

# **MULTI-JURISDICTIONAL NATURAL HAZARD MITIGATION PLAN**

**Lower Connecticut River Valley Council of Governments  
Towns of  
Cromwell, Durham, East Haddam, East Hampton,  
Haddam, Middlefield, Middletown and Portland**



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**Map 1:** RiverCOG Region, with former Midstate Planning Region shown in yellow outline.

Source: RiverCOG

*On the Cover:*

**Photo 1:** Harbor Park flooding during typical Spring River Flood.

Source: Bill Revel – flickriver.com

**Executive Summary 2014**

**1. Planning Process**

**Overview**

The State of Connecticut has not had a county government structure since it was abolished by a vote of the General Assembly in 1960. With the exception of the state court system, the eight Connecticut counties primarily represent geographic boundaries only. For the purpose of regional planning, Connecticut municipalities are represented by fourteen Regional Planning Organizations (RPOs), of which the Lower Connecticut River Valley Council of Governments is one.

For the purpose of state and federal financial resources, the regional planning organizations serve the same purpose as county governments in terms of acting as funding paths. The grant and program funds of the Federal Highway Administration and the Department of Transportation (DOT) which supports roadway planning must be passed through the RPOs. The Department of Emergency Services and Public Protection (DESPP) through its Division of Emergency Management and Homeland Security (DEMHS) funnels federal emergency grants for assessments, mitigation, planning, response and recovery and mitigation dollars through RPOs as well. The Connecticut Department of Energy and Environmental Protection (DEEP), also provides grants for regional environmental protection and the work in process energy assurance planning. Department of Public Health funds public health issues, sheltering and evacuation (with the DOT) projects art through local health departments and regional health districts.

Staff and consultants of the former Midstate Regional Planning Agency (MRPA), which has been merged with the Connecticut River Estuary Regional Planning Agency (CRERPA) to form the Lower Connecticut River Valley Council of Governments (RiverCOG) led efforts in the development of this Multi-Jurisdictional Natural Hazard Mitigation Plan (the Plan) which commenced in 2007 and a draft for format review was submitted in 2009. This draft is formatted to be consistent with the 2011 FEMA standards for a Multi-Jurisdictional NHM Plan. Key members of the Planning Team were; the CEOs from Durham and Portland, the Administrative Aid to the Mayor (Middletown), contracted Town Engineers (Nathan L. Jacobson Associates (Middlefield, Haddam and Durham), town and city planners (Middletown, Cromwell and East Haddam), Emergency Management Directors (all eight municipalities) and the public works directors from all eight municipalities. Input was also received from the public who contributed through public workshops and direct interviews, particularly those clusters in at risk areas.

Other organizations such as local and regional historical societies, local and regional chambers of commerce, business owners and senior citizen organizations also proved to be valuable sources of information.

All eight municipalities within the former MRPA actively participated in the establishment of this Natural Hazard Mitigation Plan. They worked collaboratively in

the research, justification of the conclusions regarding risks, provided documentation and contributed their own mitigation strategies to the final draft Plan.

Former MRPA staff, in particular the original consultant charged with the preparation of this Plan, served on the Statewide Emergency Operations Plan Workgroup, developing the (local) Emergency Operations Plan (LEOP) Template. He also worked locally with each municipality in updating/developing their own LEOP (adopted in 2004). In 2006 there was a major rewrite/updating of three attachments in the EOPs. Serving on the Regional Public Health Emergency Response Planning Team, he also assisted in developing a regional Public Health Emergency Response Plan, and contributed to some of the local PHERPs. He also served on the State Energy Assurance Plan update and exercise planning team.

HAZUS-MH GIS mapping, repetitive loss properties and damage reports were utilized extensively for this Plan. Financial risks (where known) were also included as one of the methodologies for determining financial exposure to major weather events.

The eight northern RiverCOG municipalities in the planning area are relatively small individual communities (with the exception of the City of Middletown) that are accustomed to working together for the most part. This is true for transportation, emergency, economic, social services, planning services and others. For emergency management planning elements three of the eight communities are part of DEMHS Region 2, the other 5 municipalities are part of DEMHS Region 3. (RiverCOG is the lead agency for DEMHS Region 2.)

Open public workshops were held, but given that local individuals hold municipal employee positions and volunteer positions, local input was not hard to come by. This revised Plan design/formatting has been designed for ease of review and evaluation by DEEP and FEMA representatives and ease of understanding by Town representatives and members of the public.

### **Regional and Local Planning Process**

The following list demonstrates the steps taken in the regional and local planning process:

#### **Regional Process**

1. Develop preliminary Plan template
2. Educate stakeholders with regard to the hazards to which they and the region are vulnerable
3. Data collection
4. Vulnerability assessments
5. Discuss alternative strategies to mitigate these hazards
6. Mutual agreement on existing capabilities (local and regional) to recover
7. Educate the public concerning mitigation actions that are being taken
8. Implement Geographic Information Systems (GIS) emergency management planning

9. Develop draft Plan
10. Develop stakeholder support of the Plan
11. Prepare final Plan for approval
12. Create new draft is so required by DEEP/FEMA

#### Local Process

1. Eight (8) former Midstate Regional Planning Agency municipalities

Goal: Determine baseline data for future planning (policies, plans and protocols), mitigation and recovery assistance.

Objective: Identify local vulnerabilities to potential natural hazards

2. Vulnerabilities (by hazard)
3. List vulnerable structures and infrastructure
4. Assess capability to respond/recover
5. Identify the differences between vulnerability and capability
6. Estimate potential losses in dollar value
7. Assess vulnerability by analyzing development trends
8. Multi-jurisdictional Risk Assessment

#### **Review of Other Plans:**

The preparers of this Natural Hazard Mitigation Plan have based its format on previously approved Plans including that of the Southwestern Regional Planning Agency (SWRPA) and the Southeast Council of Governments (SECOG).

Throughout the process of producing this Plan, staff of the former Connecticut River Estuary Regional Planning Agency (now the Lower Connecticut River Council of Governments) was consulted with coordination occurring throughout the process. The Chief Elected/Appointed Officials of the former Midstate and Connecticut River Estuary RPAs (now together, the RiverCOG) have and continue to meet monthly for the purpose of regional planning.

The preparation of this Plan drew from and was coordinated with numerous local municipal plans, regulations, ordinances and codes including existing Plans of Conservation and Development, zoning regulations, subdivision regulations, town codes and public health codes and standards. The Connecticut River, with its risk of flooding, extends from north to south through Connecticut including Hartford County, and Middlesex County. At its southernmost extent the river splits Middlesex and New London Counties. Only two of the former Midstate Regional Planning Agency municipalities do not have direct waterfront on the Connecticut River, Durham and Middlefield.

### **Incorporation into Existing Planning Mechanisms**

Through coordination with the staff of the eight municipalities that are represented in this Plan, there is an ability to insure consistency with the various municipal plans. This also applies with the wide area regional planning efforts. As an example, various staff members participate with the Regional Emergency Planning Teams in preparation of Regional Emergency Support Planning. Although these efforts are related to emergency response, they represent other opportunities for planning, mitigation support and funding.

A complete list of plans and other sources that relate to mitigation planning that were considered in the preparation of this Natural Hazard Mitigation Plan can be found in Appendix S: Sources of Information.

### **Hazard Identification**

Utilizing FEMA guidelines, potential natural hazards were identified as indicated in Section I.A.1 Acknowledgements and Technical Support, the Russell Library provided information including photographs, some of which had to be interpreted by a staff member (Denise Russo). The Middlesex County Historical Society Librarians were also helpful.

Section III, NATURAL HAZARDS, presents the history of weather events that pose a threat to the region. Studies, reports, records, Press and noteworthy books are referenced and quoted. The State meteorologist (Dour Glowacki) provided valuable input and is quoted often in this Plan. He also edited the original research done by this Plan author for this section.

The regional portion of the Plan and the Municipal Annexes discuss in detail the natural hazards that pose a threat to the region and individual municipalities within. Also noted is the history of these storms in the state and county record of severe weather events for the last 150 years is included as Appendix R: Prior Occurrences.

Though the State Hazard Mitigation Plan was the source of much of the data, this Plan has been enhanced by personal experiences of the Planning Team members, the public and particularly the historical societies and librarians. The State emergency management meteorologist was also very helpful in providing input.

In the RiverCOG region, a primary concern is with flooding due to frequent major rain events. For this reason, the Planning Team devoted a significant amount of time and effort in researching, analyzing and projecting flood events. (See Region: Section III.C.1) and local Annexes A through H Sections VII.A). The natural hazard next most likely to occur are hurricanes. Sections III.C.2) and locals Annexes A through H Sections VII.B.

Structures in flood plains are vulnerable to flooding from these two weather events. All eight municipalities within the region have vulnerabilities; from Seasonal Spring

Flooding to flash flooding. The most at risk are the structures on the roads adjacent to the Connecticut River.

Structures covered under the Flood Insurance Rate Map (FIRM) Program and Repetitive Loss Properties with a history of damage caused by flooding are listed in the Repetitive Loss Sections (Regional and Local) of this Plan.

For proof sources of risks, many historic photographs are included in the Annexes to the Plan. An example (which is included in the Middletown Annex of this Plan) is the photograph provided by Wesleyan University of damage from the Hurricane of 1938. It shows a mass of trees down and the missing steeple off the Wesleyan Chapel.

### **Profiling Hazards**

Vulnerability to flash flooding is explained in Section III.C.1.a. Vulnerability is significant because of the large number of waterways and significant elevation changes. In addition, at the core of the region is the Connecticut River, the largest river in New England, which is subject to flooding.

Each of the municipalities within the northern RiverCOG area has flood plains within their municipal borders and many contain structures at risk. The HAZUS-MH Flood Report sections in the Plan summarize the consequences of major floods on those structures (For the full report, see Appendix A). The Repetitive Loss Properties discusses the number of such properties in the Region and their general location. In Annex A through H, the local Mitigation Action Annex Sections, the reader will find prioritized listings (and where available costing information) of structures and infrastructure vulnerable to major weather events.

The RiverCOG region, including the eight northern municipalities, has a significant number of dams that are rated for size by the State of Connecticut. The Plan consultant retained a subject matter expert from Robida Engineering, LLC (a retired State Dam Engineer) to evaluate the significant and high hazard dams for the purpose of this Plan. The dams at risk are summarized the Regional Section of this Plan and detailed in the Annexes.

#### **1. Weather Events**

The extent, probability and past weather event occurrences are described as follows:

- a. Extent. Section III.B details the methodologies for how the Region's significant weather events are measured. We also indicate local knowledge where appropriate. For example, we know that with a River height of 19' above flood stage, Route 9 in Middletown will be underwater. Many of the municipal public works directors know the limitations of culverts and other storm water infrastructure in their towns.

- b. Probability. Using local knowledge, the State NHMP, NOAA reports and with assistance from the State weather expert we are able to predict probabilities of weather events; as pointed out in Section III.D.
- c. Past Occurrences. Historical data in the Plan is extensive. This includes costs where documented such as is indicated in the RLP parts of this Plan.
  - (1) Occurrence lists come from a variety of sources: NOAA, the Connecticut State website, the Connecticut State NHMP, local and regional libraries and historical societies. Repetitive Loss Properties are discussed in each Local Town Annex.
  - (2) The RiverCOG region has not been seriously impacted by tornadoes of late, but other Connecticut communities outside of the region have been. As a result, preparations and mitigation strategies presented in this NHMP are based on experiences from those other areas. Research has also been included such as attendance at a workshop for After Action Report on a recent tornado which occurred in the Hartford area Town of Wethersfield in 2009.
  - (3) The RiverCOG has not been impacted by an out of control wildfire but many of our communities are heavily forested. As a result, the towns of the RiverCOG are always at risk for the occurrence of an uncontrolled forest fire (see Regional and Local Annex Wildfire sections). Local fire departments within the region have supported and supplemented their response plans by including annual budget requests as well as submitting applications for Federal Assistance to Fire Fighters Grants. In addition, the Forestry Division of DEEP has provided forest fire support to local fire departments as well.

## **2. Risk Assessment**

The following section provides an overview and summary of the Multi-jurisdictional Risk Assessment:

### **Overview**

Risks were evaluated overall to the communities and by each natural hazard.

Results were based on historical data, public officials and public input. Local administrators, engineers, planners, emergency management and public works officials are all veterans of the natural hazard risk evaluation.

Subject matter experts were engaged for specific areas at risk, specifically; dam hazards and repetitive loss properties (RLP). As part of the assignment, the RLP contractor also projected future potential financial exposures.

The RLP expert along with Planning Team members also interviewed other high risk property owners that are not FEMA, FIRM, and RLP listed.

The natural hazards were researched relative to their risk to life, limb, structural effect and economic impact to the communities. Taken into consideration were; mitigation efforts in the past, currently in place, and proposed.

Section III Natural Hazard Identification and Risk Assessment details at great length the natural hazard risks that pose a threat to the region and municipalities. The FEMA guideline of potential hazards is indicated throughout the Plan and risks of each are indicated. History, ours and others with similar risks, form the basis for our assessments and mitigation plans.

### **Multi-jurisdictional Risk Assessment**

The regional aspect of risk assessments in this Plan generalizes the risks to its region, by natural hazard; based on historical records and data

For most of the Region, the risks are the same. The main exception to this is the lack of Spring River Flooding in the towns of Durham and Middlefield which do not have River shoreline.

A small fault line runs through the Moodus section of East Haddam, occasionally causing small earthquakes. Typically referred to as the “Moodus Noises,” these small quakes do little more than rattle windows. The earth has been making noises since before European Colonization of the area and there are many Native American legends surrounding the noises. A major earthquake would affect other surrounding municipalities.

In East Haddam frequent ice dam problems have occurred along the Salmon River; but the possibility exists in all towns. An ice dam in one municipality will affect those above the dam.

Middletown has one affordable income housing unit that is vulnerable to erosion, but not in a flood hazard area.

All the municipalities have at risk dams. During the risk assessment, it was determined that no dam failure in one municipality posed a significant risk to another municipality or to an adjoining region.

### **Identified Structures**

This section addresses the identification of structures (listings of identified structures at risk are included in each municipal section):

1. The reports referenced in Section III.B contain data and projections of residential municipal and critical infrastructure facilities.
2. With the exception of the wastewater treatment plants, the structures at risk along the Connecticut River are primarily constructed of wood. The only elevated buildings are some of those along the River in Haddam.

3. Section III.B.1.c.1) is a special section provided by the Mattabassett Wastewater Regional Treatment facility. The facility is located in Cromwell on the common border with Middletown. A failure of the levee in this location would have consequences in all downstream municipalities. Only two former Midstate municipalities (Durham and Middlefield) would not be impacted as they are in inland locations. At present, the Middletown wastewater treatment plant on River Road, just south of the downtown area is a high risk facility which is scheduled for closure.
4. Cromwell's Main Street structures and businesses are at risk for impact in a major flood on the Connecticut River.
5. The Portland Fair Grounds is subject to closing due to minor flooding of the Connecticut River. In addition, Main Street residential dwellings and businesses in Portland are at risk to flood damage due to an aging drainage system.
6. The Goodspeed Airport on the Connecticut River in East Haddam (privately owned) is adjacent to the River and at risk for flooding.
7. Washington Street in the heart of Middletown where many businesses are located has been flooded several times over the years. It's widely thought that flood mitigation here would be prohibitively expensive.

### **Infrastructure Projects**

Each municipal Annex contains lists of needed infrastructure improvements. Such improvements include the need for culvert replacements where the infrastructure has either outlived its useful life or is not adequately sized for the upslope areas drained because of increased development through time. The City of Middletown Water and Wastewater Department provided information to their Annex which includes needed replacements, elevations or relocations for its facilities at risk. The Town of Portland also provided information for their Annex regarding the state of their waste water treatment plant. Staff of the regional Mattabassett Wastewater Treatment Plant also provided information for inclusion in the Plan.

### **National Flood Insurance Program (NFIP)**

The following items address the NFIP within the northern eight municipalities of the RiverCOG (former Midstate) region:

1. All eight northern RiverCOG municipalities participate in the National Flood Insurance Plan. The MRPA, and now the RiverCOG, assists those municipalities in updates when they are published. Staff began working with the FEMA contractor on the revision of the flood plain lines at a regional workshop held on May 17, 2005. The municipalities approved the maps in 2008.
2. Staff of the RiverCOG works with those responsible for the updating of local Plans of Conservation and Development and local Zoning Regulations in insuring compliance with the new FIRM specifications.
3. the most recent flood plain maps are included in the individual local Annexes within the Flood Sections of this Plan.
4. A map of flood plains in the northern RiverCOG region is included in the Regional Section of the Plan within the "Floods" section.
5. None of the eight northern RiverCOG municipalities participate in Community Rating System (CRS) program of the NFIP.

### **Addressing RLPs**

The following items address RLPs as it relates to the eight northern municipalities within the RiverCOG region:

1. Section III.B.5 includes historical claims and future cost risks in the event that no mitigation takes place. Most, but not all, of these properties are located in designated flood plains. Mitigation strategies listed in the local municipal Mitigation Action Plans, Section IV.C.5., (a) through (h), shows many more structures and infrastructures at risk. The HAZUS-MH flood and hurricane reports also indicate the numbers and types of structures and associated cost exposure of at-risk residential, business and municipal facilities (Appendices A & B). It should be noted that in all the local Plans of Conservation and Development and Zoning Regulations, standards and regulations are in place to limit expansion and new development in vulnerable areas (Section IV.C).
2. The City of Middletown has expressed interest in buying out, and willingness of the RLP residents to sell, their properties on Nejako Drive for the subsequent creation of open space.

### **Estimating Potential Losses**

HAZUS-MH Reports and the RLP Sections include and project losses from flooding, hurricanes, and earthquakes (See Annexes A, B, and C for full HAZUS – MH Reports). Loss of life and injuries can be found in the historic records in each natural hazard section.

## **3. Mitigation Strategies**

Mitigation strategies are at the heart of a Natural Hazard Mitigation Plan. The following section presents mitigation strategies included in this NHMP:

### **Overview**

The regional and local mitigation strategies sections address past mitigation efforts, including ongoing and planned efforts. These sections also contain regional and local goals and objectives. Section IV.A outlines the recommended guidelines for strategizing mitigation efforts and identifies responsible authorities, policies and programs in place and resources available. Natural Hazard Mitigation Plan guidelines are indicative of connectivity with local emergency responders' plans in mitigation planning. In some areas the difference between mitigation response and natural hazard mitigation planning can be slight. In such cases, this NHMP identifies such cross-overs for the purposes of clarification. Desired mitigation actions are defined in Section IV.H with such actions serving to protect against or prevent identified risks by type of natural hazard.

### **Prevention**

The NHMP addresses the local Plans of Conservation and Development which are being updated on a continual basis as required by the adoption date of the original plan. Regulatory tools including Zoning and Subdivision Regulations and Reasoned Growth guidelines are highlighted as a demonstration of municipal efforts to reduce losses and casualties created as a result of natural hazards.

### Protection

Mitigation efforts are underway and planned in a number of municipalities and are designed to protect property values and life. Examples of these efforts include property acquisition in especially prone areas as well as the programs for acquisition of open space.

### Natural Resource Protection

Although not primary priorities in most mitigation efforts, the NHMP addresses the protection of natural resources as they relate to protection of development, life and property. Examples include protection of tidal wetlands along the shore of the RiverCOG area, especially along Long Island Sound and throughout the lower river valley. Bluffs and escarpments, composed of glacial debris left behind following the last glacial advance and retreat, serve as buffers to storm waves and tides thereby protecting life and properties as well.

In the RiverCOG towns, public works departments are the primary party responsible for the continued clearing of debris from culverts and bridges over streams that flow either through inland or tidal wetlands. It has been shown that, especially in the Town of Old Lyme for example, debris clogging of culvert outlets in areas subject to the tide has resulted in the back-up of flood waters that create flooding impacts in low-lying neighborhoods like the Soundview and Miami Beach areas on Long Island Sound.

On a larger scale, the Mattabassett River Watershed Council oversees a major watershed protection effort in the upper areas of the RiverCOG region. Forest protection efforts are strong within East Hampton through the work of The Nature Conservancy and the Middlesex Land Trust. Meshomasic State Forest located in the towns of Portland and East Hampton is protected by efforts of the Meshomasic Hiking Club.

Forest fires, a somewhat rare but dangerous and damaging form of natural hazard, pose a significant threat for forest resources. A large concern occurs when forest management efforts remove trees but leave dry, highly flammable brush on the ground (left for the protection of small wildlife). Local fire companies, however, are said to be well-prepared for the fighting of forest fires, both in and out of the RiverCOG region. In many cases, local firefighters work in partnership with firefighters of the DEEP State Forestry Division. Large forests in the RiverCOG region include the Meshomasic and Cockaponset State Forests.

### Public Education and Awareness

Public education and awareness are important aspects of mitigating the costly impacts of natural hazards. Most of the Towns in the RiverCOG region have information on their town websites that serve as some degree of outreach to their citizens regarding hazard mitigation. Fourteen RiverCOG towns have access to varying forms of information posted conspicuously on the homepages of their website (Clinton, Deep River, Durham, East Haddam, East Hampton, Essex, Haddam, Killingworth, Middletown, Middlefield, Portland, Old Lyme, Old Saybrook and Westbrook) while three have little or no easily accessed or

identified information or links for residents to access (Chester, Cromwell and Lyme).

#### Analyzing Development Trends

Regional organizations like the RiverCOG are better able to analyze overall development trends utilizing information from State and Federal government sources. Municipalities are better equipped in most cases to understand their local conditions. Development patterns over the past several decades demonstrate that more and more of the general population is migrating to locations closer and closer to the water. As a result, more of the population and a greater level of development are located in areas where natural hazards – especially flooding and high winds - are more prevalent and mitigation measures are becoming increasingly necessary. This is addressed in the Plan of Development Section IV.C.d.4) Regional Plan for Reasoned Growth and 5) Plan of Conservation and Development.

In those desirable waterfront areas, the little remaining undeveloped areas are under increasing pressure for development. Many of these areas in the RiverCOG region are residentially zoned. Those who oversee our municipal flood programs at both the staff and Commission level are increasingly diligent in managing the consequences of construction in such areas. Zoning Regulations impacting development take into account the availability of water for firefighting. The lack of sewer infrastructure in most of the RiverCOG towns also acts to limit development densities in most cases which, in turn, reduces the number of people in harm's way.

Pet sheltering during hazard events is considered within this plan. Because of the lack of accommodation for pets during evacuations, many pet owners are choosing to stay home rather than leave their pets for what can be days on end leaving them in harm's way and creating a potential of the need for more emergency services.

#### Regional and Local Hazard Mitigation Goals

This Natural Hazard Mitigation Plan follows FEMA recommendations in developing regional and local hazard mitigation goals that are SMART (simple, m measurable, attainable, r realistic, and timely). Such regional and local goals can often overlap requiring concise language that is easily followed. Lists of regional goals and objectives are included in Section IV.C.3 of this Plan. Local primary goals and objectives are included in within each Local Town Annex. It is noted that the spreadsheets columns for Mitigation Action Plans and Risk and Mitigation information further define actions to achieve the desired goals and objectives which are based on vulnerability assessments of each natural hazard.

#### Implementation of Mitigation Actions

Actions for implementing mitigation projects are located in several sections of the plan in response to the guidelines for input. The primary Action Plans are found in the municipal Annexes. The mitigation actions are prioritized and defined.

The Goals and Objectives sections (Regional IV.C.3 and Town Annexes IV.C.9.) also highlight timelines for mitigation actions planned. Only where the benefit cost analysis was already known was it included in their Section.

Section IV.C.1.a lists departments and agencies with responsibilities for monitoring and mitigation actions. Funding sources can be found in Section I.B.3&4.

Regular maintenance actions are funded through the local budgeting process. They are not eligible for federal grants. Section II.A.1 shows financial impacts by weather event; where known.

#### Multi-Jurisdictional Goals and Objectives

The Goals and Objectives were considered and created on a regional level.

The Regional Planning Team was made up of representatives from each individual town within the region. Through research of regional records and local input; storm risks were assessed and vulnerabilities determined. The result was goals and objectives to mitigate risks. Private and public mitigation goals and objectives were similar.

Agency and or local departmental responsibilities and goals can be found in Section IV.C and IV.F, respectively along with in the Municipal Annexes.

#### Mitigation Highlights

The local Public Works Departments house improvement plans for at risk properties and those projects are funded with their budget.

It is in the local responder departments' best interest to contribute to mitigation strategies. They need the equipment, training and exercises to be prepared for natural hazard emergencies. This activity is in synch with their training, planning, mitigation response and recovery activities as outlined in the Emergency Operations Plans, Standard Operating Plans/Guidelines.

#### Critical Path

The critical path for mitigation projects is funding. Annually, during local budget negotiations, public works has to struggle to get their projects approved. While at the same time, police have their own desired mitigation projects. They must compete with other non-mitigation projects "on the table".

The Regional Emergency Planning Teams are a dedicated source of mitigation funding; including CBRNE projects including natural hazard. But it is highly competitive.

Section I.B.3 and 4 address other sources of funding. Upon approval of this Plan projects can be funded thru the Natural Hazard Mitigation Grant process. This also is a competitive process.

Summary: Mitigation of structure related projects must be assessed with a cost benefit analysis.

#### **4. Plan Updating**

NHMP maintenance including ongoing public involvement is an important component during the intervening time between the adoption of a Plan or Plan Update and then next update which is required five years in the future. The following explains the Plan maintenance process and continued public involvement:

##### Plan Maintenance Process

This NHMP which has been developed for the eight individual towns of the former Midstate Region and the region itself in compliance with FEMA Local Multi-Hazard Mitigation Planning guidelines which are contained in Section 201.6(c)(4) of Section 44 CFR of the Federal Code.

Section V.E explains the maintenance and updating process for this Plan. Each individual town will be responsible for maintaining their own projects. It is the CEO's responsibility to ensure that projects are moving forward at the appropriate time. See Table 22 for the full schedule.

##### Continued Public Involvement

Public input, a required aspect of the adoption of a NHMP, is carried out in what is considered the most effective and far-reaching ways using Town websites and other public venues to notify the public of public meetings. Based upon experience gained from workshops, many residents will attend meetings that are *not* intended to be devoted toward adoption of NHMPs and discussing their concerns in other forums. Such forums predominantly include monthly or bimonthly meetings of Boards of Selectmen and Town Councils. There will be at the very least one public meeting per year in each municipality to discuss the status of action items and the overall Plan. See Section V.E for the schedule.

#### **5. Plan Adoption**

Upon "Approval Pending Adoption" by FEMA, each municipality will have an opportunity to officially adopt the Plan. A date of expiration will be provided to the region at the time of the Approval Letter, set by FEMA. The Plan must be updated and approved by FEMA by the expiration date set by FEMA. For the Certificate of Adoption in each town, see the last page of each Annex A-H.

#### **6. Benefit to the Region and Participants in this Planning Process**

This Plan is an Action Plan providing:

- a. A guide for mitigation
- b. A reference source for local budgeting process
- c. A reference for sourcing State, regional and Federal grants
- d. Ability to apply for hazard mitigation grant.

## I Introduction

### A. Background

1. Acknowledgement and Technical Support [See Section II.A]

Appreciation for assistance in the preparation of this Plan goes to:

Doug Glowacki, DEMHS for technical assistance in researching information regarding past Connecticut storms and other contributions.

Denise Russo for assistance in locating historic storm photos at the Russell Library

Deborah D. Shapiro for providing guidance in the location of local photos in the Middlesex County Historical Society Library.

Dan Bourret, RiverCOG GIS specialist for the development of the maps and the HAZUS-MH input for the Plan.

Diane Ifkovic, and Karen Michaels from the DEEP for their guidance, technical assistance, and advice in the development of this Plan.

Joan Tweedale, a visiting Public Assistance Disaster Assistance Employee who reviewed the Plan and provided comments.

Source of Information

See Appendix S for a full list of sources used in this Plan.

