estimated Montgomery County Building Value (Structure Only) Damaged by the 100-Year and 500-Year MRP Wind Events

Occupancy Category	Building Value Damage (Structure Only)	
	100-Year	500-Year
Residential	$3,713	$2,568,283
Commercial	$0	$87,725
Industrial	$0	$46,540
Agricultural, Religious Government , Education	$0	$27,329

Source: HAZUS-MH MR3

Note: The valuation of general building stock and the loss estimates determined in Montgomery County were based on the default general building stock database provided in the HAZUS-MH MR3 hurricane model. The general building stock valuations provided in HAZUS-MH MR3 are Replacement Cost Value from R.S. Means as of 2006.

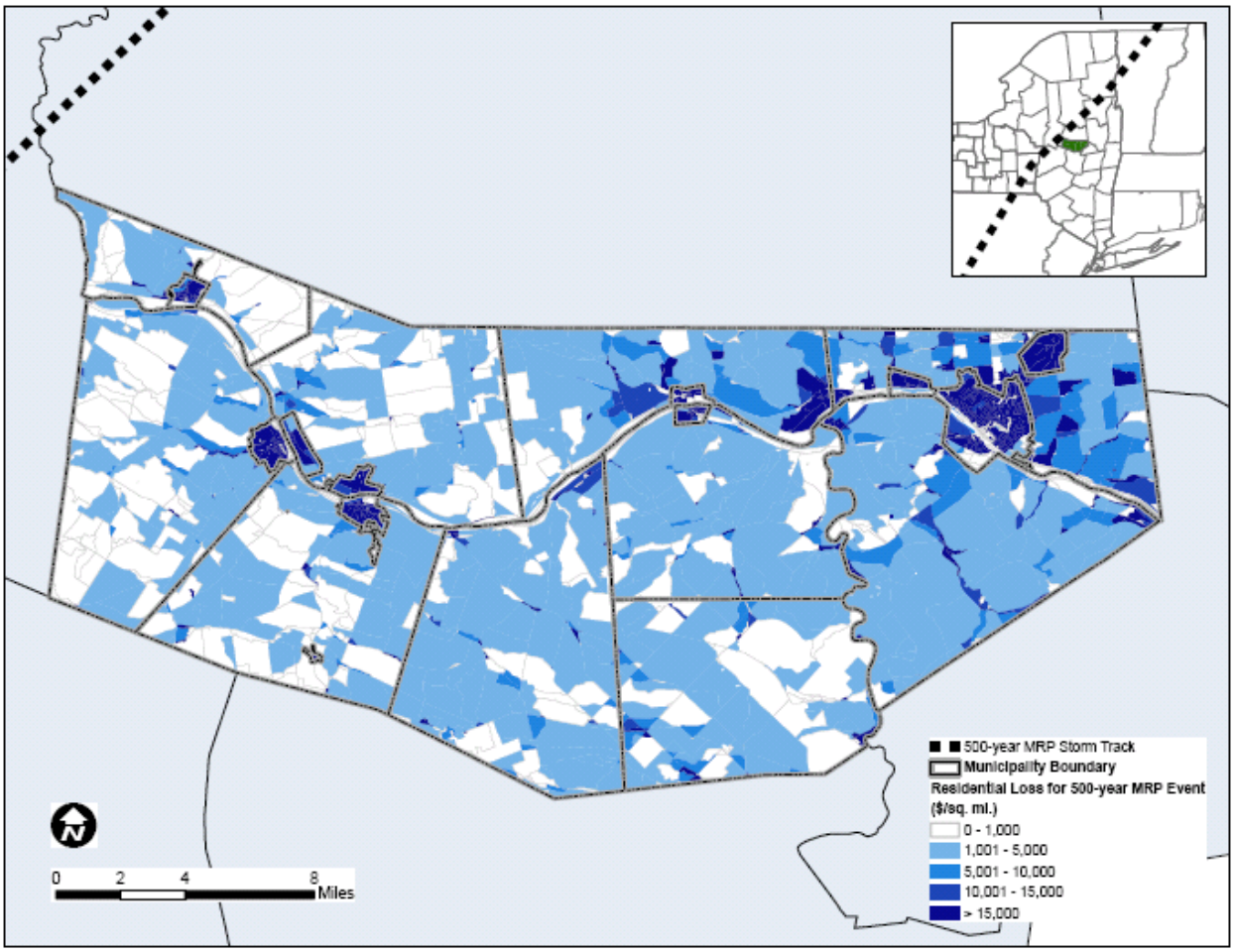
Table 5.4.5-14. Estimated Building Value (Structure Only) Damaged by the 500-Year MRP Wind Event

Jurisdiction	Estimated Total Damage	Percent of Total Building Value	Estimated Residential Damage	Estimated Commercial Damage	Estimated Industrial Damage	Estimated Agriculture, Religious, Government and Education Damage
City of Amsterdam	$982,585	0.07	$908,694	$41,443	$23,057	$9,391
Town of Amsterdam	$271,558	0.09	$257,964	$5,194	$4,182	$4,218
Town of Canajoharie	$63,060	0.08	$60,773	$351	$1,254	$682
Town of Charleston	$96,707	0.14	$94,882	$626	$445	$754
Town of Florida	$236,411	0.08	$204,828	$23,460	$3,844	$4,279
Town of Glen	$84,572	0.09	$81,658	$1,441	$873	$600
Town of Minden	$74,711	0.09	$73,369	$578	$198	$566
Town of Mohawk	$187,400	0.11	$185,090	$1,020	$539	$751
Town of Palatine	$57,545	0.09	$56,128	$730	$331	$356
Town of Root	$108,203	0.11	$106,652	$829	$453	$269
Town of St. Johnsville	$22,348	0.05	$21,716	$424	$208	$0
Village of Ames	$7,925	0.11	$7,789	$36	$0	$100
Village of Canajoharie	$120,778	0.07	$113,154	$2,423	$3,579	$1,622
Village of Fonda	$46,837	0.05	$40,643	$697	$4,534	$963
Village of Fort Johnson	$38,292	0.13	$37,749	$188	$121	$234
Village of Fort Plain	$92,230	0.07	$88,457	$2,310	$585	$878
Village of Fultonville	$33,863	0.08	$32,581	$630	$463	$189
Village of Hagaman	$101,063	0.11	$98,267	$1,979	$30	$787
Village of Nelliston	$26,307	0.08	$25,242	$758	$151	$156
Village of Palatine Bridge	$29,542	0.07	$28,515	$878	$14	$135
Village of St. Johnsville	$47,940	0.04	$44,132	$1,730	$1,679	$399
Montgomery County Total	**$2,729,877**	**0.08**	**$2,568,283**	**$87,725**	**$46,540**	**$27,329**

Source: HAZUS-MH MR3
Notes: All values are rounded to the nearest thousand.
The valuation of general building stock and the loss estimates determined in Montgomery County were based on the default general building stock database provided in HAZUS-MH MR3. The general building stock valuations provided in HAZUS-MH MR3 are Replacement Cost Value from R.S. Means as of 2006. Note: All replacement value totals/damage estimates for Towns do not include the totals for their incorporated Villages.

Residential buildings account for a majority of the building stock damage and also comprise the majority of the building inventory. Because of differences in building construction, residential structures are generally more susceptible to wind damage than commercial and industrial structures. HAZUS-MH does not estimate significant damages to the residential general building stock inventory as a result of the 100-year MRP event ($3,713 total for the County). Therefore, only the density of estimated damages to residential structures as a result of the 500-year MRP event is shown below in Figure 5.4.5-5.

Figure 5.4.5-5. Density of Losses for Residential Structures (Structure Only) for the 500-Year MRP Event



Source: HAZUS-MH MR3

Mobile homes are particularly vulnerable to severe storms. HAZUS-MH estimates there are 2,352 manufactured housing units (mobile homes) in Montgomery County each with a replacement value of approximately $32,000 each. For the 500-year event, HAUZS-MH estimates over $146,000 in damages to manufactured homes.

Impact on Critical Facilities

HAZUS-MH estimates the probability that critical facilities may sustain damage as a result of a 100-year and 500-year MRP wind events. Additionally, HAZUS-MH estimates the loss of use for each facility in number of days. HAZUS-MH does not estimate any critical facilities will be damaged as a result of a 100-year MRP event. Therefore, Table 5.4.5-13 only lists the estimated loss of use in days for each critical facility and the percent

probability of sustaining the damage category as defined by the column heading for the 500-year wind event. The damage categories are defined in Table 5.4.5-9 under "Impact on General Building Stock."

At this time, HAZUS-MH does not estimate losses to transportation lifelines and utilities as part of the hurricane model. Transportation lifelines are not considered particularly vulnerable to the wind hazard; they are more vulnerable to cascading effects such as flooding, falling debris, etc. Impacts to transportation lifelines affect both short-term (e.g., evacuation activities) and long-term (e.g., day-to-day commuting) transportation needs. Critical transportation routes for evacuating areas of greatest risk to a severe storm's impact include the following:

- Major East-West Route: New York State Thruway Interstate-90

Table 5.4.5-15. Critical Facility Impacts by the 500-Year MRP Wind Event

500-Year Event							
			(Days)	Percent Probability of Sustaining Damage			
Name	Town	Type	Loss Of Use	Minor	Moderate	Severe	Complete
Amsterdam Public Safety	City of Amsterdam	EOC	0	1	0	0	0
Amsterdam Fire Dept	City of Amsterdam	Fire	0	1	0	0	0
Fort Johnson Fire CO	City of Amsterdam	Fire	0	1	0	0	0
St. Mary's Hospital	City of Amsterdam	Medical	0	1	0	0	0
Amsterdam Police Dept	City of Amsterdam	Police	0	1	0	0	0
Marie Curie ES	City of Amsterdam	School	0	1	0	0	0
William Barkley School	City of Amsterdam	School	0	1	0	0	0
Clara S. Bacon School	City of Amsterdam	School	0	1	0	0	0
Lynch MS	City of Amsterdam	School	0	1	0	0	0
Montessori School of Amsterdam	City of Amsterdam	School	0	1	0	0	0
St Stanislaus School	City of Amsterdam	School	0	1	0	0	0
Raphael J. McNulty ES	City of Amsterdam	School	0	1	0	0	0
St Mary's Institute	City of Amsterdam	School	0	1	0	0	0
St. Stanislaus Church	City of Amsterdam	Shelter	NP	1	0	0	0
St. Luke's Lutheran Church	City of Amsterdam	Shelter	NP	1	0	0	0
Our Lady of Mount Carmel	City of Amsterdam	Shelter	NP	1	0	0	0
Centro Civico of Amsterdam, Inc.	City of Amsterdam	Shelter	NP	1	0	0	0
Cranesville Fire Dept	Town of Amsterdam	Fire	0	1	0	0	0
Amsterdam Memorial Hospital	Town of Amsterdam	Medical	0	1	0	0	0
William B. Tecler ES	Town of Amsterdam	School	0	1	0	0	0
Amsterdam HS	Town of Amsterdam	School	0	1	0	0	0
Amsterdam HS	Town of Amsterdam	Shelter	NP	1	0	0	0
Burtonville Fire Dept	Town of Charleston	Fire	0	1	0	0	0
Esperance Fire Dept	Town of Charleston	Fire	0	1	0	0	0
No Name	Town of Florida	Fire	0	1	0	0	0
No Name	Town of Florida	Fire	0	1	0	0	0
No Name	Town of Florida	Fire	0	1	0	0	0
Florida Dept of Public Works	Town of Florida	User-Defined	NP	1	0	0	0
Charleston Volunteer Fire Dept	Town of Glen	Fire	0	1	0	0	0
Glen Volunteer Fire Dept	Town of Glen	Fire	0	1	0	0	0

500-Year Event							
			(Days)	Percent Probability of Sustaining Damage			
Name	Town	Type	Loss Of Use	Minor	Moderate	Severe	Complete
Montgomery County Sheriff	Town of Glen	Police	0	1	0	0	0
South Minden Fire Dept	Town of Minden	Fire	0	1	0	0	0
Victory Christian Academy	Town of Minden	School	0	1	0	0	0
Stone Arabia Amish Parochial School	Town of Minden	School	0	1	0	0	0
Town Of Mohawk Fire District	Town of Mohawk	Fire	0	1	0	0	0
Fonda-Fultonville 5-8 School	Town of Mohawk	School	0	1	0	0	0
Fonda-Fultonville K-4 School	Town of Mohawk	School	0	1	0	0	0
Fonda-Fultonville SHS	Town of Mohawk	School	0	1	0	0	0
Tribes Hill Presbyterian Chuch	Town of Mohawk	Shelter	NP	1	0	0	0
No Name- Cell Phone Tower 1	Town of Mohawk	User-Defined	NP	1	0	0	0
No Name- Cell Phone Tower 2	Town of Mohawk	User-Defined	NP	1	0	0	0
Fonda Fultonville School	Town of Mohawk	User-Defined	NP	1	0	0	0
Ephratah Volunteer Fire Dept	Town of Palatine	Fire	0	1	0	0	0
Amish School No 3	Town of Palatine	School	0	1	0	0	0
Amish School No 2	Town of Palatine	School	0	1	0	0	0
Amish School No 4	Town of Palatine	School	0	1	0	0	0
Amish School No 1	Town of Palatine	School	0	1	0	0	0
Fire Dept Rural Grove #1	Town of Root	Fire	0	1	0	0	0
Fire Dept Rural Grove #2	Town of Root	Fire	0	1	0	0	0
Faith Bible Academy	Town of Root	School	0	1	0	0	0
Root Highway Garage	Town of Root	User-Defined	NP	1	0	0	0
Root Town Hall	Town of Root	User-Defined	NP	1	0	0	0
Ames Fire Dept	Village of Ames	Fire	0	1	0	0	0
Firemen Club Rooms	Village of Canajoharie	Fire	0	1	0	0	0
Canajoharie Police Dept	Village of Canajoharie	Police	0	1	0	0	0
Canajoharie SHS	Village of Canajoharie	School	0	1	0	0	0
East Hill School	Village of Canajoharie	School	0	1	0	0	0
West Hill ES	Village of Canajoharie	School	0	1	0	0	0
Canajoharie MS	Village of Canajoharie	School	0	1	0	0	0
East Hill School	Village of Canajoharie	Shelter	NP	1	0	0	0
Canajoharie Senior High School	Village of Canajoharie	Shelter	NP	1	0	0	0
St. Jn & St. Mk Lutheran Church	Village of Canajoharie	Shelter	NP	1	0	0	0

500-Year Event							
			(Days)	Percent Probability of Sustaining Damage			
Name	Town	Type	Loss Of Use	Minor	Moderate	Severe	Complete
Arkell Hall	Village of Canajoharie	User-Defined	NP	1	0	0	0
Montgomery County Building	Village of Fonda	EOC	0	1	0	0	0
Fort Johnson Fire CO	Village of Fort Johnson	Fire	0	1	0	0	0
Fort Plain Police Hdqrs	Village of Fort Plain	Police	0	1	0	0	0
Fort Plain HS	Village of Fort Plain	School	0	1	0	0	0
Harry Hoag School	Village of Fort Plain	School	0	1	0	0	0
Harry Hoag ES	Village of Fort Plain	Shelter	NP	1	0	0	0
Fultonville Reformed Chruch	Village of Fultonville	Shelter	NP	0	0	0	0
Hagaman Volunteer Fire Dept	Village of Hagaman	Fire	0	1	0	0	0
Palatine Limited Partnership	Village of Palatine Bridge	User-Defined	NP	1	0	0	0
Palatine Village Apartments	Village of Palatine Bridge	User-Defined	NP	1	0	0	0
Main Street Fire Dept	Village of St. Johnsville	Fire	0	0	0	0	0
St Johnsville Police Dept	Village of St. Johnsville	Police	0	0	0	0	0
David H. Robbins ES	Village of St. Johnsville	School	0	0	0	0	0
St Johnsville JSHS	Village of St. Johnsville	School	0	0	0	0	0
House of Bread-Seeker's Fellowship	Village of St. Johnsville	Shelter	NP	0	0	0	0
St Johnsville Nursing Home	Village of St. Johnsville	User-Defined	NP	0	0	0	0

Source: HAZUS-MH MR3

Notes: NP = Not provided as output in HAZUS-MH.

Impact on Economy

Severe storms also impact the economy, including: loss of business function, damage to inventory, relocation costs, wage loss and rental loss due to the repair/replacement of buildings. HAZUS-MH estimates the total economic loss associated with each storm scenario (direct building losses and business interruption losses). Direct building losses are the estimated costs to repair or replace the damage caused to the building. This is reported in the "Impact on General Building Stock" section discussed earlier. Business interruption losses are the losses associated with the inability to operate a business because of the wind damage sustained during the storm.

HAZUS-MH estimates minimal business interruption losses for the County as a result of the 100-year MRP event ($660). All of these losses are sustained by residential occupancies in terms of relocation and rental costs.

For the 500-year MRP event, HAZUS-MH estimates greater than $180,000 in business interruption losses for Montgomery County. Nearly all of these losses (> 99%) are sustained by residential occupancies in terms of relocation and rental costs. The remainder of the losses is associated with relocation and rental costs for all other occupancy classes.

Utility structures could suffer damage associated with falling tree limbs or other debris. Such impacts can result in the loss of power, which can impact business operations and can impact vulnerable populations including the young and elderly. Historic storms have caused downed power lines, poles and trees impacting the County's power supply (e.g., August 1998 TSTM caused a power outage for at least 10 hours in eastern Montgomery County).

It is estimated that the impact to the economy, as a result of severe storm event, would be considered low in accordance with the risk ranking shown in Table 5.3-4.

Effect of Climate Change on Vulnerability

Refer to the "Climate Change Impacts" section discussed earlier in this profile.

Future Growth and Development

As discussed in Section 4, areas targeted for future growth and development have been identified across the County. Any areas of growth could be potentially impacted by the severe storm hazard because the entire planning area is exposed and vulnerable.

Additional Data and Next Steps

Over time, Montgomery County will obtain additional value data to support the analysis of this hazard. Data that will support the analysis would include additional details on damage impacts to general building stock and the economy as they occur. In addition, more detailed information regarding the replacement value and construction of critical facilities and their input into HAZUS-MH will support updates regarding the particular assets in the County that are most vulnerable to severe storm (wind-related) events.

For the severe storm events that cannot currently be modeled in HAZUS-MH (tornado, thunderstorm, windstorm, etc.), additional detailed loss data from past and future events will assist in assessing potential future losses. Based on these values and a sufficient number of data points, future losses could be modeled. Alternately, percent of damage estimates could be made and multiplied by the inventory value to estimate potential losses. This methodology is based on FEMA's How To Series (FEMA 386-2), Understanding Your Risks, Identifying and Estimating Losses (FEMA, 2001) and FEMA's Using HAZUS-MH for Risk

Assessment (FEMA 433) (FEMA, 2004). Finally, with time, HAZUS-MH will be released with modules that address hurricane wind and associated flooding as one model and will include a tornado module. As this version of HAZUS-MH is released, the County can run analyses for the tornado hazard and re-run an analysis for an overall picture of the hurricane-associated wind and flood damages.

Overall Vulnerability Assessment

Severe storms are common in the study area, often causing impacts and losses to the County's structures, facilities, utilities, and population. Existing and future mitigation efforts should continue to be developed and employed that will enable the study area to be prepared for these events when they occur.

5.4.6 Severe Winter Storm

The following section provides the hazard profile (hazard description, location, extent, previous occurrences and losses, probability of future occurrences, and impact of climate change) and vulnerability assessment for the Severe Winter Storm hazard in Montgomery County.

5.4.6.1 Profile

Hazard Description

A winter storm is a weather event in which the main types of precipitation are snow, sleet or freezing rain. They can be a combination of heavy snow, blowing snow, and/or dangerous wind chills. There are three basic components needed to make a winter storm. Below freezing temperatures (cold air) in the clouds and near the ground are necessary to make snow and ice. Lift, something to raise the moist air to form clouds and cause precipitation, is needed. Examples of this is warm air colliding with cold air and being forced to rise over the cold dome or air flowing up a mountainside. The last thing needed to make a winter storm is moisture to form clouds and precipitation. Air blowing across a body of water, such as a large lake or the ocean (National Severe Storms Laboratory 2014).

Some winter storms are large enough to immobilize an entire region while others may only affect a single community. Winter storms are typically accompanied by low temperatures, high winds, freezing rain or sleet, and heavy snowfall. The aftermath of a winter storm can have an impact on a community or region for days, weeks, or even months; potentially causing cold temperatures, flooding, storm surge, closed and/or blocked roadways, downed utility lines, and power outages. In Montgomery County, winter storms include blizzards, snow storms, Nor'Easters and ice storms. Extreme cold temperatures and wind chills are also associated with winter storms; however, based on input from the Planning Committee, these events are further discussed in this Plan in Section 5.4.2 (Extreme Temperatures).

Heavy Snow

According to the National Snow and Ice Data Center (NSIDC), snow is precipitation in the form of ice crystals. It originates in clouds when temperatures are below the freezing point (32°F), when water vapor in the atmosphere condenses directly into ice without going through the liquid stage. Once an ice crystal has formed, it absorbs and freezes additional water vapor from the surrounding air, growing into a snow crystals or snow pallet, which then falls to the earth. Snow falls in different forms: snowflakes, snow pellets, or sleet. Snowflakes are clusters of ice crystals that form from a cloud. Snow pellets are opaque ice particles in the atmosphere. They form as ice crystals fall through super-cooled cloud droplets, which are below freezing but remain a liquid. The cloud droplets then freeze to the crystals. Sleet is made up of drops of rain that freeze into ice as they fall through colder air layers. They are usually smaller than 0.30 inches in diameter (NSIDC 2013).

Blizzards

A blizzard is a winter snowstorm with sustained or frequent wind gusts of 35 mph or more, accompanied by falling or blowing snow reducing visibility to or below 0.25 mile. These conditions must be the predominant over a 3-hour period. Extremely cold temperatures are often associated with blizzard conditions, but are not a formal part of the definition. The hazard, created by the combination of snow, wind, and low visibility, significantly increases when temperatures are below 20°F. A severe blizzard is categorized as having temperatures near or below 10°F, winds exceeding 45 mph, and visibility reduced by snow to near zero. Storm systems powerful enough to cause blizzards usually form when the jet stream dips far to the south, allowing cold air from the north to clash with warm, moister air from the south. Blizzard conditions often develop on

the northwest side of an intense storm system. The difference between the lower pressure in the storm and the higher pressure to the west creates a tight pressure gradient, resulting in strong winds and extreme conditions caused by the blowing snow (The Weather Channel 2012).

Sleet or Freezing Rain Storms

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).

Ice Storms

An ice storm describes those events when damaging accumulations of ice are expected during freezing rain situations. Significant ice accumulations are typically accumulations of 0.25-inches or greater (NWS 2013). Heavy accumulations of ice can bring down trees, power lines and utility poles, and communication towers. Ice can disrupt communications and power for days. Even small accumulations of ice can be extremely dangerous to motorists and pedestrians (NWS 2008).

Nor'Easter

A Nor'Easter is a cyclonic storm that moves along the East Coast of North America. It is called a Nor'Easter because the damaging winds over coastal areas blow from a northeasterly direction. Nor'Easters can occur any time of the year, but are most frequent and strongest between September and April. These storms usually develop between Georgia and New Jersey within 100 miles of the coastline and typically move from southwest to northeast along the Atlantic Coast of the United States (NOAA 2013b).

In order to be called a Nor'Easter, a storm must have the following conditions, as per the Northeast Regional Climate Center (NRCC):

- Must persist for at least a 12-hour period
- Have a closed circulation
- Be located within the quadrilateral bounded at 45°N by 65° and 70°W and at 30°N by 85°W and 75°W
- Show general movement from the south-southwest to the north-northeast
- Contain wind speeds greater than 23 miles per hour (mph)

A Nor'Easter event can cause storm surges, waves, heavy rain, heavy snow, wind, and coastal flooding. Nor'Easters have diameters that can span 1,200 miles, impacting large areas of coastline. The forward speed of a Nor'Easter is usually much slower than a hurricane, so with the slower speed, a Nor'Easter can linger for days and cause tremendous damage to those areas impacted. Approximately 20 to 40 Nor'Easters occur in the northeastern United States every year, with at least two considered severe (Storm Solution, 2014). The intensity of a Nor'Easter can rival that of a tropical cyclone in that, on occasion, it may flow or stall off the mid-Atlantic coast resulting in prolonged episodes of precipitation, coastal flooding, and high winds.

Extent

The magnitude or severity of a severe winter storm depends on several factors including a region's climatological susceptibility to snowstorms, snowfall amounts, snowfall rates, wind speeds, temperatures, visibility, storm duration, topography, and time of occurrence during the day (e.g., weekday versus weekend), and time of season.

The extent of a severe winter storm can be classified by meteorological measurements and by evaluating its societal impacts. NOAA's National Climatic Data Center (NCDC) is currently producing the Regional Snowfall Index (RSI) for significant snowstorms that impact the eastern two-thirds of the United States. The RSI ranks snowstorm impacts on a scale from 1 to 5. It is based on the spatial extent of the storm, the amount of snowfall, and the interaction of the extent and snowfall totals with population (based on the 2000 Census). The NCDC has analyzed and assigned RSI values to over 500 storms since 1900 (NOAA-NCDC 2011). Table 5.4.6-1 presents the five RSI ranking categories.

Table 5.4.6-1. RSI Ranking Categories

Category	Description	RSI Value
1	Notable	1-3
2	Significant	3-6
3	Major	6-10
4	Crippling	10-18
5	Extreme	18.0+

Source: NOAA-NCDC 2011
Note: RSI = Regional Snowfall Index

The NWS operates a widespread network of observing systems such as geostationary satellites, Doppler radars, and automated surface observing systems that feed into the current state-of-the-art numerical computer models to provide a look into what will happen next, ranging from hours to days. The models are then analyzed by NWS meteorologists who then write and disseminate forecasts (NWS 2013).

The NWS uses winter weather watches, warnings and advisories to ensure that people know what to expect in the coming hours and days. A winter storm watch means that severe winter conditions (heavy snow, ice, etc.) may affect a certain area, but its occurrence, location and timing are uncertain. A winter storm watch is issued when severe winter conditions (heavy rain and/or significant ice accumulations) are possible within in the next day or two. A winter storm warning is issued when severe winter conditions are expected (heavy snow seven inches or greater in 12 hours or nine inches or greater in 24 hours; ice storm with ½ inch or more). A winter weather advisory is used when winter conditions (snow, sleet and/or freezing rain/ice) are expected to cause significant inconvenience and may be hazardous (snow and/or sleet with amounts of four to six inches; freezing rain and drizzle in any accretion of ice on roads but less than ½ inch). A blizzard warning is issued when snow and strong winds will combine to produce a blinding snow, visibility near zero/whiteouts, and deep snow drifts (NWS 2015).

Location

Snow and Blizzards

On average, New York State receives more snowfall than any other states within the United States, with the easternmost and west-central portions of the State most likely to suffer under severe winter storm occurrences than the southern portion. Average snowfall in the State is about 65 inches, but varies greatly in the different regions of the State.

Ice Storms

The Midwest and Northeast United States are prime areas for freezing rain and ice storm events. These events can occur anytime between November and April, with most events occurring during December and January.

Nor'Easters

Nor'Easters threaten the entire east coast of the United States, where the coastal ears are the most susceptible because these areas are directly exposed; however, the impacts of these storms are often felt far inland as well. According to the New York State Hazard Mitigation Plan, the coastal region of New York State is extremely vulnerable to Nor'Easters. The location of Montgomery County is in an area that is extremely susceptible and vulnerable to Nor'Easters.

Previous Occurrences and Losses

Many sources provided winter storm information regarding previous occurrences and losses associated with winter storm events throughout Montgomery County. With so many sources reviewed for the purpose of this Hazard Mitigation Plan (HMP), loss and impact information for many events could vary depending on the source. Therefore, the accuracy of monetary figures discussed is based only on the available information identified during research for this HMP.

Between 1954 and 2015, FEMA included New York State in 25 winter storm-related major disaster (DR) or emergency (EM) declarations classified as one or a combination of the following disaster types: severe winter storm, snowstorm, snow, ice storm, winter storm, blizzard, and flooding. Generally, these disasters cover a wide region of the State; therefore, they may have impacted many counties. Montgomery County was included in two of these declarations.

For this Plan, winter weather events were summarized from 2007 to 2015. Known severe winter storm events, including FEMA disaster declarations, which have impacted Montgomery County are identified in Table 5.4.6-2. For information regarding events prior to 2007, refer to the 2009 Montgomery County HMP. For detailed information on damages and impacts to each municipal, refer to Section 9 (jurisdictional annexes). Please note that not all events that have occurred in Montgomery County are included due to the extent of documentation and the fact that not all sources may have been identified or researched. Loss and impact information could vary depending on the source. Therefore, the accuracy of monetary figures discussed is based only on the available information identified during research for this HMP Update.

Table 5.4.6-2. Severe Winter Events between 2007 and 2015

Dates of Event	Event Type	FEMA Declaration Number	Montgomery County Designated?	Losses / Impacts	Source(s)
January 15, 2007	Ice Storm	NA	NA	A low pressure system over the Midwest moved east, reaching south central New York State around midday on Monday, January 15th. Cold low level air remained in place as precipitation overspread the region early Monday morning, producing a mix of freezing rain and some sleet. Significant icing, with ice accretions of one half of an inch, to up to one inch, occurred from the freezing rain during Monday, leading to widespread power outages from downed trees and tree limbs, and from power transformers which shorted out. Although the freezing rain tapered off Monday evening, strengthening winds in the wake of the storm continued to down tree limbs and exacerbate power outages across the region into Monday night. This ice storm had a significant impact on travel and economy across the region. Estimates of 85,000 customers were affected by power outages at the height of the ice storm Monday afternoon and evening. Some of these customers did not receive power back until Thursday, January 18th.	NOAA-NCDC
February 1-12, 2007	Snowstorm	EM-3273	No	Resulted in a Disaster Declaration for multiple New York State counties (DR-3273), however, it did not include Montgomery County. However, the USDA designated Montgomery County, New York, as a primary natural disaster area because of losses caused by the excessive snow and blizzard that occurred during this time period. Average temperatures during this time period for the Mohawk Valley were below 10 ^{O}F	FEMA, USDA FSA, NCDC
February 12-15, 2007	Snowstorm "Valentines Day Storm"	NA	NA	Schenectady, Schoharie, Montgomery, Washington, Essex, Warren and Clinton counties in New York State, which were affected by extensive snowfall from the storm, had declared a state of emergency. 24 to 42 inches of snow fell in Montgomery County. St. Johnsville received the most amount of snow in the County totaling nearly 40 inches. Average temperatures during this time period for the Mohawk Valley were below 10 ^{O}F	NWS, Evans, Kocin and Uccellini, MSNBC, NEWS10, NOAA, NWS, NCDC
March 15-18, 2007	Snowstorm	NA	NA	10 to 20 inches of snow fell in Montgomery County.	Kocin and Uccellini
April 16, 2007	Severe Storms and Inland and Coastal Flooding (also identified as a Nor'Easter)	DR-1692	Yes	New York State experienced approximately $12.76 M in eligible damages (NYSDPC). However, more than $61 M in disaster aid has been approved for the State. Losses in Montgomery County are unknown; however, public assistance to Montgomery County totaled $55 K as of July 10, 2007.	NOAA, FEMA

Dates of Event	Event Type	FEMA Declaration Number	Montgomery County Designated?	Losses / Impacts	Source(s)
December 16, 2007	Snowstorm	NA	NA	6.5 to 10.8 inches of snow fell in Montgomery County The Village of Ames received the most snowfall.	NWS
February 23, 2008	Winter Weather	NA	NA	The storm was not unusual for mid-February, but it was easily the New York area's most significant storm of the winter. 3.5 to 9 inches of snow fell in Montgomery County.	NOAA, Trapasso
January 29, 2009	Winter Weather	NA	NA	This storm spread a significant wintry mix of precipitation across eastern New York State, with heavy snow and sleet across much of the southern Adirondacks into the Lake George Saratoga region, with a significant mix of snow, sleet and freezing rain occurring elsewhere. Snow and sleet amounts ranged from 8 to 12 inches across the southern Adirondacks and the Lake George Saratoga region, with 4 to 8 inches occurring further south across the Mohawk River Valley, the Greater Capital District, the eastern Catskills, the Schoharie Valley, the mid-Hudson Valley and into the central and southern Taconics. In addition, ice accretion from freezing rain of between one and three tenths of an inch occurred across areas near and south of the Mohawk River Valley, with locally higher amounts of up to one half of an inch occurring across portions of the mid-Hudson Valley. This wintry mix resulted in the closure of numerous schools and businesses across east central New York for both Wednesday and Thursday mornings, and also created treacherous travel conditions.	NOAA-NCDC
February 1, 2011	Winter Weather	NA	NA	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 4 inches up to 15 inches with a majority of reports falling between 8 and 12 inches. Snow emergencies were declared in the City of Albany, City of Amsterdam, Village of Athens, Town of Cairo, Village of Castleton-on-the-Hudson, Village of Catskill, Town of Coeymans, Town of Cohoes, Town of Colonie, Columbia County, Dalton, Town of East Greenbush, City of Glens Falls, Village of Green Island, Village of Hudson Falls, City of Mechanicville, Village of Menands, City of Poughkeepsie, Village of Ravena, City of Rensselaer, City of Saratoga Springs, Town of Schodack,	NOAA-NCDC

Dates of Event	Event Type	FEMA Declaration Number	Montgomery County Designated?	Losses / Impacts	Source(s)
				Village of Schuylerville, Village of Stillwater, City of Troy and Village of Waterford.	
February 25, 2011	Snowstorm	NA	NA	This storm system produced a widespread swath of heavy wet snow across the greater Capital District and surrounding area, the Lake George Saratoga region, the Mohawk River Valley, Schoharie Valley and southern Adirondacks during the day Friday. Snowfall rates of 1 to 2 inches per hour occurred, beginning during the early morning hours, and persisting until late afternoon. Snowfall amounts reached 12 to 15 inches across northern portions of the Capital Region extending into the east central Mohawk River Valley and Lake George Saratoga region, with generally 8 to 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.	NOAA-NCDC
March 6-7, 2011	Snowstorm	NA	NA	Heavy snow accumulated across the western Adirondacks, Mohawk and Schoharie Valleys, the central and eastern Catskills, the Lake George Saratoga region, and across the Capital District. One to 2 feet of snow was reported across the southern Adirondacks and Mohawk Valley, 8 to 18 inches across the Lake George Saratoga region, Helderbergs, and Schoharie Valley, with 5 to 8 inches of snow and sleet across the Capital District on top of the quarter to about a half of an inch of ice accretion. The snow came down heavy at times, with snowfall rates of 1 to 2 inches per hour. In addition, brisk northerly winds resulted in blowing and drifting of the snow during the morning hours. This combination of heavy snow, along with blowing and drifting of the snow made it difficult for snow plows to clear the roads. The heavy snow and sleet resulted in widespread power outages, school closures, traffic accidents and even a few roof collapses. A partial roof collapse occurred at the Hero/Beech-Nut facility in the Florida Industrial Park in Florida. In addition, the third floor of an unoccupied brick building collapsed in Gloversville.	NOAA-NCDC
February 29 – March 1, 2012	Snowstorm	NA	NA	A complex multi-part long duration (24 to 36 hour) storm blanketed east central New York with 3 up to 15 inches of snow and sleet on Wednesday,	NOAA-NCDC

Dates of Event	Event Type	FEMA Declaration Number	Montgomery County Designated?	Losses / Impacts	Source(s)
				February 29th and Thursday, March 1st.	
February 8, 2013	Snowstorm	DR-4111	No	On the morning hours of Thursday, February 8th, an area of low pressure rapidly developed off the mid-Atlantic coast. The development of this storm was aided by the phasing with another strong upper level disturbance moving towards the coast from the Great Lakes region. As this developing storm moved northeast off the Northeast coast from the afternoon of Thursday, February 8th and into the overnight hours, a large amount of Atlantic moisture was pulled westward, producing snowfall. The track of the storm remained just far enough to the east to keep the heaviest snowfall east of the region across New England. However, a widespread moderate snowfall occurred across much of eastern New York, with some pockets of heavier snow across the Taconics and Catskills. In addition, strong northeast winds allowing for some blowing and drifting of snowfall, especially across the high terrain.	NOAA-NCDC
December 14-15, 2013	Heavy Snow	N/A	N/A	A steady, heavy snowfall fell overnight across the region, with snow fall rates of greater than one inch per hour over much of the region. Sleet and freezing rain mixed in with the snow across portions of the mid-Hudson Valley and Taconics, but remaining all snow north and west. Snowfall totals in Montgomery County ranged from 6.5 inches in Palatine Bridge to 13.5 inches in Amsterdam.	NOAA-NCDC, NWS
January 1-3, 2014	Heavy Snow	N/A	N/A	A long lasting snowstorm impacted eastern New York State with generally six to 12 inches falling over much of the region. In addition to the snow, temperatures remained very cold and with a cold northwest wind, wind chill values were zero to -20°F. Snowfall totals in Montgomery County ranged from 8.3 inches in Hessville to 11.5 inches in Saint Johnsville.	NOAA-NCDC, NWS
February 5-6, 2014	Heavy Snow	N/A	N/A	A widespread snowfall occurred across eastern New York State bringing a period of moderate to heavy snow. Snow fell at rates in excess of one to two inches per hour, causing a messy commute. Snowfall totals in Montgomery County ranged from 8.2 inches in Stone Ridge to 11.5 inches in Amsterdam.	NOAA-NCDC, NWS
November 26-27, 2014	Nor'Easter	DR-4204	No	An early season winter storm impacted all of eastern New York State during the Thanksgiving travel period. Once the snow began, it increased in intensity, falling at rates at or greater than one inch per hour. The snowfall caused difficult travel. Due the weight of the snow, some tree limbs fell and caused power outages, especially across the mid-Hudson Valley. Up to 32,000 customers were without power. In Montgomery County, snowfall totals ranged from 9.5 inches in Palatine Bridge to 11.8	NWS, NOAA-NCDC

Dates of Event	Event Type	FEMA Declaration Number	Montgomery County Designated?	Losses / Impacts	Source(s)
				inches in Amsterdam.	
December 9-11, 2014	Winter Weather	N/A	N/A	A slow moving coastal storm impacted all of eastern New York State with a variety of winter weather. This event began as freezing rain and drizzle with some sleet mixed in. In the higher elevations, this turned to snow and had rates of several inches per hour and was also accompanied by lightning and thunder in some locations. The heavy, wet snow caused some traffic accidents and power outages across the region. In Montgomery County, snowfall totals ranged from 5.2 inches in Fort Plain to 12.2 inches in Amsterdam.	NOAA-NCDC, NWS
February 2, 2015	Heavy Snow	N/A	N/A	A heavy snow event brought between 10.2 inches and 14 inches of snow to Montgomery County.	NWS

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

B Billion ($)
DR Federal Disaster Declaration
EM Federal Emergency Declaration
FEMA Federal Emergency Management Agency
K Thousand ($)
M Million ($)
NA Not Available
NCDC National Climate Data Center
NOAA National Oceanic Atmospheric Administration
NWS National Weather Service
NYS New York State

Probability of Future Events

Winter storm hazards in New York State are virtually guaranteed yearly since the State is located at relatively high latitudes resulting in winter temperatures that range between 0ºF and 32 ºF for a good deal of the fall through early spring season (late October until mid-April). In addition, the State is exposed to large quantities of moisture from both the Great Lakes and the Atlantic Ocean. While it is almost certain that a number of significant winter storms will occur during the winter and fall season, what is not easily determined is how many such storms will occur during that time frame (NYS DHSES 2014).

The New York State HMP includes a similar ranking process for hazards that affect the State. Based on historical records and input from the Planning Committee, the probability of at least one winter snow storm of emergency declaration proportions, occurring during any given calendar year is virtually certain in the State. Based on historical snow related disaster declaration occurrences, New York State can expect a snow storm of disaster declaration proportions, on average, once every three to five years. Similarly, for ice storms, based on historical disaster declarations, it is expected that on average, ice storms of disaster proportions will occur once every seven to 10 years within the State (NYS DHSES 2014). It is estimated that Montgomery County will continue to experience direct and indirect impacts of severe winter storms annually.

In Section 5.3, the identified hazards of concern for Montgomery County were ranked. The probability of occurrence, or likelihood of the event, is one parameter used for hazard rankings. Based on historical records and input from the Planning Committee, the probability of occurrence for severe winter storms in the County is considered 'frequent' (event is likely to occur within 25 years, as presented in Table 5.3-3).

Climate Change Impacts

New York State averages more than 40 inches of snow each year. Snowfall varies regionally, based on topography and the proximity to large lakes and the Atlantic Ocean. Maximum snowfall is more than 165 inches in parts of the Adirondacks and Tug Hill Plateau, as well as in the westernmost parts of the State. The warming influence of the Atlantic Ocean keeps snow in the New York City and Long Island areas below 36 inches each year.

Climate change is beginning to affect both people and resources in New York State, and these impacts are projected to continue growing. Impacts related to increasing temperatures and sea level rise are already being felt in the State. ClimAID: the Integrated Assessment for Effective Climate Change in New York State (ClimAID) was undertaken to provide decision-makers with information on the State's vulnerability to climate change and to facilitate the development of adaptation strategies informed by both local experience and scientific knowledge (New York State Energy Research and Development Authority [NYSERDA] 2011).

Each region in New York State, as defined by ClimAID, has attributes that will be affected by climate change. Montgomery County is part of Region 5, East Hudson and Mohawk River Valleys. Some of the issues in this region, affected by climate change, include: more frequent heat waves and above 90°F days, more heat-related deaths, increased frequency of heavy precipitation and flooding, decline in air quality, etc. (NYSERDA 2014).

Temperatures in New York State are warming, with an average rate of warming over the past century of 0.25° F per decade. Average annual temperatures are projected to increase across New York State by 2° F to 3.4° F by the 2020s, 4.1° F to 6.8° F by the 2050s, and 5.3° F to 10.1° F by the 2080s. By the end of the century, the greatest warming is projected to be in the northern section of the State (NYSERDA 2014).

Regional precipitation across New York State is projected to increase by approximately one to eight-percent by the 2020s, three to 12-percent by the 2050s, and four to 15-percent by the 2080s. By the end of the century, the greatest increases in precipitation are projected to be in the northern areas of the State (NYSERDA 2014).

In Region 5, it is estimated that temperatures will increase by 3.5ºF to 7.1ºF by the 2050s and 4.1ºF to 11.4ºF by the 2080s (baseline of 47.6ºF). Precipitation totals will increase between 2 and 15% by the 2050s and 3 to 17% by the 2080s (baseline of 38.6 inches). Table 5.4.6-3 displays the projected seasonal precipitation change for the East Hudson and Mohawk River Valleys ClimAID Region (NYSERDA 2014).

Table 5.4.6-3. Projected Seasonal Precipitation Change in Region 5, 2050s (% change)

Winter	Spring	Summer	Fall
5 to +15	-5 to +10	-5 to +5	-5 to +10

Source: NYSERDA 2011

It is uncertain how climate change will impact winter storms. Based on historical data, it is expected that the following will occur at least once per 100 years:

- Up to eight inches of rain fall in the rain band near the coast over a 36-hour period
- Up to four inches of freezing rain in the ice band near central New York State, of which between one and two inches of accumulated ice, over a 24-hour period
- Up to two feet of accumulated snow in the snow band in northern and western New York State over a 48-hour period (NYSERDA 2011)

New York State is already experiencing the effects of climate change during the winter season. Winter snow cover is decreasing and spring comes, on average, about a week earlier than it did a few years ago. Nighttime temperatures are measurably warmer, even during the colder months (NYSDEC Date Unknown). Overall winter temperatures in New York State are almost five degrees warmer than in 1970 (NYSDEC Date Unknown). The State has seen a decrease in the number of cold winter days (below 32°F) and can expect to see a decrease in snow cover, by as much as 25 to 50% by end of the next century. The lack of snow cover may jeopardize opportunities for skiing, snowmobiling and other types of winter recreation; and natural ecosystems will be affected by the changing snow cover (Cornell University College of Agriculture and Life Sciences 2011).