2. Purpose

The purpose of this Natural Hazard Mitigation Plan is to identify the natural hazards most likely to affect the area and to locate the area's vulnerabilities, assess the risks and estimate corrective actions to protect life, limb and property. In addition, the purpose is to insure that this Plan is consistent with other plans for local, regional and State land use, clean water, wetland, debris management and emergency response plans.

This Plan represents a long term strategy implemented to reduce the loss of life, limb, property (both public and private, including structures and infrastructure) and to minimize economic disruption. Implementation of this Plan is intended to develop an awareness of the need to continually update and revise local plans of development, planning, zoning and wetland ordinances with respect to the impacts of natural hazards.

This Plan will take into consideration the following potential natural disasters:

*High Risk*

- Floods
- Hurricanes
- Winter Storms
- Wind Storms

*Medium Risk*

- Extreme Cold
- Heat wave

*Low Risk*

- Earthquakes
- Drought
- Wildfire

Each natural hazard and subsequent risk has been evaluated to ascertain the vulnerabilities in the municipalities.

The impacts of these events are evaluated based on the following vulnerabilities:

- The community as a whole including threats to life, limb and physiological well-being of the area's residents;
- Infrastructure, structures, and property that is likely most vulnerability to damage and impact, including potential economic impact;
- Guidelines from the NFIP under the Federal Insurance Administration are also followed, which enables property owners to purchase insurance protection against losses from flooding.

The FEMA guideline publication Reducing Losses in High Risk Flood Hazard Areas: A Guidebook for Local Officials was also used in drafting this Plan. This guidebook states; "properties in some high risk flood areas have not been specifically identified by the Federal Insurance Administration". As a result, planners responsible for the development of this Plan looked beyond the (NFIP) and identified properties during the hazard assessment that are not included in the Federal program.

3. Authority

Authority for this Natural Hazard Mitigation Plan, Risk and Vulnerability Assessment, is established by the Department of Homeland Security, the Federal Emergency Management Agency's Robert T. Stafford Disaster Relief

and Emergency Assistance Act, Section 203, 42 U.S.C 5121-5206, as amended by Section 102 of the Disaster Mitigation Act of 2000.

The Federal Emergency Management Agency's (FEMA's) National Flood Insurance Program (NFIP) is administered by the Connecticut Department of Energy and Environmental Protection's (DEEP's) Flood Management Program utilizing guidelines from the Department of Emergency Management and Homeland Security (DEMHS) and managed by the RiverCOG. At the local level, authority for this Plan is established under the administration of each of the municipalities covered in the Plan.

Regulations governing local mitigation plans are published under Section 404 of the Stafford Act of 1989, Public Law 100-707, as implemented by 44 CFR, Part 206, Subpart N, subsection 206.40744 CFR §201.6. In addition, Natural Hazard Mitigation Plans must address National Flood Insurance Program insured structures that have been repeatedly damaged by floods, known as Repetitive Loss Properties (RLP): §201.6(c)(2)(ii).

Local governments must have a FEMA-approved Natural Hazard Mitigation Plan in order to apply for and/or receive project grants under the following hazard mitigation assistance programs:

- Hazard Mitigation Grant Program (HMGP)<sup>1</sup>
- Pre-Disaster Mitigation (PDM)
- Flood Mitigation Assistance (FMA)
- Severe Repetitive Loss (SRL)<sup>2</sup>

FEMA may require an approved Natural Hazard Mitigation Plan under the Repetitive Flood Claims (RFC) program in order for local and regional governments to apply for and/or receive assistance under the RFC program.

The following FEMA regulations are also applicable:

- Section 44 CFR, Part 206, Subparts M and N (Public Law 93-288 as amended by Public Law 100-707, The Robert T. Stafford Disaster Relief and Emergency Assistance Act) and the Disaster Mitigation Act of 2000, Section 322.
- Title V: The National Flood Insurance Program Reform Act of 1994, Subtitles D, E and F.
- Section 44 CFR, Part Section 60.3, the National Flood Insurance Program.

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<sup>1</sup> Administered by DEMHS

- Section 44 CFR, Part 14, Administration of Grants: Audits of State and Local Governments.
- Section 44 CFR §201.6(d) (3) Local Jurisdictions are required to review and revise its plan and resubmit it for approval within 5-years.
- Section 44 CFR §201.6(c) (2) (ii) Risk Assessment; Assessing Vulnerability: Addressing Repetitive Loss.
- FEMA 386-2, Step 3 Understanding Your Risks, worksheet #3a Inventory Assets.
- FEMA 386-8 p.25 Multijurisdictional Mitigation Planning.

## **B. The Region**

### 1. Overview

Staff of the Lower Connecticut River Valley Council of Governments (formerly staff of the Midstate Regional Planning Agency) and contractors including GIS experts, emergency management planners, transportation specialists, National Flood Insurance experts and dam engineers worked collaboratively with municipal administration, land use planners, public works, water and septic/sewer, emergency management, planning and zoning officials, historical societies and the public to gather information for this Natural Hazard Mitigation Plan.

Plan preparers utilized HAZUS-MH projections in the planning process for flood and hurricane projections. In most cases the staff was able to utilize the most recent FIRM maps for this Plan, produced in August of 2008.

Data was also derived from a wide variety of State sources including DEEP, Connecticut Department of Transportation (DOT), and DESPP. Federal sources included the National Weather Service (NWS), the US Geodetic Service (USGS) and the Federal Emergency Management Agency (FEMA).

Under the Natural Hazard Mitigation Grant Program (HMGP), both the Stafford Act and the National Flood Insurance Act, require mitigation planning for natural hazards. Projects listed in approved Natural Hazard Mitigation Plans are prioritized for funding by FEMA

### 2. Demographics

The area of the former Midstate Regional Planning Agency consists of eight municipalities. Amongst the eight municipalities, the size, population and

geography vary widely with six having shores on the Connecticut River and two being inland. All eight towns have some degree of hilly terrain. The City of Middletown, with a population (2010 Census) of 47,648 is the largest while the Town of Middlefield with a population (2010 Census) of 4,425 is the smallest. Elevations of the eight towns vary from approximately 1 foot above sea level along the Connecticut River to an elevation of approximately 750 feet.

Within each of the eight municipalities, population density varies as does the character of development existing in each town. This variability is a reason why natural hazard mitigation planning on the local level is important to municipal planners and other land use staff in the municipalities. Areas that do not fit into recognized categories are taken into consideration by mitigation planners using the following resources:

- Google Earth
- GIS overlays
- FIRM maps for flood plains
- Unmanaged forest tracks,
- Private and/or neglected dams,
- DEEP periodic photographic fly-overs

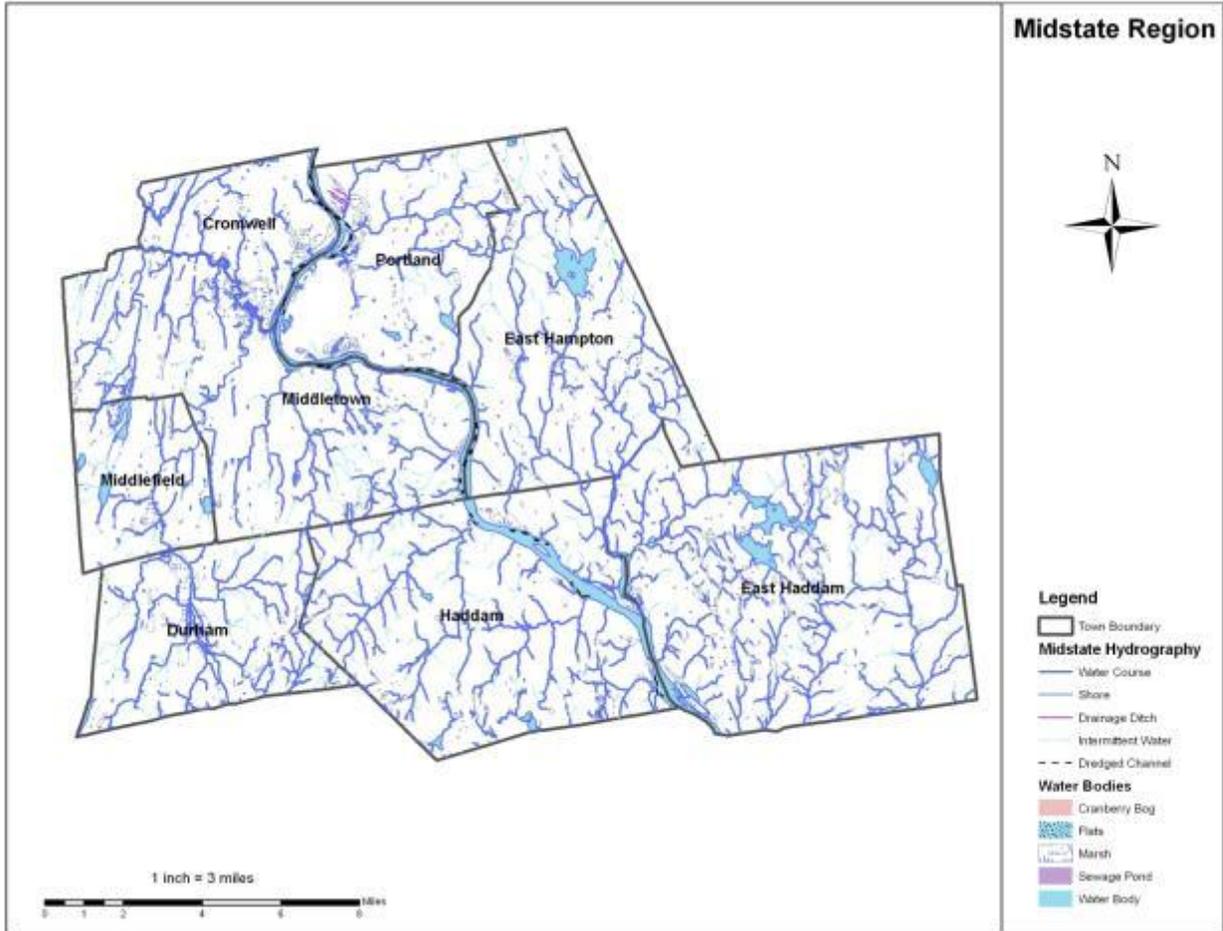
Geographic Area	Population (2010)	Housing Units	Total Area (sq. miles)	Water Area (sq. miles)	Land Area (sq. miles)	Population Density per sq. mile of land area	Housing Units per sq. mile
<b>Middlesex County</b>	165,626	74,837	439	70	369	449	203
<b>Middletown</b>	47,648	21,223	42.3	1.4	40.9	1,165	519
<b>Cromwell</b>	14,005	6,001	12.9	0.5	12.4	1,129	484
<b>East Hampton</b>	12,959	5,485	36.8	1.2	35.6	364	154
<b>Portland</b>	9,508	4,077	24.9	1.5	23.4	406	174
<b>East Haddam</b>	9,126	4,508	56.6	2.3	54.3	168	83
<b>Haddam</b>	8,346	3,504	46.3	2.3	44	190	80
<b>Durham</b>	7,338	2,694	23.8	0.2	23.6	311	114
<b>Middlefield</b>	4,425	1,863	13.3	0.6	12.7	348	147

**Table 1:** Population Density by Municipality and all of Middlesex County (including towns that are not a part of this Plan).

**Source:** Census 2010

3. Hydrography of the Eight Municipalities of the Former Midstate Region

The following map shows hydrography of the eight former Midstate municipalities:



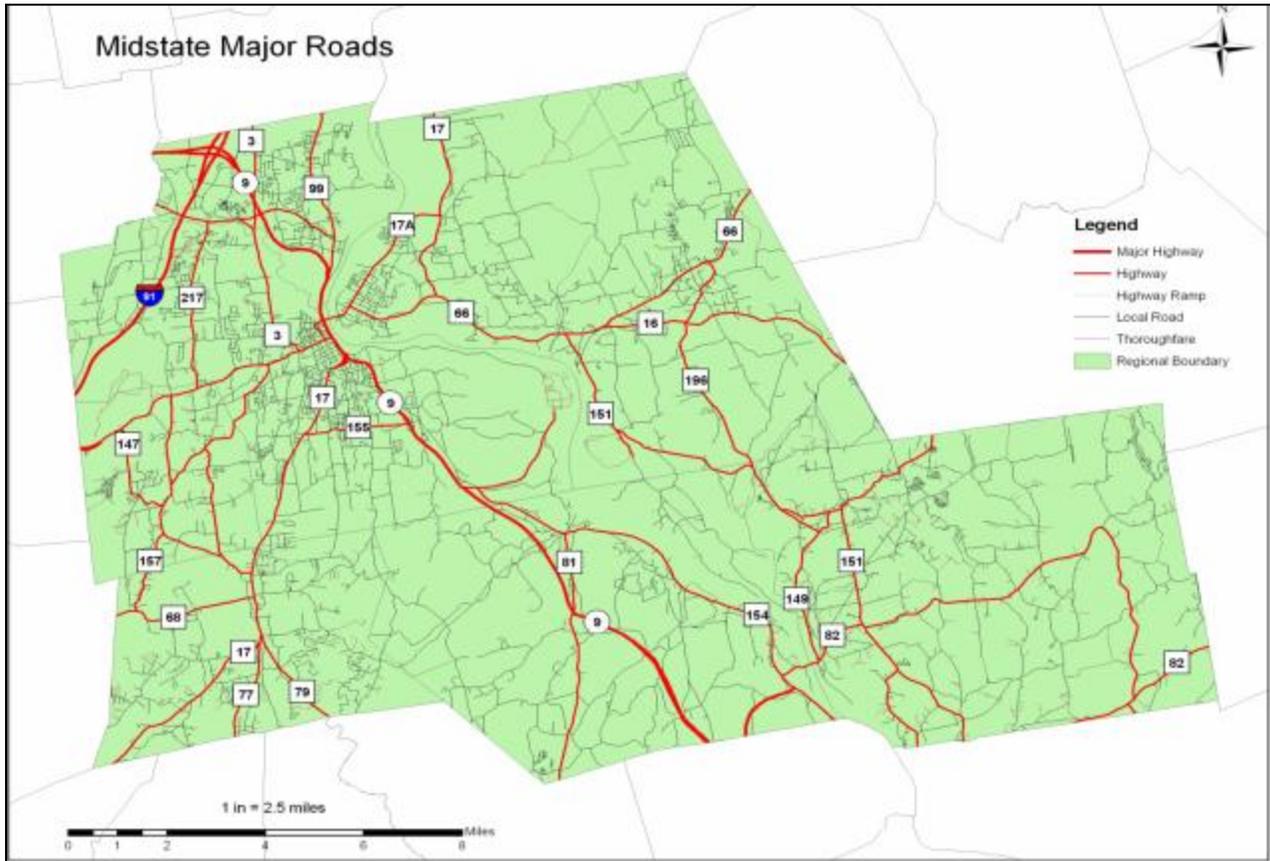
**Map 2:** Hydrography of the Eight Former Midstate Region Municipalities

Source: RiverCOG

Six of the eight municipalities (Cromwell, East Haddam, East Hampton, Haddam, Middletown and Portland) have frontage on the Connecticut River while two (Durham and Middlefield) are located inland. All of the towns are located within the watershed of the Connecticut River. Visible within this map is the vast extent of waterways within the area. The number of streams present highlight the need for flood mitigation planning.

4. Major Roads in the Eight Municipalities of the Former Midstate Region

The following map shows the major arteries and collectors within the eight northern RiverCOG towns:



**Map 3:** Major Roads in the Eight Former Midstate Region Municipalities

Source: RiverCOG

Route 9 and Interstate 91 are the Region’s two limited-access highways. Interstate 91 passes through a short section of Cromwell and Middletown while Route 9 passes through Cromwell, Middletown and Haddam. Numerous smaller state and local roads pass through the eight towns as well. In the eight municipalities, only two river crossings – the Arrigoni Bridge connecting Middletown and Portland and the East Haddam Bridge connecting Haddam and East Haddam – provide connection between towns separated by the river. Haddam is the only town bisected by the Connecticut River without a bridge directly connecting to the two portions. Residents must travel through East Hampton and East Haddam in order to access the other side of the town.

## 5. Regional and Local Forms of Government

Connecticut and neighboring Rhode Island are two of only five states in the United States that do not have a county form of government. Many of the traditional planning roles of county government are performed by regional planning agencies or councils of government. There are fourteen regional planning organizations in Connecticut. The eight municipalities that were a part of the former Midstate Regional Planning Agency and that are the subject of this Natural Hazard Mitigation Plan are now members of the seventeen-town Lower Connecticut River Valley Council of Governments (RiverCOG). The other nine towns are those that were formerly a part of the Connecticut River Estuary Regional Planning Agency (CRERPA), which have been merged into the RiverCOG as well.

Within the former Midstate Region, Middletown operates as a city with a Mayor heading a City Council while East Hampton operates with a Town Manager and a Town Council. As of November 1, 2013 the Town of Cromwell will also switch to a Town Manager Town Council form of government. The other six municipalities operate with a First Selectman and a Board of Selectmen.

## C. **Primary Funding Sources**

This project was funded through a planning grant from the Federal Emergency Management Agency (FEMA) and administered by the Connecticut Department of Energy and Environmental Protection. The former Midstate Regional Planning Agency and the eight participating municipalities provided in-kind local matches. The Hazard Mitigation Grant Program (HMGP), the program from which mitigation grants can be obtained, is administered by the Connecticut Division of Emergency Management and Homeland Security (DEMHS) which is part of the Connecticut Department of Emergency Services and Public Protection (DESPP).

To be eligible for grants for natural hazard mitigation planning available through the Department of Homeland Security's Public Law 103-325, Sections 553 and 554, all regulations and requirements under the NFIP (44 CFR, Subchapter B)<sup>2</sup>, as amended, must be followed during this planning process as well as any Federal or State Executive Orders, Local Ordinances, Charter Provisions or Special Acts as may be applicable. This Regional Natural Hazard Mitigation Plan, including the eight individual town annexes for each of the participating municipalities, has been developed and will be maintained in accordance with Federal, State and local requirements.

The Federal Hazard Mitigation Grant Program (HMGP) and the management of mitigation projects are funded under the provisions of Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1989 (Stafford Act), Public Law 100-707, as implemented by 44 CFR, Part 206, Subpart N, subsection 206.407. Section 404 of the Stafford Act establishes an independent grant program to be used to fund State and local mitigation measures.

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<sup>2</sup> See Section I.A.5

## D. Alternate Funding Sources

The projects in need of mitigation or improvements to prevent loss of life and limb or structures and infrastructure can be funded by a variety of sources. Those sources are as follows:

Funding at the Municipal Level. Funding can take the form of an annual capital expenditure or budgetary set-asides for anticipated expenses. Funds can also be leveraged through a bonding process.

Funding at the Regional Level. Funding for mitigation can sometimes occur at the regional level in Connecticut. The Capital Region Council of Governments manages the Homeland Security grants for the Towns of Cromwell, East Hampton, East Haddam and Portland, and the City of Middletown, all members of DEHMS Region 3. The remaining three municipalities of the former Midstate Region manage their own (local) Homeland Security Grants. This particular funding is available through the Emergency Management Planning Grant Program (EMPG) of the Department of Emergency Management and Homeland Security. EMPG is recognized as a good funding source for items like sand bags, barricades, generators and other similar equipment and resources.

There are a variety of State funding sources periodically available with restrictions and limited uses. Those funding sources include:

- The Department of Transportation offers road improvement grants.
- The Department of Public Health funds public health emergency response mitigation and planning projects.
- The Office of Policy Management offers the following grant programs:
  - Ct Small Town Economic Assistance Program
  - Small Municipality;
  - Larger municipalities; Block Grants
  - The Small Town Economic Assistance Program (STEAP) funds
  - Economic development, community conservation and quality of life projects for localities that are ineligible to receive Urban Action (CGS Section 4-66c) bonds. This program is administered by the Office of Policy and Management.
  - Local Capital Improvement Program (LoCIP)

The LoCIP program offers distribution of funds to municipalities to reimburse the cost of eligible local capital improvement projects such as road, bridge or public building construction activities. A municipality can request LoCIP funds by completing a simple application form for project approval and project reimbursement that gives a general description of the project, its work location, and the actual cost of the project. Each year, the State Office of Policy and Management provides a formula-based entitlement to each municipality's available LoCIP balance. These funds can accumulate from year to year.

The Connecticut Department of Public Health offers public health funding (from the Center for Disease Control) for planning, communications, special needs cluster planning and other projects.

Funding for the mitigation of vulnerable facilities within the RiverCOG region from these sources is very limited.

Other advisable locally funded projects:

Public - Developing Flood Plans, Business COOP/COG

Private - Self relocating, Water proofing

FEMA - Hazard Mitigation Assistance (HMA). Recent amendments to Title 44 of the Code of Federal Regulations added a new Part 80. The Part 80 rule and implementing property acquisition guidance are effective for all disasters declared on or after December 3rd, 2007 (12/03/2007).

Arrangements for the municipality to purchase land under Open Space Grants is included in: Property Acquisition and Relocation for Open Space. More detailed guidance to assist with implementation of the provisions found in Part 80 has also been developed. This property acquisition and relocation guidance applies to all FEMA hazard mitigation grant programs. It is included in the FY09 Hazard Mitigation Assistance (HMA) Program Guidance at Section 2.3.13 and also governs this project type under the Hazard Mitigation Grant Program (HMGP) in place of previous desk reference sections. The property acquisition guidance section must be read in conjunction with the overall requirements for each grant program including the HMGP.

Public Assistance Program for Municipalities:

The mission of the FEMA Public Assistance (PA) Grant Program is to provide assistance to state, tribal and local governments, and certain types of private nonprofit organizations so that communities can quickly respond to and recover from major disasters or emergencies declared by the President of the United States.

Through the PA Program, FEMA provides supplemental federal disaster grant assistance for debris removal, emergency protective measures, and the repair, replacement, or restoration of disaster-damaged, publicly owned facilities and the facilities of certain Private Non-Profit (PNP) organizations. The PA Program also encourages protection of these damaged facilities from future events by providing assistance for hazard mitigation measures during the recovery process.

The federal share of assistance is not less than 75% of the eligible cost for emergency measures and permanent restoration. The grantee (usually the state) determines how the non-federal share (up to 25%) is split with the sub-grantees (eligible participants).

Eligibility – Overview of eligibility criteria and definitions

Roles and Responsibilities – Information on the duties of federal, state, and local partners

Public Assistance Grant Program Process – Step-by-step description of the PA Grant life cycle

Policy and Guidance – 9500 series policies and other publications.

Frequently Asked Questions (FAQ) – Top 10 questions pertaining to the Public Assistance Program.

Resource and Tools – Appeal database, equipment rates, cost-estimating format, performance goals, funding trends, and other resources.

Office of Equal Rights – Information about the Office of Equal Rights and how to file a discrimination complaint.

FEMA summarizes the Public Assistance Program for municipalities as follows:

*“Under the PA Program, which is authorized by the Stafford Act, FEMA awards grants to assist State and local governments and certain Private Nonprofit (PNP) entities with the response to and recovery from disasters. Specifically, the program provides assistance for debris removal, implementation of emergency protective measures, and permanent restoration of infrastructure. The program also encourages protection from future damage by providing assistance for hazard mitigation measures during the recovery process. The Federal share of these expenses cannot be less than 75 percent of eligible costs.*

*The PA Program is based on a partnership between FEMA, State, and local officials. FEMA is responsible for managing the program, approving grants, and providing technical assistance to the State and applicants. The State educates potential applicants, works with FEMA to manage the program, and is responsible for implementing and monitoring the grants awarded under the program. Local officials are responsible for identifying damage, providing information necessary for FEMA to approve grants, and managing the projects funded under the PA Program.*

*The PA Program is managed at the Disaster Field Office (DFO) by the Public Assistance Officer (PAO). As the program manager, the PAO advises the Federal Coordinating Officer (FCO) on all PA Program matters; manages the operation of PA Program staff and any coordination between the PA Program and other arms of the Federal disaster recovery effort; works with State counterparts; and ensures that the PA Program is operating in compliance with all laws, regulations, and policies.*

*The PA Program staff consists of field personnel who assist the applicant during the recovery process. These staff members include Public Assistance Coordinators (PACs), Project Officers, and Specialists.”*

### Public Assistance: Pre-Disaster Mitigation versus Disaster Mitigation

A funding source option for mitigation projects is the Public Assistance program of FEMA. This program is for repair, restoration or replacement of municipal facilities damaged by a storm but only when a disaster has been officially declared.

Within the program, there are two avenues of Public Assistance: Pre-Disaster Mitigation and Disaster Mitigation.

As described by Section 104 of the FEMA Pre Disaster Mitigation Program (PDM) Section 404 Property Acquisition and Relocation for Open Space is an example of pre-

disaster mitigation. Damaged property reimbursement after a disaster declaration is another example. Stafford Disaster Relief and Emergency Assistance Act, 42 U.S.C §5121, et seq. Section 406. Under this program. Individual Assistance (includes residences and businesses). It should also be noted that low interest SBA loans for rebuilding are also available. There is also an ONA assistance program available if all the above fail.... (Other Needs Assistance). Disaster Mitigation will only allow reconstruction or restoration to a previously-existing condition. Pre-Disaster Mitigation allows for rebuilding beyond what was previously existed.

### Applying for Public Assistance

Following a disaster declaration by the President of the United States, FEMA provides assistance for recovery from the disaster to eligible applicants. This section describes the process through which this assistance becomes available.

### Process Overview

The PA Program is implemented through the steps listed below, each of which is described in detail in this chapter.

- An Applicants' Briefing is held.
- Potential applicants submit the Request for Public Assistance.
- A PAC is assigned to each applicant.
- The PAC holds a Kickoff Meeting with the applicant.
- The applicant's specific needs are identified and cost estimates developed through the project formulation process.
- Cost estimates for small projects that have been prepared by the applicant are checked through the validation process.
- FEMA approves and processes grants for the applicant's projects.

### Projects

As described by FEMA, a project is a logical method of performing work required as a result of the declared event. A project may consist of one item of work, such as repairs to a single structure, or work that occurs at multiple sites, such as repairs to several washouts along a road. The applicant is responsible for identifying all work that is required as a result of the disaster. The PAC may assist the applicant in combining various recovery efforts into projects.

### FEMA Individual Assistance (IA): Residents and Businesses

FEMA and other federal, state, local and volunteer agencies offer disaster assistance in several forms. Due to the nature of grant funding and the fluidity of Federal Program dollars, grant funding may be different each year.

## **E. Potential Financial Resources**

Along with the important task of being planning for natural hazards, adoption of an approved Natural Hazard Mitigation Plan provides an avenue for pre-disaster funding

for the purpose of mitigating natural hazards. Through the implementation of the Plan, the municipality becomes eligible for Pre Disaster Mitigation and Post Disaster Recovery Grants and Severe Repetitive Loss (SRL) funding.<sup>3</sup> The Stafford Act, Section 406 Funding through the discussed mechanisms is intended to reduce overall risks to the population and structures

If specific mitigation projects or initiatives are included in an approved and adopted Natural Hazard Mitigation Plan, they will be eligible for a grant funding of 75% under the Hazard Mitigation Grant Program (HMGP). The municipality will be responsible for a 25% grant match.

Further, if a disaster declaration is approved, such projects and initiatives will receive funding priority over projects that haven't been included in approved and adopted Plans from other municipalities. If damage occurs to a listed project which specifies that a level of improvement was needed, the grant may be approved for improvement and not just reconstructing to a previously existing level.

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<sup>3</sup> *"These grants are awarded on a competitive basis and without reference to state allocations, quotas, or other formula-based allocation of funds."*

**II THE PLANNING PROCESS (Element A)**

**A. Plan Preparation**

1. Risk Assessment (Overall Planning Process)

The following factors were taken into consideration in estimating the value of a mitigation project to prevent losses. The Planning Team predicted future values by considering:

- a). Hazus-MH data,
- b). Repetitive loss records,
- c). Cost of living increases,
- d). Standard replacement costs,
- e). Restoration to a level beyond previously existing versus improvement to a level of previously existing only,
- f). Evaluate impact of population growth and subsequent property value loss in developing vulnerable areas.