Some climatologists believe that climate change may play a role in the frequency and intensity of Nor'Easters. Two ingredients are needed to produce strong Nor'Easters and intense snowfall: (1) temperatures which are just below freezing, and (2) massive moisture coming from the Gulf of Mexico. When temperatures are far below freezing, snow is less likely. As temperatures increase in the winter months they will be closer to freezing rather than frigidly cold. Climate change is expected to produce more moisture, thus increasing the likelihood that these two ingredients (temperatures just below freezing and intense moisture) will cause more intense snow events.

5.4.6.2 Vulnerability Assessment

To understand risk, a community must evaluate what assets are exposed or vulnerable in the identified hazard area. For severe winter storms, the entire County has been identified as the hazard area. Therefore, all assets in the County (population, structures, critical facilities and lifelines), as described in the County Profile section, are vulnerable to a severe winter storm. The following text evaluates and estimates the potential impact of severe storms on the County including:

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

Overview of Vulnerability

Severe winter storms are of significant concern to Montgomery County because of the frequency and magnitude of these events in the region, the direct and indirect costs associated with these events, delays caused by the storms, and impacts on the people and facilities of the region related to snow and ice removal, health problems, cascade effects such as utility failure (power outages) and traffic accidents, and stress on community resources.

Data and Methodology

National weather databases and local resources were used to collect and analyze severe winter storm impacts on the County. Default HAZUS-MH data was used to support an evaluation of assets exposed to this hazard and the potential impacts associated with this hazard.

Impact on Life, Health and Safety

According to the NOAA National Severe Storms Laboratory (NSSL); every year, winter weather indirectly and deceptively kills hundreds of people in the U.S., primarily from automobile accidents, overexertion and exposure. Winter storms are often accompanied by strong winds creating blizzard conditions with blinding wind-driven snow, drifting snow and extreme cold temperatures and dangerous wind chill. They are considered deceptive killers because most deaths and other impacts or losses are indirectly related to the storm. People can die in traffic accidents on icy roads, heart attacks while shoveling snow, or of hypothermia from prolonged exposure to cold. Heavy accumulations of ice can bring down trees and power lines, disabling electric power and communications for days or weeks. Heavy snow can immobilize a region and paralyze a city, shutting down all air and rail transportation and disrupting medical and emergency services. Storms near the coast can cause coastal flooding and beach erosion as well as sink ships at sea. The economic impact of winter weather each year is huge, with costs for snow removal, damage and loss of business in the millions (NSSL, 2006).

Heavy snow can immobilize a region and paralyze a city, stranding commuters, stopping the flow of supplies, and disrupting emergency and medical services. Accumulations of snow can collapse buildings and knock down trees and power lines. In rural areas, homes and farms may be isolated for days, and unprotected livestock may be lost. In the mountains, heavy snow can lead to avalanches. The cost of snow removal, repairing damages, and loss of business can have large economic impacts on cities and towns (NSSL, 2006).

Heavy accumulations of ice can bring down trees, electrical wires, telephone poles and lines, and communication towers. Communications and power can be disrupted for days while utility companies work to repair the extensive damage. Even small accumulations of ice may cause extreme hazards to motorists and pedestrians. Bridges and overpasses are particularly dangerous because they freeze before other surfaces (NSSL, 2006).

For the purposes of this HMP, the entire population in the County (50,219 people) is exposed to severe winter storm (U.S. Census, 2010). Snow accumulation and frozen/slippery road surfaces increase the frequency and impact of traffic accidents for the general population, resulting in personal injuries. Refer to Table 4-2 in the County Profile for population statistics for Montgomery County. The elderly are considered most susceptible to the severe winter storm hazard due to their increased risk of injuries and death from falls and overexertion and/or hypothermia from attempts to clear snow. In addition, severe winter storm events can reduce the ability of these populations to access emergency services.

Table 5.4.6-4. Vulnerable Population Exposed to Severe Winter Storm/Extreme Cold Temperature Events in Montgomery County

Population Category	Number of Persons Exposed
Elderly (Over 65 years of age)	8,329
Persons living below Census poverty threshold*	9,438

Source: Census 2010; American Community Survey 2008-2012
** The Census poverty threshold for a three person family unit is approximately $15,000. The population for which poverty status was determined for was 49,075.*

Impact on General Building Stock

The entire general building stock inventory is exposed and vulnerable to the severe winter storm hazard. In general, structural impacts include damage to roofs and building frames, rather than building content. Table 5.4.6-8 presents the total exposure value for general building stock for each participating municipality.

Current modeling tools are not available to estimate specific losses for this hazard. As an alternate approach, this plan considers percentage damages that could result from severe winter storm conditions. Table 5.4.6-5 below summarizes percent damages that could result from severe winter storm conditions for the Planning Area's total general building stock. Given professional knowledge and the currently available information, the potential loss for this hazard is many times considered to be overestimated because of varying factors (building structure type, age, load distribution, building codes in place, etc.). Therefore, the following information should be used as estimates only for planning purposes with the knowledge that the associated losses for severe winter storm events vary greatly.

Table 5.4.6-5. General Building Stock Exposure and Estimated Losses from Severe Winter Storm Events in Montgomery County

Building Occupancy Class	Total Value	1% Damage Loss Estimate	5% Damage Loss Estimate	10% Damage Loss Estimate
Residential	$2,475,463,000	$24,754,630	$123,773,150	$247,546,300
Commercial	$530,450,000	$5,304,500	$26,522,500	$53,045,000
Industrial	$278,760,000	$2,787,600	$13,938,000	$27,876,000
Agricultural	$26,377,000	$263,770	$1,318,850	$2,637,700
Religious	$64,753,000	$647,530	$3,237,650	$6,475,300
Government	$40,766,000	$407,660	$2,038,300	$4,076,600
Educational	$63,796,000	$637,960	$3,189,800	$6,379,600
Total	$3,480,365,000	$34,803,650	$174,018,250	$348,036,500

Source: HAZUS-MH MR3

Note: The building values shown are building structure only because damage for the severe winter storm hazard will generally impact structures such as the roof and building frame (rather than building content). The valuation of general building stock and the estimates of losses determined in Montgomery County were based on the default general building stock database provided in HAZUS-MH MR3. The general building stock valuations provided in HAZUS-MH MR3 are Replacement Cost Value from R.S. Means as of 2006.

A specific area that is vulnerable to the severe winter storm hazard is the floodplain. Severe winter storms can cause flooding through blockage of streams or through snow melt. At-risk residential infrastructures are presented in the flood hazard profile (Section 5.4.X). Generally, losses resulting from flooding associated with severe winter storms should be less than that associated with a 100-year flood. In addition, coastal areas are at high risk during winter storm events that involve high winds. Please refer to the severe storm profile (Section 5.4.4) profile for losses resulting from wind.

Impact on Critical Facilities

Full functionality of critical facilities such as police, fire and medical facilities is essential for response during and after a severe winter storm event. HAZUS-MH estimates the replacement value for each police station is $1,652,000 and each fire station is $708,000. These critical facility structures are largely constructed of concrete; therefore, they should only suffer minimal structural damage from severe winter storm events. Because power interruption can occur, backup power is recommended for critical facilities and infrastructure. It is unknown if the five police stations and 20 fire stations have a backup power source. Infrastructure at risk for this hazard includes roadways that could be damaged due to the application of salt and intermittent freezing and warming conditions that can damage roads over time. Severe snowfall requires the clearing roadways and alerting citizens to dangerous conditions; following the winter season, resources for road maintenance and repair are required.

Impact on Economy

The cost of snow and ice removal and repair of roads from the freeze/thaw process can drain local financial resources. Another impact on the economy includes impacts on commuting into, or out of, the area for work or school. The loss of power and closure of roads prevents the commuter population traveling to work within and outside of the County.

Future Growth and Development

As discussed in Sections 4 and 9, areas targeted for future growth and development have been identified across the County. Any areas of growth could be potentially impacted by the severe winter storm hazard because the entire planning area is exposed and vulnerable. Areas targeted for potential future growth and development in the next five (5) years have been identified across the County at the municipal level. Refer to the jurisdictional annexes in Volume II of this HMP.

Current New York State land use and building codes incorporate standards that address and mitigate snow accumulation. Some local municipalities in the State have implemented the following activities to eliminate loss of life and property and infrastructure damages during winter storm events:

- Removal of snow from roadways
- Removal of dead trees and trim trees/brush from roadways to lessen falling limbs and trees
- Ensure proper road signs are visible and installed properly
- Bury electrical and telephone utility lines to minimize downed lines
- Removal of debris/obstructions in waterways and develop routine inspections/maintenance plans to reduce potential flooding

- Replace substandard roofs of critical facilities to reduce exposure to airborne germs resulting from leakage
- Purchase and install backup generators in evacuation facilities and critical facilities to essential services to residents
- Install cell towers in areas where limited telecommunication is available to increase emergency response and cell phone coverage (NYS DHSES, 2014)

Effect of Climate Change on Vulnerability

Refer to the "Climate Change Impacts" section discussed earlier in this profile.

Additional Data and Next Steps

The assessment above identifies vulnerable populations and economic losses associated with this hazard of concern. Historic data on structural losses to general building stock are not adequate to predict specific losses to this inventory; therefore, the percent of damage assumption methodology was applied. This methodology is based on FEMA's How to Series (FEMA 386-2), Understanding Your Risks, Identifying and Estimating Losses (FEMA, 2001) and FEMA's Using HAZUS-MH for Risk Assessment (FEMA 433) (FEMA, 2004). The collection of additional/actual valuation data for general building stock and critical infrastructure losses would further support future estimates of potential exposure and damage for the general building stock inventory. Mitigation strategies addressing early warning, dissemination of hazard information, provisions for snow removal and back-up power are included in Volume II, Section 9 of this plan.

SECTION 6 MITIGATION STRATEGIES

This section presents mitigation actions for Montgomery County to reduce potential exposure and losses identified as concerns in the Risk Assessment portion of this plan. The Planning Committee reviewed the Risk Assessment to identify and develop these mitigation actions, which are presented herein.

This section includes:

(1) Background and past mitigation accomplishments
(2) General Mitigation Planning Approach
(3) Review and Update of Mitigation Goals and Objectives
(4) Capability Assessment
(5) Review and Update of Mitigation Strategies
(6) Mitigation Strategy Prioritization, including Review of Cost-Effectiveness

Hazard mitigation reduces the potential impacts of, and costs associated with, emergency and disaster-related events. Mitigation actions address a range of impacts, including impacts on the population, property, the economy, and the environment.

Mitigation actions can include activities such as: revisions to land-use planning, training and education, and structural and nonstructural safety measures.

6.1 BACKGROUND AND PAST ACCOMPLISHMENTS

In accordance with DMA 2000 requirements, a discussion regarding past mitigation activities and an overview of past efforts is provided as a foundation for understanding the mitigation goals, objectives, and activities outlined in this Plan. Montgomery County, through previous and ongoing hazard mitigation activities, has demonstrated that it is pro-active in protecting its physical assets and citizens against losses from natural hazards.

All jurisdictions in the County with the exception of the Villages of Ames and Nelliston, participate in the National Flood Insurance Program (NFIP), which requires the adoption of Federal Emergency Management Agency (FEMA) floodplain mapping and certain minimum construction standards for building within the floodplain.

The County has leveraged its limited resources to provide a wide array of support for mitigation projects. County-wide and local progress has been accomplished on numerous projects and programs, many of which are in addition to those included in the 2008 County-wide hazard mitigation plan. Examples of pro-active mitigation successes which have improved floodplain management and decreased the impact of flooding include the following initiatives.

- The County has obtained funding to move the DPW and annex building, which are critical facilities, out of floodplain.
- The County is in the process of construction of an office annex adjacent to jail, which is outside of the floodplain.
- All public schools have Red Cross shelter agreements (Town of Amsterdam and Town of Florida Municipal Buildings are shelters.)
- The County is supporting the development of NYS DEC response plans for rail assets (These will be integrated in the flood, earthquake and severe storm profiles as a reference in case of a hazard event.)
- As part of annual road maintenance the County reviews and upgrades drainage issues prior to resurfacing of roadways to minimize the impact of flooding.
- The County and municipalities upgrade culvert capacity and provides erosion control –heavy stone, retaining walls, riprap as part of their ongoing maintenance program. For example this type of improvements have been completed on Spring Street in the Town of Minden and on Lasselville Rd in

the Town of St Johnsville. Driveway culverts have been replaced on Happy Hill Rd in the Town of Canajoharie.

- The County consistently increases waterway openings during bridge replacement projects. for example openings were increased on the bridge on Logtown and Brand Roads in the Town of Root
- The County provides continuous debris cleaning of all "hotspots" to mitigate flooding prior to large events.
- Culvert capacities have been increased for infrastructure in Florida and Amsterdam through the NY Rising program.
- The County is in process of moving the emergency operations center, probation, emergency management and public defender to the new wing at the public safety building and out of the flood zone.
- The County has raised generator at annex building above flood stage to protect website and email capabilities
- All electrical outlets in Annex building and all electrical panels in DPW building have been raised above the base flood elevation.
- As standard practice, the County DPW does not use bottom 4 feet of storage and relocates DPW equipment out of floodplain based on expected flood events.
- NYDOT provides bi-annual inspections of transportation infrastructure.
- The County identifies trees annually (for pruning.)
- City of Amsterdam has created a snow removal plan with alternate side of street parking. Most villages have night parking regulations form November to April.
- Ft. Plain and Minden are applying for a grant to create a flood channel along the Otsquago Creek to mitigate flooding.
- Shelter ID's and agreements in place. County currently communicates, and will continue to communicate evacuation routes based on emergency at hand. Evacuation routes are situational and must be established event by event;
- The County monitors water heights and knows resulting flooding from experience. Fire departments have procedures and have hyper-reach systems for reverse robo-calls to evacuate and firemen are stationed at various creeks across the county to report water levels.
- The New York Rising program is implementing stream level gages to improve flood forecasting.
- The County Capital Improvement Plan includes replacing buildings, radios and the retrofit of bridges.
- A storm sewer improvement project is in the process of being funded through the County with CHIP funding (Consolidated Highway Improvement Fund) for Midline Road in the Town of Amsterdam.
- The County provides ongoing stream stabilization on Schoharie Creek in Glen and Charleston.

A summary of progress of County-wide mitigation actions included in the 2008 Montgomery County Hazard Mitigation Plan is provided in Section 9.1 of this Plan Update. In the case of projects that were not completed, an explanation of obstacles has been provided. Projects that have not been commenced and those that are partially complete have been included in the mitigation strategies in Volume II of this plan as appropriate. These past and ongoing activities have contributed to the County's understanding of its hazard preparedness and future mitigation activity needs, costs, and benefits. These efforts provide a foundation for the Planning Committee to use in developing this Hazard Mitigation Plan (HMP).

6.2 GENERAL MITIGATION PLANNING APPROACH

The overall approach used to update the County and local 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 portions 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

6.3 REVIEW AND UPDATE OF MITIGATION GOALS AND OBJECTIVES

This section documents the efforts to update the guiding principle (mission statement), and hazard mitigation goals and objectives established to reduce or avoid long-term vulnerabilities to the identified hazards.

6.3.1 Mission Statement

Per FEMA guidance (386-1), a mission statement or guiding principle describes the overall duty and purpose of the planning process, and serves to identify the principle message of the plan. It focuses or constrains the range of goals and objectives identified. This is not a goal because it does not describe outcomes. Montgomery County's mission statement is broad in scope, and provides a direction for the HMP.

During the original Montgomery County hazard mitigation planning process, the Planning Committee developed a mission statement. As part of the 2014 update process, the Montgomery County Hazard Mitigation Steering Committee reviewed the mission statement and elected to revise it, as:

To develop a Pre-Disaster Mitigation Plan that will utilize all available resources to educate and inspire all citizens, business and civic leaders of Montgomery County to recognize potential disasters and implement projects that will mitigate the effect of these hazards.

6.3.2 Goals and Objectives

According to CFR 201.6(c)(3)(i): "The hazard mitigation strategy shall include a description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards." Currently, the Planning Committee has developed mitigation goals based on the risk assessment results, discussions, research, and input from amongst the committee, existing authorities, polices, programs, resources, stakeholders and the public. For the purposes of this plan, goals are defined as follows:

Goals are general guidelines that explain what is to be achieved. They are usually broad, long-term, policy-type statements and represent global visions. Goals help define the benefits that the plan is trying to achieve. The success of the plan, once implemented, should be measured by the degree to which its goals have been met (that is, by the actual benefits in terms of hazard mitigation).

The Montgomery County goals were developed based in part on a review of the hazard mitigation goals and objectives established in the NYS HMP, the 2009 Montgomery County HMP, as well as the current or expired

municipal hazard mitigation plans within the County. Further, these goals were selected to be compatible with the needs and goals expressed in other available County and local community planning documents. Achievement of these goals helps to define the effectiveness of a mitigation strategy.

The following are the update goals for the 2014 Montgomery County HMP Update:

1. Protect Life and Property
2. Increase (Public) Awareness of Hazard Risk and Preparedness
3. Encourage Partnerships
4. Provide for Emergency Services
5. Improve Fiscal Mitigation Capabilities

FEMA defines ***Goals*** as general guidelines that explain what should be achieved. Goals are usually broad, long-term, policy statements, and represent a global vision.

FEMA defines ***Objectives*** as strategies or implementation steps to attain mitigation goals. Unlike goals, objectives are specific and measurable, where feasible.

FEMA defines ***Mitigation Actions*** as specific actions that help to achieve the mitigation goals and objectives.

The goals of the Montgomery County HMP Update are compatible with the needs and goals expressed in other community planning documents, as well as the New York State HMP. Each goal has a number of corresponding objectives that further define the specific actions or implementation steps. Achievement of these goals will define the effectiveness of the mitigation strategy. The goals are also used to help establish priorities.

Objectives are short-term aims which, when combined, form a strategy or course of action to meet a goal. Unlike goals, objectives are specific and measurable.

In January 2014, the Steering Committee met to discuss the existing mission statement and goals. The committee reviewed the mission statement, goals and objectives of the 2008 plan and concluded that they continued to represent the needs of the plan and, hence, agreed to maintain the original mission statement, goals and objectives with the addition of an objective to address the need for wise waterfront development. The objectives are used to 1) measure the success of the HMP once implemented, and 2) to help prioritize identified mitigation actions.

Table 6-1 presents Montgomery County's goals and objectives for their Hazard Mitigation Plan. Although an objective is listed with each goal, the objectives were developed to meet multiple goals as demonstrated in Table 6-2.

Table 6-1. Montgomery County Hazard Mitigation Plan Update Goals and Objectives

Goal	Objective
Goal 1: Protect Life and Property	*Objective 1-1: Implement mitigation activities that will assist in protecting lives and property by making homes, businesses, infrastructure, and critical facilities more resistant to hazards.*
	Objective 1-2: Encourage property owners to take preventive actions in areas that are especially vulnerable to hazards.
	Objective 1-3: Review existing local laws and ordinances, building codes, safety inspection procedures, and applicable rules to help ensure that they employ the most recent and generally accepted standards for the protection of buildings and environmental resources.
	Objective 1-4: Ensure that public and private facilities and infrastructure meet established building and safety codes and immediately enforce the codes to address any identified deficiencies.
	Objective 1-5: Integrate hazard considerations and the recommendations of this plan into existing local and county plans, programs and mechanisms, including land-use planning and natural

Goal	Objective
	resource management.
	Objective 1-6: Address maintenance issues with critical infrastructure, including stormwater management and flood-control structures.
	Objective 1-7: Address obstacles to maintain and restore conveyance in streams and culverts.
	Objective 1-8: Acquire land in hazard areas as it becomes available.
	Objective 1-9: Address repetitive loss and severe repetitive loss properties.
	Objective 1-10: Improve detection, warning/notification and communications systems, taking advantage of available technological improvements.
	Objective 1-11: Review Codes for contemporary practicality of zoning designations and hazard susceptibility; and Review allowable land uses to ensure that they are appropriate for waterfront development and location with respect to floodplains.
Goal 2: Increase (Public) Awareness of Hazard Risk and Preparedness	*Objective 2-1:* Develop and implement education and outreach programs to increase public awareness of the risks associated with hazards and to educate the public on flood insurance and specific, individual preparedness, response and recovery activities.
	Objective 2-2: Implement mitigation activities that enhance the capabilities of the jurisdictions and agencies in the County to better profile and assess exposure of hazards.
	Objective 2-3: Improve public understanding of residential retrofit (elevation, waterproofing, etc.) and relocation and acquisition programs.
	Objective 2-4: Improve public understanding of proper installation of backup utility systems.
Goal 3: Encourage Partnerships	*Objective 3-1:* Strengthen inter-jurisdiction and inter-agency communication, coordination, and partnerships to foster hazard mitigation strategies and/or projects designed to benefit multiple jurisdictions.
	Objective 3-2: Improve cooperation with regional stakeholders towards effective mitigation.
	Objective 3-3: Identify and implement ways to engage public agencies with individual citizens, non-profit organizations, business, and industry to implement mitigation activities more effectively.
	Objective 3-4: Encourage shared services in acquiring maintaining and providing emergency services and equipment.
Goal 4: Provide for Emergency Services	*Objective 4-1:* Encourage the establishment of policies at the local level to help ensure the prioritization and implementation of mitigation strategies and/or projects designed to benefit essential facilities, services, and infrastructure.
	Objective 4-2: Where appropriate, coordinate and integrate hazard mitigation activities with existing local emergency operations plans.
	Objective 4-3: Identify the need for, and acquire, any special emergency services, training, and equipment to enhance response capabilities for specific hazards..
	Objective 4-5: Ensure continuity of governmental operations, emergency services, and essential facilities at the County and local level during and immediately after disaster and hazard events.
	Objective 4-6: Improve sheltering capabilities.
Goal 5: Improve Fiscal Mitigation	*Objective 5-1*: Provide information on tools, partnership opportunities, funding resources, and current government initiatives to assist in implementing mitigation activities.