Potential Financial Impact by Natural Disaster

The following table compares natural hazard events with their loss potential and financial impact:

Event	Likelihood	Value	Loss Potential	Value	Financial Impact	Value	Total
Earthquakes	L	1	M	2	L	1	4
Extreme heat	H	3	L	1	L	1	5
Fires	M	2	M	2	L	1	5
Floods	H	3	H	3	H	3	9
Hurricanes	H	3	H	3	H	3	9
Landslides	L	1	L	1	L	1	3
Thunderstorms	H	3	L	1	L	1	5
Tornadoes	L	1	H	3	M	2	6
Winter storms (extreme cold)	H	3	M	2	L	1	6
* Risk: risk of life, limb, property and/or financial impact H= High (3); high priority; M= Medium (2) ; medium priority; L = Low priority (1); a priority; but not high or medium.							

**Table 2:** Potential Financial Impacts from Natural Hazards in the former Midstate Area

Table 2 above is broken down into priorities and likelihood which are rated on by High, Medium, or Low. For the purpose of this and other tables like it the Regional Planning Team (RPT) has set the definitions as follows: a High Priority is one that is of immediate concern and poses a threat to life limb, and property; a Medium Priority is one that is of concern, but poses no great threat to life, limb, or property; and a low priority is one in which no immediate threat is presented. In terms of likelihood High is defined as being an event likely to take place more than once per year; Medium is defined as being an event likely to take place at least once per year; and low is defined as one that is not likely to take place more than every few years. Financial impacts are rated on a 1-3 scale. A rating of 3 is more than \$100,000, a 2 is between \$50,000 and \$99,999 and a 1 is defined as being between \$1 and \$49,999. These definitions are maintained throughout the Plan.

2. Methodology

Recommendations from a variety of sources (listed in each vulnerability section) were used to prepare this Plan and for cost estimates (where appropriate). Each municipality utilizes its own methodology, from the many options as indicated within this Plan. For example, the more populous municipalities such Middletown, Cromwell and Portland, have staff utilizing the more formal methods of assessing Vulnerabilities and costing, the smaller municipalities utilized less formal methods.

3. Land Use Planning

Local planning and zoning regulations take into consideration past hazards when approving applications such as those in the Flood Plain. In the summer of 2008, the former Midstate municipalities adopted the new, revised Flood Insurance Rate Maps (FIRMs) (See Table 20). In some cases flood plains were expanded and municipal planners have taken the changes into consideration.

**B. Regional Planning Team**

The following partners are those participants involved in the Natural Hazard Mitigation process:

The RiverCOG (and its predecessors CRERPA and Midstate) is a regional agency for the purpose of supporting its member municipalities in various categories of planning, both regionally and locally. The planning categories consist of transportation, emergency management, land use and environment as well as numerous support functions (such as GIS mapping) as may be requested. The member municipalities included under this NHMP are Cromwell, Durham, East Haddam, East Hampton, Haddam, Middlefield, Middletown and Portland.

Throughout the duration of the preparation of this NHMP, the RPT has been managed by the board of the former Midstate agency and the agency's Executive Director Geoff Colegrove. Upon the merging of the two former RPAs, that management was passed to the 17-town RiverCOG and its Executive Director Linda B. Krause. Through the course of Plan preparation, the RPT has developed a blueprint for the future impacts of natural

hazards that are based upon events and disasters of the past and probability predictions from state and federal authorities.

Along with the staff of the former Midstate RPA, the RPT consisted of professionals and volunteers from many areas of planning from all eight municipalities. Those involved included Chief Elected Officials, Town Planners, Zoning Enforcement Officers, Building officials, Public Health officials, Public Works officials, Assessors and others. Due to the length of the planning and writing process of this Plan, the RPT had some changes over time. For a full list of RPT member, see Appendix N.

The RPT was supported by a GIS specialist who researched, compiled and implemented HAZUS-MH data for tables that assisted planners in identification of risks to properties in hazard prone areas. (See Tables 8, and 11)

Under the guidance of the former Midstate agency, the municipal working groups, including the input of two municipal engineers and led by the Emergency Management and Public Works Directors, were largely responsible for the gathering of local input for this Plan. The initial meeting was an informational session designed to define the scope of the work anticipated for the development of the NHMP. Subsequent meetings and many telephone and electronic communications resulted in the acquisition of information and proposed mitigation actions reflected in this Plan. For the full list of municipal participants, see Appendix N.

Important contributions were also solicited from members of the public (See Section II.C. and Appendices L and M), engineers and volunteers as well as local and county historical societies. Input, primarily for Continuity of Operations Planning (COOP), was also sought and received from several Middlesex County Chambers of Commerce members.

Sources of historic documentation were found at Middletown's Russell Library and the Middlesex County Historical Society Library.

1. Municipal Participants

Many officials from each municipality were involved in the creation of this Plan. Agency and departmental authorities and responsibilities can be found in Table 19. Responsibilities for municipal Public Works department's participants can be found in Appendix K.

Water and septic/sewer authorities are responsible for overseeing the maintenance, protection planning and growth of such infrastructure. Historical records are used in the mitigation effort by local Planning & Zoning Commission as well as their staff. Control of construction within special flood hazard areas is performed according FIRM (Federal Insurance Rate Maps update to August of 2008) information and through the use of historical records and photographs.

## 2. Technical Support

The eight municipalities of the former Midstate region utilize technical support by taking advantage of State and Federal funding sources wherever possible. For example, under the administration of President Obama, many of the municipalities submitted a list of “shovel ready” projects for possible funding under the Federal Stimulus program; specifically a federal program to energize the local economy. The application requirements were extensive and Federal construction requirements in some cases deterred project implementation.

Subject matter experts were utilized during the planning process; repetitive loss properties, hazardous dams, GIS, HAZUS-MH, meteorologists, historical record interpretation (libraries and historical societies). In addition, Town Engineers from Nathan L. Jacobson Associates were active in the regional planning efforts and local input. These experts are listed in Appendix S. The Risk Assessment is found in Section III.B.1.

## 3. Involvement of the Former Midstate Regional Planning Agency

Many sources were utilized to identify vulnerability at both the local and regional level. Those sources include:

- Personal knowledge. Knowledge and experience is a critical element in developing a NHMP. Those interviewed for such knowledge and experience included former Midstate staff, municipal officials both elected and appointed, emergency management directors, public works officials and municipal planners.
- Local Planning & Zoning Commissions, FEMA HAZUS-MH, Connecticut disaster history, FIRM Flood plain Maps (revised to August 2008).
- Connecticut Council of Municipalities (CCM) Historic Connecticut Scenarios CEO Workshop (2004)
- A subject matter expert on National Flood Insurance Program (NFIP).
- A subject matter expert on area dams.
- Local historical societies
- Public input
- Local information taken from interviews of DEEP and DEMHS personnel were utilized.
- Several Middlesex County Chambers of Commerce member groups were also visited for input, primarily for Continuity of Operations Planning (COOP).
- Each repetitive loss property owner was personally visited by a subject matter expert under contract with the former Midstate agency.
- Private dam owners were interviewed and vulnerable dams were viewed by a dam expert who was also retained by the former Midstate agency.
- A significant number of planning committee meetings were held to address the various sections of the NHMP. Communications including emails and phone calls were used extensively for input and clarifications.

It is noted that the former Midstate agency is active in many areas of regional government and, as a result, the NHMP was discussed in other meetings such as those of the Valley Shore Emergency Management Association.

- Valley Shore Emergency Management Association.
- Middletown's Russell Library and the Middlesex County Historical Society Library were a major source of historic documentation.
- Former Midstate region staff knowledge of local transportation plans, emergency operations plans, potential risk assessments and debris management planning efforts.

### **C. Public Involvement and Plan Review**

From the beginning of the planning process for this NHMP, the public has been involved. Besides the City of Middletown which is the Region's largest city, the other former Midstate municipalities are small communities with public stakeholders tending also to be public officials. Residents and business owners that have been directly impacted by repeated storms have been involved. At least one public meeting (and in several cases more than one) was held in each town where residents were given a chance to voice their opinions regarding the Plan. Officials from neighboring communities and neighboring Planning Agencies were invited to attend any of the public meetings. Notices regarding the meetings were published in local newspapers and agendas were posted to town websites and in each Town Hall. The dates, locations and subjects of the numerous meetings, public workshops and discussions held for the purpose of preparing the Plan are outlined in Appendix L, Table of Public Meetings. Appendix M contains minutes from the various meetings that were held.

On behalf of the municipalities of the former Midstate region, the Mayor of Middletown published a public notice in the Hartford Courant (Appendix D), announcing the Plan development and which advised residents wishing to participate in Plan preparation to contact their local City or Town Hall and to be looking for announcements of a local workshop.

Participation by the public ranged from few individuals to as many as thirty one members of the public in Haddam. Input ranged from an eagerness to help to those with specific issues they wished to emphasize to public officials.

Suggestions for additional input were offered during public workshops, meetings of Boards of Selectmen, meetings of Town Councils and interviews of local businesses and residences.

Competing interests pose a challenge to the planning process and subsequent mitigation plans when access is sought to what is perceived as a limited availability of money for mitigation purposes. A Director of Public Works has a priority list that includes infrastructure in need of replacement and or repair while Public Information Officials are in need of a more robust website for the purposes of disseminating public information.

This listing does not include the significant amount of less formal meetings with the individual municipal Planning Team members.

#### **D. Incorporation of Existing Plans**

The following list presents the various State and Local Plans that were researched and incorporated into this NHMP:

1. State Hazard Mitigation Plan

The following excerpt is taken from the Connecticut State Hazard mitigation plan:

*“A review by Flood Management staff of available FEMA approved local natural hazards mitigation plans indicate that natural hazards concerns are very similar throughout many geographic areas of Connecticut. From highest level of threat to lowest, the following is a list of natural hazards that almost all local plans focused upon:*

1. *Flooding*
2. *High wind events (includes hurricanes, severe thunderstorms, tornadoes, etc.)*
3. *Winter storms/events (includes ice storms, ice jams, nor’easters, etc.)”*

2. CT (local) Emergency Operations Plan (FEMA SLG-101)

3. Connecticut (local) EMERGENCY OPERATIONS PLAN. (FEMA SLG-101)

The following excerpt is from a local Emergency Operations Plans (EOP) Hazard Specific Annex (HSA), section B Flood/Dam Failure:

*Flooding conditions locally can be caused by two significant rain events. One is heavy rains from hurricanes, nor’easters, or stalled major rainstorms. The other, for municipalities on the River, is river flooding caused by significant rain events coinciding with ice and snow runoff (from up River) in the spring...called spring freshets. See HSA D Hurricanes, Attachment 5 for inundation prone areas in the EOPs*

*Dam failures caused by significant rain events (a lot of rain over a short period of time) are a very real possibility here in Southern New England. The DEEP watches our dams closely and rates them. They notify the municipality and or owners of those that are most vulnerable to failure.*

*Hurricanes themselves can cause extremely high tides (tidal surges) on riverfront municipalities, causing flood prone areas to become inundated. To a lesser extent this could also occur with the passing of a major nor’easter that causes Long Island Sound and the River to “back-up”.*

*The National Weather Service, CLIMATE PREDICTION CENTER is a valuable source of warnings of potential adverse weather. [www.cpc.noaa.gov/products/predictions/threats2](http://www.cpc.noaa.gov/products/predictions/threats2)*

4. Other Plans Consulted

Other local and state plans utilized in the preparation of this NHMP include:

Municipal Plans of Conservation and Development  
Municipal Land Use Plans including:  
    a. Zoning Regulations (Comprehensive Plan)  
    b. Subdivision Regulations  
    c. Inland Wetlands Regulations  
Local Sustainability Plans  
Local Capital Improvement Plans  
Redevelopment Plans  
Post-Disaster Redevelopment and Recovery Plans  
Municipal Open Space Plans  
Future Land Use Plans  
Flood Management Plans  
Plans for Special Districts  
Plans for Historic Districts  
Military Base Plan/Redevelopment/Reuse Plan  
College Campus Plans  
CT Department of Public Health – Hazards, Natural Hazard without CBRNE  
Emergency Operation Plans – state and local  
Regional Plans for CRERPA, SECCOG, SWRPA and WINCOG  
Local NHMPs – Guilford  
CT Natural Hazards Mitigation Plan  
Natural Hazard Identification and Evaluation  
Regional Emergency Support Plans (DEMHS Regions 2 and 3)

**III Natural Hazard Identification and Risk Assessment (Element B)**

**A. Identification of Significant Natural Hazards**

This multi-jurisdictional natural hazard planning section addresses events that affect the entire region independent of municipal boundaries. For example, the effect of a dam failure in one jurisdiction that impacts another is included in this section. Hazards discussed in this section include the effects of an ice dam or blocked drainage culvert that impacts upstream areas and wild fires that could impact numerous municipalities.

The assessment section of this Plan considers all the risks of the eight municipalities that could impact the neighboring municipalities. Details of individual municipal risk assessments are summarized in sections addressing municipal vulnerabilities (Annexes A through H).

For this project, local planners and regulators input was based on inventories of existing and proposed buildings, infrastructure and critical facilities (structures), located within hazard boundaries; whether listed in a flood plain or known from local experience as being in a vulnerable area as vulnerable.

1. Weather Events Assessed

The following list of weather events are assessed according to FEMA guidelines:

1. Hurricanes
2. Floods
3. Major Nor'easters
4. Wildfire
5. Tornado
6. Earthquake
7. Severe winter storms
8. Ice Storms
9. Drought
10. Extreme Heat/Cold

2. Special Hazard Characteristics

The following characteristics of special hazards were reviewed:

- Soils (flash flooding)
- Meteorological conditions (hurricanes, wind storms, floods Winter storms)
- Topography (Earthquakes, ice jams, Dams)

3. Profiling Hazards

The profiling of hazards in this report is based on a variety of sources, local municipal input, personal observations of recent events, discussions with state

officials and those citizens who have witnessed hazard events during their residency in the area. A significant amount of information also came from local and regional historical societies, public input and local businesses.

The former Midstate region includes significant elevation differences, numerous streams and the Connecticut River, the largest river in New England. These geographic features contribute to the vulnerability of the area to flooding.

All eight northern RiverCOG municipalities participate in the NFIP and are committed to following NFIP guidelines into the future. When updates are published, as in 2008, staff works with the local planning agencies in the updating of their land use plans. All eight municipalities have adopted the NFIP 2008 update. Those updates and map adoption dates are specified in each Local Town Annex.

When addressing the specific risk of flooding, it should be noted that when the Connecticut River exceeds a flood level of 19 feet, the adjacent section of Route 9 in Middletown floods, jeopardizing transportation along the major north-south road in the northern reaches of the RiverCOG region. Numerous buildings, including Middletown City Hall and other critical infrastructure including two wastewater treatment facilities could be impacted as well along with numerous businesses and residences.

See the Repetitive Loss Properties Part of this Plan and in Annexes A through H for RLP histories.

## **B. Risk Assessment**

### **1. Introduction:**

Housing near water bodies, particularly along the River continues to be desirable, despite the associated risks. As is indicated throughout the Mitigation Strategies (Section IV), acquisition, elevation, and flood proofing are the three best ways to protect properties along the River and in Flood Zones. Current standards throughout the municipalities restrict new construction in Flood Hazard Zones; mitigation efforts are focused on existing structures.

According to the State Natural Hazard mitigation plan, Middlesex County is the 4<sup>th</sup> fastest growing county in the state. The most desirable properties are those along waterways or deep in a forest.

### **2. Assessments utilized by regional and local planners for development of this Plan.**

Risk Assessment is the evaluation of the regions risk by storm type. This risk assessment gains to understand what building, roadway, bridge, culvert, dam, water supply, sewer/septic facilities are vulnerable to a hurricane (high winds, heavy rain & swollen streams), significant rain event (e.g. 1982 rain storm), forest fire, ice storm, snow storm (snow removal costs) ice dam, or other hazard considering the risks to life, limb, property, and financial impacts.

During the planning process, the participating Town officials, commercial property owners, and the public at large took the following into consideration when “thinking” of what their risks are.

### 3. Extent of Risk

The following list describes the *extent* of risk of certain hazards and lists various scales for measuring particular hazards:

- Magnitude/severity /potential strength of hazard. E.g. Category 2 or 3 hurricanes.
- Consideration of using 100 MPH winds for planning purposes.
- The vulnerability section of this Plan discusses possible water rise, wind speed, etc. that could be experienced.
- Technical data is used wherever possible: the Fujita Scale, the Torro Hail Intensity Scale, the Saffir-Simpson Scale, the Richter Scale, the Beaufort Wind Scale and the Palmer Index (See appendices)

Quantitative measurements included are:

- Miles per hour
- Flood depth (River Stages/Gauge)
- Inches of rain
- Fire danger rating
- Acres burned
- Sustained vs. gusts

### 4. State Classifications

Where available, classification methods used are defined. For example, low medium high (low - minimal possibility of a fire spreading; medium - possibility of a fire spreading; and high – high possibility of a fire spreading) is used for danger of the spread of fires by the DEEP Forestry Division.

### 5. History

This investigation reviewed past storm records in an attempt to anticipate the future for land use planning and emergency responses. Those records included information regarding:

- Damage that occurred
- Costs of recovery
- Property damage
- Lives lost/injured/threatened
- Level of severity: flood depth, wind speeds, earthquake intensity
- Duration of event
- Date of occurrence
- Source of information
- Mapped areas affected by the event
- Note, if an area or structure is damaged multiple times its vulnerability priority increases.

- Probabilities quoted are based on statistical measures of the likelihood that the hazard would occur in an area

The historic storm records utilized are summarized and included in Section III.B.2.

6. Assessing Vulnerabilities and Estimating Potential Risk

When assessing vulnerabilities and potential risk, the following factors must be considered when looking at negative impacts:

- The community as a whole (physiological)
- Vulnerable structures
- Vulnerable populations
- Vulnerable infrastructure
- Estimates of losses included:
- Structure, calculated as percentage of replacement loss vs. percentage of loss;
- Contents, calculated as percentage of the replacement value vs. % of loss;
- Functional, calculated as number of days in non-operation vs. daily loss in dollars.

6. Ongoing Risk Assessments

When evaluating mitigation measures the following considerations are to be taken into consideration by the identified responsible entities:

Does the proposed measure prevent losses to a NFIP insurable building?

**Responsibility:** Building Official

Does the measure directly mitigate the effects of a frequent natural disaster such as flooding or high winds?

**Responsibility:** Emergency Management

Will the measure result in a long-term solution to a flooding problem & require minimum maintenance?

**Responsibility:** Planning and Zoning authority

Is the proposed measure multi-dimensional (coupling construction with planning)?

**Responsibility:** Building Official and Planning and Zoning authority

Training or improved response systems?

**Responsibility:** Emergency Responders

Does the proposed measure provide benefits to a large population of an area (e.g. infrastructure improvements such as culvert upgrade, bridge replacement, and public education)?

**Responsibility:** Public Works

Does the project represent an innovative approach which can serve as a pilot project in another jurisdiction?

**Responsibility:** Town and COG planners

Does the project have a Benefit to Cost Ratio greater than 1:1 (projects which use a FEMA approved model to prove their benefits are considered more approvable than projects that only present benefits without supporting documentation)?

**Responsibility:** COG

Will the mitigation measure eliminate future vulnerability to a common natural hazard (e.g. land acquisition, elevation of buildings, hurricane clips, etc.)?

**Responsibility:** COG and Planning Team

Does the project protect a critical facility or community service such as a police station or school?

**Responsibility:** COG and Planning Team

Is the proposed measure located in a community that has recently or repeatedly suffered damages from natural disasters?

**Responsibility:** COG and Planning Team

#### 7. Infrastructure and Structures at Risk in Consideration

The following is a list of examples of infrastructure and structures at risk:

##### Infrastructure:

- Roadways: bridges at risk, insufficient or deteriorated culverts, deteriorated wing walls, poor drainage, those that frequently flood during freshets or significant rain events
- Drainage systems insufficient (or nonexistent) to handle rain fall greater than 4", 6", 8" etc.
- Dams at risk including developing beaver dams/complexes
- Buildings at risk of flooding (repetitive loss records)
- Facilities with only one access route (a safety issue)
- Water Treatment facilities
- Waste water Treatment facilities
- Public areas (e.g. ball fields, recreation facilities, parking lots, etc.) prone to liquefaction or saturated soil conditions
- Municipal facilities prone to damage due to lack of tree pruning (knowing that the clearing of foliage is not eligible for grant funding under this program)
- Sufficient equipment to handle a major snowfall, downed tree work, debris disposal, etc. Especially pay loader mounted grappling hooks and or a tub grinder (or contractual accessibility to one)
- Building stock: residential, commercial industrial, institutional, municipal, etc.

##### Critical Facilities:

- Essential to health and welfare of the whole population that are at risk of identified hazardous events.
- Include service losses as well as facility damage and content projections
- Fire stations EMS Barns, PW facilities, medical care facilities, police stations, shelters, schools, and special needs clusters.
- Transportation Systems;

- Highways
- Roads accessing critical infrastructure
- Bridges accessing critical infrastructure
- Pedestrian tunnel under Route 9 in Middletown
- Docks

Lifeline Utility Systems:

- Water Supply
- Waste Treatment facilities
- Electricity
- Natural Gas
- Petroleum

Communications Systems

- Telephone substations
- Emergency service radio systems
- TV, Radio etc.

High Potential Loss Facilities

- Power plants, dams, etc.
- Hazmat Facilities; manufacturing, transit and/or storage
- Economic Elements; facilities in a vulnerable area where damage could significantly affect local or regional economy if interrupted.
- Special Consideration Areas; High density residential commercial, etc. that if damaged could result in economic and or functional losses and in high death tolls and injury rates.
- Historic cultural and Natural Resource areas;

Special consideration was given to sheltering (including in-place for people with functional needs or fixed populations that are vulnerable to power outages, blocked roadways for access, etc.

Because of recent special legislation pet sheltering planning was also given special attention (see Appendix C).

Dams at Risk

The Planning Team and the former Midstate region retained the services of a dam subject matter expert, Gene Robida, P.E. of Robida Engineering for analysis of the DEEP dam listings for the region. Site inspections made by Mr. Robida included those that were known, in his opinion, to need updating. The dam summary report can be found in the **Flood Section (III.C.1)** of this Plan with the individual reports contained in each Annex.

Dam safety is significant because upstream flooding caused by significant rain events can impact dams throughout the entire region. Rain associated with hurricanes, nor'easters and other major rain events can trigger dam failures in a

sudden manner with little or no warning. Significant earthquakes, although not common, could also create structural deterioration that could promote dam failure in a future rain event. The failure of dams that are in some state of disrepair can be accelerated by these significant rain events.

The hazard classification of a dam is determined by the CTDEEP. The hazard classification for a specific dam is based upon the potential damage to the life or property that is located downstream of the dam if it were to fail.

The hazard classification of a dam is not an indication of the condition of the dam. The dam must be inspected by the CT/DEEP dam safety files

8. Economic Risk Factors (Cost/Benefit considerations):

Section 201.6(c) (3) (iii) of the US Code requires that “*mitigation actions measures are directly related to the cost to repair or replace the vulnerable structure. The financial shortfall of the mitigation of the vulnerability is cost less outside funding (net) [if cost sharing] available includes the ability of the municipality to respond, withstand and recover equals what the municipality must budget for. C-Funding=Budget Line Item. The mitigation strategy section shall include] an action plan describing how mitigation actions will be prioritized, implemented, and administered by the local jurisdiction.*

*Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated. The Vulnerability Section summarizes the vulnerable items, mitigation strategy and cost (if available).”*

When prioritizing mitigation actions, the former Midstate Region municipalities considered what would result from the mitigation actions versus the cost of those actions. Where possible, particularly during the prioritization exercise the planning team conducted a benefit versus cost analysis for projects in order to prioritize vulnerabilities for the mitigation action item lists. Those lists are found in Section IV.H, IV.L and the municipal Annexes A through H.

Mitigation projects will come under cost-benefit scrutiny by all stakeholders with the understanding that money for such projects is limited.

Cost calculations for estimating future expenses for structures and infrastructure; (other than as identified in the Vulnerability Section of this Plan, that are adjacent to streams, in designated flood plains, or in the watershed areas) are impossible to calculate at this time. For example, the increasing of the size of a culvert could exacerbate downstream problems. Therefore a multi municipal (regional) engineering study must be done before work begins.

Future Mitigation Cost Estimate Methodology (Cost Benefit Strategies)

The potential of natural hazards played a factor in prioritization of projects. For example a cost-benefit for a low probability hazard (tornado) will not supersede a high cost-benefit flood control project. Several projects were and will be discounted as not viable as the cost-benefit may not be reasonable. Though not cost-benefit specific, many local Vulnerabilities such as low lying flood prone state roads are State owned; therefore, it is not up to the municipalities to carry out a cost benefit analysis. The potential negative environmental impact of a desired project may outweigh the benefit strategy.

9. Compliance

Former MRPA staff worked with local officials in describing required mitigation actions to be included in this mitigation plan. The local municipalities in the Annexes describe the results of prioritizing the actions, to minimize risk; including realistic possibilities of implementation. Local Mitigation Action Plans Section I

Considerations that may be used to prioritize the action plan include compliance with local regulations and State law plus social impact, technical feasibility, administrative capabilities, political and legal effects, and economic, as well as environmental issues.

Elements of the FEMA guideline called STAPLEE were utilized in the planning process and are recommended to be utilized in the future to evaluate potential actions for mitigation strategizing.

10. Other Considerations:

Other considerations in the analysis of potential impact of dams include:

Residential and business in flood plain or watershed, with no history; but are at risk.

Dams at risk, unnatural dams (beavers)

Residential areas with only one way in & out (a safety issue)

Areas (e.g. ball fields, parking lots, road beds) prone to soil liquefaction,

Roadways: bridges at risk, insufficient or deteriorated culverts, deteriorated wing walls, poor drainage, those that frequently flood during freshets or significant rain events, etc.

Street Drains: back flow during freshets

Municipal facilities prone to damage due to lack of tree pruning

Small Streams that are not classified as having an associated flood plain are susceptible to significant rain events

Risk Factors for Non-Municipal Owned Facilities (Private/Public areas of concern) include NGOs:

Of concern to the municipalities are roads, bridges, culverts and dams that are State or privately owned.

The State Department of Transportation recommends that problems involving state roads/structures be reported every time they occur so that DOT can

coordinate an evaluation of the problem. State of Connecticut agencies are also able to apply for hazard mitigation funding and should be encouraged to do so.<sup>4</sup>

Risk of Non-Municipal Owned Dams:

See the Dam Summary (See Section III.C.1.c) and the dam failure sections in the Annexes for listings and responsibilities of dam owners.

Risk Consequences Taken into Consideration, if No Mitigation Actions Taken:

The following risk consequences must be taken into consideration if no hazard mitigation efforts or actions are taken:

- Mandatory Evacuations; people with functional needs being evacuated first
- Sheltering capability
- Risk of damage to critical municipal vehicles.
- Damage to critical infrastructure
- Challenges of notifications to evacuate

Cause and Effect:

The following list of natural hazards is included with potential effects on particular facilities:

- a) Rain -
  - dams
  - structures in flood plains
  - Evacuation of vulnerable populations
  - Damage to municipal vehicles not dispersed
  - Sewage Treatment/Septic failures and public health issues
- b) Wind -
  - Recovery; Requires TDSRS<sup>5</sup> activation
  - Power outages
- c) Ice/Snow Storms -
  - Power outages
  - Blocked evacuation routes
  - Blocked access to critical infrastructure
  - Recovery; requiring TDSRS activation
- d) Wildfires –
  - Forests in the region are made up of primarily large, old-growth trees.
  - There currently is no “wildfire plan” in place at the DEEP

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<sup>4</sup> From SECCOG HMP

<sup>5</sup> Temporary Debris Storage and Reduction Site

- Forestry Division: Having said that; we do have experience working with forest rangers and with local municipalities on fighting forest fires.
- Periodically foresters and the public are allowed into the forest to cut timber/firewood. But brush is allowed to remain posing an additional problem.

### **C. Natural Hazards**

This section contains details on potential natural hazards that could affect the area and have adverse effects including personal injury, loss of life, business interruption, damage to structures, and financial losses. Though the impacts of such weather related hazards can be devastating, in some cases the damage can be localized. Information regarding floods and hurricanes includes greater detail as they are the most likely natural hazards to occur in the RiverCOG Region. HAZUS-MH Reports are included in this plan for both of these hazards as well as earthquakes See Appendices A,B, and C). Specific discussions on local municipal issues concerning natural disasters can be found in the individual Annexes A through H.

The profiling of hazards in each municipality is based upon a variety of sources and personal observations of recent events as well as discussions with those who have experienced natural hazard events. Public meetings provided forums for concerns to be presented that augment issues already understood.

Each of the eight municipalities in the former Midstate region is vulnerable to many types of natural hazards. Flooding is by far the most significant natural hazard with the potential to cause the most harm to people, property and infrastructure and to cause financial losses. The second greatest threat is from hurricanes (which include impacts of flooding in addition to high winds). Therefore, the focus of this Plan is on these two most prevalent natural hazard impacts. Due to the impacts of Tropical Storm Irene in 2011, discussions of the impacts of tropical storms are included with those of hurricanes and other wind events. Tropical storms feature sustained winds up to 74 miles per hour; a storm is classified as a Category 1 Hurricane if sustained winds reach 75 mph.

Due to the size and path a hurricane may take, damage is typically widespread. Coastal flooding is a possibility due to high wind and inland flooding is a possibility because of high rainfall totals. High winds can bring down trees and power lines, cutting the power supply for long periods of time.

#### Relative Likelihood of Natural Disasters, including Financial Impact:

The following table shows the relative probability of the occurrence of natural disasters and shows relative priority levels for each type of hazard. The definitions of high, medium and low and the 1-3 rankings can be found in Section II.A.

EVENT	Relative Probability	Value	Loss Potential	Value	Financial Impact	Value	Total
Earthquakes	L	1	M	2	L	1	4
Extreme heat	H	3	L	1	L	1	5
Fires	M	2	M	2	L	1	5
Floods	H	3	H	3	H	3	9
Hurricanes	H	3	H	3	H	3	9
Landslides	L	1	L	1	L	1	3
Thunderstorms	H	3	L	1	L	1	5
Tornadoes	L	1	H	3	M	2	6
Tsunamis	-	-	N/A	-	N/A	-	-
Volcanoes	-	-	N/A	-	N/A	-	-
Winter storms (extreme cold)	H	3	M	2	L	1	6
* Risk: risk of life, limb, property and/or financial impact							

**Table 3:** Probability of Natural Disasters and their Financial Impacts on the Former Midstate Planning Area.

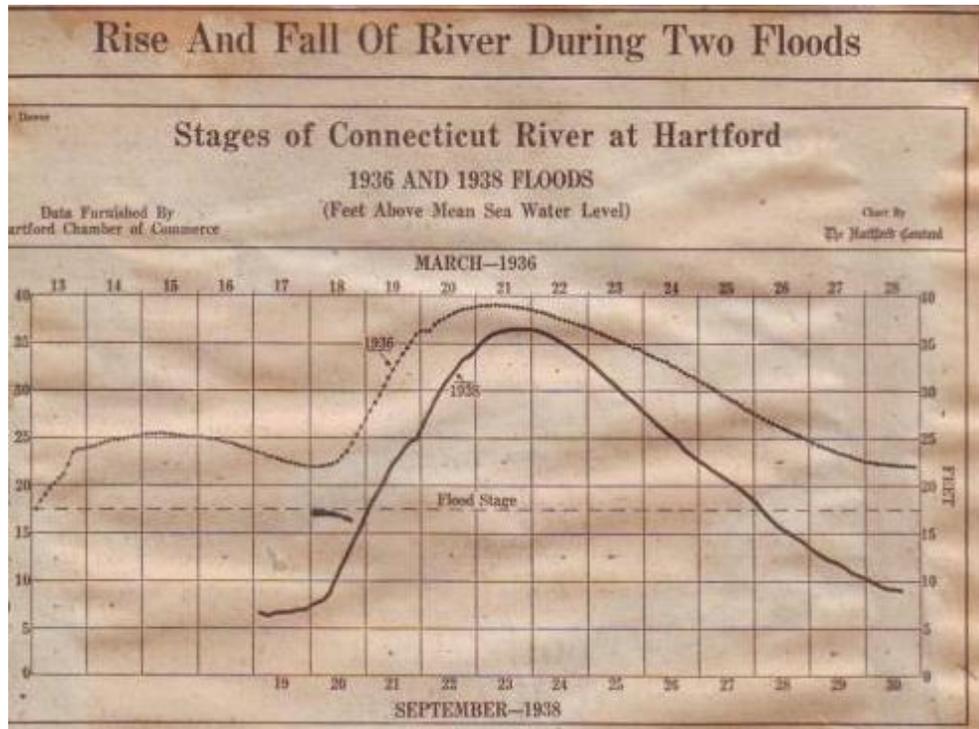
### 1. Floods

According to the USGS, during the 20<sup>th</sup> century, floods were the number one natural disaster in the United States in terms the number of lives lost and property damage experienced. For more than 110 years, the U.S. Geological Survey (USGS) has measured floods for the Nation’s benefit while supplying additional stream flow data with its extensive stream-gaging network. Thirty-two of the most significant floods (in terms of number of lives lost and (or) property damage) in the United States during the 20<sup>th</sup> century are listed according to the various types of floods.

There are four types of floods covered in this section, Flash Floods, Seasonal River Floods, Floods caused by Dam Failures, and floods caused by Ice Dams.

The most notorious and memorable floods within the RiverCOG region are those of 1936, 1938, 1982, and 1984. The 1936 and 1984 flooding were higher than usual Spring Floods, while the 1938 flooding was caused by the Great Hurricane of 1938 and the 1982 flood was caused by a stalled rain storm over the region which dropped as much as 16 inches of rain in three days in some part of the region.

The following newspaper clipping from the Hartford Courant presents a comparison of flood stages between the flood of 1936 and the Hurricane of 1938:



**Illustration 1:** 1936/1938 Flood Stage Comparison along Connecticut River

**Source:** Hartford Courant Archives

The most vulnerable areas to flooding are located within the mapped, low-lying flood plains of the Connecticut River (see Map 4). The six former Midstate Region municipalities on the River – Cromwell, Portland, Middletown, East Hampton, Haddam and East Haddam - have structures in or adjacent to flood hazard areas. Only Durham and Middlefield are in inland locations away from the Connecticut River.

The structures are primarily residential with several being seasonal as opposed to year-round. Exceptions to this statement include non-residential structures such as the Haddam Town Garage and the Middletown Harbor Park building, which is currently housing a restaurant under contract with the City of Middletown. The Middletown Wastewater Treatment plant adjacent to the Connecticut River is also at risk, although it is scheduled for closure. Cromwell’s Main Street and the regional Mattabassett Wastewater Treatment Plant are also at risk in the event of exceptional river flooding. In East Haddam, the privately-owned Goodspeed Airport and the numerous small private planes that are housed in the hangars there are at risk for flooding as well.

Through recorded history there have been seven federally declared<sup>6</sup> Connecticut flood disasters<sup>7</sup>. According to the CT State Hazard Mitigation Plan, the state is subject to severe flooding once every five years on average.

The following summaries provide insight into the generation of various regulations impacting flood plain management:

1. **Flood plain Development Regulations**  
The Inland Wetlands and Watercourses Commissions administer the Wetland Regulations. The regulations restrict development in flood plains, wetlands, and other flood-prone areas.
2. **Flood plain Planning**  
Land Use Planners develop and maintain the local Plan of Conservation and Development.
3. **State Mitigation Strategy Actions**  
Since 1982 the State of Connecticut has undertaken several mitigation measures, which reduced the damage caused by Tropical Storms or hurricanes. The installation of an Automated Flood Warning system in 1986, and its subsequent expansions in 1992, 1996, and 1998, to include the State's most flood prone rivers. Emergency management will monitor these notifications.

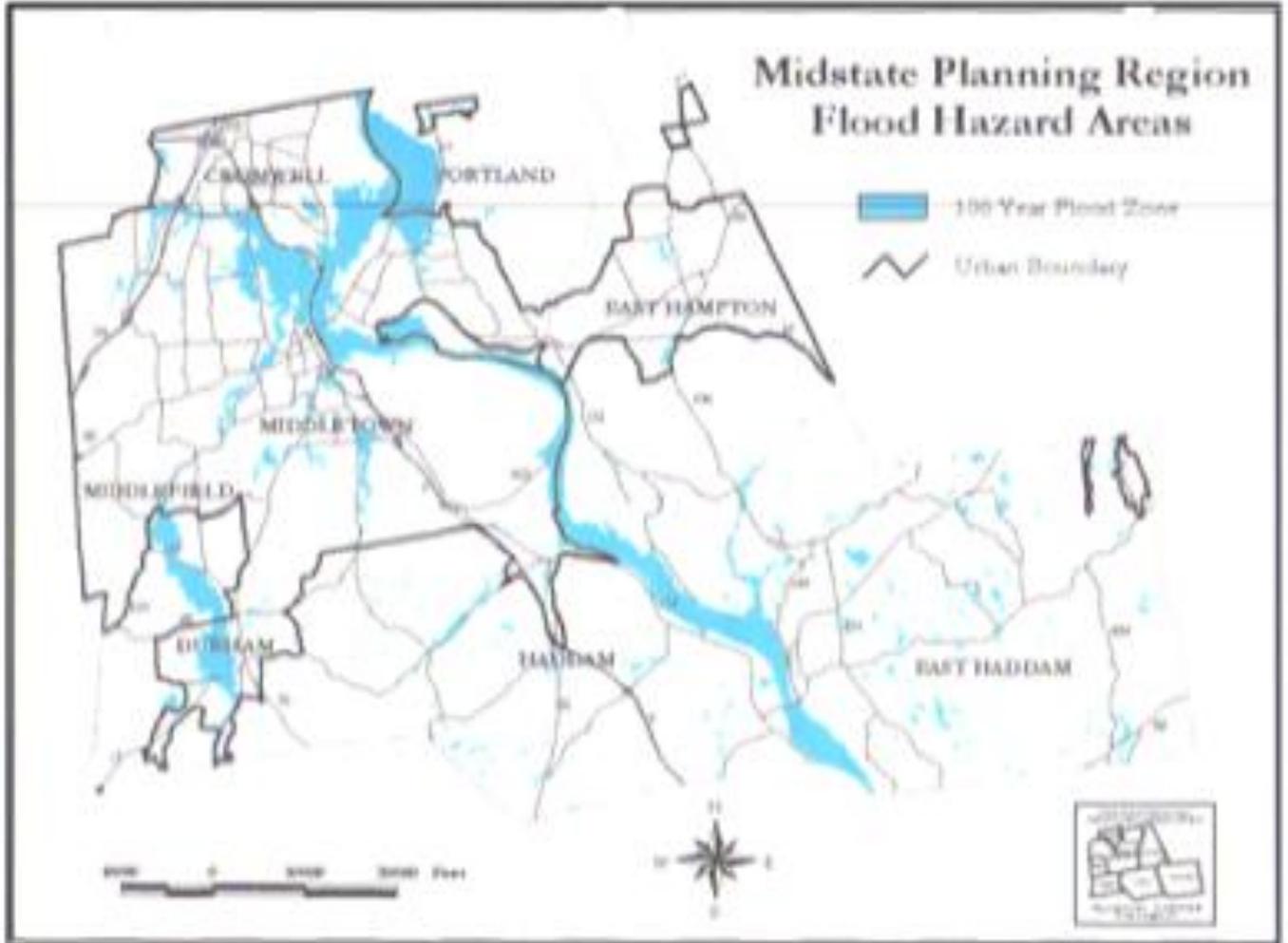
The State (DEEP and DEHMS) activates its flood prediction center when conditions are optimal for a flood condition providing local official's time to activate a monitoring of at risk dams. Dam Watch – a new electronic, Internet-based solution is in place at the Department of Energy and Environmental Protection to give state inspectors the ability to constantly monitor the conditions of the state's 234 dams during adverse weather conditions.

4. **Regional Flood Hazard Areas**  
In the eight municipalities of the former Midstate Region, flooding is by far the most significant natural hazard with the potential to do harm to people, places and things.

Two particular types of flood events tend to impact the region; flash floods and river flooding caused by rain events located within the drainage basin.

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<sup>7</sup> *Certain criteria must be met in order for the President to accept a request for a disaster declaration from a county or state making them eligible for disaster funding. (County \$3.05/capita & Statewide \$1.22 /capita)*



**Map 4:** Flood plains in former Midstate Planning Region.

Source: Former Midstate Planning Region

a. Flash Floods:

Because the RiverCOG Region is characterized as having significant topographic elevation differences and many streams, flash flooding has the potential to create significant impacts in all of the region’s eight municipalities. The erosive effects of fast flowing water as it moves toward the Connecticut River can create significant problems.

Flash floods are caused by significant amounts of rainfall occurring in a short amount of time. These floods can be violent and come without any advanced warning. Flash floods are characterized by high velocity flowing water often accompanied with debris. Flash floods often cause significantly greater damage than riverine flooding.

Flash flooding can be localized such as when a storm cell stalls over an area, such as the case was in 1982. The 1982 flood was caused when approximately sixteen (16) inches of rain fell within a 24 hour period. In the southern RiverCOG

towns of Chester, Deep River and Essex – located south of the former Midstate Region towns – upwards of fourteen (14) to eighteen (18) inches of rain fell during the same period. In Haddam, rainfall was measured at about 16 inches during that period.

Flash floods are the most dangerous flooding condition as is evidenced by the history of flooding in the area. There are 6 high-hazard and 19 significant-hazard dams in the region many of which could be breached by a sudden surge of a large amount of runoff (flash flooding). The many small streams throughout the region are vulnerable to flooding, putting the properties near them at risk.

During the flood of 1982, Town of Haddam experienced significant flooding of its downtown Higganum Center when several dams upstream along Candlewood Brook burst, the largest having been the Upper Pond Dam, sending a wave of water downtown where three streams converge. More details of that flood are included in Annex E; Haddam Natural Hazard Mitigation Annex.

As noted, continuous rain over an extended period of time (days) can create significant problems for the area's infrastructure. Aging roadways are susceptible to washouts and bridges and culverts can be overwhelmed. Even secure bridges can lose wing walls and approaches, leaving the bridge itself undamaged but without roadway approaches.

The most damaging flood events tend to accompany hurricanes. As outlined in the Hurricane Section of this Plan, there are two significant consequences of a major hurricane; impacts from wind and flooding. Hurricane flooding poses the threat to our rivers, streams and dams.

Ground condition and soil characteristics are factors in the potential for damage from flowing water. The ground can quickly reach its saturation point after back to back rain events, sending the water into streams more quickly. Frozen soils can cause the same effect. In these cases, the natural absorption of rain into the ground water system is prevented and surface flooding results. Similar soil saturation conditions can occur if a slow-moving heavy rain event lasting several days moves through the area.

In all of these situations, the region's streams become swollen and overflow their banks onto flood plains and fill culverts and overwhelm undersized bridges resulting in street flooding. In either case, it should also be noted that unusually heavy rain events can also contribute to dam failure which can result in downstream impacts and losses.

Exacerbating water flow problems during floods are situations where a bridge or culvert becomes clogged with debris or, in some cases, ice. In such cases, the bridge can act as a dam with damaging results including road flooding, and flooding of properties upstream of the bridge.

b. Seasonal River Flooding:

Seasonal River flooding can result from large rainstorms that impact a significant portion of the Connecticut River watershed from Long Island Sound to the Canadian border. Another more typical cause of this seasonal flooding is the melting of snowpack within the same watershed area during warmer spring months. Significant river flooding caused in these manners occurred in 1936 and 1984. Of the eight northern RiverCOG towns included in this Plan, only Durham and Middlefield are not vulnerable to major river flooding from these mechanisms because they are not located on the Connecticut River.

Of the seasonal floods recorded, the seasonal flooding in 1936 was the most significant with the river level reaching a flood stage of 31 feet. When the Connecticut River reaches a flood stage of 19 feet, Route 9 in Middletown in the Harbor Park area is overtopped with flood waters. During the past 200 years, the Connecticut River flood stage has exceeded 19 feet a total of 21 times.

During the 1936 flood, which was by far the greatest flood in recorded history, the old automobile between Middletown and Portland was closed due to a concern that the river level would cover the roadway. In addition to inundation, there was a buildup of debris above the road level against the steel trusses which further exacerbated the danger. The current Arrigoni Bridge, which has a clearance of 90 feet, was completed two years later in 1938. It opened on August 6, 1938, a month before the Hurricane of 1938.



**Photo 2:** Railroad bridge; view is toward Portland during the Flood of 1936  
Source: Middlesex County Historical Society Library



**Photo 3:** Aerial Photograph of the 1936 Flood in Middletown, Connecticut  
Source: Middlesex County Historical Society Library



**Photo 4:** Harbor Park Restaurant (now Canoe Club) during the Flood of 1984  
Source: Mario of Marcos Deli

The following table includes a listing of floods in the Connecticut River in Middletown. The list was kept at the Middletown Yacht Club (now Middlesex Yacht Club), formerly located in the Harbor Park area. Not all entries in the original list were legible as the chart was damaged by flood waters during the 1938 flood.

Rank	Feet Above Flood Stage	Date
1	31.0	Saturday, March 21, 1936
2	25.8	Saturday, September 24, 1938
3	24.5	Wednesday, May 02, 1934
4	22.7	Monday, November 07, 1927
5	22.6	April 2, 1801
6	22.6	Saturday, February 04, 1905
7	21.3	Saturday, June 02, 1984
8	22.4	Saturday, August 20, 1955
9	21.8	Spring 1843
10	20.8	April 1859
11	20.7	April 18, 1869
12	20.4	April 1, 19?
13	20.4	Monday, October 17, 1955
14	19.7	Friday, October 8, 1869
15	19.5	Wednesday, April 10, 1901
16	18.7	Thursday, April 07, 1960

**Table 4:** River Flood History for Flooding Events with River Levels Greater than 18 Feet Above Flood Stage.

c. Dam Failure<sup>8</sup>

1. Introduction

The State Department of Environmental Protection requires the registration of all dams over the height of six feet. The Dam Safety Section of the Inland Water Resources Division of DEEP is responsible for administering and enforcing Connecticut’s dam safety laws. The existing statutes require that permits be obtained to construct, repair or alter dams, dikes and similar structures and that existing dams, dikes and similar structures be registered and periodically inspected to assure that their continued operation and use does not constitute a hazard to life, health or property.

2. History

<sup>8</sup> MRPA retained the services of a dam subject matter expert for input to this section.

(Data source: DEEP)

Many of the dams in the RiverCOG region were built to power mills downstream when industry relied on water power. Today, although unused for powering mills, many dams remain as they have created attractive ponds upstream.

In Connecticut, numerous dam failures have occurred. The two most catastrophic events were in 1963 and 1982. In 1963, the Spaulding Pond Dam in Norwich failed and caused six deaths and \$6 million in damage. In 1982, severe flooding caused 17 dams to fail and damaged 31 others, resulting in losses totaling approximately \$7 -million. The Town of Deep River suffered the greatest loss (\$50-million) when the Bushy Hill Pond Dam failed.

Dam failures often occur in conjunction with flooding when the dam breaks under the additional force of floodwaters. In addition, a dam failure can cause a chain reaction where the sudden release of floodwaters causes the next dam downstream to fail. For example, during the flood of 1982, small dams upstream along Candlewood Brook in Higganum failed, causing the Upper Pond Dam to fail, sending a wall of water washing downstream over Higganum Center.

### 3. Dam- and Levee-Failure Floods

Often today, dams and levees are built for flood protection; however, dams may be built for a variety of reasons. They usually are engineered to withstand a flood with a computed risk of occurrence in that location. If a larger flood occurs, then that structure will be overtopped, a condition where water washes over the top of the dam. If during the overtopping the dam or levee fails or is washed out, the water behind it is released. Failed dams or levees can create floods that are catastrophic to life and property because of the tremendous energy of the released water.

### 4. Dam Risk Assessments

Serious flooding conditions in the region are caused by the heavy rains from hurricanes, nor'easters, or stalled major rainstorms.

Dam failures can be caused by these significant rain events (high rainfall totals over a short period of time). DEEP inspects dams on a recurring basis and reports to owners on suggested maintenance or repairs.

### 5. Dam warning sites

For a listing of all Northeast Warning sites, See:

<http://www.ct.gov/oem/cwp/view.asp?A=1198&Q=252714>

### 6. Northern RiverCOG Significant and High Hazard Dams:

In the northern eight RiverCOG municipalities, there are twenty-five (25) Significant and High hazard dams.

6 High Hazard dams - Class C  
19 Significant Hazard dams - Class B

### **Dam Ownership**

12 of the dams are owned by the State of Connecticut;  
4 of the dams are owned by municipalities;  
9 of the dams are privately owned.

All of these dams are discussed in more detail by municipality in the municipal Annexes, A through H.

### **Dam Classifications**

DEEP assigns dams to one of five classes according to their hazard potential:

Class AA: negligible hazard potential dam which, if it were to fail, would result in no measurable damage to roadways, land and structures, and negligible economic loss.

Class A: low hazard potential dam which, if it were to fail, would result in damage to agricultural land, damage to unimproved roadways, or minimal economic loss.

Class BB: moderate hazard potential dam which, if it were to fail, would result in damage to normally unoccupied storage structures, damage to low volume roadways, or moderate economic loss.

Class B: significant hazard potential dam which, if it were to fail, would result in possible loss of life; minor damage to habitable structures, residences, hospitals, convalescent homes, schools, etc.; damage to or interruption of the use or service of utilities; damage to primary roadways and railroads; or significant economic loss.

Class C: high hazard potential dam which, if it were to fail, would result in the probable loss of life; major damage to habitable structures, residences, hospitals, convalescent homes, schools, etc; damage to main highways; or great economic loss.

The classification of a dam can change due to changes in downstream development. 83% of dams in Connecticut fall within the negligible to moderate hazardous categories while only 17% fall within the significant and high hazard categories.

DEEP keeps track of which dams have emergency plans but not all of them would be up to date and not all dam owners will want those plans shared publically. Only the larger significant and high hazard dams would typically have an emergency plan with inundation areas but not all do as it is not yet mandated by state statute or regulation.

Town	Dam ID#	Name	Hazard Class	Ownership
Durham	3801	YMCA Pond Dam	B	Privately Owned
	3802	Miller Pond Dam	B	CT DEEP
East Haddam	4103	Leesville Dam	C	CT DEEP
	4102	Moodus Reservoir Dam	B	CT DEEP
	4109	Boardman Pond Dam	B	Privately Owned
	4113	Bashan Lake Dam	B	CT DEEP
	4114	Pickerel Lake Dam	B	CT DEEP
East Hampton	4204	Artistic Wire Company	B	Privately Owned
	4206	Lake Pocotopaug	B	Privately Owned
Haddam	6101	Higganum Reservoir Dam	C	CT DEEP
	6102	Scovill Reservoir Dam	C	Privately Owned
	6107	Hidden Lake Dam	B	Privately Owned
Middlefield	8201	Beseck Dam	B	CT DEEP
	8204	Coginchaug River Dam	B	Privately Owned
Middletown	8301	Crystal Lake Dam	C	CT DEEP
	8307	Dooley Pond	C	CT DEEP
	8302	Adder Reservoir Dam	B	City of Middletown
	8303	Mt. Higby Reservoir	B	City of Middletown
	8305	Butternut Hollow Dam	B	City of Middletown
	8310	Hubbard Pond	B	CT Valley Hospital
	8315	Highland Pond Dam	B	Privately Owned
	8322	Asylum Reservoir #1	B	CT Valley Hospital
Portland	11301	Portland Reservoir Dam	C	Town of Portland
	11302	Great Hill Pond Dam	B	CT DEEP
	11304	Kelsey Pond Dam	B	Privately Owned

**Table 5:** Significant and High Hazard Dams in the northern RiverCOG area.

d. Ice Dams (a.k.a. Ice-Jams)

An ice dam (or ice jam) occurs when water builds up behind a blockage of ice. Ice dams can occur in various ways including ice blocking an unfrozen river and a thawing river being blocked by a still-frozen section further downstream.

Ice dams can and do occur in the RiverCOG region. Ice Dams pose a potential hazard wherever bridges and culverts exist. Narrow waterways can be jammed by breaking up blocks of ice in late winter or early spring. The “Tax Day Flood of 2007” was caused mostly by ice jams upstream.

According to the FEMA Guidebook for Local Officials:

*“Ice-jam floods occur on rivers that are totally or partially frozen. A rise in stream stage will break up a totally frozen river and create ice flows that can pile up on channel obstructions such as shallow riffles, log jams, or bridge piers. The jammed ice creates a dam across the channel over which the water and ice mixture continues to flow, allowing for more jamming to occur. Backwater upstream from the ice dam can rise rapidly and overflow the channel banks. Flooding moves downstream when the ice dam fails, and the water stored behind the dam is released. At this time the flood takes on the characteristics of a flash flood, with the added danger of ice flows that, when driven by the energy of the flood wave, can inflict serious damage on structures. An added danger of being caught in an ice-jam flood is hypothermia, which can quickly kill.”*

1. Ice Dam history: East Haddam

Ice dam related flooding has historically been a problem along the lower Salmon River in the Leesville area of East Haddam. Ice Dams have occurred here in: 2007, 2000, 1994, 1982, 1940, and 1910.

In the ice dam event in February 1982 ice flowed over the Leesville Dam and jammed at the Route 151 Bridge. Many residents in the area believe the lowering of the Leesville Dam and removal of its control gates has resulted in increased ice jam activity in the area below the dam. Historical evidence supports this presumption as similar winter ice dams occurred in January 1910 and 1940 when structural damage to the Leesville Dam allowed ice to flow out of the impoundment area.

In 1994 a similar event occurred as a result of a break-up of thick river ice in response to a sudden increase in discharge by snow melt and rainfall. The ice jam formed about a half mile downstream of the Route 151 Bridge and progressed back to about 500 feet downstream of the dam. This jam caused water levels in the river to rise, flooding several homes and Powerhouse Road.

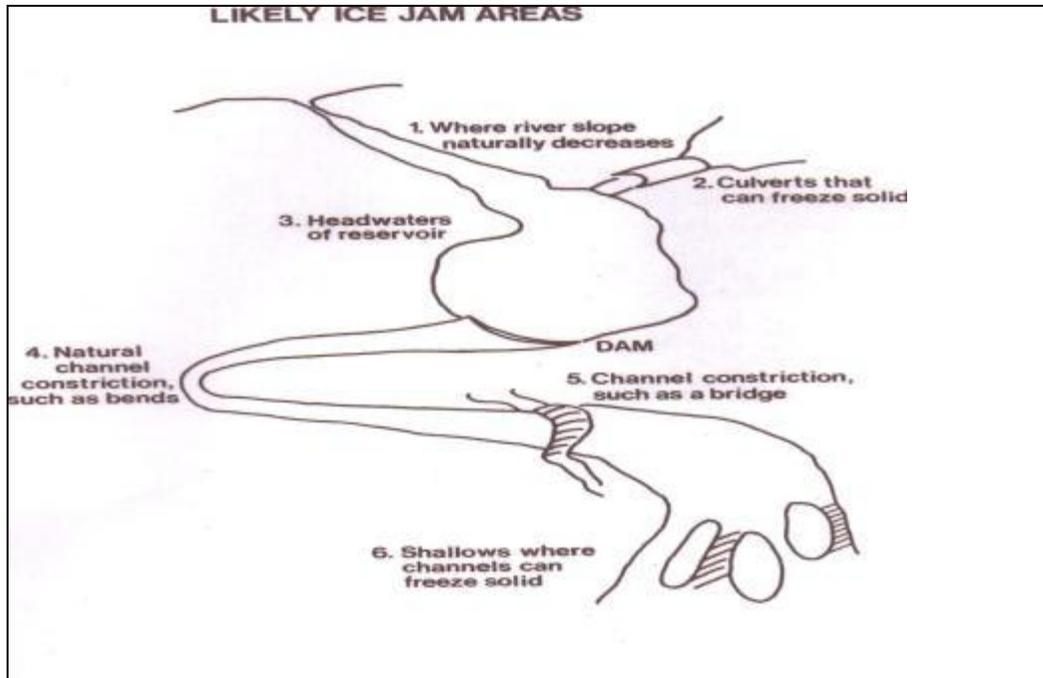
The ice dam in 2000 resulted in local road closures. The then Department of Environmental Protection and Department of Transportation completed a total rebuild of the Route 151 Bridge (DOT) and the Leesville Dam (DEEP). However in the April 2007 (Tax Day Storm of 2007) a major ice

dam situation occurred. The bridge construction equipment still on site was utilized to break-up the ice which was causing the damming of the Salmon River.