Goal	Objective
Capabilities	*Objective 5-2:* Develop strategies to better take advantage of and leverage available funding opportunities
	Objective 5-3: Work with funding agencies to improve reimbursement schedules.

6.4 CAPABILITY ASSESSMENT

According to FEMA 386-3, a capability assessment is an inventory of a community's missions, programs and policies; and an analysis of its capacity to carry them out. This assessment is an integral part of the planning process. The assessment process enables identification, review and analysis of local and state programs, policies, regulations, funding and practices currently in place that may either facilitate or hinder mitigation.

During the original planning process, the County and all municipalities identified and assessed their capabilities in the areas of planning and regulatory, administrative and technical, and fiscal. By completing this assessment, the Planning Committee and each jurisdiction learned how or whether they would be able to implement certain mitigation actions by determining the following:

- Limitations that may exist on undertaking actions;
- The range of local and/or state administrative, programmatic, regulatory, financial and technical resources available to assist in implementing their mitigation actions;
- Action is currently outside the scope of capabilities;
- Types of mitigation actions that may be technically, legally (regulatory) administratively, politically or fiscally challenging or infeasible;
- Opportunities to enhance local capabilities to support long term mitigation and risk reduction.

During the 2015 plan update process, all participating jurisdictions were tasked with developing or updating their capability assessment, paying particular attention to evaluating the effectiveness of these capabilities in supporting hazard mitigation, and identifying opportunities to enhance local capabilities.

County, municipal and tribal capabilities in the areas of planning and regulatory, administrative and technical, and fiscal may be found in the Capability Assessment section of their jurisdictional annexes in Section 9. Further, within each annex participating jurisdictions have identified how they have 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"). A further summary of these continued efforts to develop and promote a comprehensive and holistic approach to hazard risk management and mitigation is presented in Section 7.

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 Montgomery County are presented below.

6.4.1 Planning and Regulatory Capabilities – County and Local

National Flood Insurance Program (NFIP)

The U.S. Congress established the NFIP with the passage of the National Flood Insurance Act of 1968 (FEMA's 2002 NFIP: Program Description). The NFIP is a Federal program enabling property owners in participating communities to purchase insurance as a protection against flood losses in exchange for State and

community floodplain management regulations that reduce future flood damages. Please refer to Section 5.4.4 (Flood) for information on recent legislation related to reforms to the NFIP.

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

All municipalities in Montgomery County participate in the NFIP; however, two communities have been suspended (Village of Ames and Village of Nellistown). As of May 31, 2013, there were 273 NFIP policyholders in Montgomery County. There have been 200 claims made, totaling nearly $6.7 million for damages to structures and contents. There are 25 NFIP Repetitive Loss (RL) properties, and one NFIP Severe Repetitive Loss (SRL) properties in the County. Further details on the County's flood vulnerability may be found in the flood hazard profile in Section 5.

Municipal participation in and compliance with the NFIP is supported at the Federal level by FEMA Region II and the Insurance Services Organization (ISO), at the state-level by the New York State Department of Environmental Conservation (NYSDEC) and New York State Office of Emergency Management (NYSOEM). Additional information on the NFIP program and its implementation throughout the County may be found in the flood hazard profile (Section 5).

The State and communities may adopt higher regulatory standards when implementing the provisions of the NFIP. Specifically identified are the following:

Freeboard: By law, NYS requires Base Flood Elevation plus 2 feet (BFE+2) for all single- and two-family residential construction, and BFE+1 for all other types of construction. Communities may go beyond this State requirement, providing for additional freeboard or requiring BFE+2 for all types of construction. Further, a number of communities have supported property owners meeting and exceeding freeboard requirements through the site plan review and zoning board of approvals process; for instance, allowing overall structure heights to be determined from BFE+2 rather than grade within NFIP floodplains.

Cumulative Substantial Improvements/Damages: The NFIP allows improvements valued at up to 50% of the building's pre-improvement value to be permitted without meeting the flood protection requirements. Over the years, a community may issue a succession of permits for different repairs or improvement to the same structures. This can greatly increase the overall flood damage potential for the structure and within a community. The community may wish to deme "substantial improvement" cumulatively so that once a threshold of improvement within a certain length of time is reached, the structure is considered to be substantially improved and must meet flood protection requirements.

NFIP Community Rating System (CRS)

As an additional component of the NFIP, the Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. As a result, flood insurance premium rates are discounted to reflect the reduced

flood risk resulting from the community actions meeting the three goals of the CRS: (1) reduce flood losses; (2) facilitate accurate insurance rating; and (3) promote the awareness of flood insurance (FEMA, 2012). Municipalities and the county as a whole could expect significant cost savings on premiums if enrolled in the CRS program. Currently, none of the municipalities participate in the CRS Program.

Local Waterfront Revitalization Program

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) (pdf) 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. 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. To date, the City of Beacon, Town of Poughkeepsie, Town of Red Hook, Town of Rhinebeck, and the Village of Tivoli have State-approved LWRPs, while the City of Poughkeepsie has an unofficial LWRP.

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 LWRP follows a step-by-step process by which a community can advance community planning from a vision to implementation, which is described in the Making the Most of Your Waterfront Guidebook (pdf) developed by the Department of State. Additionally, the Opportunities Waiting to Happen Guidebook (pdf), developed by the Department of State, provides help to assist all New Yorkers to redevelop abandoned buildings as part of the overall vision for their community.

In addition to landward development, water uses are subject to an ever-increasing array of use conflicts. These include conflicts between passive and active types of recreation, between commercial and recreational uses, and between all uses and the natural resources of a harbor. Increases in recreational boating, changes in waterfront uses, coastal hazards what to do with dredged materials, competition for space, climate change, and multiple regulating authorities, all make effective harbor management complex. These conflicts and a lack of clear authority to solve them have resulted in degraded natural and cultural characteristics of many harbors, and their ability to support a range of appropriate uses. As part of an LWRP, a harbor management plan can be used to analyze and resolve these conflicts and issues.

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.

In Montgomery County, the Mid-Montgomery Local Waterfront Revitalization Plan (LWRP) includes up to $44,000 ($22,000 from the New York Department of State and a local match) for economic development in the towns of Mohawk and Glen and the villages of Fonda and Fultonville.

6.4.2 Planning and Regulatory Capabilities – State and Federal

New York State Flood Plain Management

There are two 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.

6.4.3 Administrative and Technical Capabilities - County and Local

Montgomery County Emergency Management Office

The Montgomery County Emergency Management Office provides a countywide emergency management program for the County. They have emergency plans, trained personnel and emergency facilities and equipment to deal with a wide variety of potential disasters. The Director of Emergency Management's role involves planning, organizing, implementing, controlling, and evaluating the countywide program.

Montgomery County Department of Planning and Economic Development

The Montgomery County Department of Economic Development and Planning (MCDEDP) was created to administer the Montgomery County Economic Development and Planning Program and is the lead Economic Development Agency in Montgomery County, New York. In addition, the staff acts as the administrative body for the Montgomery County Industrial Development Agency (MCIDA). By joining forces and pooling resources, the County and the MCBDC provide professional economic development assistance to businesses interested in expanding or relocating in Montgomery County.

In addition to business attraction, MCBDC places a strong focus on retaining and expanding existing businesses to maintain economic stability within Montgomery County. MCBDC works directly with local employers to promote capital investments and job creation, reducing the risk of closure or relocation out of the County. Services delivered by MCBDC include needs assessments, identification of expansion opportunities and securing financial, technical, marketing and training resources. Through the MCBDC, Montgomery County businesses can access loans and grants to assist with acquisition and/or expansion. The MCIDA can provide long-term tax-exempt bond financing with lower interest rates than are available through conventional financing.

MCBDC also implements the County's Planning Program and provides all the planning services for the County and its municipalities. MCBDC maintains an in depth Geographic Information Systems database. As the Census Data Affiliate for the County, the department is the clearinghouse for all County and municipal demographic data. The department also actively seeks grants that assist in developing plans for economic development, transportation, disaster mitigation, recreation and other quality of life issues.

Montgomery County Department of Public Health

The Montgomery County Public Health Department is a public agency serving all residents of Montgomery County regardless of their age, creed, national origin, sex or socioeconomic status in accordance with agency policy. We are responsible to carry out public health programs through population-based services to prevent disease and injuries and promote and protect health. The agency focuses on identification and surveillance of health threats, community health protection and promotion, screening and prevention services and outreach services to help individuals access and benefit from the health care system and community resources.

Montgomery County Fire Service

The Montgomery County Fire Service encompasses the fire departments of Montgomery County including those of Ames, Amsterdam, Burtonsville, Canajoharie, Charleston, Cranesville, Florida, Fonda, Fort Hunyer, Fort Johnson, Fort Plalin, Fultonville, Glen, Hagaman, Mohawk, Rural Grove, South Minden, St. Johnsville, and Tribes Hill. Additionally part of the north-central county is covered by Ephratah out of Fulton County.

Montgomery County Department of Public Works

The mission of the Department of Public Works is to effectively develop, provide and maintain an efficient public infrastructure through long range planning, quality design and construction, and proper maintenance; to provide proficient maintenance and repairs to County owned facilities while providing the highest level of protection of occupants safety and health; to supply preventative maintenance and repairs for all County vehicles and equipment to ensure safety and efficiency at all times. The Department accomplishes this with an interest in achieving the highest-level result at the least cost to the County Taxpayer. The Department of Public Works work to ensure that Montgomery County grows and develops to enhance the quality of life for fellow residents, growing businesses and welcomed visitors in the most realistic, economical, safe and efficient way.

Montgomery County Sheriff Department

The Montgomery County Sheriff's Office is committed to improving the quality of life in Montgomery County by strengthening our neighborhoods, delivering superior services, embracing the diversity of our citizens, and keeping Montgomery County a desirable, safe community in which to live, work, raise a family, shop, study, play and grow old.

Montgomery County Soil and Water Conservation District

The Montgomery County Soil & Water Conservation District helps with the technical assistance, education, and implementation of farm programs to help meet the changing needs of farmers and landowners.

6.4.4 Administrative and Technical Capabilities – State and Federal

New York State Division of Homeland Security and Emergency Services (NYS DHSES)

For more than 50 years, NYS DHSES (formerly New York State Office of Emergency Management – NYS DHSES) and its predecessor agencies have been responsible for coordinating the activities of all State agencies to protect New York's communities, the State's economic well-being, and the environment from natural and man-made disasters and emergencies. NYS DHSES routinely assists local governments, voluntary organizations, and private industry through a variety of emergency management programs including hazard identification, loss prevention, planning, training, operational response to emergencies, technical support, and disaster recovery assistance.

NYS DHSES administers the FEMA mitigation grant programs in the state, and supports local mitigation planning in addition to developing and routinely updating the State Hazard Mitigation Plan. NYS DHSES prepared the current State Hazard Mitigation Plan working with input from other State agencies, authorities and organizations. It was approved by FEMA in 2014 and it keeps New York eligible for recovery assistance in all Public Assistance Categories A through G, and Hazard Mitigation assistance in each of the Unified Hazard Mitigation Assistance Program's five grant programs. For example, the 2008-2011 State Mitigation Plan allowed the State and its communities to access nearly $57 million in mitigation grants to prepare plans and carry out projects. The 2014 New York State HMP was used as guidance in completing the Montgomery County HMP Update.

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

Within the NYSDEC – Division of Water, 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. The Bureau consists of the following Sections:

- Coastal Management: Works to reduce coastal erosion and storm damage to protect lives, natural resources, and properties through structural and non-structural means.
- Dam Safety: 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: Is responsible for reducing flood risk to life and property through construction, operation and maintenance of flood control facilities.
- Floodplain Management: 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.

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

Technical Bulletins for the 2010 Codes of New York State

The DCEA publishes 14 technical bulletins including two recent bulletins with guidance related to flood hazard areas: Electrical Systems and Equipment in Flood-damaged Structures and Accessory Structures. One archived bulletin from January 2003, Flood Venting in Foundations and Enclosures Below Design Flood Elevation, refers to the out-of-date edition of FEMA Technical Bulletin 1 and to American Society of Civil Engineers (ASCE) 24-98, which is not the edition referenced by the current codes.

Forms and Publications

The DCEA posts several model reporting forms and related publications on its web page. The Building Permit Application requests the applicant to indicate whether the site is or is not in a floodplain and advises checking with town clerks or NYSDEC. The General Residential Code Plan Review form includes a reminder to "add 2' freeboard." Sample Flood Hazard Area Review Forms, including plan review checklists and inspection checklists for Zone A and Zone V, are based on the forms in Reducing Flood Losses through the International Code Series published by International Code Council and FEMA (2008).

6.4.5 Fiscal Capabilities – County and Local

In addition to the funding that Montgomery County and its constituent localities may access through the state and federal sources enumerated below, these governmental bodies may generate revenue through property taxes, sales taxes and numerous fees. It is important to note that the fiscal capacity of the County, as well as the city of Amsterdam, the villages and the towns to raise annual revenue is severely constricted by the New York State property tax cap. In certain instances, the County and its municipalities may issue general obligation bonds for capital projects.

6.4.6 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.

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.

Within Montgomery County, the City of Amsterdam, Town of Amsterdam, and Town of Florida are designated NY Rising Communities, all with $3 million allocations for project implementations. The County was also designated as a NY Rising Community with $3 million allocated for project implementations as well. Funding can go to economic development, infrastructure, prevention of further damages including construction of protective mitigation measures like dunes or sea walls, to the development of community planning documents such as comprehensive master plans or economic development plans.

Federal Hazard Mitigation Funding Opportunities

Federal mitigation grant funding is available to all communities with a current hazard mitigation plan (this plan); however most of these grants require a "local share" in the range of 10-25% of the total grant amount. The FEMA mitigation grant programs are described below.

Hazard Mitigation Grant Program (HMGP)

The HMGP is a post-disaster mitigation program. It is made available to states by FEMA after each Federal disaster declaration. The HMGP can provide up to 75% funding for hazard mitigation measures. The HMGP can be used to fund cost-effective projects that will protect public or private property in an area covered by a federal disaster declaration or that will reduce the likely damage from future disasters. Examples of projects include acquisition and demolition of structures in hazard prone areas, flood-proofing or elevation to reduce future damage, minor structural improvements and development of state or local standards. Projects must fit into an overall mitigation strategy for the area identified as part of a local planning effort. All applicants must have a FEMA-approved Hazard Mitigation Plan (this plan).

Applicants who are eligible for the HMGP are state and local governments, certain nonprofit organizations or institutions that perform essential government services, and Indian tribes and authorized tribal organizations. Individuals or homeowners cannot apply directly for the HMGP; a local government must apply on their behalf. Applications are submitted to NYS DHSES and placed in rank order for available funding and submitted to FEMA for final approval. Eligible projects not selected for funding are placed in an inactive status and may be considered as additional HMGP funding becomes available.

Flood Mitigation Assistance (FMA) Program

The FMA combines the previous Repetitive Flood Claims and Severe Repetitive Loss Grants into one grant program. FMA provides funding to assist states and communities in implementing measures to reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insurable under the NFIP. The FMA is funded annually; no federal disaster declaration is required. Only NFIP insured homes and businesses are eligible for mitigation in this program. Funding for FMA is very limited and, as with

the HMGP, individuals cannot apply directly for the program. Applications must come from local governments or other eligible organizations. The federal cost share for an FMA project is 75%. At least 25% of the total eligible costs must be provided by a non-federal source. Of this 25%, no more than half can be provided as in-kind contributions from third parties. At minimum, a FEMA-approved local flood mitigation plan is required before a project can be approved. FMA funds are distributed from FEMA to the state. NYS DHSES serves as the grantee and program administrator for FMA.

Pre-Disaster Mitigation (PDM) Program

The PDM program is an annually funded, nationwide, competitive grant program. No disaster declaration is required. Federal funds will cover 75% of a project's cost up to $3 million. As with the HMGP and FMA, a FEMA-approved local Hazard Mitigation Plan is required to be approved for funding under the PDM program.

Federal and State Disaster and Recovery Assistance Programs

Following a disaster, various types of assistance may be made available by local, state and federal governments. The types and levels of disaster assistance depend on the severity of the damage and the declarations that result from the disaster event. Among the general types of assistance that may be provided should the President of the United States declare the event a major disaster are the following:

Individual Assistance (IA)

IA provides help for homeowners, renters, businesses and some non-profit entities after disasters occur. This program is largely funded by the U.S. Small Business Administration. For homeowners and renters, those who suffered uninsured or underinsured losses may be eligible for a Home Disaster Loan to repair or replace damaged real estate or personal property. Renters are eligible for loans to cover personal property losses. Individuals may borrow up to $200,000 to repair or replace real estate, $40,000 to cover losses to personal property and an additional 20% for mitigation. For businesses, loans may be made to repair or replace disaster damages to property owned by the business, including real estate, machinery and equipment, inventory and supplies. Businesses of any size are eligible. Non-profit organizations such as charities, churches, private universities, etc. are also eligible. An Economic Injury Disaster Loan provides necessary working capital until normal operations resume after a physical disaster. These loans are restricted, by law, to small businesses only.

Public Assistance (PA)

PA provides cost reimbursement aid to local governments (state, county, local, municipal authorities and school districts) and certain non-profit agencies that were involved in disaster response and recovery programs or that suffered loss or damage to facilities or property used to deliver government-like services. This program is largely funded by FEMA with both local and state matching contributions required.

Small-Business Administration (SBA) Loans

Small Business Administration (SBA) provides low-interest disaster loans to homeowners, renters, business of all sizes, and most private nonprofit organizations. SBA disaster loans can be used to repair or replace the following items damaged or destroyed in a declared disaster: real estate, personal property, machinery and equipment, and inventory and business assets.

Homeowners may apply for up to $200,000 to replace or repair their primary residence. Renters and homeowners may borrow up to $40,000 to replace or repair personal property-such as clothing, furniture, cars, and appliances – damaged or destroyed in a disaster. Physical disaster loans of up to $2 million are available to qualified businesses or most private nonprofit organizations.

Social Services Block Grant

To address the needs of critical health and human service providers and the populations they serve, the State of New York will receive a total of $235.4 million in federal Superstorm Sandy Social Services Block Grant funding. The State will distribute $200,034,600 through a public and transparent solicitation for proposals. The State is also allocating $35.4 million in State Priority Projects, using the SSBG funding. Sandy SSBG resources are dedicated to covering necessary expenses resulting from Superstorm Sandy, including social, health and mental health services for individuals, and for repair, renovation and rebuilding of health care facilities, mental hygiene facilities, child care facilities and other social services facilities.

Department of Homeland Security

The Homeland Security Grant Program (HSGP) plays an important role in the implementation of the National Preparedness System by supporting the building, sustainment, and delivery of core capabilities essential to achieving the National Preparedness Goal of a secure and resilient nation. The FY 2013 HSGP supports core capabilities across the five mission area of Prevention, Protection, Mitigation, Response, and Recovery based on allowable cost. HSGP is comprised of three interconnected grant programs including the State Homeland Security Program (SHSP), Urban Areas Security Initiative (UASI), and the Operation Stonegarden (OPSG). Together, these grant programs fund a range of preparedness activities, including planning, organization, equipment purchase, training, exercises, and management and administration.

Community Development Block Grants (CDBG)

CDBG are federal funds intended to provide low and moderate-income households with viable communities, including decent housing, as suitable living environment, and expanded economic opportunities. Eligible activities include community facilities and improvements, roads and infrastructure, housing rehabilitation and preservation, development activities, public services, economic development, planning, and administration. Public improvements may include flood and drainage improvements. In limited instances, and during the times of "urgent need" (e.g. post disaster) as defined by the CDBG National Objectives, CDBG funding may be used to acquire a property located in a floodplain that was severely damaged by a recent flood, demolish a structure severely damaged by an earthquake, or repair a public facility severely damaged by a hazard event.

Community Development Block Grants – Disaster Recovery (CDBG-DR)

CDBG-DR funding supports the recovery process after Presidentially-declared disasters, particularly in low-income area, however this program is not currently available to support mitigation within Montgomery County.

U.S. Economic Development Administration

The U.S. Economic Development Administration (USEDA) is an agency of the U.S. Department of Commerce that supports regional economic development in communities around the country. It provides funding to support comprehensive planning and makes strategic investments that foster employment creation and attract private investment in economically distressed areas of the United States. Through its Public Works Program USEDA invests in key public infrastructure, such as in traditional public works projects, including water and sewer systems improvements, expansion of port and harbor facilities, brownfields, multitenant manufacturing and other facilities, business and industrial parks, business incubator facilities, redevelopment technology-based facilities, telecommunications and development facilities. Through its Economic Adjustment Program, USEDA administers its Revolving Loan Fund (RLF) Program, which supplies small businesses and entrepreneurs with the gap financing needed to start or expand their business, in areas that have experienced or are under threat of serious structural damage to the underlying economic base.

Homeownership Repair and Rebuilding Fund

The Homeownership Repair and Rebuilding Fund provides grants of up to an additional $10,000 to eligible homeowners who have already qualified for FEMA housing assistance's maximum grant ($31,900) and will not receive other assistance from private insurance or government agencies that would duplicate the grant's funding. The HRRF includes $100 million dedicated to help homeowners affected by Sandy and was provided directly from the State of New York.

Empire State Relief Fund

The Empire State Relief Fund is dedicated to providing resources to help recover from Hurricane Sandy and rebuild and restore homes. In many cases, New Yorkers face a substantial gap between the cost of repair or replacement of their home and the funds available to them to cover this cost. The Empire State Relief Fund will focus on long-term residential housing assistance to help fill the funding gap by providing up to $10,000 in additional grants. Homeowners eligible for the funding must have received the maximum FEMA grant assistance as well as the maximum funding from HRRF ($41,900). The ESRF is funded through donations where 100% of the money is dedicated to NYS housing programs.

Empire State Development

Empire State Development offers a wide range of financing, grants and incentives to promote business and employment growth, and real estate development throughout the State. Several programs address infrastructure construction associated with project development, acquisition and demolition associated with project development and brownfield remediation and redevelopment.