2. Other Ice Dam Risks in the Region:

If conditions are right and the Connecticut River is frozen solid above the Arrigoni and Railroad Bridges, Middletown, Cromwell and the Mattabassett Sewer Treatment Plant are vulnerable to flooding and damage when the ice breaks up suddenly. Large pieces of ice coming ashore can cause major damage downstream.

Any bridge, culvert or bottleneck in a stream is vulnerable if the conditions are right, for an ice jamming situation.



**Illustration 2:** Diagram of Ice Jams

Source: FEMA Reducing Losses in High Risk Flood Hazard Areas: A Guidebook for Local Officials – Ice Dams.

A nor'easter can exacerbate an ice jam problem. The backing up of tidewater in the Connecticut River would also back-up waters in the streams that flow into it. This can result in a greater build-up of water above ice dammed areas. Before the break-up, large ice cakes can be pushed ashore causing damage to structures and gouging of the shoreline. When the dam breaks up, the built up water and ice cakes will rush downstream. The Salmon River ice dam problem is vulnerable to this condition.

Examples of ways to minimize the effects of an ice dam include placing certain products in or on the ice to encourage melting: dynamite, black coal dust (if available), and black rubber blankets (available from garden centers that sell fish pond materials).

3. Ice Jam Mitigation Strategies

A full list of mitigation projects can be found in Section IV.H. Below are two possible mitigation actions:

- Vegetation management near bridges and culverts to reduce water restrictions.
- Ice Jam Plan: A plan including availability of dynamite, black coal dust, black rubber blankets and “long reach” construction equipment in order to aid in melting the ice or breaking it up.

e. Flood Probability:

All eight municipalities in the northern RiverCOG area are vulnerable to flooding. As stated previously, because they are not located directly on the Connecticut River, Durham and Middlefield are not subject to the seasonal flooding impacts of the Connecticut River. Flood plains, shown in Map 4, were updated by the USGS in 2008. Many of the areas alongside the Connecticut River in the Region are developed with residential structures.

The benchmark flood used in flooding probability is the “1% annual chance” flood, which is defined as follows:

“The flood elevation that has a one percent chance of being equaled or exceeded in any given year. It is also known as the base flood elevation.”

The following table presents the flood probability for the towns of the former Midstate Region:

<b>Recurrence interval, in years</b>	<b>Probability of occurrence in any given year</b>	<b>Percent chance of occurrence in any given year</b>
500	1 in 500	0.2
<b>100</b>	<b>1 in 100</b>	<b>1</b>
50	1 in 50	2
25	1 in 25	4
10	1 in 10	10
5	1 in 5	20
2	1 in 2	50

**Table 6:** Flood Probability per Year.

Source: Modified from Robinson, Hazell, and Young, 1998

Advance Warning:

Significant River flooding, especially when associated with seasonal variations, can be anticipated with advanced warning being offered to all of those that may be impacted. DEEP and DEMHS as well as radio and TV broadcasts provide warnings with time line predictions for when a flood will crest in particular locations. Local officials can warn businesses and residences at risk of potential stream and or river flooding using the CTAlert systems as well.

Residential and Business Flooding Vulnerabilities:

As a part of the research for this NHMP, businesses, residences, municipal officials and first responders were interviewed and attended workshops providing input to the Plan's vulnerabilities list. As a result of such input it was recognized that not all properties that had suffered losses were counted in the RLP count. Those properties needed to be identified as at risk as well.

For private property owners, a number of vulnerable elements should be reviewed. Those vulnerabilities include but are not limited to:

- Furnaces and electrical systems when located in flood-prone areas of the house such as a basement;
- Conditions that present health and safety hazards;
- Conditions that can lead to power outages;
- Spoiled food due to loss of power;
- Inoperable septic systems caused by flood waters;
- Medical conditions where oxygen use is required;
- Contaminated carpeting, sheetrock, furniture, and other similar home or business materials;
- Extensive soil erosion problems and driveway washouts associated with floodwater erosion.

Erosion:

Another significant impact that can be created during riverine flood events is that of erosion. Bluff erosion can be a significant concern, especially where infrastructure such as road and sewer lines exist. In some situations the protection of development, including residential and business structures, consists of moving the building back from the eroded edge of an embankment. For a more thorough treatment of erosion and its impacts, see Town Annex sections concerning this subject.

f. National Flood Insurance Program

Structures in and or adjacent to flood plains are vulnerable to damage caused by rushing or slowly rising water. Consequently they are prone to both spring flooding events and flash floods. The most damage is due to the rushing waters in a flash flood including structures and their contents. Damage from the slow rising (with warnings) spring flooding is usually limited to the contents of structures.

Structures in a flood plain should carry flood insurance. Lending institutions that write mortgages for these structures usually require them to do so. Flood insurance is underwritten under NFIP. A community's compliance with NFIP allows residents to obtain such insurance. All RiverCOG towns participate in NFIP and are committed to doing so in the future. See Table 28 for the history of FIRM adoptions throughout the region. If a municipality were to participate in the FEMA, Community Rating System (CRS) these rates could be somewhat reduced.

Of concern in RiverCOG municipalities is infrastructure damage from flash floods. As seen in the vulnerabilities sections of this Plan, a major vulnerability is flooded roads. Fatalities can and have occurred when vehicles attempt to cross over washed out bridges or thru rushing water and they are swept away.

As stated, all RiverCOG municipalities participate in the NFIP. The agency assists them in updates when they are published. All eight municipalities covered by this Plan adopted their new FIRMs in August 2008.

RiverCOG staff works with the maintainers of the local Plans of Conservation and Development and Planning and Zoning in compliance with the new FIRM specifications.

None of the former Midstate municipalities participate in CRS.

g. Repetitive Loss Properties [§201.6(c) (2) (ii)]

Under the National Flood Insurance Program, Repetitive Loss Properties are those for which two or more losses of at least \$1,000 each have been paid within any 10-year period since 1978. The properties included in this review are from an 6/30/2013 list provided by the CT DEEP.

There are a total of 23 Repetitive Loss Properties and 1 Severe Repetitive Loss Property within the former Midstate Region. Middlefield is the only town within the former region that does not have an RLP. The majority of these properties lie along the Connecticut River, but various properties lie along smaller inland streams.

This Plan indicates agencies; municipal and public, responsible for future land use in hazard areas. If damage to a structure and or contents has occurred in the past it can be assumed that without mitigation, damage will occur again.

At this time, none of the properties have been mitigated.

The following Table is a summary of the RLPs in the region.

Town	RL Properties	SRL Properties	Locations	Type of Property
Cromwell	3	0	Connecticut River, Inland Stream	Residential
Durham	1	0	Inland Stream	Residential
East Haddam	3	0	Connecticut River, Inland Streams	2 Res., 1 Com.
East Hampton	1	0	Inland Stream	Residential
Haddam	6	0	Connecticut River	4 Res, 2 Com
Middlefield	0	0		
Middletown	3	0	Connecticut River, Inland Streams	2 Res., 1 Com.
Portland	6	1	Connecticut River, Inland Streams	Residential

**Table 7:** Repetitive Loss Properties within the former Midstate Planning Region.  
Source: CT DEEP

h. Hazus- MH Flood Event Report

A HAZUS MH – MH Flood Event Report was generated for the entire former Midstate region, comprising of eight towns and a total population of about 104,000 residents at the 2000 Census (HAZUS based on 2010 Census data is not yet available).

Expected Building Damage by Occupancy												
Occupancy	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	20	66.67	3	10.00	0	0.00	1	3.33	6	20.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	100.00
Government	3	100.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	1	50.00	0	0.00	1	50.00
Religion	0	0.00	1	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	9	1.01	21	2.36	26	2.92	90	10.11	150	16.85	594	66.74
<b>Total</b>	<b>12</b>		<b>42</b>		<b>29</b>		<b>91</b>		<b>151</b>		<b>602</b>	

**Table 8:** Expected Building Damage as a Result of a 100 Year Probabilistic Flood Event in Former Midstate Region.

Source: HAZUS – MH Flood Event Report

This report generates loss estimates, as well as a prediction of loss of life and property. The Table above shows a summary of the buildings that would be damaged throughout the eight towns. HAZUS estimates that 927 or 2.3% of the regions total buildings would experience some level of damage, including 602 building that would be substantially damaged in this type of event. The majority of these buildings are residential structures, indicating that there would be a severe

need for shelter requirements. Also note that three government buildings would experience damage as a result of this type of flood event. For the full report, **see Appendix A: HAZUS – MH Flood Event Report**, which includes shelter requirements, debris generation and public health requirements as a result of a flood of this magnitude

HAZUS is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences.

The primary purpose of HAZUS is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates are to be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

Public Health professionals have particular concerns during flooding. They have responsibilities in shelters, habitat contamination after the flood waters fall and spoiled food. Wells that become flooded are also an issue. Each municipality has a health director and/or is represented in a health district

HAZUS estimates the number of households that are expected to be displaced from their homes due to a major flood and the associated potential evacuation. HAZUS also estimates those displaced people that will require accommodations in temporary public shelters. The sample model estimates 4,842 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, it is estimated 10.6% of the population will seek temporary shelter in public shelters.

i. Vulnerable Populations – Evacuation and Sheltering

Special needs populations need early notification and in some cases transportation to shelters during floods. Under the guidance of early efforts by the local regional public health planning team and currently under the Regional Emergency Planning Teams (Region 2 and 3) (RiverCOG is the lead agency for Region 2) people with disabilities and those in convalescent hospitals and rest homes plus senior citizen housing sites are in the plans for notification and relocation. The large State mental hospital in Middletown is on top of a hill and is comprised of brick buildings; therefore less vulnerable to storms than others. The many Group Homes within the region are covered under their State DSS evacuation plan. The municipal sheltering plans include contingencies for “special” medical needs. There are no facilities where occupants are shelter dependent (such as prisons) in the area. There are holding cells; but they are for temporary occupants only.

j. Summary

Urban flooding has become more prevalent in recent years as urban and suburban areas continue to grow and become too developed for older, under-designed drainage systems<sup>9</sup>. Urban flooding strikes most communities on an annual basis and is most often caused by slow moving heavy or severe thunderstorms.

Heavy rain in succession can have more impact than singular heavy rain events

The Hurricane of 1938 followed several days of rain, saturating the soil. The region experienced significant rains and minimal wind from Hurricane Agnes in 1972, but a major rain storm shortly thereafter resulted in major flooding in the entire Northeast. The major CT flood in 1955 occurred shortly after Hurricane Diane.

k. Local Flood Mitigation Strategies

For a more detailed list in each town, see the individual Town Appendices.

A broad list of mitigation items include:

- Flood Proofing
- Elevation
- levee construction
- Relocation
- Restrictions on winterizing structures in flood plains
- Restrictions on new buildings or expansions in flood plains.
- “Signing-up “of residents living in flood prone areas, to storm warnings over local notification systems.
- Wherever possible; acquisition of structures in flood prone areas and creation of open space.
- Aggressive vegetation management program
- Keeping narrow bridge openings and culverts free of debris.
- Maintaining a Debris Management Plan.

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<sup>9</sup> The reader will note a vast majority of our vulnerabilities are caused by undersized or aging culverts.

## 2. Hurricanes



**Photo 5:** Durham, Main Street looking north in the aftermath of the Hurricane of 1938.

Source: Russell Library

Hurricanes are one of the most threatening natural hazards facing the Region. Hurricanes often do not travel up the east coast as far as New England; however, when they have, there is a history of significant damage. A hurricane can bring with it wide spread destruction from both wind and rain.

Although hurricanes affecting Connecticut typically have a more severe impact along the shoreline, the inland areas can experience significant damage as well.

Depending on which side of the eye of the storm the region falls on, conditions can be bad for different reasons. The winds are strongest in the northeast quadrant. The rains are heaviest on the northwest quadrant. Depending on where the storm makes landfall, the region may be a dry hurricane receiving higher wind but less rain, or a wet hurricane receiving much more rain, but lower wind speeds.

Some hurricanes only bring wind Gloria 1985 (a dry hurricane), some mostly rain (1955 Hurricanes Connie and Diane).

If conditions are right, hurricanes can travel the east coast in succession. Just two months after Connie (Disaster Declaration #42) made landfall in Connecticut, and with the soil still saturated, the State was hit by heavy rains from Diane (October 15 to 17) resulting in severe flooding. Flood damage was extreme with

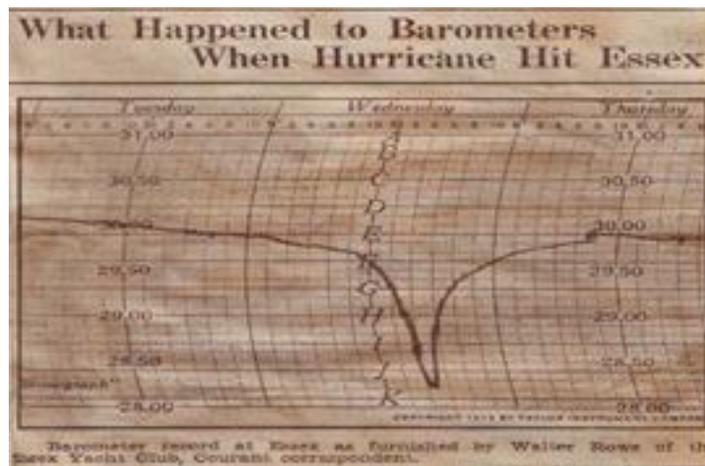
countless road and bridge washouts. Fourteen out of 39 towns affected by the flooding were declared health hazards. Seventy people were killed and 4,700 were injured.

Hurricanes with heavy rain and strong winds are possible as well. The Great Hurricane of 1938, which produced both wind and rain, came after several days of soaking rains. More recently, Tropical Storm Irene, and Hurricane Sandy in August of 2011 and September 2012 respectively, descended upon New England causing significant damage to homes along the Connecticut coastline and taking out power for up to 8 days in much of the former Midstate region. While Tropical Storm Irene caused both significant rain and strong winds, Hurricane Sandy brought much higher wind and less rain.

In order to calculate wind velocity forecasters add wind speed predictions to sustained winds (not gusts) to forward motion of the storm. Hurricanes are determined by their sustained wind speed.

A consequence of Hurricanes and Tropical Storms is long-term power outages. After both Tropical Storm Irene and Hurricane Sandy, fallen trees tore down wires and poles, causing week long power outages in some case. Tropical Storm Irene caused over 800,000 power outage statewide while Hurricane Sandy caused over 600,000 outages.

Hurricanes are rated by NOAA by several factors. Commonly hurricanes are classified by sustained wind velocity. See Appendix B for the Saffir Simpson Scale for measuring hurricanes and Appendix E for anticipated damage from Cat 1 & 2 hurricanes (Appendix E). Wind gusts may be higher than the sustained wind speed.



**Illustration 3:** Barometric Pressure Drop at time of 1938 Hurricane  
Source: Hartford Courant

a. Prior Occurrences<sup>10</sup>

Although Hurricanes do not reach New England as often as other parts of the east coast, hurricanes can travel up the coast and have a devastating effect on Connecticut and the RiverCOG region. Most recently the region experienced Tropical Storm Irene in August 2011 and Hurricane Sandy in October 2012. Both of these storms resulted in significant coastal flooding, damage to homes along the shoreline, downed power lines and week-long power outages. As a result businesses were closed and school was cancelled throughout the State.

During the Hurricane of 1938, Parts of interior Connecticut and Massachusetts not only bore the brunt of high winds, but also experienced severe river flooding as rain from the hurricane combined with heavy rains earlier that week to produce rainfall totals of up to 17 inches. This resulted in some of the worst river flooding ever experienced in parts of Connecticut and Massachusetts.

The Atlantic hurricane season begins on June 1st and ends on December 1st each year<sup>11</sup>. A hurricane is a warm-core (having warmer air at its center) tropical cyclone. (From the CT Hazardous Mitigation Plan)

As previously mentioned, two hurricanes affected Connecticut in 1955, Diane and Connie.

On October 30, 1991, a rare late season Hurricane Grace combined with a large non-tropical low-pressure system east off Maine to produce what has become known as the Perfect Storm. Damage in Connecticut was light due to the protective effect of Long Island. However, moderate to heavy damage resulting from 30 – 50 foot seas occurred along the exposed coastlines from New Jersey to Maine (where seas reached 100'). Another factor that made this storm damaging was its 6-day duration. (See Appendix F, Perfect Storm)

The 7<sup>th</sup> deadliest hurricane in U.S. history was in the continental northeast at Newfoundland Banks in 1775 4,000 people were killed.

Since 1900, Connecticut has been affected by a hurricane or tropical storm 19 times. 39 hurricanes or tropical storms have impacted New England. The most notable hurricane in our recorded history was the Great Hurricane of 1938, a Category 3 storm. A wind gauge in Clinton recorded a gust of 161 M.P.H. The hurricane tracked northward, up the Connecticut River Valley. Damaging winds took their toll all the way to the Canadian Border. Berlin, in northern New Hampshire, suffered damage to its trees. A 186 MPH gust was registered at the Blue Hills Weather Station in Massachusetts.

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<sup>10</sup> From a variety of resources, CT Hazard Mitigation Plan, NATIONAL INFRASTRUCTURE COORDINATING CENTER (2009 webcast), conferences and other plans and pubs.

<sup>11</sup> An exception to the rule: Hurricane Beth, December 10, 1972

Three storms reached Connecticut in 1954: Carol, Edna, and Hazel

Hurricane Agnes, in 1972, fused with another storm system, producing floods in the Northeastern U.S. that contributed to 122 deaths and \$6.4 billion in damage.

The chart below shows a list of hurricanes which have made landfall in or very near Connecticut since 1858. The chart details the storms name, category, place of landfall and wind speed at landfall. (This information was gathered from Ryan Hanrahan, meteorologist at WVIT, NBC 30 Connecticut.)

Date	Name	Category (in CT)	Landfall	Wind Speed (mph)
September 16, 1858	Storm # 3	1	Groton, CT	80
September 8, 1869	Storm # 6	1	Westerly, RI	115
August 24, 1893	Storm # 4	1	Queens, NY	85
October 10, 1894	Storm # 5	1	Clinton, CT	85
September 21, 1938	Great New England Hurricane	3	New Haven, CT	115
September 15, 1944	Great Atlantic Hurricane	1	Matunk, RI	85
August 30, 1954	Carol	2	Groton, CT	115
September 12, 1960	Donna	1	Old Saybrook, CT	100
September 127, 1985	Gloria	1	Milford, CT	85
August 19, 1991	Bob	1	New Shoreham, RI	105
August 28, 2011	Irene	TS	Brooklyn, NY	65
October 29, 2012	Sandy	1	Brigantine, NJ	80

**Table 9:** Major Hurricanes and Tropical Storms in Affecting Connecticut since 1858.  
Source: Ryan Hanrahan, WVIT NBC 30

The following is an excerpt from the Hartford Courant:

*YEAR IN REVIEW 2011.....HARTFORD COURANT*

**Storm damage:** *Middlesex County residents suffered power outages, damage to their homes and road closures after Tropical Storm Irene in August of 2011. Following that, an early-season snowstorm passed through the area at the end of October. Residents in some areas waited for more than a week to have their power restored. Water levels in the Connecticut River rose significantly flooding low-lying areas like Palmer Field in Middletown. Shelters were opened up at area high schools and residents took advantage of heat, hot water and meals offered before things returned to normal.*

b. Probability

According to Connecticut’s 2010 Natural Hazard Mitigation Plan Update in 2010, “a Category 1 hurricane can be expected to make landfall in/near Connecticut once every ten to fifteen years. A Category 2 hurricane could be expected to make landfall in/near Connecticut once every twenty-three to thirty years, and a Category 3 hurricane has a calculated return period of forty-six to seventy-four years.”

HURRICANE LANDFALL POTENTIAL BY CATEGORY IN NEW ENGLAND – NEXT 20 YEARS 2009-2029		
CATEGORY		PROBABILITY (Frequency)
CAT. 1	WINDS 74-95 MPH	250% ( 8 Years)
CAT. 2	WINDS 96-110 MPH	125% (16 Years)
CAT. 3	WINDS 111-130 MPH	54% (37 Years)
CAT. 4	WINDS 131-155 MPH	2% (1,000 Years)
CAT. 5	WINDS > 155 MPH	0.4% (5,000 Years)

**Table 10:** Frequency of large Hurricanes in Connecticut  
Source: DEMHS

c. Future Hurricane Risk

In a large Category 1 or stronger storm we can expect 80% of our mature growth trees to be felled. Until Tropical Storm Irene made landfall in New England in August 2011, the region had not experienced a Tropical Storm or Hurricane in 26 years. When Hurricane Sandy hit the northeast in September October 2012, it had been a full 27 years since New England experienced a true hurricane.

See additional predictions in the HAZUS – MH: Hurricane Event Report Located in Appendix B.

d. HAZUS-MH: Hurricane Event Report

HAZUS is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). On Wednesday, May 8, 2013 RiverCOG generated HAZUS-MH Reports for the former Midstate Region. These reports can be found in the Appendices A through C.

HAZUS is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences.

The primary purpose of HAZUS is to provide a methodology and software application to develop multi-hazard losses at a regional scale.

These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

Expected Building Damage by Occupancy : 100 - year Event										
Occupancy	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	180	90.68	14	7.2	3	1.44	1	0.63	0	0.04
Commercial	2,132	92.69	142	6.17	24	1.03	2	0.11	0	0.00
Education	105	93.32	7	6.03	1	0.63	0	0.02	0	0.00
Government	54	93.78	3	5.58	0	0.62	0	0.02	0	0.00
Industrial	826	93.17	52	5.81	7	0.83	2	0.18	0	0.01
Religion	169	93.13	11	6.31	1	0.54	0	0.03	0	0.00
Residential	32,414	89.69	3,293	9.11	416	1.15	11	0.03	6	0.02
Total	35,879		3,522		452		17		6	

**Table 11:** Expected Building Loss from 100 Year Probabilistic Hurricane  
Source: HAZUS - MH

e. Local Mitigation Strategies

For more detailed mitigation action items in each town, see the individual town Annexes A-H. The following are generalized mitigation actions for the region as a whole.

- Flood Proofing
- Elevation
- Levee construction
- Relocation
- Restrictions on winterizing structures in flood plains
- Restrictions on new buildings or expansions in flood plains.
- Registering residents living in flood prone areas to local storm warnings notification systems.
- Wherever possible; acquisition of structures in flood prone areas and creation of open space.
- Aggressive vegetation management program
- Keeping narrow bridge openings and culverts free of debris.
- Maintaining a Debris Management Plan

### **3. Winter Storms**

#### **a. Overview**

A winter storm is an event in which the varieties of precipitation are formed that only occur at low temperatures, such as snow or sleet, or a rainstorm where ground temperatures are low enough to allow ice to form (i.e. freezing rain). In Connecticut, these storms are not necessarily restricted to the winter season, but may occur in the late autumn and early spring as well.

Heavy snowfall, ice storms, and extreme cold can immobilize an entire region. Areas that normally experience mild winters can experience a major snowstorm or extreme cold. Winter storms can result in flooding, storm surge, closed highways, blocked roads, downed power lines and hypothermia in people. There are four characteristics of a winter storm; though not all may be present at the same time, in the same storm. They are: snow, wind, icing and cold temperatures. A winter low, with heavy moisture content, fairly low temperatures, exacerbated by northeast winds result in a nor'easter.

Middlesex County and the RiverCOG region have experienced many snow storms and winter weather events. The region is generally well prepared for such events. However, events out of the normal winter season can be especially troublesome for the region. In October 2011 Connecticut was struck by an unprecedented winter storm which resulted in a very wet snowfall exceeding any previous winter storm in the month of October dating at least back to 1650. Damages were estimated to be nearly 400 million dollars. Human suffering from this storm was aggravated by the recent damage caused by Tropical Storm Irene (many state residents were without power for a combined total of nearly three weeks) and the much colder temperatures which resulted in 10 deaths from carbon monoxide poisoning and house fires from improper generator and fireplace use.

Blizzards can also come without much warning and leave the area with significant snowfall totals making clean-up difficult. The Blizzard of 1888 resulted in a 50 inch snowfall in the area with monstrous drifts. More recently, the Blizzard of February 2013 dropped upwards of 40 inches of snow on the region in less than 12 hours. For many cities and towns it took more than a week for clean-up efforts to be completed.

#### **b. Prior Occurrences**

All RiverCOG municipalities are vulnerable to winter storms. Sever winter storms which have resulted in over a foot of snow combined with ice storms have occurred at least seven times since 1973 in the RiverCOG area. Below is a chart of the more severe winter weather events that have taken place in Middlesex County since 1950.

<b>Middlesex County Winter Weather Events 1950-2013</b>					
<b>Blizzard</b>	<b>Ice Storm</b>	<b>Heavy Snow</b>	<b>High Wind</b>	<b>Snow</b>	<b>Total</b>
5	16	11	12	24	68

**Table 12:** Winter Weather events between 1950 and 2013  
Source: SHEL DUS

c. Ice Storms

By far the greatest risk of damage (especially to utility lines) is from ice storms. Where heavy snow may be an inconvenience, a severe ice storm can cause major damage to trees, power lines and create hazardous driving conditions. A large amount of tree debris can result from an ice storm. In the past Northeast Utilities/Connecticut Light and Power had spent over a million dollars a year pruning trees away from their wires as a mitigation measure; however as a result of Tropical Storm Irene and the October Nor'easter in 2011 this amount was increased to \$52,000,000 for 2012.

A major ice storm could bring down trees impeding emergency services access to requests for assistance. Special needs people such as those who rely on oxygen machines are vulnerable to loss of power. People with other special needs also may need to go to the nearest open shelter.

d. Heavy Snow

Since 1804, when a hurricane force winter blizzard occurred, the region had not been impacted as extensively as it was during the January 2011 Blizzard (Disaster #1958) and the October Nor'easter of 2011 (Disaster # 3342/4046).

The October 2011 snow storm was especially troublesome as it occurred just a month after Tropical Storm Irene impacted the region.

Referred to as both the Halloween Nor'easter and Snow storm Alfred, the storm occurred while the leaves were still on the trees. The state was paralyzed with trees down across wires and over roads. Many communities were without power for up to eight days. The municipal annexes illustrate local details of the storm.



**Photo 6:** A Middletown Church in the 1888 Blizzard

Source: Russell Library, Middletown

e. Threats<sup>12</sup>

Although the region and the State as a whole are well prepared for the clean-up efforts needed after most winter storms, the general public may not be prepared for large winter storms which can have a dangerous affect. Ice storms pose particular danger as the weight of the ice can knock down power lines and telephone poles. Power outages during winter months can be dangerous as residents may not have a heat source. Excessive snowfall can lead to roof collapses if roofs are not cleared of snow. Some of the threats facing the public include:

- Exposure to cold
- Hypothermia
- Frostbite
- Vehicle accidents
- Fires in the home
- High winds
- Icing conditions
- Loss of utilities due to power outages

Winter storms can put the general public at risk in other ways:

i. Accidents

70% of injuries result from vehicle accidents

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<sup>12</sup> Modified from *WINTER STORMS ... THE DECEPTIVE KILLERS* @ [weather.gov/nyc](http://weather.gov/nyc)

25% occur in people caught out in a storm  
Most happen to males over 40 years old

ii. Sheltering

Because of heavy icing power outages are likely. Shelters will be opened, with Public Health supervision.