Federal Highway Administration - Emergency Relief

The Federal Highway Administration Emergency Relief is a grant program that may be used for repair or reconstruction of Federal-aid highways and roads on Federal lands which have suffered serious damage as a result of a disaster. NYS is serving as the liaison between local municipalities and FHWA. $30 Million in funding was released in October-November of 2012 for emergency repair work conducted in first 180 days following Hurricane Sandy. Another $220 Million in additional funding became available February 2013.

Federal Transit Administration - Emergency Relief

The Federal Transit Authority Emergency Relief is a grant program that funds capital projects to protect, repair, reconstruct, or replace equipment and facilities of public transportation systems. Administered by the Federal Transit Authority at the U.S. Department of Transportation and directly allocated to MTA and Port Authority. This transportation-specific fund was created as an alternative to FEMA PA. Currently, a total of $5.2 Billion has been allocated to NYS-related entities.

Hurricane Sandy Coastal Resiliency Competitive Grant Program

Interior Secretary Sally Jewell has announced that competitive grants are now available from the Hurricane Sandy Coastal Resiliency Competitive Grant Program. The program, funded by the Hurricane Sandy disaster relief appropriation, is administered by NFWF.

The Hurricane Sandy Coastal Resiliency Competitive Grants Program will award more than $100 million in grants throughout the region affected by Hurricane Sandy, including Connecticut, Delaware, the District of Columbia, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Virginia, and West Virginia—the states that officially declared a natural disaster as a result of the storm event.

Grants from $100,000 to $5 million will be awarded to projects that assess, restore, enhance or create wetlands, beaches and other natural systems to better protect communities as well as fish and wildlife species and habitats from the impacts of future storms and naturally occurring events.

New York State Department of Transportation (NYSDOT)

Damaged Roads and Signals

High winds, storm tidal surge and flooding caused significant damage to NYSDOT facilities, roads and local transportation infrastructure in the Hudson Valley, Long Island and New York City. Repair and replacement will be necessary for these facilities and infrastructure. In some cases, municipalities will be direct applicants; therefore, not all FEMA-eligible costs are included for damaged infrastructure.

Scour around Culverts and Bridges

Scour has some of the most significant and destructive effects on roadway culverts and bridges. It is the result of fast flowing water's erosive action, which erodes and carries away foundation materials (sand and rocks from around and beneath abutments, piers, foundations and embankments). Water's intensity and velocity can quickly compromise the integrity of roadway culverts and bridges and is one of three main causes of bridge failures (the other two are collision and overloading). Superstorm Sandy, Tropical Storm Lee, and Hurricane Irene each exposed the vulnerability of the State's bridges and culverts to scour, as the storms weakened or damaged these structures across the State.

There are 20,000 bridges in New York State, with 91 state bridges, 731 local bridges and 431 culverts at risk of scour18. This program addresses scoured and critical roadway culverts and bridges. It provides replacements and/or permanent scour retrofits to facilities that are unable to protect the transportation system from storm events. Five hundred million dollars will be made available for this critical work.

U.S. Department of Agriculture Natural Resources Conservation Service

Emergency Watershed Protection Program

The purpose of the Emergency Watershed Protection Program (EWP) was established by Congress to respond to emergencies created by natural disasters. The EWP Program is designed to help people and conserve natural resources by relieving imminent hazards to life and property caused by floods, fires, drought, windstorms, and other natural occurrences. The U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) administers the EWP Program; EWP-Recovery, and EWP–Floodplain Easement (FPE).

EWP - Recovery

The EWP Program is a recovery effort program aimed at relieving imminent hazards to life and property caused by floods, fires, windstorms, and other natural occurrences. Public and private landowners are eligible for assistance, but must be represented by a project sponsor that must be a legal subdivision of the State, such as a city, county, township or conservation district, and Native American Tribes or Tribal governments. NRCS may pay up to 75 percent of the construction cost of emergency measures. The remaining 25 percent must come from local sources and can be in the form of cash or in-kind services.

EWP work is not limited to any one set of measures. It is designed for installation of recovery measures to safeguard lives and property as a result of a natural disaster. NRCS completes a Damage Survey Report (DSR) which provides a case-by-case investigation of the work necessary to repair or protect a site.

Watershed impairments that the EWP Program addresses are debris-clogged stream channels, undermined and unstable streambanks, jeopardized water control structures and public infrastructures, wind-borne debris removal, and damaged upland sites stripped of protective vegetation by fire or drought.

EWP - FPE

Privately-owned lands or lands owned by local and state governments may be eligible for participation in EWP-FPE. To be eligible, lands must meet one of the following criteria:

- Lands that have been damaged by flooding at least once within the previous calendar year or have been subject to flood damage at least twice within the previous 10 years
- Other lands within the floodplain are eligible, provided the lands would contribute to the restoration of the flood storage and flow, provide for control of erosion, or that would improve the practical management of the floodplain easement
- Lands that would be inundated or adversely impacted as a result of a dam breach

EWP-FPE easements are restored to the extent practicable to the natural environment and may include both structural and nonstructural practices to restore the flood storage and flow, erosion control, and improve the practical management of the easement.

Structures, including buildings, within the floodplain easement must be demolished and removed, or relocated outside the 100-year floodplain or dam breach inundation area.

6.5 MITIGATION STRATEGY DEVELOPMENT AND UPDATE

6.5.1 Update of Municipal Mitigation Strategies

To evaluate progress on local mitigation actions, each jurisdiction with actions in previous DMA2000 or related plans was provided with a Mitigation Action Plan Review Worksheet. Each worksheet was pre-populated with those actions identified for their jurisdiction in the prior plan. For each action, municipalities were asked to indicate the status of each action ("No Progress/Unknown", "In Progress/Not Yet Complete", "Continuous", "Completed", "Discontinued") and provide review comments on each. Municipalities were requested to quantify the extent of progress, and provide reasons for the level of progress or why actions were discontinued. Each jurisdictional annex provides a table identifying their prior mitigation strategy, the status of those actions and initiatives, and their disposition within their updated strategy.

Local mitigation actions identified as "Complete", and those actions identified as "Discontinued", have been removed from the updated strategies. Those local actions that municipalities identified as "No Progress/Unknown", "In Progress/Not Yet Complete" as well as certain actions/initiatives identified as "Continuous", have been carried forward in their local updated mitigation strategies. Municipalities were asked to provide further details on these projects to help better define the projects, identify benefits and costs, and improve implementation.

Certain continuous or ongoing strategies represent programs that are, or since prior and existing local hazard mitigation plans have become, fully integrated into the normal operational and administrative framework of the community. Such programs and initiatives have been identified within the Capabilities section of each annex, and removed from the updated mitigation strategy.

At the Kick-Off and subsequent planning meetings, all participating municipalities were provided surveys to further assist in identifying mitigation activities completed, ongoing and potential/proposed. As new additional potential mitigation actions, projects or initiatives became evident during the plan update process,

including as part of the risk assessment update and as identified through the public and stakeholder outreach process (see Section 3), communities were made aware of these either through direct communication (local meetings, email, phone) or via their draft municipal annexes.

The County and municipalities identified projects that have been submitted to NYS DHSES for grant funding, including projects for which Letters of Intent (LOI) and grant applications have been submitted under the Irene/Lee and Sandy Hazard Mitigation Grant Programs. In general, LOI/application-based projects submitted directly by the communities are identified within their updated mitigation strategies. Communities may also have included other LOI/application-based projects submitted by special-purpose districts (e.g. fire or school districts), local utilities, and hospitals and health care entities.

To help support the selection of an appropriate, risk-based mitigation strategy, each annex provided a summary of hazard vulnerabilities identified during the plan update process, either directly by municipal representatives, through review of available county and local plans and reports, and through the hazard profiling and vulnerability assessment process.

Beginning in January 2013 and continuing through December 2015, members of the Planning Committee and contract consultants worked directly with each jurisdiction (phone, email, local support meetings) to assist with the development and update of their annex and include mitigation strategies, focusing on identifying well-defined, implementable projects with a careful consideration of benefits (risk reduction, losses avoided), costs, and possible funding sources (including mitigation grant programs).

Concerted efforts were made to assure that municipalities develop updated mitigation strategies that included activities and initiatives covering the range of mitigation action types described in recent FEMA planning guidance (FEMA "Local Mitigation Planning Handbook" March 2013), specifically:

- Local Plans and Regulations – These actions include government authorities, policies or codes that influence the way land and buildings are being developed and built.
- Structure and Infrastructure Project - These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures as well as critical facilities and infrastructure. This type of action also involves projects to construct manmade structures to reduce the impact of hazards.
- Natural Systems Protection – These are actions that minimize damage and losses, and also preserve or restore the functions of natural systems.
- Education and Awareness Programs – These are actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. These actions may also include participation in national programs, such as the National Flood Insurance Program and Community Rating System, StormReady (NOAA) and Firewise (NFPA) Communities.

In consideration of federal and state mitigation guidance, the Steering Committee recognized that all municipalities would benefit from the inclusion of certain mitigation initiatives. These include initiatives to address vulnerable public and private properties, including RL and SRL properties; initiatives to support continued and enhanced participation in the NFIP; improved public education and awareness programs; and initiatives to support countywide and regional efforts to build greater local mitigation capabilities.

In August 2015, a mitigation strategy workshop was conducted by FEMA Region II representatives for all participating jurisdictions to support the identification, evaluation and prioritization of local mitigation strategies, as well as how to present and document this process within the plan. Based on FEMA's

guidance and recommendations provided at this workshop and otherwise, the following significant modifications to the mitigation strategy identification and update process and documentation was made:

- An overarching effort has been made to better focus local mitigation strategies to clearly defined, readily actionable projects and initiatives that meet the definition or characteristics of mitigation. Broadly defined mitigation objectives have been eliminated from the updated strategy unless accompanied by discrete actions, projects or initiatives.
- Certain continuous or ongoing strategies that represent programs that are, or since prior and existing plans have become, fully integrated into the normal operational and administrative framework of the community have been identified within the Capabilities section of each annex, and removed from the updated mitigation strategy.
- Where applicable, mitigation projects have been documented with an Action Worksheet, based on FEMA's Action Worksheet templates and recent guidance documents.

FEMA Action Worksheets have been included for new physical projects identified by the County and participating municipalities. Physical projects being carried forward from the prior plan strategies are not necessarily documented on Action Worksheets as the project screening, identification and development, and prioritization process was accomplished during the last planning process. Whether or not the projects were new or "carry forward", and documented on Action Worksheets or not, all projects included in the updated County and local mitigation strategies have identified hazards addressed, project description, benefits, costs, responsible party, sources of funding, timeline and priority. Further, non-physical actions (e.g. integration actions, studies, etc.) are typically not documented on Action Worksheets.

As discussed within the hazard profiles in Section 5.4, the long term effects of climate change are anticipated to exacerbate the impacts of weather-related hazards including extreme temperatures, flood, severe storm, severe winter storm and wildfire. By way of addressing these climate change-sensitive hazards within their local mitigation strategies and integration actions, communities are working to evaluate and recognize these long term implications and potential impacts, and to incorporate in planning and capital improvement updates.

Municipalities included mitigation actions to address vulnerable critical facilities. These actions have been proposed in consideration of protection against 500-year events, or worst-case scenarios. When determined to be feasible and practical, mitigation planning for critical facilities identified as previously sustaining flooding and/or being located in a FEMA floodplain will be developed to achieve protection to the 500-year flood event or the actual worst-damage scenario, whichever is greater.

It is recognized, however, that in the case of projects being funded through Federal mitigation programs, the level of protection may be influenced by cost-effectiveness as determined through a formal benefit-cost analysis. In the case of "self-funded" projects, municipal discretion must be recognized. Further, it must be recognized that the County and municipalities have limited authority over privately-owned critical facility owners with regard to mitigation at any level of protection.

6.5.2 Update of County Mitigation Strategy

The update of the county-level mitigation strategies included a review of progress on the actions/initiatives identified in the 2009 Montgomery County Hazard Mitigation Plan, using a process similar to that used to review municipal mitigation strategy progress. The County, through their various department representatives, were provided with a Mitigation Action Plan Review Worksheet identifying all of the county-level actions/initiatives from the 2005 plan. For each action, relevant county representatives were asked to indicate the status of each action ("No Progress/Unknown", "In Progress/Not Yet Complete", "Continuous", "Completed", "Discontinued"), and provide review comments on each.

Projects/initiatives identified as "Complete", as well as though actions identified as "Discontinued", have been removed from this plan update. Those actions the county has identified as "No Progress/Unknown", "In Progress/Not Yet Complete" or "Continuous" have been carried forward in the County's updated mitigation strategy.

Throughout the course of the plan update process, additional regional and county-level mitigation actions have been identified. These were identified through:

- Review of the results and findings of the updated risk assessment;
- Review of available regional and county plans, reports and studies;
- Direct input from county departments and other county and regional agencies, including:
  - Department of Emergency Services – Office of Emergency Management
  - Department of Planning
  - Department of Public Works
- Input received through the stakeholder outreach process.

As discussed within the hazard profiles in Section 5.4, the long term effects of climate change are anticipated to exacerbate the impacts of weather-related hazards including extreme temperatures, flood, severe storm, severe winter storm and wildfire. As such, the County has included mitigation actions and initiatives, including continuing and long term planning and emergency management support, to address these long term implications and potential impacts.

Various County departments and agencies have included mitigation actions to address vulnerable critical facilities. These actions have been proposed in consideration of protection against 500-year events, or worst-case scenarios. It is recognized, however, that in the case of projects being funded through Federal mitigation programs, the level of protection may be influenced by cost-effectiveness as determined through a formal benefit-cost analysis. In the case of "self-funded" projects, local government authority must be recognized. Further, it must be recognized that the County has limited authority over privately-owned critical facility owners with regard to mitigation at any level of protection.

6.5.3 Mitigation Strategy Evaluation and Prioritization

Section 201.c.3.iii of 44 CFR requires an action plan describing how the actions identified will be prioritized.

Recent FEMA planning guidance (March 2013) identifies a modified STAPLEE (Social, Technical, Administrative, Political, Legal, Economic, and Environmental) mitigation action evaluation methodology that uses a set of 10 evaluation criteria suited to the purposes of hazard mitigation strategy evaluation. This method provides a systematic approach that considers the opportunities and constraints of implementing a particular mitigation action. The October mitigation workshop presented by FEMA representatives further amplified these evaluation criteria, and indicated that communities may want to consider other factors.

Based on this guidance, the Steering Committee and planning partnership have developed and applied an action evaluation and prioritization methodology which includes an expanded set of fourteen (14) criteria to include the consideration of cost-effectiveness, availability of funding, anticipated timeline, and if the action addresses multiple hazards.

The fourteen (14) evaluation/prioritization criteria used in the 2015 planning process are:

1. Life Safety – How effective will the action be at protecting lives and preventing injuries?
2. Property Protection – How significant will the action be at eliminating or reducing damage to structures and infrastructure?

3. Cost-Effectiveness – Are the costs to implement the project or initiative commensurate with the benefits achieved?
4. Technical – Is the mitigation action technically feasible? Is it a long-term solution? Eliminate actions that, from a technical standpoint, will not meet the goals.
5. Political – Is there overall public support for the mitigation action? Is there the political will to support it?
6. Legal – Does the municipality have the authority to implement the action?
7. Fiscal - Can the project be funded under existing program budgets (i.e., is this initiative currently budgeted for)? Or would it require a new budget authorization or funding from another source such as grants?
8. Environmental – What are the potential environmental impacts of the action? Will it comply with environmental regulations?
9. Social – Will the proposed action adversely affect one segment of the population? Will the action disrupt established neighborhoods, break up voting districts, or cause the relocation of lower income people?
10. Administrative – Does the jurisdiction have the personnel and administrative capabilities to implement the action and maintain it or will outside help be necessary?
11. Multi-hazard – Does the action reduce the risk to multiple hazards?
12. Timeline - Can the action be completed in less than 5 years (within our planning horizon)?
13. Local Champion – Is there a strong advocate for the action or project among the jurisdiction's staff, governing body, or committees that will support the action's implementation?
14. Other Local Objectives – Does the action advance other local objectives, such as capital improvements, economic development, environmental quality, or open space preservation? Does it support the policies of other plans and programs?

Participating jurisdictions were asked to use these criteria to assist them in evaluating and prioritizing mitigation actions identified in the 2014 update. Specifically, for each mitigation action, the jurisdictions were asked to assign a numeric rank (-1, 0, or 1) for each of the 14 evaluation criteria, defined as follows:

- 1 = Highly effective or feasible
- 0 = Neutral
- -1 = Ineffective or not feasible

Further, jurisdictions were asked to provide a brief summary of the rationale behind the numeric rankings assigned, as applicable. The numerical results of this exercise were then used by each jurisdiction to help prioritize the action or strategy as "Low", "Medium," or "High." While this provided a consistent, systematic methodology to support the evaluation and prioritization of mitigation actions, jurisdictions may have additional considerations that could influence their overall prioritization of mitigation actions.

It is noted that jurisdictions may be carrying forward mitigation actions and initiatives from prior mitigation strategies that were prioritized using different, but not necessarily contrary, approaches. Mitigation actions in the existing Montgomery County HMP were prioritized according to the following criteria:

- **High Priority:** A project that meets multiple plan goals and objectives, benefits exceed cost, has funding secured under existing programs or authorizations, or is grant-eligible, and can be completed in 1 to 5 years (short-term project) once project is funded.
- **Medium Priority:** A project that meets at least one plan goal and objective, benefits exceed costs, funding has not been secured and would require a special funding authorization under existing

programs, grant eligibility is questionable, and can be completed in 1 to 5 years once project is funded.

- **Low Priority:** A project that will mitigate the risk of a hazard, benefits exceed costs, funding has not been secured, and project is not grant-eligible and/or timeline for completion is considered long-term (5 to 10 years).

It is important to note that certain initiatives from the 2009 Montgomery County HMP and other local single- and multi-jurisdictional HMPs within the County are being carried forward in their updated strategies, with or without modification. These initiatives were previously prioritized using approaches that may be different from that used in this update process; however it is reasonable to assume that all evaluation and prioritization approaches included similar considerations (e.g. mitigation effectiveness, technical and administrative feasibility, cost-effectiveness, etc.)

At their discretion, jurisdictions carrying forward prior initiatives were encouraged to re-evaluate their priority, particularly if conditions that would affect the prioritization criteria had changed. Where communities have determined that their original priority ranking for "carry forward" initiatives remained valid, their earlier priority ranking is indicated on the prioritization table, however the 2014 criteria ratings are indicated with a null "-" marking.

For the 2015 plan update, there has been an effort to develop more clearly defined and action-oriented mitigation strategies. These local strategies include projects and initiatives that have been well-vetted, and are seen by the community as the most effective approaches to advance their local mitigation goals and objectives within their capabilities. As such, many of the initiatives in the updated mitigation strategy were ranked as "High" or "Medium" priority, as reflective of the community's clear intent to implement, available resources not-withstanding. In general, initiatives that would have had "low" priority rankings were appropriately screened out during the local action evaluation process.

6.5.4 Benefit/Cost Review

Section 201.6.c.3iii of 44CFR requires the prioritization of the action plan to emphasize the extent to which benefits are maximized according to a cost/benefit review of the proposed projects and their associated costs. Stated otherwise, cost-effectiveness is one of the criteria that must be applied during the evaluation and prioritization of all actions comprising the overall mitigation strategy.

The benefit/cost review applied in for the evaluation and prioritization of projects and initiatives in this plan update process was qualitative; that is, it does not include the level of detail required by FEMA for project grant eligibility under the Hazard Mitigation Grant Program (HMGP) and Pre-Disaster Mitigation (PDM) grant program. For all actions identified in the local strategies, jurisdictions have identified both the costs and benefits associated with project, action or initiative.

Costs are the total cost for the action or project, and may include administrative costs, construction costs (including engineering, design and permitting), and maintenance costs.

Benefits are the savings from losses avoided attributed to the implementation of the project, and may include life-safety, structure and infrastructure damages, loss of service or function, and economic and environmental damage and losses.

When available, jurisdictions were asked to identify the actual or estimated dollar value for project costs and associated benefits. Having defined costs and benefits allows a direct comparison of benefits versus costs, and a quantitative evaluation of project cost-effectiveness. Often, however, numerical costs and/or benefits have not been identified, or may be impossible to quantitatively assess.

For the purposes of this planning process, jurisdictions were tasked with evaluating project cost-effectiveness with both costs and benefits assigned to "High", "Medium" and "Low" ratings. Where quantitative estimates of costs and benefits were available, ratings/ranges were defined as:

Low = < $10,000 *Medium = $10,000 to $100,000* *High = > $100,000*

Where quantitative estimates of costs and/or benefits were not available, qualitative ratings using the following definitions were used:

Table 6-2. Qualitative Cost and Benefit Ratings

Costs	
High	Existing funding levels are not adequate to cover the costs of the proposed project, and implementation would require an increase in revenue through an alternative source (e.g., bonds, grants, and fee increases).
Medium	The project could be implemented with existing funding but would require a re-apportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.
Low	The project could be funded under the existing budget. The project is part of or can be part of an existing, ongoing program.
Benefits	
High	Project will have an immediate impact on the reduction of risk exposure to life and property.
Medium	Project will have a long-term impact on the reduction of risk exposure to life and property or will provide an immediate reduction in the risk exposure to property.
Low	Long-term benefits of the project are difficult to quantify in the short term.

Using this approach, projects with positive benefit versus cost ratios (such as high over high, high over medium, medium over low, etc.) are considered cost-effective.

For some of the projects and initiatives identified, jurisdictions may seek financial assistance under FEMA's HMGP or Hazard Mitigation Assistance (HMA) programs. These programs require detailed benefit/cost analysis as part of the application process. These analyses will be performed when funding applications are prepared, using the FEMA BCA model process. The planning partnership is committed to implementing mitigation strategies with benefits that exceed costs. For projects not seeking financial assistance from grant programs that require this sort of analysis, the planning partnership reserves the right to define "benefits" according to parameters that meet its needs and the goals and objectives of this plan.

SECTION 7. PLAN MAINTENANCE PROCEDURES

This section describes the system that Montgomery County and all participating jurisdictions have established to monitor, evaluate, and update the mitigation plan; implement the mitigation plan through existing programs; and solicit continued public involvement for plan maintenance.