Extended power outages mean spoiled perishable foodstuffs. Shelters can provide meals as necessary.

iii. Cold Injuries

50% happen to people over 60 years of age

Over 75% happen to males

20% occur in the home

f. Local Winter Storms Mitigation Strategies

A more detailed individual town mitigation action item list can be found within each town Annex (Annexes A-H). Below is a general list of actions that the region can take as a whole:

- Registering residents to local notification of storm warnings systems.
- Aggressive vegetation management program
- Have a snow disposal site plan in place.
- Coordination with CL&P on tree trimming adjacent to their power lines.
- Coordination between public works and fire re priority of road clearings.
- Debris management Plan updates/development

**4. Wind Storms**

Connecticut is a heavily forested state, especially so in the RiverCOG region, susceptible to a heavy limb clearing storm. Although Irene, Sandy and the October Snow Storm cleared a lot of dead wood and weak trees and branches, another storm could cause more damage. According to CL&P arborists, as presented at a Regional Emergency Planning Team -Steering Committee meeting: many large maple trees have now reached their 'end of life' cycle resulting in older trees that may fall during heavy wind events, possibly damaging structures, utility lines and vehicles.

All RiverCOG communities are vulnerable to the effects of a high velocity wind storm.

There are four classifications of wind storms taken into consideration in this Plan. Blizzards and hurricane winds are discussed in their respective sections of this Plan.

The four wind storms are:

a. Thunder Storms

- b. Nor'easters
- c. TORNADOS
- d. Windshear/Microbursts

a. Thunder Storms

Thunder storms are the most likely wind event to occur and the strongest ones can create considerable damage when strong imbedded winds accompany them. For planning purposes, these storms are separated into tornado activity and microbursts/ windshear.

1. Introduction<sup>13</sup>

All thunderstorms are dangerous as every thunderstorm produces lightning. In the United States an average of 300 people are injured and 80 people are killed each year by lightning. Although most lightning victims survive, people struck by lightning often report a variety of long-term, debilitating symptoms. Other associated dangers of thunderstorms include tornadoes, strong winds, hail, and flash flooding. Flash flooding is responsible for more fatalities than any other thunderstorm associated hazard. In dry conditions, lightning strikes can cause wildfires.

2. Thunderstorm Facts

The following list describes some facts about Thunderstorms:

- Some of the most severe occur when a single thunderstorm affects one location for an extended time.
- Thunderstorms typically produce heavy rain for a brief period, anywhere from 30 minutes to an hour.
- Warm, humid conditions are highly favorable for thunderstorm development.
- Some thunderstorms generate hail particles
- About 10 percent of thunderstorms are classified as severe—one that produces hail at least three-quarters of an inch in diameter, has winds of 58 miles per hour or higher, or produces a tornado.

3. Lightning Facts

The following list describes some facts about lightning:

- Lightning's unpredictability increases the risk to individuals and property.

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<sup>13</sup> NOAA source of lightning information

- Lightning often strikes outside of heavy rain and may occur as far as 10 miles away from any rainfall.
- "Heat lightning" is actually lightning from a thunderstorm too far away for thunder to be heard.
- Most lightning deaths and injuries occur when people are caught outdoors in the summer months during the afternoon and evening.
- Your chances of being struck by lightning are estimated to be 1 in 600,000.
- Lightning strike victims carry no electrical charge and should be attended to immediately.

b. Nor'easters

A major winter storm, regionally known as a Nor'easter, is typically an intense low-pressure system that forms either in the Carolinas or just off the mid-Atlantic coastline between November 1st and April 1st. These storms normally move in a northeastward direction to a position about 80 miles south of Cape Cod. The Nor'easter derives its name from the strong northeast winds that are characteristic during the storm.

Nor'easters can be particularly damaging when accompanied with heavy rain and can linger over an area for long periods of time exacerbating the situation.

Nor'easters occur year-round; but, the most common and severe ones occur during the winter months.

i. Winter Nor'easters<sup>14</sup>

The strongest winter storms can be as intense as a Category II hurricane, both in their high winds, low central pressure and subsequent flooding.

Over the years there have been significant nor'easter winter storms in Connecticut. Six resulting in fatalities (1979, 1983, 1988, 1992, 1996, and 2003)

These storms have claimed nearly a dozen lives during the past 25 years, and injured dozens of people while causing millions of dollars in damages.

During the Nor'easter of 1992, three people were killed as a result of the storm and 26 homes were destroyed. Tides in Long Island Sound and Connecticut River were backed up by the continued strong east/northeast winds. This buildup of water resulted in the fourth highest tide (10.16 Feet NGVD as measured at Bridgeport, CT) ever recorded in the Long Island Sound. It caused over 4.3 million dollars (1992 dollars) in damages to over six thousand homes. Northeastern Connecticut received up to 4 feet of snow. The heavy wet snow snapped tree limbs and power lines cutting power to 50,000 homes. A statewide snow emergency was declared

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<sup>14</sup> Modified from the CT. DEEP Hazard Mitigation Plan (2.1.2)

(Emergency Declaration # 972). This storm continued north stalling off the coast of Massachusetts, meeting up with a slow moving high in the north and then being joined by an intense low from the west. This combination of storms created a large storm that meteorologists referred to as “THE PERFECT STORM”. See Appendix F for the *GRACE THE PERFECT STORM* story.

In recent memory one of our most significant snow storms was February 6-7 1978. Heavy snow, icing and strong winds created impassable roads. Then Governor Ella T. Grasso closed State roads to non-essential travel for 5 days (Emergency Declaration # 3060).

The Great Blizzard of 1993, also called the “1993 Storm of the Century” occurred March 12 -13 in Connecticut, dropping over a foot of heavy, wet snow. This storm was known not only for its intensity but its size, affecting 26 states and much of eastern Canada. (Emergency Declaration #3098).

Another major storm to strike Connecticut occurred on January 8-9, 1996. Winter Storm "Ginger" brought up to 27 inches of snow to Connecticut and forced the state to shut down for 24 hours. In terms of overall snowfall (outside Connecticut) this was the largest winter storm on the U.S. East Coast since 1888. Emergency Declaration # 1092.

A major winter storm occurred on February 17<sup>th</sup>, 2003. This storm was a very slow moving low pressure system with a snowfall that blanketed the northeast U.S. from Washington to Boston with 1– 3 feet of snow. This storm shut down most air travel for 24 – 36 hours. Governor Rowland ordered a tractor trailer truck ban on CT roads. Emergency Declaration # 3176.

Snow storm Alfred (Disaster #3342) resulted in the largest number of power outages in Connecticut history. Being in October, Alfred was technically not a winter storm. However, the winds were accompanied by a large amount of snow: 7-12 inches depending on the location. Most trees still had leaves and many could not withstand the built up weight of the snow.

c. Tornadoes

A tornado is a violently rotating column of air that is in contact with both the surface of the earth and a cumulonimbus cloud or, in rare cases, the base of a cumulus cloud. Tornadoes come in many shapes and sizes, but are typically in the form of a visible condensation funnel, whose narrow end touches the earth and is often encircled by a cloud of debris and dust. Most tornadoes have wind speeds less than 110 miles per hour, are about 250 feet across, and travel a few miles before dissipating. The most extreme tornadoes can attain wind speeds of more than 300 miles per hour (483 km/h), stretch more than two miles across, and stay on the ground for dozens of miles.

## 1. Overview

Tornadoes are nature's most violent storms. Spawned from powerful thunderstorms, tornadoes can cause fatalities and devastate a neighborhood 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 300 miles per hour. Damage paths can be in excess of one mile wide and 50 miles long. Every municipality in the state is at some risk from this hazard.

Some tornadoes are clearly visible, while rain or nearby low-hanging clouds obscure others. Occasionally, tornadoes develop so rapidly that little, if any, advance warning is possible. Forecasters report "the conditions are right" or "the possibility exists" for tornadoes to form.

Before a tornado hits, the wind may die down and the air may become very still. A cloud of debris can mark the location of a tornado even if a funnel is not visible. Tornadoes generally occur near the trailing edge of a thunderstorm. It is not uncommon to see clear, sunlit skies behind a tornado.

## 2. Tornado Facts

- They may strike quickly, with little or no warning.
- They may appear nearly transparent until dust and debris are picked up or a cloud forms in the funnel.
- The average tornado moves Southwest to Northeast, but tornadoes have been known to move in any direction.
- The average forward speed of a tornado is 30 MPH, but may vary from stationary to 70 MPH.
- Tornadoes can accompany tropical storms and hurricanes as they move onto land.
- Waterspouts are tornadoes that form over water.
- Tornadoes are most frequently reported east of the Rocky Mountains during spring and summer months.
- Peak tornado season in the southern states is March through May; in the northern states, it is late spring through early summer.
- Tornadoes are most likely to occur between 3 p.m. and 9 p.m., but can occur at any time.
- 127 Tornadoes have been spawned by hurricanes 1972 - 2008<sup>15</sup>

## 3. Tornado History

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<sup>15</sup> *The 1999 TORNADO PROJECT*

Connecticut experienced 81 tornado incidents in the period from 1950 to 2003. These incidents occurred throughout all of Connecticut in the months from April through October. These tornadoes have caused \$590 million in damage, claimed at least 7 lives and injured 700 people. Table 13 below shows tornado activity in the RiverCOG region since 1950.

Enhanced Fujita Scale	Date	Injuries	Fatalities	Town
EF 2	July 12, 1950	0	0	Portland
EF 3	August 21, 1951	8	0	East Hampton
EF 1	July 19, 1963	0	0	Middletown
EF 1	July 21, 1972	0	0	Middletown
EF 1	June 27 1974	0	0	Essex
EF 0	June 30, 1998	0	0	Killingworth
EF 1	June 30,1998	0	0	Chester
EF 1	June 30, 1998	0	0	Old Lyme

**Table 13:** Recorded Tornadoes in RiverCOG Region, 1950-2013.  
Source: Tornado History Project

Other tornadoes in the Connecticut include:

- The deadliest Connecticut tornado on record occurred August 9, 1878 in Central Connecticut.
- Another deadly tornado occurred in Connecticut on May 24, 1962, in which one person was killed and 45 injured. This tornado destroyed 70 structures and heavily damaged 175 others along its 12-mile path. Damage exceeded \$5 million (2004 dollars).
- On October 3, 1979, at two o'clock in the afternoon, an EF-4 tornado ripped a path through Windsor Locks, killing 2 persons, and injuring 10 others. It destroyed 12 homes, left another 40 uninhabitable and caused an estimated 214 million (1979) dollars in damages. As a result of this tornado, two towns were declared Federal disaster areas. (Disaster Declaration #608)
- The most recent deadly tornado in Connecticut occurred on July 10, 1989, at 4:45 PM an EF-4 tornado cut a path through western Connecticut, from Salisbury to New Haven in less than 1 hour. Two persons were killed and 67 homes were destroyed. Damages totaled 125 million (1989) dollars. (Disaster Declaration # 837).
- On June 26, 2009 an EF-1 (85-100MPH) Tornado touched down in Wethersfield.
- On June 24, 2010 an EF-1 tornado struck Bridgeport with 100 MPH winds) causing major damage along its relatively short path. 100 yards wide and lasted for less than one quarter mile. One of the

casualties was the P.T. Barnum Museum. The building has stood since 1890. It has taken two years to restore the structure.

- On July 1, 2013 an EF-1 tornado was confirmed to have touched down in Windsor Locks, CT with winds up to 90 MPH. It traveled northeast into East Windsor around 1:30 p.m. and tracked along I-91 for a period of time. The tornado was on the ground for an estimated 2.3 miles. The width of the tornado was as wide as 200 yards. Damage was reported in the form of downed trees, shingles ripped off of homes and structural damage to a "sports bubble" at Sports World in East Windsor. Some witnesses reported seeing debris flying in the air including tobacco netting from nearby tobacco farms.

### 3. Tornado Risk

Tornadoes occur on average once every ten years in Connecticut.<sup>16</sup>

Tornados, though rare, do occur and cause a considerable amount of damage to the area touched by them. Many of the in Connecticut thunderstorms come with an atmospheric condition ripe for the birth of a tornado.

The pattern of occurrence and locations for tornadoes in Connecticut is expected to remain unchanged in the twenty-first century. The highest risk for tornadoes is expected in Litchfield and Hartford Counties. The second area of moderate to high risk is in Fairfield and New Haven counties. The counties of Middlesex, Tolland and Windham have a moderate risk and the county of New London can expect a low risk<sup>17</sup>.

Tornado intensities are measured by the Enhanced Fujita Scale from EF-0 (lowest wind speed) to EF-5 (highest wind speed). See Appendix J for an explanation of the entire EF Scale.

#### d. Microburst and Wind Shear

A microburst is a much localized column of sinking air, producing damaging divergent and straight-line winds at the surface that are similar to, but distinguishable from, tornadoes, which generally have convergent damage. There are two types of microbursts: wet microbursts and dry microbursts. They go through three stages in their life cycle: the downburst, outburst, and cushion stages.

Wind shear is a sudden change in the direction and/or velocity of the wind. It can happen vertically, horizontally, or both, as in the case of a microburst preceding a thunderstorm. A microburst is an intense, localized, burst of air from a storm

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<sup>16</sup> Doug Glowaski, DEMHS

<sup>17</sup> State NHM Plan

front. The strength of the shear can run the range of barely noticeable to potentially deadly.

Tornadoes, microbursts and wind shear can all produce violent winds and destruction. A tornado is a circular motion; whereas microbursts and wind shears are straight line winds. In the aftermath of a storm, the debris can indicate which type of wind caused the destruction. Debris from a tornado will be scattered about in all directions. Straight line winds will cause debris to be in a straight line, for example, downed trees will all be laying in the same direction. Here also, there is an interesting phenomenon.

Microbursts are nearly impossible to predict and are dangerous.

Low level wind shear presents an extreme hazard to aircraft during takeoff and landing. It has been determined to be responsible for a significant percentage of all commercial aviation fatalities. Low level wind shear is the result of downbursts which are often associated with thunderstorms. This is of particular concern in Durham and East Haddam, where there are small airports for private aircraft.

When the downburst of air hits the ground, it spreads out sideways (outflow), much like the stream of water from a faucet hitting the bottom of the sink. As a result, low level wind shear occurs only at very low altitudes.

Small downbursts (less than 4 km in diameter) are called microbursts. Research has determined that microbursts are much more common, and occur much more frequently than had previously been thought.

Microbursts are difficult to predict. Velocity “folding” (the measure of unambiguous velocities) occurs when the actual wind velocity exceeds the maximum wind velocity radar is capable of measuring.

e. Mitigation Strategies

Local mitigation strategies are discussed in more details within the local municipal NHMPs, Annexes A-H. Below is a list of general mitigation strategies that could be used on a regional level:

- Aggressive vegetation management programs to reduce risk of blocked roads and downed power lines from falling trees and limbs.
- Encourage residents to sign up for CTAlert notification system.
- Create a Debris Management Plan to aid in quicker debris cleanup after a wind event.

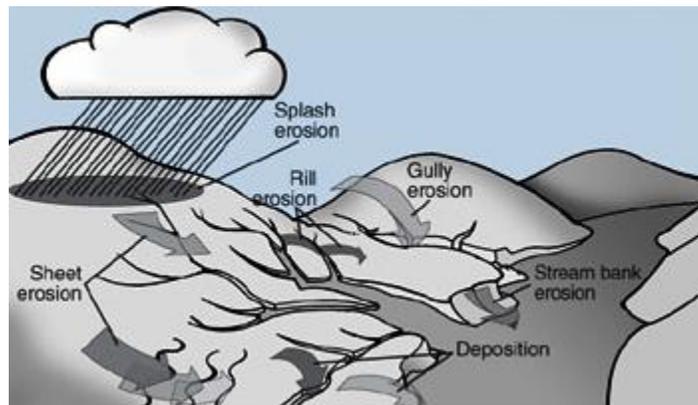
## 5. Other Natural Hazards

### a. Erosion

Erosion is the process of soil and vegetation being washed away and is usually associated with watershed areas.

Erosion can be initiated or accelerated by hurricane rains, other significant rain events, and spring river flooding. Typically a moving body of water such as a stream or river will cause erosion. Areas that are improperly drained or lose vegetation can also be susceptible to erosion.

The State DEEP considers erosion to be a natural process and typically deny permits to stop the eroding of property along rivers and streams. This is an issue for property owners at risk of losing their property. Commercial and municipal properties have a much better chance of obtaining a banking stabilization permit than residences. Through legislative action municipal officials should consider encouraging the State to change this.



**Illustration 4:** Types of Erosion  
Source: U. of Michigan Extension Center

### b. Extreme Cold

Extreme cold spells do occur periodically, typically between the months of December and March. Although cold temperatures are normal during the winter months, occasionally temperatures can drop below freezing for extended periods, sometimes as low as 0°. Low income housing residents and the elderly in homes without sufficient heat sources are particularly vulnerable. Town officials have planned and continue to update the accommodations of shelters in their municipalities. One classification of shelters is warming centers, to be use by those that either have insufficient heat sources or for times of power outages.

DEMHS Regions 2 and 3 are developing plans for accommodating overflows from local shelters. This was tested in 2009. Shelters were opened and others positioned to open if needed. Emergency management officials and social services monitored the needs of residents. The State, DEMHS and DPH

monitored the situation closely. There were regularly scheduled conference calls with updates; specifically which shelters were open or what might be needed.

Using the State's WebEOC internet software program, emergency management personnel can identify open shelters online. Calling 211 can also help locate open shelters when needed. This information source is also available to the public.

c. Extreme Heat

Extreme heat and heat waves are a possibility during the summer months, particularly between June and August. A heat wave in Connecticut is defined as a period where the high temperature reaches at least 90° for three consecutive days. The elderly in homes without air conditioning are vulnerable. Town officials have identified cooling centers for those desiring a place to go to cool off.

Local emergency management, public health and social services officials monitor the needs of their residents and make announcements when cooling shelters will be open. The State; DEMHS and DPH monitor the situation closely. They regularly schedule conference calls with updates; specifically where there are available cooling centers.

d. Drought

A drought is a period of unusually dry weather that can lead to severe water shortages. Unlike floods, hurricanes and earthquakes, droughts rarely pose an immediate threat to life and property. Instead, drought causes economic hardship through failed crops, loss of livestock and increased expenses and/or lost revenue for water dependent businesses. In addition, drought can have health consequences, especially when ground water quality degrades or becomes unavailable to residences using wells. Droughts also increase the risk of wildfires.

Droughts are not frequently occurring natural events. When they do occur, the most at risk populations are those residents with shallow wells. Dangerously low water company reservoirs put everyone on those systems at risk.

Droughts occurred in Connecticut in 1957, 1964-67, 1980-81 and 2002. The most recent drought was unusual; the peak water shortage occurred in the spring rather than the typical hot summer months. In response to the 2002 drought, many Connecticut municipalities implemented education and outreach programs that encouraged residents and business owners to conserve water. Droughts can also exacerbate wildfire conditions. Municipalities and water companies often ask for the public's help in conserving water during dry periods to prevent the depletion of water supplies.

e. Wildfire

A wildfire is an uncontrolled fire in an area of combustible vegetation that occurs in the countryside or a wilderness area. Other names such as brush fire,

bushfire, forest fire, desert fire, grass fire, hill fire, peat fire, and vegetation fire may be used to describe the same phenomenon depending on the type of vegetation being burned. A wildfire differs from other fires by its extensive size, the speed at which it can spread out from its original source, its potential to change direction unexpectedly, and its ability to jump gaps such as roads, rivers and fire breaks. Wildfires are characterized in terms of the cause of ignition, their physical properties such as speed of propagation, the combustible material present, and the effect of weather on the fire.

One area of concern is the potential for a wildfire in large forest tracks. Approximately 600 acres of forest burn each year in Connecticut. There currently is no wildfire plan in place at the DEEP Forestry Division. All eight communities are at risk of fire during a period of drought. According to DEEP, Connecticut traditionally experiences high forest fire danger during the Spring from mid-March through May.

Large forest in the region include the Cockaponset, a forest encompassing over 17,000 acres in the towns of Middletown Durham, Haddam, and neighboring Chester and Killingworth and the Meshomasic, encompassing 9,118 acres in Portland and East Hampton.

In 2001 Connecticut was classified as a “watch” area by the National Drought Mitigation Center. Many areas of the municipality are adjacent to forests (see Forest maps in each local Annex) and are vulnerable; especially as residential growth continues further into the woods. A wildfire in any forest would put the adjacent properties at risk. The fire departments are prepared; but in a large forest fire during a drought the firefighters would rely on neighboring assets and the DEEP, State Forestry Division for assistance.

The threat of wildfires for people living near wild land areas or using recreational facilities in wilderness areas is real. Dry conditions at various times of the year increase the potential for wildfires.

The DEEP Forestry Division updates fire danger each day and publishes it on their website. The State also requires that any open burning of brush be done with a permit and prohibits burning land for the purpose of clearing. In addition, no open burning permits will be granted if the air quality index is above 75 or if the fire danger is rated as high, very high, or extreme.

See Appendix I for Forest Fire Information from the CT-DEEP

1. Mitigation Strategy

Advance planning and knowing how to protect buildings in these areas can lessen the devastation of a woodland fire. There are several safety precautions that can be taken to reduce the risk of fire losses. Protecting your home from wildfire is your responsibility. To reduce the risk, property owners need to consider the fire resistance of their home, the topography of their property and the nature of the vegetation close by.

Public life safety, injury and Economic Vulnerabilities: As more residences are built into the forest, their vulnerability to forest fires increases. Land use planners should take this into consideration when approving building plans.

f. Earthquakes

An earthquake is the sudden, rapid shaking of the earth, caused by the breaking and shifting of subterranean rock as it releases strain that has accumulated over a long time.

The entire region could be affected by an earthquake; however, impacts could vary locally.

Earthquakes can strike suddenly, violently, and without warning. If an earthquake occurs in a populated area, it may cause many deaths and injuries and extensive property damage.

Although there are no guarantees of safety during an earthquake, identifying potential hazards ahead of time and advance planning can save lives and significantly reduce injuries and property damage.

1. Risk and vulnerability

With the exception of East Haddam, damage causing earthquakes are not likely in this area and the vulnerability is low. Rumbblings do occur periodically throughout the area, especially in the Moodus section of East Haddam.

According to a Former DEMHS Commissioner:

*“Believe it or not Connecticut has the oldest record of earthquakes in the United States. The earliest settlers learned of seismic activity in this area, dating back to 1568 in Moodus. This area is still very active today. We are located near the middle of the North American Tectonic Plate which is subject to intra-plate earthquakes, as opposed to inter-plate earthquakes which afflict California. While we are not near a plate boundary, there are numerous fault lines formed hundreds of millions of years ago.” – Skip Thomas*

2. Earthquake history in Connecticut

The following chart details earthquake history in the city of Middletown. Although the distance from the epicenter is different from each of the eight municipalities, the magnitude, date, and depth of the quake does not. There have been six earthquakes in the region since 1980.

Date	Distance (miles)	Magnitude	Depth (miles)
6/3/2011	15.10	1.7	5
6/16/2000	38.99	3.3	9
6/17/1982	14.64	3	2
10/21/1981	27.93	3.8	5
10/25/1980	19.06	3	0
10/24/1980	19.61	3.1	0

**Table14:** Earthquakes within 50 Miles of Middletown, 1980 – 2013  
Source: USGS

The most severe earthquake in Connecticut's history occurred at East Haddam on May 16, 1791.

Describing that earthquake an observer said: *"It began at 8 o'clock p.m., with two very heavy shocks in quick succession. The first was the most powerful; the earth appeared to undergo very violent convulsions. The stone walls were thrown down, chimneys were un-topped, doors which were latched were thrown open, and a fissure in the ground of several rods in extent was afterwards discovered. Thirty lighter ones followed in a short time, and upwards of one hundred were counted in the course of the night."*

A moderate tremor occurred at Hartford in April 1837. It jarred loose articles, set lamps swinging, and rang bells.

In August 1840, an earthquake of similar intensity was centered a few miles southwest of the 1837 tremor.

On June 30, 1858, New Haven was shaken by a moderate tremor at 10:45 in the evening. Residents reported rattling of glasses and a noise "like carriages crossing a bridge."

The strong tremor hit near Hartford on November 14, 1925.

An intensity V earthquake in southern Connecticut occurred on November 3, 1968. It cracked plaster at Madison, furniture shifted at Chester, and small items fell and broke.

A few damaging shocks centering in neighboring States, and several Canadian tremors, have been noted by Connecticut citizens the past three hundred years. A devastating earthquake near Tros-Rivieres (Three Rivers), Quebec, on February 5, 1663, caused moderate effects in some areas of Connecticut.

An earthquake near Massena, New York, in September 1944 was felt over a wide region. Mild effects were noticed by residents of Hartford, Marion, New Haven and Meriden, Connecticut. At its epicenter, the shock destroyed nearly all chimneys, crippled several buildings, and caused \$2 million property damage in that region. [Source: USGS website, 2012]

As recently as March 23, 2011 the village of Moodus in East Haddam, just north of Chester experienced a 1.3 on the Richter scale tremor.

Earthquakes from distant locations can also be felt in Connecticut, such as the magnitude 5.8 earthquake that shook the Washington DC area on August 23, 2011.

## **D. Probability**

### **1. Natural Disasters Predictions**

Many Natural Hazards often occur repeatedly in the same geographical locations because they are related to weather patterns or physical characteristics of an area. Natural disaster hazards can occur on the local, regional or State level. All RiverCOG communities are vulnerable to natural hazards.

According to the National Weather Service on Average, the United States as a whole experiences:

- 6 Atlantic Hurricanes
- 5,000 Floods
- 1,300 Tornadoes
- 26,000 Severe Thunderstorms
- Drought and Large Wildfires
- 600 Deaths and \$14B in Losses

In the RiverCOG Region, each Natural Hazard has a different probability of occurring. Floods are the most likely occurrence in the area, as each spring towns along the Connecticut River are subject to seasonal spring flooding as snow in northern New England begins to melt and flow south, in addition to typically rainy conditions during spring months.

2. Major types of natural hazards and their Probability as determined by the Planning Team.

The following chart details the potential for a weather event to occur in the eight northern towns of the RiverCOG region in any given year. The list potential was defined by the Planning Team based on past events and data gathered. Definitions are as follows: Low: 0% - 25%, Medium: 25% - 75%, High: 76% to 100%

Event	Potential
<input type="checkbox"/> Earthquakes within 50 miles	L
<input type="checkbox"/> Extreme heat,	H
<input type="checkbox"/> Fires,	M
<input type="checkbox"/> Floods,	H
<input type="checkbox"/> Hurricanes,	H
<input type="checkbox"/> Landslides,	L
<input type="checkbox"/> Thunderstorms,	H
<input type="checkbox"/> Tornadoes,	L
<input type="checkbox"/> Winter storms (extreme cold	H

**Table 15:** Potential for Natural Disasters to occur in the former Midstate Planning Region.

3. Frequencies of Natural Hazards

See Appendix N for a complete listing of weather events within the northern towns of the RiverCOG Planning Region.

a. Floods

The eight northern RiverCOG towns can experience several different types of flooding. Spring river flooding can occur along the Connecticut River, while large rain events can cause flash flooding and nuisance flooding along inland streams. These smaller events can occur multiple times a year, while significant river flooding does not typically occur on a yearly basis.

According to the USGS, the Connecticut River has a 10% annual chance for flooding at Middletown. The table below is from “Estimates of the Magnitude and Frequency of Flood Flows in the Connecticut River in Connecticut” published by the USGS in 2005.