7.1 MONITORING, EVALUATING, AND UPDATING THE PLAN

The procedures for monitoring, evaluating, and updating the plan are provided below. A staff member of the Montgomery County Business Development Center Planning Division will be designated as Montgomery County's Hazard Mitigation Coordinator, to provide leadership and continuity for plan maintenance to ensure overarching, long term goals of the plan are addressed rather than focusing predominantly on emergency management or engineering solutions. The Hazard Mitigation Coordinator is also the chair of the Mitigation Planning Committee, described below. The duties of the Hazard Mitigation Coordinator will be in addition to the daily responsibilities of this individual.

Each participating jurisdiction is expected to maintain a representative on the Mitigation Planning Committee (MPC) who shall fulfill the monitoring, evaluation and updating responsibilities identified in this Section. Table 7-1 identifies the representation of the MPC as of the date of this Plan as indicated in each of the jurisdiction's annexes.

Table 7-7-1. Mitigation Planning Committee

Organization	Name	Title	POC	Alternate POC
Montgomery County	William Roehr	Senior Planner, Economic Development and Planning	x	
	Paul Clayburn	County DPW	x	
Ames (Village)	Michael McMahon	Mayor	x	
	Katie Böttger	Clerk/Treasurer/Collector/Registrar		
City of Amsterdam	Michael Whitty	Fire Chief	x	
	Richard Miller	City Engineer		x
Amsterdam (Town)	Thomas DiMezza	Town Supervisor	x	
	Linda Bartone Hughes	Town Clerk		x
Canajoharie (Town)	John Klock	Deputy Superintendent/Acting Town Highway Superintendent	x	
	Herb Allen	Town Supervisor		x
Canajoharie (Village)	Jeff Swartz	DPW/Water Superintendent	x	
	Francis Avery	Mayor		
Charleston (Town)	Robert Sullivan	Supervisor	x	
	Paul Orzelik	Town Councilperson		x
Florida (Town)	William (Bill) Strevy	Supervisor	x	
	Bill Weller	Highway Superintendent		x
Fonda (Village)	Bill Peeler	Mayor	x	
	JoAnn Downing	Clerk		x
Ft. Johnson (Village)	Barbara S. Smith	Clerk	x	
	Christopher Blessing	Trustee		x
Ft. Plain (Village)	Guy Barton	Mayor	x	
	Dianne Hoffman	Clerk/Treasurer/Collector		x
Fultonville (Village)	Robert Headwell Jr.	Mayor	x	
	Jack Kilmartin	DPW Superintendent		x
Glen (Town)	Lawrence (Larry) Coddington	Supervisor	x	
	Roxanne Douglass	Town Clerk		x
Hagaman (Village)	Robert Krom	Mayor	x	

Organization	Name	Title	POC	Alternate POC
	Virginia Salamack	Clerk/Treasurer/Collector/Registrar		x
Minden (Town)	Cheryl Reese	Township Supervisor	x	
	Scott A. Crewell	Superintendent of Highways		x
	Janet I. Trumbull	Town Clerk/Tax Collector/Registrar		x
Mohawk (Town)	William Holvig	Highway Superintendent	x	
	Ed Bishop	Town Supervisor		x
Nelliston (Village)	Randy Conrad	DPW Director	x	
	TBD	TBD		x
Palatine Bridge (Village)	Rodney Sutton	DPW Superintendent	x	
	TBD	TBD		x
Palatine (Town)	Sara Niccoli	Supervisor	x	
	Art Logan	Highway Superintendent		x
Root (Town)	Gary Kamp	Supervisor	x	
	Donald Oeser	Highway Superintendent		x
St. Johnsville (Town)	Wayne Handy	Supervisor	x	
	Jeff Doxtater	Highway Superintendent		x
St. Johnsville (Village)	Bernard Barnes	Mayor	x	
	William Vicciarelli	DPW Supervisor		x

**TBD=to be determined*

It is recognized that individual commitments change over time, and it shall be the responsibility of each jurisdiction and its representatives to inform the Hazard Mitigation Coordinator of any changes in representation. The Hazard Mitigation Coordinator will strive to keep the committee makeup as a uniform representation of planning partners and stakeholders within the planning area.

7.1.1 Monitoring

The MPC shall be responsible for monitoring progress on, and evaluating the effectiveness of, the Plan, and documenting annual progress. Each year, beginning one year after plan development, county and local MPC representatives will collect and process information from the departments, agencies and organizations involved in implementing mitigation projects or activities identified in their jurisdictional annexes (Volume II, Section 9) of this Plan, by contacting persons responsible for initiating and/or overseeing the mitigation projects.

Copies of any grant applications filed on behalf of any of the participating jurisdictions shall be provided to the MPC. Further, the representatives shall obtain from their municipal supervisor/mayor or clerk any public comments made on the plan and provide to the MPC for inclusion in the annual report.

The MPC representatives shall be expected to document, as needed and appropriate:

- Any grant applications filed on behalf of any of the participating jurisdictions;
- Hazard events and losses occurring in their jurisdiction including their nature and extent and the effects that hazard mitigation actions have had on impacts and losses;
- Progress on the implementation of mitigation actions, including efforts to obtain outside funding for mitigation actions;
- Any obstacles or impediments to the implementation of actions;
- Additional mitigation actions believed to be appropriate and feasible; and
- Public and stakeholder input and comment on the Plan.

Local MPC representatives may use the progress reporting forms, Worksheets #1 and #3 in the FEMA 386-4 guidance document, to facilitate collection of progress data and information on specific mitigation actions. FEMA guidance worksheets are provided in Appendix G. **Local progress reports shall be provided to**

Montgomery County Hazard Mitigation Coordinator at least two weeks prior to the annual MPC plan review meeting.

7.1.2 Evaluating

The evaluation of the mitigation plan is an assessment of whether the planning process and actions have been effective, if the Plan goals are being reached, and whether changes are needed. The Plan will be evaluated on an annual basis to determine the effectiveness of the programs, and to reflect changes that may affect mitigation priorities or available funding.

The status of the hazard mitigation plan will be discussed and documented at an annual plan review meeting of the Mitigation Planning Committee. At least one month before the annual plan review meeting, the Montgomery County Hazard Mitigation Coordinator will advise MPC members of the meeting date, agenda and expectations of the members. The Montgomery County Hazard Mitigation Coordinator will be responsible for calling and coordinating the annual plan review meeting, and assessing progress toward meeting plan goals and objectives. These evaluations will assess whether:

- Goals and objectives address current and expected conditions.
- The nature or magnitude of the risks has changed.
- Current resources are appropriate for implementing the HMP and if different or additional resources are now available.
- Actions were cost effective.
- Schedules and budgets are feasible.
- Implementation problems, such as technical, political, legal or coordination issues with other agencies exist.
- Outcomes have occurred as expected.
- Changes in county or municipal resources impacted plan implementation (for example, funding, personnel, and equipment).
- New agencies/departments/staff should be included, including other local governments as defined under 44 CFR 201.6.
- Documentation for hazards that occurred during the last year.

Specifically, the MPC will review the mitigation goals, objectives, and activities/projects using performance based indicators, including:

- New agencies/departments created that have authority to implement mitigation actions or are required to meet goals, objectives, and actions;
- Project evaluation based on current needs of the mitigation plan;
- Project completion regarding progress of proposed or ongoing actions;
- Under/over spending regarding proposed mitigation action budgets;
- Achievement of the goals and objectives;
- Resource allocation to note if resources are required to implement mitigation activities;
- Timeframes comment on whether proposed schedules are sufficient to address actions;
- Budgets note if budget basis should be changed or is sufficient;
- Lead/support agency commitment note if there is a lack of commitment on the part of lead or support agencies;
- Resources regarding whether resources are available to implement actions; and
- Feasibility comment regarding whether certain goals, objectives, or actions prove to be unfeasible.

Finally, the MPC will evaluate how other programs and policies have conflicted or augmented planned or implemented measures, and shall identify policies, programs, practices, and procedures that could be modified to accommodate hazard mitigation actions (see the "Implementation of Mitigation Plan through Existing Programs" subsection later in this section). Other programs and policies can include those that address:

- Economic Development
- Environmental Preservation & Permitting
- Historic Preservation
- Redevelopment
- Health and/or safety
- Recreation
- Land use/zoning
- Public Education and Outreach
- Transportation

The MPC may refer to the evaluation forms, Worksheets #2 and #4 in the FEMA 386-4 guidance document (provided in Appendix I), to assist in the evaluation process.

The Hazard Mitigation Coordinator shall be responsible for preparing an Annual HMP Progress Report, based on the provided local annual progress reports from each jurisdiction, information presented at the annual MPC meeting, and other information as appropriate and relevant. These annual reports will provide data for the five-year update of this HMP and will assist in pinpointing implementation challenges. By monitoring the implementation of the Plan on an annual basis, the MPC will be able to assess which projects are completed, which are no longer feasible, and what projects may require additional funding.

This annual progress report shall apply to all planning partners, and as such, shall be developed according to an agreed format and with adequate allowance for input and comment of each planning partner prior to completion and submission to the State Hazard Mitigation Officer. Each planning partner will be responsible for providing this report to its governing body for their review. During the annual MPC meeting, the planning partners shall establish a schedule for the draft development, review, comment, amendment and submission of the Annual HMP Progress Report to NYSOEM.

The Annual HMP Progress Report shall be posted on the Montgomery County website (https://www.co.montgomery.ny.us/sites/public/government/hazardmitigation/HazardMitigation_Documents/default.aspx) to keep the public apprised of the Plan's implementation. This report will also be provided to each community participating in the CRS to meet CRS Activity 510 and annual CRS recertification requirements. To meet this recertification timeline, the MPC will complete the review process and prepare an Annual HMP Progress Report.

The Plan will also be evaluated and revised following any major disasters, to determine if the recommended actions remain relevant and appropriate. The risk assessment will also be revisited to see if any changes are necessary based on the pattern of disaster damages or if data listed in the Section 5.4 (Hazard Profiles) of this Plan has been collected to facilitate the risk assessment. This is an opportunity to increase the community's disaster resistance and build a better and stronger community.

7.1.3 Updating

44 CFR 201.6.d.3 requires that local hazard mitigation plans be reviewed, revised as appropriate, and resubmitted for approval in order to remain eligible for benefits awarded under DMA 2000. It is the intent of the Montgomery County MPC to update this Plan on a five year cycle from the date of initial plan adoption.

To facilitate the update process, the Montgomery County Hazard Mitigation Coordinator, with support of the MPC and Montgomery County Planning, shall use the **third annual MPC meeting** (2016) to develop and commence the implementation of a detailed Plan update program. The Montgomery County Hazard Mitigation Coordinator shall invite representatives from NYSOEM to this meeting to provide guidance on plan update procedures. This program shall, at a minimum, establish who shall be responsible for managing and completing the Plan update effort, what needs to be included in the updated plan, and a detailed timeline with milestones to assure that the update is completed according to regulatory requirements.

At this meeting, the MPC shall determine what resources will be needed to complete the update. The Montgomery County HMP Coordinator shall be responsible for assuring that needed resources are secured.

Following each five year update of the mitigation plan, the updated plan will be distributed for public comment. After all comments are addressed, the HMP will be revised and distributed to all municipal planning committee members, special purpose district participants and the New York State Hazard Mitigation Officer.

Further, it is recognized that additional jurisdictions within Montgomery County may elect to join this Plan. Any such new Plan participants shall be formally included and documented in the five-year formal Plan update. Procedures for the addition of new Plan participants shall be reviewed with NYSOEM and FEMA prior to their formal inclusion in this Plan.

7.2 IMPLEMENTATION OF THE MITIGATION PLAN THROUGH EXISTING PROGRAMS

Effective mitigation is achieved when hazard awareness and risk management approaches and strategies become an integral part of public activities and decision-making. Within the county there are many existing plans and programs that support hazard risk management, and thus it is critical that this hazard mitigation plan integrate and coordinate with, and complement, those existing plans and programs.

The "Capability Assessment" section of Chapter 6 (Mitigation Strategy) 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. Within each jurisdictional annex in Chapter 9, the County and each participating jurisdiction have identified how they have 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").

It is the intention of the MPC and all participating jurisdictions to incorporate mitigation planning as an integral component of daily government operations. MPC members will work with local government officials to integrate the newly adopted hazard mitigation goals and actions into the general operations of government and partner organizations. Further, the sample adoption resolution (Appendix A) includes a resolution item stating the intent of the local governing body to incorporate mitigation planning as an integral component of government and partner operations. By doing so, the MPC anticipates that:

1) Hazard mitigation planning will be formally recognized as an integral part of overall emergency management efforts;
2) The Hazard Mitigation Plan, Comprehensive Plans, Emergency Management Plans and other relevant planning mechanisms will become mutually supportive documents that work in concert to meet the goals and needs of County residents.

During the annual plan evaluation process, the MPC will identify additional policies, programs, practices, and procedures that could be modified to accommodate hazard mitigation actions, and include these findings and recommendations in the Annual HMP Progress Report.

7.3 CONTINUED PUBLIC INVOLVEMENT

Montgomery County and participating jurisdictions are committed to the continued involvement of the public in the hazard mitigation process. Therefore, the plan will be posted on-line (https://www.co.montgomery.ny.us/sites/public/government/hazardmitigation/HazardMitigation_Documents/default.aspx) and copies of the Plan will be made available for review during normal business hours at the Montgomery County Business Development Center Planning Division and at local municipal buildings.

In addition, public outreach and dissemination of the Plan will/may include:

- Links to the plan on municipal websites of each jurisdiction with capability,
- Continued utilization of existing social media outlets (Facebook, Twitter) to inform the public of flood hazards and severe storm events,
- Educate the public via the jurisdictional websites on available preparedness and warning applications, and how the can be used in an emergency situation,
- Development of annual articles or workshops on flood and severe storm hazards to educate the public and keep them aware of the dangers of such hazards.

Municipal supervisors/mayors or clerks and the Montgomery County HMP Coordinator will be responsible for receiving, tracking, and filing public comments regarding this HMP. Contact information for Montgomery County is included in the Point of Contact information at the end of Section 3 of this document.

The public will have an opportunity to comment on the plan via the hazard mitigation website at any time. The HMP Coordinator will maintain this website, posting new information and maintaining an active link to collect public comments.

The public can also provide input at the annual review meeting for the HMP and during the next 5-year plan update. The Montgomery County HMP Coordinator is responsible for coordinating the plan evaluation portion of the meeting, soliciting feedback, collecting and reviewing the comments, and ensuring their incorporation in the five-year plan update as appropriate. Additional meetings may also be held as deemed necessary by the planning group. The purpose of these meeting would be to provide the public an opportunity to express concerns, opinions, and ideas about the mitigation plan.

The MPC representatives shall be responsible to assure that:

- Public comment and input on the plan, and hazard mitigation in general, are recorded and addressed, as appropriate.
- Copies of the latest approved plan (or draft in the case that the five year update effort is underway) are available for review at the town hall and public library, along with instructions to facilitate public input and comment on the Plan.
- Appropriate links to the Montgomery County Hazard Mitigation Plan website (currently https://www.co.montgomery.ny.us/sites/public/government/hazardmitigation/HazardMitigation_Documents/default.aspx) are included on municipal websites.
- Public notices are made as appropriate to inform the public of the availability of the plan, particularly during Plan update cycles.

The Montgomery County HMP Coordinator shall be responsible to assure that:

- Public and stakeholder comment and input on the plan, and hazard mitigation in general, are recorded and addressed, as appropriate.
- The Montgomery County HMP website is maintained and updated as appropriate.
- Copies of the latest approved plan (or draft in the case that the five year update effort is underway) are available for review at appropriate County facilities (e.g. libraries), along with instructions to facilitate public input and comment on the plan.
- Public notices, including media releases, are made as appropriate to inform the public of the availability of the plan, particularly during plan update cycles.

7.4 ONGOING INTENT

Participating jurisdictions have provided a detailed listing of related programs, through which mitigation planning may be implemented, in the local capability assessments provided in each jurisdictional annex (Volume II, Section 9).

It is the intention of the Steering Committee, Planning Committee and participating jurisdictions to incorporate mitigation planning as an integral component of daily government operations. Steering Committee members will work with local government officials to integrate the newly adopted hazard mitigation goals and actions into the general operations of government and partner organizations. Further, the sample adoption resolution (Appendix B) includes a resolution item stating the intent of the local governing body to incorporate mitigation planning as an integral component of government and partner operations. By doing so, the Steering Committee anticipates that:

3) Hazard mitigation planning will be formally recognized as an integral part of overall emergency management efforts;
4) The Hazard Mitigation Plan and Comprehensive and Emergency Management Plans for both Montgomery County and its municipalities will become mutually supportive documents that work in concert to meet the goals and needs of County residents; and
5) Duplication of effort can be minimized.

The information on hazard, risk, vulnerability and mitigation contained in this Plan is based on the best science and technology available at the time of the Plan's preparation. It is recognized by all participating jurisdictions that this information can be invaluable in making decisions under other planning programs, such as comprehensive, capital improvement, and emergency management plans.

When County and local officials are considering capital improvements, they will use this plan to improve future development and safety within Montgomery County. Budgeting for future capital improvements will also contribute to realization of the goals in the Hazard Mitigation Plan. Emergency managers will be encouraged to work with Montgomery County Planning Department and local jurisdictions to ensure that high-hazard areas are subject to proper development and are designated for low risk uses.

Montgomery County government and local jurisdictions will incorporate goals and objectives of the Hazard Mitigation Plan into community plans, plan revisions and updates. Local jurisdictions will incorporate actions that meet hazard mitigation plan goals into capital improvement plans, economic development activities, and grant submittals. The data provided in the risk assessment will be used as supporting data and justification for grant applications.

Montgomery County will ensure through the Hazard Mitigation Coordinator duties that all jurisdictions are aware they need to incorporate hazard mitigation plan aspects into their comprehensive and master plan updates, as well as making specific recommendations, such as having the Floodplain Administrator review all site plan review and zoning permits within the 100-year floodplain and including the hazards map in their plan. Municipalities now in the process of creating and/or updating their plans are the Town of Brutus and the Village of Weedsport and so they will be the immediate focus.

Examples of integrating mitigation criteria from this plan into planning mechanisms include:

- Incorporating vulnerability data, maps, and information from this plan as supporting documentation in grant applications.
- Use of the hazard mitigation plan as support for floodplain management actions in local planning and zoning ordinances.
- Incorporation of hazard mitigation actions into County and local operating and capital improvement budgets.
- Including hazard mitigation responsibilities in employee job descriptions such as engineer, administrator, and public works superintendent in county and local human resource manuals.
- Including mitigation criteria when updating comprehensive plans and land use regulations and ordinances.
- Utilizing the identification of hazard areas when assisting new business in finding a location, for economic development.

The Montgomery County HMP Coordinator is currently designated as:

Mr. William Roehr
Senior Planner
Montgomery County Business Development Center
Old County Courthouse, 9 Park Street, P.O. Box 1500, Fonda, NY 12068
(518) 853-8334
wroehr@co.montgomery.ny.us

SECTION 8. PLANNING PARTNERSHIP

8.1 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 & Emergency Services (NYS DHSES) both encourage multi-jurisdictional planning. Therefore, in the preparation of the Montgomery County Multi-Jurisdictional Multi-Hazard Mitigation Plan (HMP) Update, a planning partnership was formed meet requirements of the federal Disaster Mitigation Act of 2000 (DMA) for Montgomery County and inclusive municipal governments.

In addition to the County's participation, the Montgomery County Department of Economic Development and Planning (MCDEDP) solicited the participation of all incorporated cities, towns and villages within the County at the outset of this plan update. Municipalities that expressed interest, signed a "Letter of Intent to Participate" and/or authorizing resolution committing their participation and resources to the development of the Montgomery County Plan Update.

Table 8-1 lists those jurisdictions that elected to participate in the 2015 Montgomery County HMP Update process, and have met the minimum requirements of participation as established by the County and Steering Committee:

Table 8-1. Participating Jurisdictions in Montgomery County

Jurisdictions		
Montgomery County		
City of Amsterdam	Town of Mohawk	Village of Ft. Johnson
Town of Amsterdam	Town of Palatine (pending)	Village of Ft. Plain
Town of Canajoharie	Town of Root	Village of Fultonville
Town of Charleston	Town of St. Johnsville	Village of Hagaman
Town of Florida	Village of Ames	Village of Nelliston
Town of Glen	Village of Canajoharie	Village of Palatine Bridge
Town of Minden	Village of Fonda	Village of St. Johnsville

8.1.1 Jurisdictional Annexes

This update is organized according to a two-volume format, including jurisdictional annexes for each participating jurisdiction. While the local annex format is designed to document and assure local compliance with the DMA 2000 regulations, its greater purpose and function includes:

- Providing a locally-relevant synthesis of the overall mitigation plan that can be readily presented, distributed, and maintained;
- Facilitating local understanding of the community's risk to natural and certain man-made hazards;
- Facilitating local understanding of the community's capabilities to manage natural hazard risk, including opportunities to improve those capabilities;
- Facilitating local understanding of the efforts the community has taken, and plans to take, to reduce their natural hazard risk;

- Facilitating the implementation of mitigation strategies, including the development of grant applications;
- Providing a framework by which the community can continue to capture relevant data and information for future plan updates.

It is recognized that each jurisdiction's annex is a "living" document, and will continue to be improved as resources permit. As such, its design is intended to promote and accommodate continued efforts to maintain the currency and improve the effectiveness of the annex as the key tool, reference and guiding document by which the jurisdiction will implement hazard mitigation locally.

The following provides a description of the various elements of the jurisdictional annex.

Hazard Mitigation Plan Points of Contact: Identifies the hazard mitigation planning primary and alternate(s) contacts, identified by the jurisdiction as of August 2015.

Jurisdictional Profile: Provides an overview and profile of the jurisdiction, including an identification of areas of known and anticipated future development and the vulnerability of those areas to the hazards of concern.