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Table 1. Summary of the magnitude and frequency of flood flows for Connecticut River at Thompsonville, Conn. (USGS station 01184000), Connecticut River at Hartford, Conn. (USGS station 01190070), and Connecticut River near Middletown, Conn. (USGS station 01193000), for selected annual exceedance probabilities.

U.S. Geological Survey gaging station		Drainage area (square miles)	Period of record	Historic peaks outside period of record	Annual exceedance probability (percent)	Recurrence interval (years)	Estimates of flood flow, in cubic feet per second, derived using methods described in Bulletin 17B		
Number	Name						Flood-flow estimate	5-percent confidence limit	95-percent confidence limit
01184000	Connecticut River at Thompsonville	9,660	1929-2004	None	10	10	140,000	130,000	153,000
					4	25	163,000	150,000	181,000
					2	50	180,000	164,000	203,000
					1	100	198,000	178,000	225,000
					.2	500	239,000	211,000	279,000
01190070	Connecticut River at Hartford	10,487	<sup>1</sup> 1929-2004	1683, 1692, 1801, 1828, 1838, 1839	10	10	138,000	128,000	153,000
					4	25	163,000	148,000	183,000
			<sup>2</sup> 1841-2004	2	50	181,000	163,000	207,000	
				1	100	200,000	178,000	230,000	
				.2	500	243,000	212,000	288,000	
01193000	Connecticut River at Middletown	10,887	<sup>3</sup> 1947-2004	1814, 1854, 1860, 1862, 1927, 1936, 1938	10	10	142,000	131,000	156,000
					4	25	169,000	154,000	189,000
					2	50	190,000	171,000	216,000
					1	100	211,000	189,000	244,000
					.2	500	265,000	231,000	315,000

<sup>1</sup>1929-2004 data used for flood-flow frequency analysis.

<sup>2</sup>1841-2004 data used for stage frequency analysis.

<sup>3</sup>1929-2004 data used for frequency analysis using the "Two-station comparison" method with records at Thompsonville.

**Table 16:** Flood Occurrence along the Connecticut River.

Source: USGS

b. Hurricanes, Tropical Storms, Tornados, and Severe Thunderstorms (high winds)

According to the National Weather Service, the return period for a Hurricane with wind speeds greater than 73mph (64 kt) passing within 50 miles of the Connecticut coastline is about 18 years. Larger storms are even more unlikely, a Major Hurricane with wind speeds over 110 mph (96kt) has a return period of about 70 years. It is important to note that return periods is an expected time period; however, storms can occur more or less frequently than that.

Virtually all authorities predict that a major hurricane will result in 80 to 85% of the regions mature growth trees being knocked down, many of which are over roadways. It's important to note that The State of Connecticut is # 1 in the U.S for urban forestation.

The State, County and RiverCOG were taken by surprise by Tropical Storm Irene in August of 2011 and Hurricane Sandy in 2012. These storms caused a significant number of trees to fall; however, much more damage could occur with a larger storm.

Connecticut Tropical Storms with Disaster Declarations		
1778	Tropical Storm	
1869	Tropical Storm	
1991	Tropical Storm Grace	The Perfect Storm
1992	Tropical Storm Beth	A blizzard tropical storm
1999	Tropical Storm Floyd	A very "wet" storm
2011	Tropical Storm Irene	The Halloween Nor'easter

**Table 17:** Tropical Storms Resulting in Disaster Declarations

Source: FEMA

c. Severe Winter Storms

Between 1973 and 2010 only seven snow storms produced more than a foot of snow in the Region. Since 2010, there have been three such storms; February 2010, October 2011, and February 2013.

d. Drought

Frequency: Generally not a risk for MIDSTATE municipalities; but it can occur. According to the CT DEEP, the period between mid-March and mid-May has the highest probability for drought and wildfire.

e. Dam Failure

Dams can fail for a variety of reasons; however, they are most vulnerable when the region is experiencing unusually heavy rainfall resulting in a rush of water against the dam. Any dam that is not properly maintained can be at risk.

f. Earthquakes

Damaging earthquakes are very unlikely in this area. The table below shows the chance of varying earthquake magnitudes on the City of Middletown. Although each municipality experiences slightly different chances based on the geology, none of the RiverCOG towns have much different chance than the table below shows.

Magnitude	Probability
5.0	1.472%
5.1	1.194%
5.2	1.194%
5.3	0.969%
5.4	0.789%
5.5	0.644%

**Table 18:** Chance of earthquake in Middletown, CT  
Source: USGS

**E. Impacts of Natural Hazards**

Each natural hazard facing the region comes with an associated risk. Some hazards such as floods and hurricanes can have similar impacts since hurricanes often cause flooding; however, a wind storms will pose a very different threat than an earthquake. This section describes an overview of impacts for each of the hazards within the region. Impacts are also detailed within each municipal Annex, A through H.

1. Floods

A flood in the region can cause different impacts depending on the location. A flood along the Connecticut River will have very different impacts than a flash flood along a stream away from the river. See the municipal Annexes A through H for more local impacts. In general, a flood in the Region will have the following impacts:

*Potential Impacts:* Street closures, power outages, tree damage, utility damage, property and content damage, basement flooding, bodily harm and death.

*Vulnerable Locations:*

- a. Seasonal Spring River Flooding

Riverfront: All municipalities except Durham and Middlefield.

- b. Flash Floods, Dam Failure, Ice Dams

All the municipalities are vulnerable to these risks

*Economic Loss:* Repair and replacement costs, business disruption and debris removal and cleanup costs.

*Repetitive Loss Properties:* All towns with the exception of Middlefield have at least one repetitive loss property. None of those properties have been mitigated to date. See Section III.C.1.g (page 65) for more information.

See Appendix A: HAZUS-MH Flood Event Report for the full HAZUS prediction of impacts to the region as a result of major flooding.

2. Hurricanes, Tropical Storms, Tornados, and Severe Thunderstorms (high winds)

Wind Storms in the region can cause different impacts depending on the location. For example a hurricane or sever thunderstorm may cause flooding along the Connecticut River while high winds may disrupt power and block roads in areas away from the river. See the municipal Annexes A through H for more local impacts. In general, wind storms in the Region will have the following impacts:

*Vulnerable Locations:* Every municipality in the region. A “wet” hurricane or tropical storm can cause flash flooding. If it affects the north of the region then the Connecticut River is vulnerable to flooding.

*Economic Loss:* Would be major area wide for a hurricane and or Tropical Storm Repair and localized for a tornado. School closures are an issue as is business disruption and debris removal and cleanup costs.

See Appendix B: HAZUS-MH Hurricane Event Report for the full HAZUS prediction of impacts to the region as a result of a major hurricane.

3. Severe Winter Storms

A severe winter storms will likely affect the entire region. Higher elevations may experience high snow fall totals than lower elevations. More specific information can be found in the municipal annexes. In general a severe winter storms would have the following impacts:

*Potential Impacts:* Street closures, power outages, schools closures, utility damage, property and content damage, major tree damage, and a particular stress of our shelter capabilities..

*Vulnerable Locations:* All municipalities within the region.

*Economic Loss:* Sheltering expenses school closures, business disruption, snow removal and cleanup costs.

4. Drought

A significant drought would have regional impacts including dwindling public water supplies and an increased forest fire risk. For specific forest information per town, see the Annexes, A through H. In general, a drought in the region would have the following impacts:

*Potential Impacts:* Water shortages and increased risk of wildfires are of concern.

*Vulnerable Locations:* All the Municipalities within the region have areas of heavy forestation. Over growth of fire roads is a problem, especially of State forests of which municipalities have little control.

*Economic Loss:* Housing that is well into the forest; especially those with only one road of egress.

5. Dam Failure

Dam failure impacts vary by town. Each town has a different number of dams and locations of those dams. See each annex for a detailed discussion of impacts of dam failure in each municipality. In general dam failure would have the following impacts:

*Potential Impacts:* As indicated in the Dam Section of this Plan there are dams at risk in the region. There are 25 significant and high hazard dams in the region.

*Vulnerable Locations:* See the Dam Section of this Plan (Regional and Local Annexes)

*Financial Impact:* There are no catastrophic failure potentials in the Region from the dams at risk

6. Earthquakes

A large earthquake would have regional implications, while a small earthquake located in East Haddam would have minimal local impacts. The RiverCOG region is unprepared for a large earthquake; however, the chance of such an earthquake is very low. In general impacts from an earthquake are:

*Potential Impacts:* Very few. The chance of a damaging earthquake is little to none.

*Vulnerable Locations;* There have been periodic rumblings. There are no municipalities at risk; with perhaps the exception of the Moodus Section of East Haddam.

*Financial Impact:* minimal potential

See Appendix C: HAZUS-MH Earthquake Event Report for the full HAZUS prediction of impacts to the region as a result of a major earthquake.

5. National Flood Insurance Program (NFIP) and Repetitive Loss Properties (RLPs)

There are a total of 23 RLPs and one Severe Repetitive Loss Property (SRL) in the region.

NFIP and RLP discussions can be found, in detail, in Section III.C.1: Floods and in each Annex A - H.

## **IV Mitigation Strategies (Element C)**

### **A. Existing Strategies**

Working with the municipalities, RiverCOG staff has and will coordinate mitigation actions of a regional nature. The individual municipalities will update the Plan with the status of each mitigation action item at the five year update of the Plan.

As indicated earlier there is a collaborative effort in mitigation project prioritizations. A cost benefit analysis will be carried out for each project in order to maximize funding available.

In many cases, the list of action items was influenced by the public works departments in each of the eight municipalities.

Stakeholders often attend Council/Selectmen's' meetings to offer their input regarding mitigation efforts underway and items.

Within each municipality the CEO and their board must determine on a yearly basis which projects to pursue.

### **B. Funding Projects**

Any town embarking on a mitigation action project should first look within for funding. Capital Improvement Plans can be a source to find funding in the future for project cost. However, larger projects can be funded through state and federal grant monies.

A cost benefit analysis should always be carried out before embarking on a project to ensure that it is viable. A CB will be necessary for any grant application.

#### Outside Sources of Mitigation Efforts

Mitigation efforts, from other than regional and local efforts, are important and support effort to minimize vulnerabilities (structure, infrastructure, or loss of life or limb). These outside projects and funding sources can be important and helpful the communities in which they take place, without putting an extra burden on residents in way of increased taxes and without the need to apply for funding through the state or federal governments. These mitigation activities do not require staff time

Select examples include:

Northeast Utilities/ Connecticut Light and Power spends time and money each year on their tree-trimming program to minimize downed trees affecting electricity supply. After Tropical Storm Irene Snow Storm Alfred and Hurricane Sandy, CL&P increased their tree-trimming budget to \$52 million.

The DOT has an ongoing road and bridge repair/replacement program for their roads and bridges. With that, insufficient culverts and bridges are upgraded when needed.

DEMHS provides all municipalities with weather updates when significant weather conditions exist.

DEEP has an ongoing program of monitoring their dams.

DEEP sends warning of Connecticut River flooding when a threat is present.

Mattabassett Wastewater Treatment Plant issues warnings if their containment levee is at risk of being over-flooded. At risk would be areas downstream of the plant.

USGS continued maintenance of their flood gauges along the Connecticut River enable emergency management officials to predict when they should evacuate residents in vulnerable areas.

### C. Mitigation Authorities

The table below displays some of the various types of assets and the authority or party responsible for that asset. Assets include, but are not limited to bridges and roadways, dams, public water supply sources, and forests. The table shows the asset, any risks to that asset as a result of Natural Hazards, and what mitigation effort could be undertaken to protect that asset from the damaging effect of Natural Hazards. The party responsible for the asset would also be responsible for the mitigation action.

Mitigation Action Responsible Parties					
ASSET	RISK	Responsibility	Local Responsibility		Mitigation Strategy
		State/Federal	Assessment	Mitigation	
Roadways & Bridges/Culverts	Flash floods	DOT	PW	PW	Operations & Capital Budget/*/NHMP
Dams	Floods	DEEP	PW, EM.	PW/DEEP	Assess (Owner) /report requirements Local Admin) see Hazardous Dam Report
Truss Buildings	Snow	NFPA	Fire/Fire Marshal	Owner	Admin Ordinance
Drinking water sources	Flood, Draught	DPH	PW/ HD Water/Sewer	PW/ HD/ Water/Sewer	HD ordinances and monitoring
Superfund Site	Floods	EPA	Admin	Admin	Admin Manage
Hazardous Storage	T' Storms Floods	DEEP	Fire/Fire Marshal/EM	FD/EM/DEEP/EPA	Manage with DEEP
Forest	Wildfire	DEEP	Fire	DEEP (P&Z - zoning regs.)	P&Z - restricting building/ Fire Plan and practice (with DEEP, Forestry)
Sewage pumping stations & /or septic systems	Floods, power outages	DEEP	EM/PW/PH	PW	PW Loss of Power Plan current
Debris	Hurricane/Ice Storm/Wind Storm	DEEP/DEMHS	PW	Management Plan	ADMIN/PW facilitate the writing of a DMP plan

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Food Contamination	All storms	DPH	Health Department	Health Department	PH Plan
Special Needs & Fixed Populations	All storms	DPH	Social Services/HD/EM	Social Services/HD/EM	EOP, & PH Plan maintenance and Shelter exercising
Residences in FP	Flood	NFIP	P&Z	Owners	Owners have NFIP coverage (Elevate/relocate/flood proofing)
Repetitive Loss Properties	Flood	NFIP	P&Z	Owners	Owners continue coverage (Elevate/relocate/flood proofing)
Commercial Buildings in FP	Flood	NFIP	P&Z	Owners	Owners continue coverage (Elevate/relocate/flood proofing)
Municipal facilities in FP	Flood	NFIP	Admin/PW/ EM	Admin	Elevate/relocate/flood proofing
Ice Dams	Flood	DEEP/DEMHS	EM	PW	Develop a Plan of prevention

**Table 19:** Mitigation Action Item Responsibility

**D. Policies**

The staff of RiverCOG has extensive experience in planning for the municipalities within its State authorized area. Since the events of 9-11 MIDSTATE has also assumed the additional responsibility of regional emergency management planning and assistance in local emergency operations planning. MIDSTATE was a stakeholder in the development of the statewide emergency operation plan template. These involvements been very beneficial in developing policies for managing local natural hazards (and manmade) events that put local populations at risk, and in the prevention and protection of structures and infrastructure.

Ongoing active participation on the Regional Emergency Planning Teams (REPT) also has proven beneficial in the planning, exercise, training, mitigation, response and recovery process. The soon to be work in process of an updated State Debris Management Plan will be a “one size fits all” recovery plan for the most likely to occur catastrophic disasters. Cromwell is the only municipality in the region to have a working Debris Management Plan. It will need to be updated to reflect the under development local Plan Template.

Throughout the planning process, the State Hazard Mitigation Plan was utilized to verify and find details on storm histories and projections. This will continue.

During the years of development of policies for this Plan, former Midstate staff and RiverCOG staff has given consideration to:

- Learning from the history of natural hazards
- Evaluation of vulnerable structures (by hazard)

- Working with local officials in maintaining the list of vulnerable structure/infrastructure
- Assisting in assessing capabilities for response and recovery
- Assist in the determining the delta between vulnerability and capability
- Assist in estimating potential losses in dollars
- Assess vulnerabilities by analyzing development trends

The MRPA regional planners worked with local planners and developed broad ranging vulnerability mitigation strategies. See C.4&8 this Section. Assistance included:

- Identified and analyzed a comprehensive range of specific mitigation actions and projects considered to reduce the effects of each hazard
- Listed potential loss reduction actions identified in the planning process
- Analyzed various actions that achieve the community's goals and objectives to reduce the effects of the identified hazards.
- Developed mitigation actions addressing existing and new buildings and infrastructure at risk.
- Utilized the history of damage caused by storms as our proof source

The mitigation strategies in this Plan will serve as a long-term Action Plan for reducing the potential losses identified in the risk assessment. This includes assisting the municipalities in development of Goals, Objectives, and prioritization of mitigation actions.

Working with the municipalities RiverCOG assisted in developing sustained actions to be taken to reduce or eliminate long-term risk to people and property from the effects of natural hazards.

RiverCOG has and will provide guidance in protecting and preserving the natural and beneficial areas in the flood plain. This will yield flood plain mitigation management efforts and should fit with other community goals and objectives.

In some cases RiverCOG staff assists municipalities in rewriting land use ordinances, rezoning land, or verbalizing the denial of year round conversions in flood prone areas.

RiverCOG also will identify what collective actions the municipalities should take to correct a multi-jurisdictional risk. This includes, for example the Middlesex County CEO's contract with RiverCOG to:

- Request grants to mitigate at risk facilities
- Write a response/recovery plan,
- Purchase a regional tub grinder.
- Assist DPW Directors develop a regional Debris Management Plan following the State DM Plan
- Utilization of local capital improvement planning money to mitigate a hazard

- Assist in responding to the State requests for eligible “shovel ready” projects for stimulus grant money.

a. Prioritization policy:

The municipal mitigation action plans are to implement the desired actions contained within this Plan.

Former Midstate staff guided the local planning teams, generally led by the CEO in the listing and prioritization of the projects. See Appendix L for a full listing of the planning team.

Taken into consideration were:

- The benefits that would result from the mitigation actions vs. the estimated cost of those actions.
- Time on the already existing wish list was also taken into consideration.
- The public comments were also taken into consideration
- The season is also considered; some work can only be done certain times of the year.

1. Other Plan Policies

Local land use plans apropos to natural hazard protection are closely monitored as are all other regional, state and federal plans.

For the municipalities vulnerable to the Mattabasset River watershed flooding, there is the “MANAGEMENT PLAN FOR THE MATTABASSETT RIVER WATERSHED” for reference. This Plan can be found on the CT DEEP website.

2. Local Agency Policy:

The mitigation strategies discussed herein attempt to follow other agency’s policies, plans and procedures. e.g. roadwork plans by public works; operating procedures by police, State guided Social Services and public health plans for the handling of people with functional disabilities this includes sheltering plans, the wildfire plan by the fire department; and not the least, etc.

3. RiverCOG

The staff at RiverCOG will also continue to work with the municipalities in the development of land use plans also looking at those activities that may affect a bordering municipality. Regional guideline assistance in land development:

4. RiverCOG Regional Plan for Reasoned Growth

a. Plan Basis

The former Midstate Planning Region (now the northern half of the RiverCOG Planning Region) is located in Northern Middlesex County and

includes the towns of Cromwell, Durham, East Haddam, East Hampton, East Haddam, Portland, Middlefield and Middletown. There is one regional center— Middletown, which is surrounded by towns with identified Growth Areas, Neighborhood Conservation (development) Areas and Rural Community Centers. The Plan includes the State POCD Map, for each town, with infrastructure/open space and zoning overlays. Conflicts are identified. Also, included is a “build-out” analysis for each town.

Town infrastructure maps provide a spatial identification of key developmental elements. Planners and developers can, and have, utilized these maps to identify and review major development factors for the reuse parcels or the development of vacant land.

The State Plan of Conservation and Development states that it is essential for municipalities and regional planning organizations to understand the State’s principals and policies and apply them in their own plans and actions. The State Plan of Conservation & Development is the RiverCOG Regions Plan for Reasoned Growth. In this regional plan existing infrastructure and town regulations/ plans are reviewed for conformance with the State Plan.

There may be valid reasons for deviation from the state plan such as zoning that existed prior to the state plan, or the state is incorrect in its analysis. However, the fact remains, if there is a conflict state support will not occur. Once acknowledged, this fact can be accepted or challenged at the state level.

b. Reasoned Growth Policies

*Development:* The ability to revitalize Connecticut’s “Development Areas” (Regional Centers, Neighborhood Conservation Areas, Growth Areas, and Rural Community Centers) requires that the existing infrastructure be maintained and expanded to support compact development. As intensity increases unit costs for capital and operation are reduced; societal costs for related infrastructure i.e. electric transmission lines and natural gas pipelines are reduced and the Connecticut economy becomes more competitive. Revitalization requires the Re-Use of commercial and industrial parcels; in-fill development of vacant parcels; and the allowance of mixed uses in residential and industrial zoning districts.

*Adaptive re-use* is implemented by adapting existing economically obsolete buildings and land for new more productive purposes. The changes can be substantial; demolition or physical alterations that modify the buildings original intended use. The intent is that vacant and underutilized buildings become economically viable and are re-used.

*Density:* Zoning Commissions can provide incentives by allowing increased density or even by waiving density restrictions. Non-conforming floor areas and yard setbacks can be grandfathered. Variances are not required. Parking requirements may be adjusted. Boundaries are identified for adaptive re-use areas. Expedited approval processes are sometimes substituted for PZC Site Plans and Special Permit approval processes.

*Conservation Areas* designated for Conservation and Preservation should be protected through the use of cluster based development provisions in subdivision and zoning regulations. Conservation Easements should be required of all new subdivisions. These regulations should require and/or incent the utilization of reduced lot sizes, the construction of narrow and shorter road widths and lengths; the utilization of conservation easements. Carbon footprints are reduced. Conservation easements should be identified collectively, recorded, and mapped by town and ultimately by the region.

Note, Easements, once mapped, can be shared between towns, Conservation easements can then be linked between subdivisions and towns within the Region thereby creating additional greenways.

c. Development Trends

Uniformly throughout the region development trends are consistent. Our flood plains are desirable; visual and physical access to the water. Our forests are good neighbors; quiet and picturesque.

The revised Plans of Development (Regional and Local Sections of this Plan) reflect planner's efforts to manage development in vulnerable areas.

As a result of the revised NFIP maps in August of 08, building in flood plains has been modified as appropriate.

We think of more than flood dangers. As discussed in the NATURAL HAZARDS Sections, WILDFIRE, there are risks as homeowners are building closer into "risky" wooded areas.

An additional benefit of this (NHMP) process is a more vivid awareness of risks to municipal vital infrastructure to floods, dams at risk, crumbling roads, bridges and culverts. The trend to just "fix" aging facilities in at risk areas is being reconsidered.

RiverCOG will continue to assist the municipalities in updating regulations of structures in vulnerable areas including:

- Encourage open space in vulnerable areas
- Encourage municipal acquisition of buildings in flood plains and replace with of open space/recreational areas.
- Monitor expected growth or development over the next 10, 20 years.

d. Plan of Conservation and Development (Federal and State guidelines)

Per federal guidelines the following were taken into consideration in the municipal's Plan of Development re natural hazard protection:

- *Prevention:* regulatory actions re land development. (P&Z, Building Codes, Plan and Development documents, Open space preservation, etc.).
- *Property Protection:* Actions that include the modification of existing buildings or infrastructure to protect them from a hazard or removal from the hazard area. (Water proofing, elevating structures or infrastructure, relocations, building of a levee, etc.).
- *Public Education & Awareness:* Sections to inform the public, educate citizens, Town officials, and property owners about potential risk/s. Also potential ways to mitigate....e.g. write a general plan and make it available on the municipal website.
- *Natural Resource Protection:* Actions to preserve or restore the functions of natural systems. E.g. sediment or erosion control, watershed management, forest and vegetation management, no paving within 100' of a waterway or wetland,
- *Structural Projects:* Storm water control projects, culvert improvement, levees, safe rooms, etc.

The Conservation and Development Policies Plan for Connecticut 2005-2010 provides the policy and planning framework for administrative and programmatic actions and capital and operational investment decisions of state government. It is the basis behind Governor Roland's executive Order 15 and the MIDSTATE Region's Plan of Conservation and Development.

An integral part of the Plan is the Location Guide Map that graphically distills the conservation and development priorities of the state. The objective of the Plan, development in accordance with Section 16a-24 through 33 of the Connecticut General Statutes, is to guide a balanced response to the current and future human, economic and environmental needs of the state."

For State Agencies this Plan is more than a guide. Agencies are required to be consistent with the Plan when undertaking real property acquisitions, real property development or grants for acquisition, development or improvement of real property in excess of \$100,000. The Office of Policy &

Management is charged with implementation through the state bond commission agenda process.

If a project, and therefore a town, is to receive state development assistance it must be in conformance with the State Plan. It is possible that some Conservation and Preservation Areas may be identified in error. A town may disagree with state designations but until the plan is changed assistance will not be approved.

See Annexes A through H for local Plans of Conservation and Development.

e. Updating of Planning and Zoning Regulations

MRPA staff assists the local municipalities in updating their Planning and Zoning regulations.

1. The State POCD Guidelines

The State Plan has identified specific areas which are to be developed and areas which are to be conserved. Development Areas include Regional Centers, Neighborhood Conservation Areas, Growth Areas, and Regional Community Centers.

Regional Centers. In the RiverCOG Region, Middletown acts as the Regional Center. The Plan's goal is to redevelop and revitalize the economic, social, and physical environment of the state's traditional centers of industry and commerce.

Neighborhood Conservation Areas (NCA). A focus of this plan is to promote development and re-development in areas that are at least 80% built up and have existing water, sewer, and transportation infrastructure to support such development. Middletown, East Hampton, Portland, and Cromwell have such areas identified. The "NCA" is the State's number 2 development priority after Regional Centers. NCAs can entail a wide variety of development, such as commercial, industrial, and/or urban-scale density residential land uses. The overall intent of this policy is to maintain the overall character and vitality of the area by promoting infill development and maximum use of existing Infrastructure.

Growth Areas. The goal is to support staged urban-scale expansion in areas suitable for long-term economic growth that are currently less than 80% built up, but have existing or planned infrastructure to support such growth in the region. Middletown, East Hampton, Portland, and Cromwell have such areas identified.

Rural Community Centers. The goal is to promote concentration of mixed-use development such as municipal facilities, employment, shopping, and residential uses within a Village Center setting. Durham, Haddam, and East Haddam have such areas identified.

**Conservation Areas:** Conservation areas identified include Existing Preserved Open Space, Preservation Areas, Conservation Areas, and Rural Lands

**Existing Preserved Open Space:** The municipalities will support the permanent protection of public and quasi-public land dedicated for open space purposes. This includes Class I utility owned lands. The State's goal is preserve 21% of the state's land as open space by the year 2030, through the combined efforts of the state, municipalities, private non-profit organizations, and water utilities. In 2002 the state made the largest such acquisition in its history by purchasing approximately 15,000 acres of public water supply watershed. Farmland Preservation is also a top priority. In accordance with Section 22-26cc CGS a goal of the state is to acquire development rights to 130,000 acres of farmland.

**Preservation Areas.** Preservation areas should be managed as non-build area. These areas are identified as existing rivers and water bodies, tidal and inland wetlands, class I reservoir lands and well head lands, habitats of state endangered, threatened and special concern species, and floodways. Also, included are Agricultural lands where development rights have been acquired.

**Conservation Areas.** Conservation Areas are lands which may be utilized for the production of food, wood, water, and mineral, or are important for sustaining native flora and fauna and the landscapes essential to scenic and recreational enjoyment. Generally, some development may occur if it is in the form that is compatible with the resource that is to be protected. Conservation areas are defined as: Class II type reservoir lands and aquifer protection areas and other high yielding aquifers that are not Existing Preserved Open Space or Preservation areas regardless of ownership, prime agriculture lands that have not been protected by public actions, contiguous large forest blocks, significant sand and gravel resources, historic areas, trap rock ridges, greenways, the flood fringe of the 100 year flood plain, scenic and recreation river corridors, and areas protected by conservation easements.

**Rural Lands.** A stated goal is to protect the rural character of these areas by avoiding development forms and intensities that exceed on-site carrying capacity for water supply and sewage disposal, except where necessary to resolve localized public health concerns.

**Public drinking water supply watersheds** cover large areas of the state. These lands provide a valuable public health function by protecting reservoirs from potentially polluted runoff. The state's policy is to discourage the introduction of infrastructure for the purpose of accommodating new development. Exceptions may be allowed in certain instances where development has already

occurred, and added pollution controls are required to protect potable waters.