Natural Hazard Event History Specific to the Jurisdiction: Identifies hazard events that have caused significant impacts within the jurisdiction, including a summary characterization of those impacts as identified by the jurisdiction. The documentation of events and losses is critical to supporting the identification and justification of appropriate mitigation actions, including providing critical data for benefit-cost analysis. It is recognized that this "inventory" of events and losses is a work-in-progress, and may continue to be improved as resources permit. As such, the lack of data or information for a specific event does not necessarily mean that the jurisdiction did not suffer significant losses during that event.

Hazard Vulnerabilities and Ranking: Hazard Risk/Vulnerability Risk Ranking: The Montgomery 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.

Full 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 Section 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.

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 6.

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. The following prioritization table provides a summary of the local mitigation strategy prioritization process discussed in Section 6.

Hazard Area Extent and Location Map: Each annex includes a map (or series of maps) illustrating identified hazard zones, critical facilities, and areas of NFIP Repetitive Loss/Severe Repetitive Loss (RL/SRL).

FEMA Action Worksheets: Appended to the end of annexes as applicable.

9.13 Town of Glen

This section presents the jurisdictional annex for the Town of Glen.

9.13.1 Hazard Mitigation Plan Point of Contact

The following individuals have been identified as the hazard mitigation plan's primary and alternate points of contact.

Primary Point of Contact	Alternate Point of Contact
Lawrence Coddington Town Supervisor 7 Erie Street Fultonville, NY 12072 518.853-8525	Dennis Mihuka Highway Superintendant 7 Erie Street Fultonville, NY 12072 518.853-8525

9.13.2 Municipal Profile

This section provides a summary of the community.

Population

According to the U.S. Census, the 2010 population for the Town of Glen was 2,507, of which 282 are citizens over the age of 65. That encompasses 11.2 percent of the population.

Location

The Town of Glen is located in the central portion of Montgomery County. It shares its boundaries with the Town of Mohawk to the north, Town of Florida to the east, Town of Charleston to the south and the Town of Root to the west. The Mohawk River flows along the Town's northern border.

Brief History

The Town of Glen was located inside the original Town of Mohawk. The Town was first settled in the 18th Century. The town was formed in 1823 from the Town of Charleston. In 1846, the community of Fultonville set itself apart from the town by incorporating as a village.

Governing Body Format

The Town of Glen is governed by a supervisor and four councilmen. This governing body will be responsible for the adoption and implementation of this plan.

Growth/Development Trends

The following table summarizes major residential/commercial development and major infrastructure development that are identified for the next five (5) years in the municipality. Refer to the map in section 9.13.8 of this annex which illustrates the hazard areas along with the location of potential new development.

Table 9.13-1. Growth and Development

Property Name	Type (Residential or Commercial)	Number of Structures	Parcel ID(s)	Known Hazard Zone*	Description/Status
None identified at this time.					

* Only location-specific hazard zones or vulnerabilities identified.

9.13.3 Natural Hazard Event History Specific to the Municipality

Montgomery County has a history of natural and non-natural hazard events as detailed in Volume I, Section 5.0 of this plan. A summary of historical events is provided in each of the hazard profiles and includes a chronology of events that have affected the County and its municipalities. The table below presents a summary of natural events that have occurred to indicate the range and impact of natural hazard events in the community. Information regarding specific damages is included if available based on reference material or local sources.

Table 9.13-2. Hazard Event History

Dates of Event	Event Type	FEMA Declaration # (If Applicable)	County Designated?	Summary of Damages/Losses
August 26 – September 5, 2011	Hurricane Irene	DR-4020	Yes	Vulnerable areas from this event are discussed in further detail below in the section, "Other Vulnerabilities Identified by Municipality."
September 7-11, 2011	Remnants of Tropical Storm Lee	EM-3341 DR-4031	Yes	Vulnerable areas from this event are discussed in further detail below in the section, "Other Vulnerabilities Identified by Municipality."

Notes:
EM *Emergency Declaration (FEMA)*
FEMA *Federal Emergency Management Agency*
DR *Major Disaster Declaration (FEMA)*
IA *Individual Assistance*
N/A *Not Applicable*
PA *Public Assistance*

9.13.4 Hazard Vulnerabilities and Ranking

The hazard profiles in Section 5.0 of this plan have detailed information regarding each plan participant's vulnerability to the identified hazards. The following summarizes the hazard vulnerabilities and their ranking in the community. For additional vulnerability information relevant to this jurisdiction, refer to Section 5.0.

Hazard Risk/Vulnerability Risk Ranking

The table below summarizes the hazard risk/vulnerability rankings of potential hazards for community.

Table 9.13-3. Hazard Risk/Vulnerability Risk Ranking

Hazard type	Estimate of Potential Dollar Losses to Structures Vulnerable to the Hazard[a,c,d]	Probability of Occurrence	Risk Ranking Score (Probability x Impact)	Hazard Ranking[b]
Drought	Damage estimate not available	Occasional	26	Medium
Earthquake	500-Year MRP: $863,504 2,500-Year MRP $8,272,932	Rare	12	Low
Extreme Temperature	Damage estimate not available	Frequent	18	Medium
Flood	1% Annual Chance: $2,194,000	Frequent	18	Medium
Severe Storm	500-Year MRP: $84,572	Frequent	48	High
Severe Winter Storm	1% GBS: $927,860	Frequent	51	High

	5% GBS: $4,639,300			

Notes:

a. The general building stock valuation is based on the custom inventory generated for the municipality and based on improved value.

b. High = Total hazard priority risk ranking score of 31 and above
Medium = Total hazard priority risk ranking of 20-30+
Low = Total hazard risk ranking below 20

c. Loss estimates for the severe winter storm hazard is structural values only and do not include the value of contents. Loss estimates for the flood and earthquake hazards represent both structure and contents.

National Flood Insurance Program (NFIP) Summary

The following table summarizes the NFIP statistics for the community.

Table 9.13-4. NFIP Summary

Municipality	# Policies (1)	# Claims (Losses) (1)	Total Loss Payments (2)	# Rep. Loss Prop. (1)	# Severe Rep. Loss Prop. (1)	# Policies in the 1% Flood Boundary (3)
Town of Glen	10	6	$343,610.22	0	0	3

Source: FEMA Region 2, 2013

(1) Policies, claims, repetitive loss and severe repetitive loss statistics provided by FEMA Region 2, and are current as of May 31, 2013. Please note the total number of repetitive loss properties includes the severe repetitive loss properties. The number of claims represents claims closed by 5/31/2013.

(2) Total building and content losses from the claims file provided by FEMA Region 2.

(3) The policies inside and outside of the flood zones is based on the latitude and longitude provided by FEMA Region 2 in the policy file.

Notes: FEMA noted that where there is more than one entry for a property, there may be more than one policy in force or more than one GIS possibility.
A zero percentage denotes less than 1/100th percentage and not zero damages or vulnerability as may be the case.

Critical Facilities

The table below presents HAZUS-MH estimates of the damage and loss of use to critical facilities in the community as a result of a 1-percent annual chance flood event.

Table 9.13-5. Potential Flood Losses to Critical Facilities

Name	Municipality	Type	Exposure	Potential Loss from 1% Flood Event		
			1% Event	Percent Structure Damage	Percent Content Damage	Days to 100%(2)
RTE 5S	Glen, Town of	Highway Bridge	X	-	-	-
90I @ MP 177.38	Glen, Town of	Highway Bridge	X	-	-	-
RTE 90	Glen, Town of	Highway Bridge	X	-	-	-
RIVERSDDR	Glen, Town of	Highway Bridge	X	-	-	-
FULTONVILLE INT.	Glen, Town of	Highway Bridge	X	-	-	-

Source: HAZUS-MH 2.1
Note:
NP Not provided by HAZUS
X Facility located within the DFIRM boundary.
- No loss calculated by HAZUS
NA Not calculated in HAZUS
NF HAZUS estimate the facility will not be functional
WW Pump Wastewater Pump Station

WWTP Wastewater Treatment Plant
Please note it is assumed the wells have electrical equipment and openings are three feet above grade.
(1) HAZUS-MH 2.1 provides a general indication of the maximum restoration time for 100% operations. Clearly, a great deal of effort is needed to quickly restore essential facilities to full functionality; therefore this will be an indication of the maximum downtime (HAZUS-MH 2.1 User Manual).
(2) In some cases, a facility may be located in the DFIRM flood hazard boundary; however HAZUS did not calculate potential loss. This may be because the depth of flooding does not amount to any damages to the structure according to the depth damage function used in HAZUS for that facility type.
(3) Dams located in the floodplain are not listed in the table above. HAZUS does not calculate potential losses to a dam as a result of a flood event.

Other Vulnerabilities Identified by Municipality

The Town identified the following vulnerabilities that impact the community:

Human Welfare

During Hurricane Irene, a death by drowning was reported. To ensure human welfare before, during, and after, it is imperative main roads remain clean of debris and accessible to Emergency Services personnel to get to vulnerable populations and those in need of assistance to avoid the loss of human life. Overtime for Town employees results following large scale events.

Infrastructure

Hurricane Irene resulted in the following road closures lasting until September 7, 2011:

- Dufel Road-four homes affected. Further detail on these losses can be found in the NFIP component at the end of the Capability Assessment section.
- Hartley Road-No homes affected. A 500-foot section of the road and the culvert were washed out.
- Mill Point Lane-three homes affected. A small section of the road was washed out. Further detail on these losses can be found in the NFIP component at the end of the Capability Assessment section.
- Van Wagenen Drive-the road flooded and impacted properties along the roadway
- Hyney Hill Road – driveway on road washed out; needs four culverts, parallel with road, installed

In total, 15 homes and seven businesses sustained damages and losses related to Hurricane Irene.

During Hurricane Lee, a water pump station was struck by lightning, destroying several electrical components and causing $13,000 in damage. It is important to protect this infrastructure to ensure the continuity of services during a disaster.

Landslide

The Schoharie Creek poses a landslide threat due to its eroding and unstable banks. The Town is looking at various programs to address this issue.

Flood

Within the past seven years, the Town has reported three major flooding events. The Town continues to pursue projects to protect vulnerable properties. This includes shoring up the Schoharie Creek banks on both sides in the Towns of Glen and Florida, dredging Mohawk River, being able to raise the locks in anticipation of heavy rains, elevating homes above Base Flood Elevation (BFE), purchasing properties in floodplain areas, and strengthening building codes and zoning laws.

9.13.5 Capability Assessment

This section identifies the following capabilities of the local jurisdiction:

- Planning and regulatory capability
- Administrative and technical capability
- Fiscal capability
- Community classification
- NFIP
- Integration of mitigation planning into existing and future planning mechanisms

Planning and Regulatory Capability

The table below summarizes the regulatory tools that are available to the community.

Table 9.13-6. Planning and Regulatory Tools

Tool/Program (Code, Ordinance, Plan)	Do You Have This? (Y/N)	Authority (Local, County, State, Federal)	Dept./Agency Responsible	Code Citation and Comments (Code Chapter, Date of Adoption, Name of Plan, Explanation of Authority, etc.)
Building Code	Y	Local	Building Inspector	Must adopt Uniform Construction Codes and International Building Code
Zoning Ordinance	Y	Local	Building Inspector	Must adopt Uniform Construction Codes and International Building Code
Subdivision Ordinance	Y	Local	Building Inspector	Must adopt Uniform Construction Codes and International Building Code
NFIP Flood Damage Prevention Ordinance	Y	Local	Code Enforcement Officer	Town Code
NFIP-Freeboard	Y	Local	Code Enforcement Officer	State mandated BFE+2ft for residential construction. BFE+1ft for all other construction.
NFIP-Cumulative Substantial Damage	N			
Growth Management	N			
Floodplain Management/ Basin Plan	N			
Stormwater Management Plan/Ordinance	N			
Comprehensive Plan/ Master Plan	Y	Local	Planning Board	
Capital Improvements Plan	N			
Site Plan Review Requirements	Y	Local	Planning Board	
Habitat Conservation Plan	N			
Economic Development Plan	N			
Emergency Response Plan	Y	County	County OEM	County Plan
Post Disaster Recovery Plan	N			
Post Disaster Recovery Ordinance	N			
Real Estate Disclosure Requirements	Y	Local	Building Inspector	State mandated
Other [Special Purpose Ordinances (i.e., critical or sensitive areas)]	N			
Open Space Plan	N			
Stream Corridor Management Plan	N			
Watershed Management or	Y	County	Mohawk River	Mohawk River Watershed Management

Tool/Program (Code, Ordinance, Plan)	Do You Have This? (Y/N)	Authority (Local, County, State, Federal)	Dept./Agency Responsible	Code Citation and Comments (Code Chapter, Date of Adoption, Name of Plan, Explanation of Authority, etc.)
Protection Plan			Watershed Coalition	Plan

Administrative and Technical Capability

The table below summarizes potential staff and personnel resources available to the community.

Table 9.13-7. Administrative and Technical Capabilities

Staff/Personnel Resources	Available (Y or N)	Department/Agency/Position
Planner(s) or Engineer(s) with knowledge of land development and land management practices	Y	Town & County
Engineer(s) or Professional(s) trained in construction practices related to buildings and/or infrastructure	Y	Contractual
Planners or engineers with an understanding of natural hazards	Y	County
NFIP Floodplain Administrator	Y	Ron Hinkle, Code Enforcement Officer (per NYSDEC records)
Surveyor(s)	Y	Contractual
Personnel skilled or trained in "GIS" applications	Y	County
Scientist familiar with natural hazards in the municipality	N	
Emergency Manager	Y	County
Grant Writer(s)	Y	Contractual
Staff with expertise or training in benefit/cost analysis	Y	County/Contractual
Professionals trained in conducting damage assessments		

Fiscal Capability

The table below summarizes financial resources available to the community.

Table 9.13-8. Fiscal Capabilities

Financial Resources	Accessible or Eligible to Use (Yes/No/Don't Know)
Community Development Block Grants (CDBG)	Yes
Capital Improvements Project Funding	No
Authority to levy taxes for specific purposes	Yes
User fees for water, sewer, gas, or electric service	Yes
Impact fees for homebuyers or developers of new development/homes	No
Incur debt through general obligation bonds	Yes
Incur debt through special tax bonds	Yes
Incur debt through private activity bonds	No
Withhold public expenditures in hazard-prone areas	Yes
Other	Yes
Mitigation grant programs (e.g., NYDEC, NYS DHSES)	Don't Know

Community Classifications

The classifications listed below relate to the community's ability to provide effective services to lessen its vulnerability to the hazards identified. These classifications can be viewed as a gauge of the community's capabilities in all phases of emergency management (preparedness, response, recovery, and mitigation) and are used as an underwriting parameter for determining the costs of various forms of insurance. The Community

Rating System (CRS) class applies to flood insurance while the Building Code Effectiveness Grading System (BCEGS) and Public Protection classifications apply to standard property insurance. CRS classifications range on a scale of 1 to 10 with class 1 being the best possible classification, and class 10 representing no classification benefit. Firewise classifications include a higher classification when the subject property is located beyond 1,000 feet of a creditable fire hydrant and is within five road miles of a recognized Fire Station.

The table below summarizes classifications for community program available to community.

Table 9.13-9. Community Classifications

Program	Classification	Date Classified
Community Rating System (CRS)	NP	N/A
Building Code Effectiveness Grading Schedule (BCEGS)	NP	N/A
Public Protection	NP	N/A
Storm Ready	NP	N/A
Firewise	NP	N/A

N/A = Not Applicable
NP = Not Participating
__ = Unavailable
TBD = To Be Determined

Criteria for classification credits are outlined in the following documents:

- The CRS Coordinators Manual
- The Building Code Effectiveness Grading Schedule
- The ISO Mitigation online ISO's Public Protection website at http://www.isomitigation.com/ppc/0000/ppc0001.html
- The National Weather Service Storm Ready website at http://www.weather.gov/stormready/howto.htm
- The National Firewise Communities website at http://firewise.org/

National Flood Insurance Program (NFIP)

The following section provides details on the NFIP as implemented within the municipality:

NFIP Floodplain Administrator:

Ron Hinkle, Code Enforcement Officer, Building Department

Program and Compliance History

The community is currently in good standing in the NFIP and has no outstanding compliance issues. The current NFIP Floodplain Administrator has no knowledge of when the last Community Assistance Visit (CAV) was performed. The municipality sees no specific need for a CAV at this time.

Loss History and Mitigation

The list below inventories the properties that were flood damaged as a result of Hurricane Irene and how much damage was sustained. As per the floodplain administrator, none of the property owners expressed an interest in mitigation projects or funding. Properties have been grouped together by street to provide a better understanding of how floodwaters impacted different parts of the Town during Hurricane Irene. There are

three Town-owned properties, 15 private properties, and seven businesses reporting damage from Hurricane Irene.

Town-Owned Property: $6,000

- A section of Hartley Road washed out and will need to be rebuilt and paved.
- A small section of Mill Point Lane washed out and will need to be rebuilt.
- Sections of Mill Point Lane bordering Schoharie Creek was eroded and washed out. At this time it is unknown to which jurisdiction the section of roadway belongs.
- Additional stabilization (rip rap) was added by the State

Private Property

The Town has documented damages for 23 properties impacted by recent flooding as noted below.

- Property 1: $60,000 is the estimated loss. The property owner did not have flood insurance. The property was a single-wide mobile home with an addition. The structure was still intact but suffered severe damage both inside and out with some parts being torn off by floodwaters. Contents were a total loss. Other losses included one or more snowmobiles and a large supply of firewood.
- Property 2: $150,000 is the estimated loss. The property owner had flood insurance. Damages included-5 feet of water in entire home and garage, loss of all household furniture, carpets, appliances, interior walls, lawn tractor, mowers, power tools, clothes, and exercise equipment. The property owners ran a decorative lighthouse business out of their home which was a total loss of both income and inventory, including all 29 lighthouses.
- Property 3: $175,000 is the estimated loss. The property owner had flood insurance. Damages included over 3 feet of water in the entire house, garage, and workshop. All home furnishing, appliances, interior walls, carpeting, floors, furnace, air conditioners, Culligan water system were a total loss. Lawn tractors, mowers, air compressor, many power tools, the furnace in the workshop, and many miscellaneous small items were severely damaged or destroyed. The rear deck was damaged beyond repair.
- Property 4: $15,000-$20,000 is the estimated loss. The property owner had flood insurance. Damages included the cellar filled to the ceiling with water; three feet of water in the garage; loss of furnace, water heater, tank and filtration system, washer, dryer, dehumidifier, sump pump, power tools, lawn tractor, push mower, lawn furniture, and many miscellaneous small items.
- Property 5: $20,000 is the estimated loss. The property owner did not have flood insurance. Water inundated the repair shop and garage. Damages were sustained to several chainsaws, power tools, two welders, hydraulic lift tools, and many miscellaneous small items. Property 6: $5,000 is the estimated loss. The property owner did not have flood insurance. Several feet of water inundated the basement. Damages were sustained to the furnace, water heater, freezer, and miscellaneous small items.
- Property 7: $100,000 is the estimated loss. The property owner had flood insurance. Damages included five feet of water throughout the entire modular home and addition, loss of entire home and all furnishings and above ground pool

- Property 8: $85,000 is the estimated loss. The property owner had flood insurance. The cellar of the two-story home was completely flooded with one wall close to collapsing. The furnace, electric mast on roof, water system, roof, carpets, and electric boxes in the cellar were all destroyed. The swimming pool, large deck, and storage barn were swept away and destroyed. Two acres of land were eroded and washed away by floodwaters, causing a stone-filled cavern eight feet deep. The yard was severely damaged, and the driveway was washed out making it impassable.

- Property 9: $60,000 is the estimated loss. The property owner did not have flood insurance. This is a house built into the side of a hill. The damages were confined to the basement level which is a drive-in concrete structure. One side contained a 275-gallon fuel tank which was full and tipped over when the floodwaters inundated the structure causing a large fuel spill on the property. Damages on the finished side of the basement were sustained to the wall, hot tub, and the furniture, which were total losses. Extensive damage was sustained to the property and the driveway was impassable. Other losses included the washer, dryer, furnace, and a 12x24 foot shed which was washed away and destroyed. A large deck was ripped from the side of the house and washed away.

- Property 10: $162,000 is the estimated loss. The property owner did not have flood insurance. The single-story home and contents were completely destroyed as water came through and ripped the house apart. The garage crashed down on all of the contents, including the minivan. The yard and driveway were severely damaged by the rocks and dirt left behind by receding floodwaters.

- Property 11: $100,000 is the estimated loss. The property owner did not have flood insurance. The Schoharie Creek overflowed onto the property and eroded five to six acres of creek-side property while at least six acres of the property were left with massive rock-filled craters. A camper on the property was a total loss after being smashed and swept away by floodwaters.

- Property 12: $130,000 is the estimated loss. The property owner had flood insurance. Four feet of water inundated the entire home and garage. Items lost, damaged, or destroyed include the house walls, carpets, and all contents of the house including appliances and water system.

- Property 13: $30,000 is the estimated loss. The property owner did not have flood insurance. Three feet of water inundated the entire house and garage. Items lost, damaged, or destroyed included the house walls and contents including furniture, oil tank, water heater, and furnace.

Property 14: $40,000 is the estimated loss. The property owner had flood insurance. Extensive damage was sustained to the mobile home. Entire contents were either destroyed or damaged beyond repair.

Property 15: $90,000 is the estimated loss. The property owner did not have flood insurance. Over three feet of water inundated the modular home. The home and property were a total loss due to the construction of the modular home.

Property 16: $60,000 is the estimated loss. The property owner did not have flood insurance. The home is a total loss after being inundated with three to four feet of floodwaters.**Commercial Property**

- Property 17: $450,000 is the estimated loss. The business owner did not have flood insurance. Acres of land, the produce stand, the ice cream store, and the restaurant were covered by four to five feet of water. Damages included 100 acres of crops and produce, restaurant, ice cream equipment, large amounts of hay, and other commodities used on the farms. Several large farm tractors were submerged in water of which the full extent of damage is unknown. Other damaged machinery included sprayers, trailers, and vehicles. The full extent of the impact on the business is unknown as

the owners cannot assess when they can reopen until the business is restored.Property 18: $50,000 is the estimated loss. It is unknown whether or not the business owner had flood insurance. Several feet of water covered the entire area traveling through the farm stand and greenhouse.Property 19: $350,000 is the estimated loss. The business owner did not have flood insurance. Three feet of water inundated the animal hospital and home with a greater amount in the horse and storage barn. Items lost, damaged, or destroyed included computers, programs, fax machine, copy machines, phones, printers, laminator, furnace, X-ray machine, many miscellaneous items used in an animal hospital, dozens of antiques and collectibles including horse drawn carriages, golf carts, and 300 bales of hay. Approximately 20 acres of hay was covered by water and 200 feet of decorative fencing was carried away by flood waters. The animal crematory was destroyed as well. Severe damage was sustained to the in-ground pool-total loss of pool heater and pump. The pool has since been refurbished. The X-ray machine was purchased in 2006 and cost $30,000. The new water system installed in 2011 was also damaged and cost over $15,000.

- Property 20: $500,000-$1,500,000 is the estimated loss. It is unknown whether or not the business owner had flood insurance. Fifty inches of water inundated the entire building. Items lost, damaged, or destroyed included interior walls, office equipment, stream cleaning equipment, and many shop tools. Trucks were submerged in water and the extent of damage is unknown. The fuel island was also completely destroyed. There was extensive loss of the business operations as well that delayed the recovery and clean up from the storm.

- Property 22: $500,000 is the estimated loss. The business owner had flood insurance. Three feet or more of water inundated the offices, restaurant, and lower level of all four motel buildings. Items lost, damaged, or destroyed included all carpeting, walls, doors, all furnishings in all buildings, office equipment, and the loss of business operations for several weeks or months.

- Property 23: The business owners had flood insurance. There was minor flooding sustained to the business. Items lost, damaged, or destroyed included miscellaneous small items. The biggest problem faced was the extensive cleaning required before being able to reopen following the storm. There was a loss of business operations during the clean-up process.

Planning and Regulatory Capability

Current floodplain management regulations and ordinances meet the minimum standards set forth by both FEMA and New York State. There are additional ordinances and regulations supporting the implementation of the NFIP within the community.

Administrative and Technical Capabilities

The community FDPO identifies the Code Enforcement Officer as the local NFIP Floodplain Administrator, currently Ron Hinkle, for which floodplain administration is an auxiliary duty.

Duties and responsibilities of the Construction Official/NFIP Administrator are permit review, inspections, and education.

Ron Hinkle feels he is adequately supported and trained to fulfill his responsibilities as the municipal floodplain administrator. Ron Hinkle is not certified in floodplain management, however, attends regular continuing education programs for code enforcement.

Public Education and Outreach

Currently there is no formal public education and outreach program in place to support the NFIP in the community.

Actions to Strengthen the Program

A current barrier to running a more effective floodplain management program is the lack of funding available. Additional training and information on both floodplain management and the CRS would be welcomed. Though the Town does not currently participate in CRS, after receiving more information, a more informed decision regarding their options could be made.

Integration of Hazard Mitigation into Existing and Future Planning Mechanisms

It is the intention of this municipality to incorporate hazard mitigation planning and natural hazard risk reduction as an integral component of ongoing municipal operations. The following textual summary identifies relevant planning mechanisms and programs that have been/will be incorporated into municipal procedures, which may include former mitigation initiatives that have become continuous/on-going programs now considered mitigation "capabilities:"

- **Hazard Mitigation** – The Town actively supports this Hazard Mitigation Plan by implementing, monitoring, and updating its implementation as defined in Section 7.0 of this plan. County-wide initiatives identified in the County annex are also supported throughout the life cycle of the plan.

- **Floodplain Management** – The Town continues to pursue its options of membership in the CRS program. Efforts have been made as well to ensure compliance with and good standing in the NFIP. Town officials continue to educate themselves on floodplain management issues and pursue training opportunities available.

- **Building Code, Ordinances, and Enforcement**-The Town is continuing to incorporate hazard information and recommendations from this Hazard Mitigation Plan into pending updates and revisions to be made to Zoning, Subdivision, and Site Plan Review ordinances.

- **Emergency Response Plan** – The Town continues to develop, enhance, and implement existing emergency plans. There is currently an emergency response plan for the Town. Having this plan affords the Town the opportunity to outline in detail the functions and responsibilities of each Town department during a large scale natural or man-made emergency so that response to emergencies lessens the severity of a disaster on property and the population. This plan includes many pre-event actions that both mitigate disaster losses, and directly supports recovery efforts.

9.13.6 Mitigation Strategy and Prioritization

This section discusses past mitigations actions and status, describes proposed hazard mitigation initiatives, and prioritization.

Past Mitigation Initiative Status

The following table indicates progress on the community's mitigation strategy identified in the 2008 Plan. Actions that are carried forward as part of this plan update are included in the following subsection in its own table with prioritization. Previous actions that are now on-going programs and capabilities are indicated as such in the following table and may also be found under 'Capability Assessment' presented previously in this annex.

Table 9.13-10. Past Mitigation Initiative Status

Description	Status	Review Comments
1: Where appropriate, support retrofitting, purchase, or relocation of structures located in hazard-prone areas to protect structures from future damage, with repetitive loss and severe repetitive loss properties as priority.	Continuous	The Town continues to pursue projects to protect vulnerable properties. This includes shoring up the Schoharie Creek banks on both sides in the Towns of Glen and Florida, dredging Mohawk River, being able to raise the locks in anticipation of heavy rains, elevating homes above Base Flood Elevation (BFE), purchasing properties in floodplain areas, and strengthening building codes and zoning laws. This initiative will be carried over into the current mitigation strategy.
2: Consider participation in incentive-based programs such as CRS.	Continuous	This is a programmatic and operational action, and will be moved to the Capabilities section, Integration of Hazard Mitigation into Existing and Future Planning Mechanisms.
3: Continue to support the implementation, monitoring, maintenance, and updating of this Plan, as defined in Section 7.0	Continuous	This is a programmatic and operational action, and will be moved to the Capabilities section, Integration of Hazard Mitigation into Existing and Future Planning Mechanisms.
4: Strive to maintain compliance with, and good-standing in the NFIP.	Continuous	This is a programmatic and operational action, and will be moved to the Capabilities section, Integration of Hazard Mitigation into Existing and Future Planning Mechanisms.
5: Continue to develop, enhance, and implement existing emergency plans to address all hazards of concern including a failure of Gilboa Dam.	Continuous	Plans and strategies have been drafted to address the concerns with Gilboa Dam. This initiative will be carried over into the current mitigation strategy.
6: Create/enhance/maintain mutual aid agreements with neighboring communities.	Continuous	This is a programmatic and operational action, and will be moved to the Capabilities section, Integration of Hazard Mitigation into Existing and Future Planning Mechanisms.
7: Support County-wide initiatives identified in Section 9.1 of the County Annex.Support county-wide initiatives identified in the Suffolk County Hazard Mitigation Plan	Continuous	This is a programmatic and operational action, and will be moved to the Capabilities section, Integration of Hazard Mitigation into Existing and Future Planning Mechanisms.
8: Replace undersized culverts to increase conveyance and alleviate repetitive flooding problems at locations throughout the town.	Continuous	Continuing to pursue projects that decrease the likelihood of flooding is a priority for the Town. This initiative will be carried over into the current mitigation strategy.
9: Ditching in areas of 10% or greater (enhancement)	Continuous	Continuing to pursue projects to decrease the likelihood of flooding is a priority for the Town. This initiative will be carried over into the current mitigation strategy.
10: Maintain and enhance program of debris removal at bridges and culverts to maintain conveyance.	Continuous	Due to the constant build-up of debris in water bodies and aftermath of large storms, it is imperative the Town continue to pursue methods of clearing away debris. This initiative will be carried over into the current mitigation strategy.
11: Maintain and enhance programs to clear litter from ditches and drainage areas.	Continuous	Litter poses a threat of increasing flooding potential. The Town must continue to address this threat in order to alleviate flooding risks. This initiative will be carried over into the current mitigation strategy.
12: Beaver dams in the Town have been identified as a problem that leads to flooding	In Progress	The culvert was replaced with a larger one and the highway was raised. Due to its importance to the Town, this initiative remains continuous. This initiative will be carried over into the current mitigation strategy.
13: Pursue continuing professional education	In Progress	This is a programmatic and operational action,

Description	Status	Review Comments
and certification (e.g., Certified Floodplain Manager under the Association of State Floodplain Managers) of Code Enforcement Officers and NFIP FPAs in floodplain management and hazard risk reduction.		and will be moved to the Capabilities section, Integration of Hazard Mitigation into Existing and Future Planning Mechanisms.

Completed Mitigation Initiatives not Identified in the Previous Mitigation Strategy

- In support of the previous mitigation strategy pertaining to replacing culverts, two culverts had larger pipes installed to lessen the flood threat.
- In support of the previous mitigation strategy pertaining to the pursuit of retrofitting flood-prone properties and infrastructure, Egelston Road was raised several feet to minimize the threat posed by the beaver dams.

Proposed Hazard Mitigation Initiatives for the Plan Update

The community identified mitigation initiatives they would like to pursue in the future. Some of these initiatives may be previous actions carried forward for this plan update. These initiatives are dependent upon available funding (grants and local match availability) and may be modified or omitted at any time based on the occurrence of new hazard events and changes in municipal priorities. Table 9.13-11 identifies the municipality's updated local mitigation strategy.

As discussed in Section 6, fourteen evaluation/prioritization criteria are used to complete the prioritization of mitigation initiatives. For each new mitigation action, a numeric rank is assigned (-1, 0, or 1) for each of the 14 evaluation criteria to assist with prioritizing actions as 'High,' 'Medium,' or 'Low.' The table below summarizes the evaluation of each mitigation initiative, listed by Action Number.

Table 9.13-12 provides a summary of the prioritization of all proposed mitigation initiatives for the plan update.

Table 9.13-11 Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
Glen-1	Where appropriate, support retrofitting, purchase, or relocation of structures located in hazard-prone areas to protect structures from future damage, with repetitive loss and severe repetitive loss properties as priority.	Existing	Flood, Severe Storm	1	Town / State / Federal	High	High	FEMA	Short term	High	SIP	PP
Glen-2	Replace undersized culverts to increase conveyance and alleviate repetitive flooding problems at locations throughout the town.	Existing	Flood, Severe Storms	1	Town/County DPW's	High	Medium	Local / HMP	Short term	High	SIP	PP
Glen-3	Ditching in areas of 10% or greater (enhancement)	Existing	Flood, Severe Storms	1	Town/County DPW's	Medium	Low	Local	Short term	Low	SIP	PP
Glen-4	Maintain and enhance program of debris removal at bridges and culverts to maintain conveyance.	Existing	Flood, Severe Storms	1	Town/County DPW's	Medium	Low	Local	Short term	Medium	SIP	PP
Glen-5	Maintain and enhance programs to clear litter from ditches and drainage areas.	Existing	Flood, Severe Storms	1	Town/County DPW's	Medium	Low	Local	Short term	Medium	SIP	PP
Glen-6	Beaver dams in the Town have been identified as a problem that leads to flooding	Existing	Flood	1	Town/County DPW's	Medium	Low	Local	Short term	Medium	NSP	PP
Glen-7	Continue to develop, enhance, and implement existing emergency plans to address all hazards of concern including a failure of Gilboa Dam.	New & Existing	All Hazards	1,2,3,4	Municipal Emergency Manager with support from County OEM and SEMO	High	Low-Medium	Local Budget	Ongoing	High	LPR EAP	PI ES
Glen-8	Purchase and install permanent generators for	Existing	All	All	Town Administration	High	Medium to High	HMGP with local	Short Term /	High	SIP	PP

Table 9.13-11 Proposed Hazard Mitigation Initiatives

Initiative	Mitigation Initiative	Applies to New and/or Existing Structures*	Hazard(s) Mitigated	Goals Met	Lead and Support Agencies	Estimated Benefits	Estimated Cost	Sources of Funding	Timeline	Priority	Mitigation Category	CRS Category
	Town garage, Town offices and community center.							cost share	DOF			

Notes:
Not all acronyms and abbreviations defined below are included in the table.
**Does this mitigation initiative reduce the effects of hazards on new and/or existing buildings and/or infrastructure? Not applicable (N/A) is inserted if this does not apply.*

Acronyms and Abbreviations:

CAV	Community Assistance Visit
CRS	Community Rating System
DPW	Department of Public Works
FEMA	Federal Emergency Management Agency
FPA	Floodplain Administrator
HMA	Hazard Mitigation Assistance
N/A	Not applicable
NFIP	National Flood Insurance Program
OEM	Office of Emergency Management

Potential FEMA HMA Funding Sources:

FMA	Flood Mitigation Assistance Grant Program
HMGP	Hazard Mitigation Grant Program
PDM	Pre-Disaster Mitigation Grant Program
RFC	Repetitive Flood Claims Grant Program (discontinued 2015)
SRL	Severe Repetitive Loss Grant Program (discontinued 2015)

Timeline:

Short	1 to 5 years
Long Term	5 years or greater
OG	On-going program
DOF	Depending on funding

Costs:
Where actual project costs have been reasonably estimated:

Low	< $10,000
Medium	$10,000 to $100,000
High	> $100,000

Where actual project costs cannot reasonably be established at this time:

Low	Possible to fund under existing budget. Project is part of, or can be part of an existing on-going program.
Medium	Could budget for under existing work plan, but would require a reapportionment of the budget or a budget amendment, or the cost of the project would have to be spread over multiple years.
High	Would require an increase in revenue via an alternative source (i.e., bonds, grants, fee increases) to implement. Existing funding levels are not adequate to cover the costs of the proposed project.

Benefits:
Where possible, an estimate of project benefits (per FEMA's benefit calculation methodology) has been evaluated against the project costs, and is presented as:

Low=	< $10,000
Medium	$10,000 to $100,000
High	> $100,000

Where numerical project benefits cannot reasonably be established at this time:

Low	Long-term benefits of the project are difficult to quantify in the short term.
Medium	Project will have a long-term impact on the reduction of risk exposure to life and property, or project will provide an immediate reduction in the risk exposure to property.
High	Project will have an immediate impact on the reduction of risk exposure to life and property.

Mitigation Category:

- *Local Plans and Regulations (LPR) – These actions include government authorities, policies or codes that influence the way land and buildings are being developed and built.*
- *Structure and Infrastructure Project (SIP)- These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. This could apply to public or private structures as well as critical facilities and infrastructure. This type of action also involves projects to construct manmade structures to reduce the impact of hazards.*
- *Natural Systems Protection (NSP) – These are actions that minimize damage and losses, and also preserve or restore the functions of natural systems.*
- *Education and Awareness Programs (EAP) – These are actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. These actions may also include participation in national programs, such as StormReady and Firewise Communities*

CRS Category:

- *Preventative Measures (PR) - Government, administrative or regulatory actions, or processes that influence the way land and buildings are developed and built. Examples include planning and zoning, floodplain local laws, capital improvement programs, open space preservation, and storm water management regulations.*
- *Property Protection (PP) - These actions include public activities to reduce hazard losses or actions that involve (1) modification of existing buildings or structures to protect them from a hazard or (2) removal of the structures from the hazard area. Examples include acquisition, elevation, relocation, structural retrofits, storm shutters, and shatter-resistant glass.*
- *Public Information (PI) - Actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. Such actions include outreach projects, real estate disclosure, hazard information centers, and educational programs for school-age children and adults.*
- *Natural Resource Protection (NR) - Actions that minimize hazard loss and 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.*
- *Structural Flood Control Projects (SP) - Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include dams, setback levees, floodwalls, retaining walls, and safe rooms.*
- *Emergency Services (ES) - Actions that protect people and property during and immediately following a disaster or hazard event. Services include warning systems, emergency response services, and the protection of essential facilities*

Table 9.13-12. Summary of Prioritization of Actions

Mitigation Action/Project Number	Mitigation Action/Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community Objectives	Total	High/Medium/Low
Glen-1	Where appropriate, support retrofitting, purchase, or relocation of structures located in hazard-prone areas to protect structures from future damage, with repetitive loss and severe repetitive loss properties as priority.	1	1	0	1	1	1	1	0	1	1	0	0	0	0	8	Medium-High
Glen-2	Replace undersized culverts to increase conveyance and alleviate repetitive flooding problems at locations throughout the town.	0	1	1	1	1	1	1	0	0	1	0	1	1	1	10	High
Glen-3	Ditching in areas of 10% or greater (enhancement)	0	0	1	1	0	1	0	0	0	1	0	1	0	0	5	Low
Glen-4	Maintain and enhance program of debris removal at bridges and culverts to maintain conveyance.	0	1	1	1	0	1	0	0	0	1	0	1	0	1	7	Medium
Glen-5	Maintain and enhance programs to clear litter from ditches and drainage areas.	0	1	1	1	0	1	0	0	0	1	0	1	0	1	7	Medium
Glen-6	Beaver dams in the Town have been identified as a problem that leads to	0	1	1	1	0	1	0	0	0	1	0	1	0	0	8	Medium

Mitigation Action/Project Number	Mitigation Action/Initiative	Life Safety	Property Protection	Cost-Effectiveness	Technical	Political	Legal	Fiscal	Environmental	Social	Administrative	Multi-Hazard	Timeline	Agency Champion	Other Community Objectives	Total	High/Medium/Low
	flooding																
Glen-7	Continue to develop, enhance, and implement existing emergency plans to address all hazards of concern including a failure of Gilboa Dam.	1	1	1	1	1	1	1	0	1	1	1	0	1	1	12	High
Glen-8	Purchase and install permanent generators for Town garage, Town offices and community center.	1	0	1	1	1	1	1	0	0	1	1	1	1	0	10	High

Note: Refer to Section 6 which contains the guidance on conducting the prioritization of mitigation actions.

9.13.7 Future Needs To Better Understand Risk/Vulnerability

None at this time.

9.13.8 Hazard Area Extent and Location

Hazard area extent and location maps have been generated for the community that illustrate the probable areas impacted within the municipality. These maps are based on the best available data at the time of the preparation of this plan, and are considered to be adequate for planning purposes. Maps have only been generated for those hazards that can be clearly identified using mapping techniques and technologies, and for which the Town of Glen has significant exposure. These maps are illustrated in the hazard profiles within Section 5.4, Volume I of this Plan.

9.13.9 Additional Comments

None at this time.

Name of Jurisdiction: Town of Glen
Number: Glen-2
Mitigation Action/Initiative: Replacement of undersized culverts throughout town

Assessing the Risk	
Hazard(s) addressed	Flooding
Specific problem being mitigated	Insufficient capacity to carry water underneath roads during hiring events
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting)	Construction of bridges—too expensive
	More frequent cleaning/debris removal from existing culverts— this is already being undertaken on a regular basis and, even at full functionality, existing culvert capacity is too limited.
	Extension of ditching two different crossing points -- ineffective and simply creates problems elsewhere
Action/Project Intended for Implementation	
Description of Selected Action/Project	Replacement of undersize culverts throughout town
Mitigation Action/Project Type	SIP
Objectives Met	1
Applies to existing structures/infrastructure, future, or not applicable	Existing
Benefits (losses avoided)	Avoided erosion of roadways and property damage
Estimated Cost	$225,000
Priority*	High
Plan for Implementation	
Responsible Organization	Town of Glen
Local Planning Mechanism	Local budgeting process
Potential Funding Sources	HMGP
Timeline for Completion	Within two years
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: January, 2016 Progress on Action/Project: not completed

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	0	Does not affect life safety
Property Protection	1	Protects both private and public property
Cost-Effectiveness	1	Benefits substantially exceed required investment
Technical	1	Town has technical capacity to undertake project
Political	1	Town has political desire to undertake project
Legal	1	Town is legally able to undertake project
Fiscal	1	Town has fiscal capacity to undertake project
Environmental	0	No impact upon environment
Social	0	No social impact
Administrative	1	Town has administrative capacity to undertake project
Multi-Hazard	0	Applies only to flooding hazards
Timeline	1	Project can be completed within two years
Agency Champion	1	The town highway department actively advocates of the project
Other Community Objectives	1	Meets other community objectives such as mitigating against the fiscal injury of subsequent events
Total	10	
Priority (High/Med/Low)	High	

Name of Jurisdiction: Town of Glen
Number: Glen-8
Mitigation Action/Initiative: Purchase and installation of permanent generators for town garage town offices and Community Ctr.

Assessing the Risk	
Hazard(s) addressed	Lack of continuous power at these important operational/shelter sites
Specific problem being mitigated	Periodic and, sometimes sustained, power outages
Evaluation of Potential Actions/Projects	
Actions/Projects Considered (name of project and reason for not selecting)	Purchase portable generators -- cost and the time necessary to cite these assets makes this option and appropriate
	Develop on-site power generation capability—too expensive
	Do nothing-- please critical facilities without power during emergency situations
Action/Project Intended for Implementation	
Description of Selected Action/Project	Purchase and installation of permanent generators for town garage, town offices and community center.
Mitigation Action/Project Type	SIP
Objectives Met	**1,4**
Applies to existing structures/infrastructure, future, or not applicable	Existing
Benefits (losses avoided)	avoids loss of power add critical operational and shelter facilities
Estimated Cost	$45,000
Priority*	High
Plan for Implementation	
Responsible Organization	Town
Local Planning Mechanism	Local budgeting process
Potential Funding Sources	HMG P
Timeline for Completion	Within two years
Reporting on Progress	
Date of Status Report/ Report of Progress	Date: Progress on Action/Project:

Criteria	Numeric Rank (-1, 0, 1)	Provide brief rationale for numeric rank when appropriate
Life Safety	1	Operational shelters provide for life safety
Property Protection	0	No direct impact upon personal property
Cost-Effectiveness	1	Modest investment for potentially sizable returns
Technical	1	Town has technical capacity to undertake project
Political	1	Town has political desire to undertake project
Legal	1	Town has legal ability to undertake project
Fiscal	1	Town has fiscal ability to undertake project
Environmental	0	No impact upon environment
Social	0	The social impact
Administrative	1	Town has administrative capacity to undertake project
Multi-Hazard	1	Project will improve operational and shelter capacity during various types of hazards
Timeline	1	Project can be completed within two years
Agency Champion	1	The town board directly champions this project
Other Community Objectives	0	No other community objectives are applicable
Total	10	
Priority (High/Med/Low)	High	