**E. Programs**

a. Community Rating System (CRS)

The Community Rating System (CRS) is a part of the NFIP. When communities go beyond the NFIP's minimum standards for flood plain management and participate in the CRS, discounts may be available on flood insurance premiums for policy holders in those communities.

One of the activities that communities can take to improve their CRS rating (and subsequently lower premiums) is to develop a CRS plan. The CRS 10-step planning process is consistent with the multi-hazard planning regulations under 44 CFR Part 201. However, CRS provides additional points for activities that communities can take during their planning process that go above the minimum described below, thus possibly lowering insurance rates. At a minimum, an approved multi-hazard mitigation plan under 44 CFR Part 201 that addresses floods could qualify for CRS credit. Although communities are not required to participate in CRS in order to receive approval of a Local Mitigation Plan, FEMA encourages jurisdictions to integrate the CRS planning steps into their multi-hazard mitigation plans.

None of the MRPA municipalities participate in the CRS under the National Flood Insurance Program. It should be considered to help reduce insurance premiums.

b. Repetitive Loss Properties Program

This Plan also addresses repetitive loss properties by describing the types of structures at risk: residential, commercial, institutional, municipal, etc. Past damage losses are the basis for estimating losses in the future. See the RLP Reports in each Annex A through H Section past damage costs and for future damage cost projections. A RLP regional summary can be found in this Regional Section of the Plan in Section III.C.1.g on page 65.

Vulnerable sites not listed in the NFIP as repetitive loss properties also suffer losses. Their extent of damage is also subject to the severity of the flooding condition or accumulation of ice or strength of wind. Costs to repair will vary. These properties are taken into consideration in the planning process.

c. Participation and Compliance with NFIP

All eight of the former Midstate Regional are NFIP participants and agree to abide by and continue to enforce NFIP guidelines. Local plans, procedures and some protocols were utilized in the development of this Natural Hazards Mitigation Plan (NHMP). As a result, the every five year NHMP Maintenance program shall take into consideration activity in these other plans. Each local

municipal discipline shall contribute their input to the PDM Planning Team. Locally the municipality may opt to update their sections of this Plan annually.

The planners have taken and in the future will take into consideration, the latest FIRM maps. Any future FIRM updates will be adopted by the individual towns as updates are made in the future.

Public input will be solicited to keep this Plan current.

All the municipalities within the MIDSTATE region updated their FIRM maps and land use guidelines/regulations based on the 2008 updates. The new Flood Insurance Study for the eight towns included within this Plan became effective on August 28, 2008.

Town	Initial Hazard Boundary Map FHBM	Initial Flood Insurance Rate map	Date Municipality entered the NFIP regular Program	Date Current FIRM Adopted	Date Planning &/or Zoning Regulations Updated
Cromwell	3/22/1974	6/15/1978	6/15/1979	8/28/2008	Nov-08
Durham	11/29/1974	4/1/1982	4/1/1982	8/28/2008	Aug-08
East Haddam	8/23/1974	11/1/1979	11/1/1979	8/28/2008	Aug-08
East Hampton	11/29/1974	4/1/1982	4/1/1982	8/28/2008	Aug-08
Haddam	5/31/1974	1/16/1980	1/16/1980	8/28/2008	Aug-08
Middlefield	5/31/1974	3/28/1980	3/28/1980	8/28/2008	Aug-08
Middletown	8/16/1974	12/16/1980	12/16/1980	8/28/2008	Aug-08
Portland	3/15/1974	7/3/1978	7/3/1978	8/28/2008	Aug-08

**Table 20:** Dates of initial and updated FIRM maps within the eight northern RiverCOG towns.

**F. Goals and Objectives (Regional)**

Goals and objectives for the reduction and/or damage avoidance of structures and infrastructure that are vulnerable to major weather events. Each goal is broken into objectives and actions. Each action is described as having either a **high, medium** or **low** priority. Priority was based upon the planning teams interpretation of importance based on input from town officials including, but not limited to the Director of Public Works, Board of Selectmen and Emergency Management Director in each of the eight towns. A **High (H)** priority project is one that will aid in the protection of life and property and should be carried out ASAP. A **Medium (M)** priority project is one that while will aid in the protection of life and property, is not necessary and would be supplemental to more important projects. A **Low (L)** priority project is one which could be carried out if funding is available, but there is no immediate need. A high priority project will always take precedence over a medium or low priority project.

Definitions for all Mitigation Actions throughout the Plan and Annexes:

Cost		Schedule	
\$	Up to \$50,000	A	2014-2017
\$\$	\$50,000 to \$100,000	B	2017-2020
\$\$\$	Over \$100,000	C	After 2020

Responsible Party (Local)		Potential Funding Source	
BO	= Building Official	CIP	= Capital Improvement Plan
BOE	= Board of Education	FMA	= Flood Mitigation Assistance
BOF	= Board of Finance	HMGP	= Hazard Mitigation Program Grant
BOS	= Board of Selectman	OP	= Other Program
EMD	= Emergency Management Director	PDM	= Pre-Disaster Mitigation
LUO	= Land Use Office	RFC	= Repetitive Flood Claim
P&Z	= Planning & Zoning Commission	RTP	= Regional Transportation Program
PW	= Public Works	SRL	= Sever Repetitive Loss
ZEO	= Zoning Enforcement Officer	STIP	= State Transportation Improvement Program

Many action items throughout have more than one responsible party listed. For those item, the first party listed is the primary contact.

GOAL 1: Compliance with FEMA mitigation programs: Disaster Mitigation Act of 2000. Specifically, the flood mitigation efforts were guided by the 1995 Repetitive Loss Plan, 1997 Hazard Mitigation Plan, the 2000 Flood plain Management Plan, and the Community Rating System (CRS<sup>18</sup>) of the National Flood Insurance Program (NFIP).

<sup>18</sup> If adopted

a. RiverCOG Goals and Objectives

**Goal #1:** Provide support to the local municipalities in projects that contribute to prevention, protection or preparedness for natural disasters. The top two priorities are flood proofing and hurricane damage (high winds and flooding) elimination.

**Objective 1:** To reduce the risk of vegetation debris causing flooding and costly clean-up.

Action	Schedule	Responsible Party(ies)	Priority	Funding Source	Cost Estimate
Promote development of local Vegetation Management Plans	A	RiverCOG, BOS, PW	M	OP	\$
Develop a Regional Debris Management Plan	A	RiverCOG, BOS, PW	M	HMGP, PDM	\$\$
Assist local municipalities in debris management planning	A	RiverCOG	M	PDM	\$

**Objective 2:** Reduce the risk of loss of life, limb, damage to private property, public infrastructure and economic loss.

Action	Schedule	Responsible Party(ies)	Priority	Funding Source	Cost Estimate
Incorporate natural hazard mitigation strategies into municipal projects as they occur.	A	BOS, PW, EMD, etc.	H	OP	\$\$
Assist municipalities in seeking funding studies. For example, minimizing failed dam threats to the inundation zone.	A	RiverCOG	H	OP	\$
Assist in working with the State DOT to ensure mitigation of their at risk sites (dams and roadways).	A	RiverCOG	M	RTP, OP	\$
Encourage local acquisition of property in or near the flood plains and creation of open space.	A	RiverCOG, BOS	L	OP	\$

**Objective 3:** Through mitigation strategies, encourage enhancement and preservation of existing natural resources in the local municipalities.

Schedule	Responsible Party	Priority	Funding Source	Cost Estimate
A	RiverCOG, BOS	A	OP	\$

**Goal 2:** Synchronization of the many mitigation plans that cross regional and local planning efforts

Action	Schedule	Responsible Party(ies)	Priority	Funding Source	Cost Estimate
Encourage agencies awareness of the value of connecting other municipal land use plans, to the Natural Hazard Mitigation Plan.	A	BOS, PW, EMD, etc.	M	OP	\$
Assistance with integration of new regional, State and Federal recommendations and requirements into existing local policies, plans and regulations	A	RiverCOG	M	OP	\$
Continued participation in regional REPT ([DEMHS] Regional Emergency Planning Team) efforts on regional mitigation projects.	A	RiverCOG, BOS, EMD	H	OP	\$
When requested assist in the updating of Plans of Conservation and Development; and their Inland Wetlands regulations re construction in watersheds	A	RiverCOG, BOS	L	OP	\$\$

**Goal 3:** Responder safety and preparedness

Action	Schedule	Who Responsible	Priority	Funding Source	Cost Estimate
Support regional exercises testing mitigation efforts	2013-17	BOS, EMD, FD, PD	M		\$\$

**GOAL 4:** Reduce the financial and emotional impact on residents and businesses

**Objective 1:** Regionally, or support local municipalities in:

Action	Schedule	Who Responsible	Priority	Funding Source	Cost Estimate
Periodically publish articles re flood proofing	A	BOS, EMD	M	FMA	\$

Publish articles about the value of “opting-in to the municipal notification system	A	BOS, EMD	M	OP	\$
Seasonally publish storm ready articles (SEE Table IV-27, Pg. 172)	A	BOS, EMD	M	HMGP, FMA, OP	\$
Increase private dam owner’s knowledge of the consequences of neglecting their dam maintenance resulting in damage to downstream structures, life and limb, etc.	A	BOS, EMD	M	OP	\$
Investigate participation in CRS for all towns within this Plan.	A	RiverCOG, BOS, LUO	M	OP	\$

See the local Annexes A through H for the mitigation action items by municipality for accomplishing the aforementioned goals and objectives.

**G. Evaluating Mitigation Measures**

Mitigation measures should be evaluated yearly by the planning team in each municipality. A schedule is laid out for doing so (see Table 21). Meetings should be held among the various parties responsible for carrying out action items in addition to the Boards of Selectmen of City Councils, Boards of Finance as well as including the public. Mitigation measures may be deemed too costly to carry out in one year versus another, or not effective as originally anticipated and dropped from the list.

This Plan is a new Plan for the eight northern towns in the RiverCOG Region; therefore no mitigation items are currently in place to evaluate. In the beginning of the fiscal year which will begin in July 2014, each town should begin evaluating mitigation measures put forth within this plan. At the Plan update in five years, each municipality as well as the Region will evaluate existing mitigation measures to determine the effectiveness of completed projects, and the viability of uncompleted items. Some items may be removed from the list while others may be added.

Effectiveness of a mitigation action items can be best measured after an event that the item was meant to mitigate. For example, if tree trimming efforts are accelerated, the best way to know whether or not those efforts are successful is to experience a large wind event.

**The Cost Test (cause and effect):** An analysis of past floods yields a formula for predicting floods. One example of a formula is: If the municipality receives 6 inches of rain in a 24-hour period structures on a specific road are at a high risk of being flooded. For example those on certain lots are particularly vulnerable based on historic repetitive

loss reports can expect \$10,000 to \$20,000 in damage respectively. This formula needs to be tested.

## **H. Mitigation Action Plans (MAP)**

RiverCOG does not maintain a master list of local structures or infrastructures vulnerable to major natural hazard events; they are listed in the Annexes A through H.

Each municipal prioritized list of vulnerabilities, including mitigation measures needed and in some cases costs can be found in the Annexes A through H sections VIII. Costs, where known, are also found in the (local) MAPs

These MAPs list each municipalities prioritized list of structures or infrastructures that are vulnerable to damage or the risk of life or limb of people during a major natural weather event. Unless indicated the line items are prioritized by their position on the list.

The reader needs to know that dams at risk are not listed here; but, are discussed in detail in the Regional and Local Flood Sections of the Plans. The State Department of Energy and Environmental Protection has an aggressive dam maintenance policy in place. However this only affects the State dams. As noted in the individual municipal sections of this Plan (Annexes A through H) there are also private and municipally owned dams. The DEEP also has in place a computerized dam risk modeling program. Alerts are sounded and if appropriate, warnings issued and engineers (and in some cases DEEP management) are dispatched to dams (public or private) at risk during storms.

Throughout the planning process, the State Hazard Mitigation Plan is to be utilized to verify and find details on storm histories and projections.

Emergency Management from the State to the Region<sup>19</sup>, to local (first and emergency) responders play an extremely important role in following all-hazard emergency planning.

Each municipality needs to develop Debris Management Plans<sup>20</sup>. The roadways throughout the area are lined with mature trees. And as we found out during Tropical Storm Irene, even with sustained winds of 50 MPH, many of them will come down. Each DMP should address TDSRS (Temporary Debris Storage and Reduction Sites).

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<sup>19</sup> Region here refers to the DEMHS Emergency Management Regional Planning Team area

<sup>20</sup> Cromwell is the only MRPA municipality with a DMP in place.

**I. Incorporation into Other Plans**

As indicated in subsections *Existing Strategies* and *Other Plan Policies*, RiverCOG staff works closely with the municipalities in updating their land use plans such as the Plans of Conservation and Development and Planning and Zoning Regulations. See these Plans in Annexes A - H.

Specific flood plain management plans:

- Zoning Regulations (See Floods, Section III.C.1.)
- Plan of Conservation and Development (See Mitigation Section)
- Emergency response planning
- Emergency Operations Plan
- Public Health Emergency Response Plans
- Regional Emergency Support/Response Plans

**Administrative Departments** take on the implementation of the need for new or updated *standards* including: road specifications, zoning regulations, fire/building code, and the local flood ordinance. As these departments update and change their standards, the NHMP should be thoroughly reviewed to insure that the departmental standards are in line with the NHMP mitigation action items.

See Table X Below for a listing of possible changes to local regulations and planning mechanisms.

<b>Regulation or Plan Status Relative to Hazard Mitigation</b>	<b>Changes to Potentially Be Made</b>	<b>Responsible Party</b>
Zoning Regulations	Incorporate suggested changes from NHMP into ZR.	Planning & Zoning Commission
Subdivision Regulations	Incorporate suggested changes from NHMP into SR.	Planning & Zoning Commission
Inland Wetland Regulations	Incorporate suggested changes into IWR including prevention of runoff near waterways.	Inland Wetlands Commission
Plan of Conservation and Development	Consider adding NHMP as an appendix.	Planning & Zoning Commission
Capital Improvement Plan	Consider new projects listed throughout this NHMP.	BOS, BOF

**Table 21:** Plans and Regulations to be Potentially Updated

**J. Cost Benefit – Looking Ahead**

Mitigation projects will come under cost-benefit scrutiny by stakeholders at all levels.

Cost calculations for estimating future expenses for structures and infrastructure; other than those identified in the MAP Sections in the Annexes are in process. Some are easy...from experience. Others require engineering studies. For example, the increasing of the size of a culvert could exacerbate downstream problems...especially if they are not now at risk. Therefore a multi municipal (regional) engineering study must be done before RFIs/RFPs/RFAQs go out and work begins.

a. Cost of repair vs. replace:

Cost can be prohibitive to any project; however, it may be particularly expensive and in need of more study for the following types of projects.

- Bridge (by far) and culvert repair and or replacement
- Roadway elevation
- Structure (public/private) elevation
- Structure (public/private) relocation
- Structure (public/private) flood proofing
- Sewer/septic system (public/private) upgrades
- Levee/embankment improvement
- Stream modification (unlikely due to DEEP restrictions)
- Storm water runoff improvements
- Acquisition of storm debris managing equipment

b. Consideration/Benefit:

Is the project currently “shovel ready”; ergo eligible for Stimulus type funding?  
Consider non-tangible benefits of a project  
Does the proposed project require a lengthy, costly permitting and approval process both locally and statewide?  
Do the benefits outweigh the financial risks?

Cost-benefit analyses are complicated in that, in some cases, other factors come into play. Such as increasing the size of a culvert may exacerbate downstream flooding. Therefore an engineering study must be done ... increasing the cost. This is why many of the cost factors on the Vulnerability lists are “TBD”.

c. Environmental Impact:

The potential negative environmental impact of a desired project may outweigh the cost effectiveness of a mitigation project.

d. Local budgeting:

Locally natural hazard mitigation projects must compete with other budgetary line items. The local governing body (Councils, Town Meeting, etc.) may also do

their own cost benefit evaluations and list them on a spreadsheet. Then they can compare project requests before approving expenditures.

## **K. Collaboration**

This subsection is meant to be a summary of Federal, State, Regional, Local and private collaboration in mitigation strategies.

### **a. Federal assistance in Mitigations**

Federal funding as discussed in Section I.B.3&4 is a key to significant mitigation measures. The Federal agencies pass the information down to the State who in turn passes it on to the regional planning agencies and municipalities. This NHMP is just one example of working together.

USGS maintains river gauges to work with us in emergency management when floods are threatening. When the Bodkin Rock Gauge was at risk we were asked for comment on the viability of its continuance.

### **b. State Mitigation Measures**

These collaborative efforts are discussed in detail in Section III.

For example;

Since 1982 the State of Connecticut has undertaken mitigation measures, which resulted in reducing the damage caused by Tropical Storm Floyd (1999). The State installed an Automated Flood Warning system in 1986, and updated and expanded the program in 1992, 1996, and 1998. It now includes the State's most flood prone rivers. Emergency management has the ability to monitor the notifications.

The State DEEP activates its flood prediction center when conditions are right for a flooding condition, providing local official's warnings and giving the region time to activate local monitoring of local at risk areas.

The DEEP has in place a computerized dam risk modeling program. Alerts are sounded and if appropriate, warnings issued and engineers dispatched (and in some cases DEEP management) to dams at risk during storms<sup>21</sup>. In a collaborative effort, DEEP Dam Engineers will also respond to a request for advice on vulnerability to failure, of a dam. This applies to public or private dams. The State has implemented a CtAlert emergency notification system to notify emergency management resources when a weather event is threatening

### **c. Regional Collaboration**

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<sup>21</sup> State, municipal and or privately owned

Regional officials worked with FEMA and its contractors on flood plain development planning. We began working on the revised FIRM maps at a regional workshop May 17, 2005. The municipalities signed off on the maps August 2008.

Current and future loss prevention is, and will continue to be a joint effort for local, regional, State and Federal efforts thru updating maps (MIDSTATE), and uniform local regulatory actions.

It should also be noted that the Regional Emergency Planning Teams (REPT) works within their respective regions and collaboratively with adjoining regions in natural hazard and all hazard emergency mitigation planning.

d. Local Collaboration Measures

Municipal departments, agencies, employees, volunteers, and elected and appointed citizens historically work together to keep any Town/City functioning. This includes debating mitigation programs.

e. Private Collaborative Measures

The American Red Cross actively works with local personnel in managing shelters.

Faith based organizations also support sheltering short term and feeding.

In Durham the Exchange Club supports their sheltering activities.

Private dam owners are expected to work with the municipality in maintaining their dams.

The public, making up the local CERTeams (Citizens Emergency Response Teams) are active in the area supporting mitigation efforts.

## **L. Mitigation Strategies by Local Agencies**

Specific mitigation actions by agencies (local, with RiverCOG support) ... Specific local mitigation strategy details can be found in the Annexes.

### a. Administration

The CEOs (Chief Elected Official or Chief Executive Officer) are the facilitators of all business within a municipality. They report to a board of selectmen or city/town council. They manage the overall mitigation efforts of participating agencies. As indicated in the Public Input Section of this Plan they also find themselves in the position of arbitrating the allocation of funding to projects and working with their boards/councils in prioritizing projects. The CEO/Council/Board has the final say in which projects will get funded and which will be postponed. They do rely on their agencies/boards to do their due diligence including combining funding sources to accomplish the desired results.

### b. Public Health and Social Services

The Public Health and Social Services departments in each town should be responsible for many of the residents' needs. Projects should include:

- Continue to enhance, and exercise shelter activities; short and long term for citizens during power outages caused by: regional blackouts, hurricanes, wind storms, ice storms, heat waves, extreme cold periods and evacuations due to flooding.
- Participate in local and regional exercises.
- Focus on Special Needs and Fixed Populations in line with many measures that are underway at local, regional and State levels.

### c. Public Works

The Public Works department in each town should be responsible for many of the infrastructure projects. Projects should include:

- Continue to monitor culverts and bridges that clog (maintaining debris collections above) and for ice damming.
- Continue on culvert maintenance and replacement plan... considering budget restraints and State grants availability.
- Develop a Debris Management Plan: Cromwell is the only municipality in the MRPA Region that has a Debris Management Plan in place.
- Continue monitoring Flood Warnings from DEEP and DEMHS.
- Require private compliance with CGS §22a-402(b)-(f); dam inspection requirements. Dam owners including the municipality are responsible for periodic evaluations of their dams and making repairs as needed.

- Collaborate with neighboring Middlesex County Public Works Directors for additional assistance if needed, See Appendix M for a list of PW Directors within the region.

d. Land Use Planning

Regional officials have worked with FEMA and its contractors on flood plain development planning. See Annexes A through H for local PoCDs and P&Z Regulations that apply to flood plain management.

e. Schools

The Schools, working with Emergency Management all have weather emergency plans in place, modeled after: Snow Days. They also have their own parents alert notification system in place.

## V Plan Maintenance (Element D)

### A. Overview (Mitigation Action Plan)

Section 201.6(c) (4) of 44 CFR requires a formal plan maintenance process assuring the Plan remains an active and relevant document. The Plan is to be updated five years from the date of approval by FEMA. (FEMA Regulations – 44 CFR §201.6(d) (3).)

Annually, RiverCOG municipal officials will continue the mitigation planning process and take actions needed to improve mitigation strategies.

Utilized will be in place actions such as: building codes, capital improvement projects, and public participation; ergo continuation of the updating of this Plan. RiverCOG staff will provide guidance in the updating process.

Each department, commission and or local official body is responsible for monitoring its own vulnerable sites on an ongoing basis. This include updates from actual occurrences, historical records, hazard data updates, more recent HAZUS study results, or recommendations from regional, State or Federal Agencies. There should be an annual review on the anniversary of the adoption of this plan.

Within five years of the adoption date of this plan, the Plan will be updated and resubmitted to FEMA, regardless of whether there are updates or not. Local officials and the Planning Team will work with RiverCOG on the next 5-year update.

### B. Responsibility

The Regional Planning Team has the responsibility for continuing the Plan review process. See section II.B. for a list of the people involved in the planning team for this plan as well as who should be included moving forward.

See also Table 19 for mitigation actions responsibilities highlighting departmental and agencies involved in the review process.

Municipal planners, emergency managers and public works directors shall take the lead in monitoring this Plan for updates. A total listing of Plan responsibilities can be found in Table19 and local Annexes A though H.

They should assure that the Plan remains in synch with:  
State mitigation planning requirements  
Regional mitigation planning suggestions  
Other local municipal plans (See Appendix A)

RiverCOG staff will be a conduit of information from and to DEEP and FEMA.

### C. Actions

Annexes A through H contain each municipalities proposed mitigation strategies and actionable projects. Also included are goals and objectives for accomplishing mitigation projects. These should be the baseline for the “going forward” local Mitigation Action Plan.

Planners, going forward will involve the public, preferably in workshops, to update this Plan.

Planners will obtain approval from other affected departmental and or commission plans before submitting any changes for approval.

#### **D. Evaluation**

The natural hazard planners will continue to push for incorporation of elements of this Plan into other local plans, and vice versa. Plans under consideration include: Plan of Conservation and Development, Planning, Zoning, Inland Wetlands, and other long-range planning mechanisms. This also includes appropriate sections of emergency plans such as the Emergency Operations Plans and public health emergency response plans.

Updates to this Plan should also be added to the LEPC (Local Emergency Planning Committee)/Public Safety) meeting agendas.

#### **E. Plan Maintenance and Update Schedule**

The Planning Commission in each municipality will monitor and evaluate progress in addressing action items in this Plan and include those accomplishments in its annual report to the Town/City. Each municipality will post its Annual Report on its website to inform and update the citizenry as a part of required ongoing citizen participation in implementation. See Figure 22 for the full maintenance and update schedule. This schedule is to be used in each municipality where this Plan is effective.

In order to evaluate progress made each year, responsible parties (Planning & Zoning and Public Works) will:

##### *Conduct Review of Mitigation Actions:*

Reviews will occur on an annual basis during the first quarter of each fiscal year (July-September). The purpose of these reviews will be to ensure that action items in the NHMP remain a priority for each of the municipalities. Reviews will also determine what projects are in progress, remain on schedule, have been completed or have yet to be completed. The review will be carried out by Town officials responsible for their progress. A report will be delivered to the Planning and Zoning Commissions for their consideration for planning the following year’s projects.

*Action Progress Meeting - Public*

Matters to be reviewed on an annual basis will include the goals and objectives of the NHMP, natural hazards or disasters that occurred during the preceding year (for example, the recent damage from Hurricane Sandy and resulting power outage), mitigation activities that have been accomplished to date, a discussion of reasons that implementation may be behind schedule, and recommendations for new projects and revised activities. The review conducted by town officials during the first quarter will play an active role in determining the following year's projects. The annual meeting should be during the second quarter of each fiscal year. This will enable a list of possible projects to be circulated for Town departments to review, with sufficient time for developing grant applications and inclusions in the town budget process. These meetings will be open to the public and publicized with ample time to allow the public to attend.

*Continued Public Involvement*

Continued public involvement will be sought regarding the monitoring, evaluating, and updating of the NHMP. Public input will be solicited through appropriate measures such as meeting notices, information on the town website and other methods deemed appropriate at the time. Direct input from the homeowners in flood zone areas is anticipated to continue each year. The CEO and Planning and Zoning Commissions will continue to provide the linkage to other municipal departments throughout the plan monitoring and evaluation each year relative to communication and participation.

*Plan Update*

At a minimum, RiverCOG will update the Plan every five years or sooner if conditions warrant. The following table shows a timeline for continuing action of the current plan and the beginning of the next update. The update process will again include public meetings to allow the public to participate and offer input. See Table 22 below for a more detailed schedule. This schedule will be adhered to in each of the eight municipalities included within this Multi-Jurisdictional Plan.

It is RiverCOG's responsibility to obtain the necessary funding to produce the Plan update and form the Planning Committee. All other update functions will be carried out by the full Planning Committee after its formation.

RiverCOG Multi-Jurisdictional Natural Hazard Mitigation Plan

Update and Maintenance Schedule	FY 2015 - 2016				FY 2016 - 2017				FY 2017 - 2018				FY 2018 - 2019				FY 2019 - 2020			
	1st Q	2nd Q	3rd Q	4th Q	1st Q	2nd Q	3rd Q	4th Q	1st Q	2nd Q	3rd Q	4th Q	1st Q	2nd Q	3rd Q	4th Q	1st Q	2nd Q	3rd Q	4th Q
Action Item Review	X				X				X				X				X			
Report on Action Items Status to Town	X				X				X				X				X			
Action Progress Meeting - Public		X				X				X				X				X		
Budget Action Items Based on Review			X				X				X				X				X	
Plan Update Committee Formation (RiverCOG)													X							
Determine Funding Source for Plan Update (RiverCOG)											X									
Apply for Funding to Complete Plan Update (RiverCOG)												X								
Begin Full Plan Review in Anticipation of Update												X								
Public Meetings, Drafts, Re-Writes													X	X	X	X				
Complete Final Draft to be Submitted																	X			
Completion of 5 Year Plan Update (Submission to DEEP and FEMA and Adoption by Town)																		X		
FEMA Approval and Adoption by All Towns																			X	X

**Table 22:** Plan Update and Maintenance Schedule

**Local Municipal Annexes**

List of Local Town Annexes

<b>Annex A:</b>	Cromwell Natural Hazards Mitigation Annex	127
<b>Annex B:</b>	Durham Natural Hazards Mitigation Annex	174
<b>Annex C:</b>	East Haddam Natural Hazards Mitigation Plan	222
<b>Annex D:</b>	East Hampton Natural Hazards Mitigation Annex	274
<b>Annex E:</b>	Haddam Natural Hazards Mitigation Annex	322
<b>Annex F:</b>	Middlefield Natural Hazards Mitigation Annex	373
<b>Annex G:</b>	Middletown Natural Hazards Mitigation Annex	419
<b>Annex H:</b>	Portland Natural Hazards Mitigation Annex	476

**Annex A**  
**Cromwell Natural Hazard Mitigation Annex**

**NATURAL HAZARD MITIGATION ANNEX**  
**TOWN OF CROMWELL CONNECTICUT**

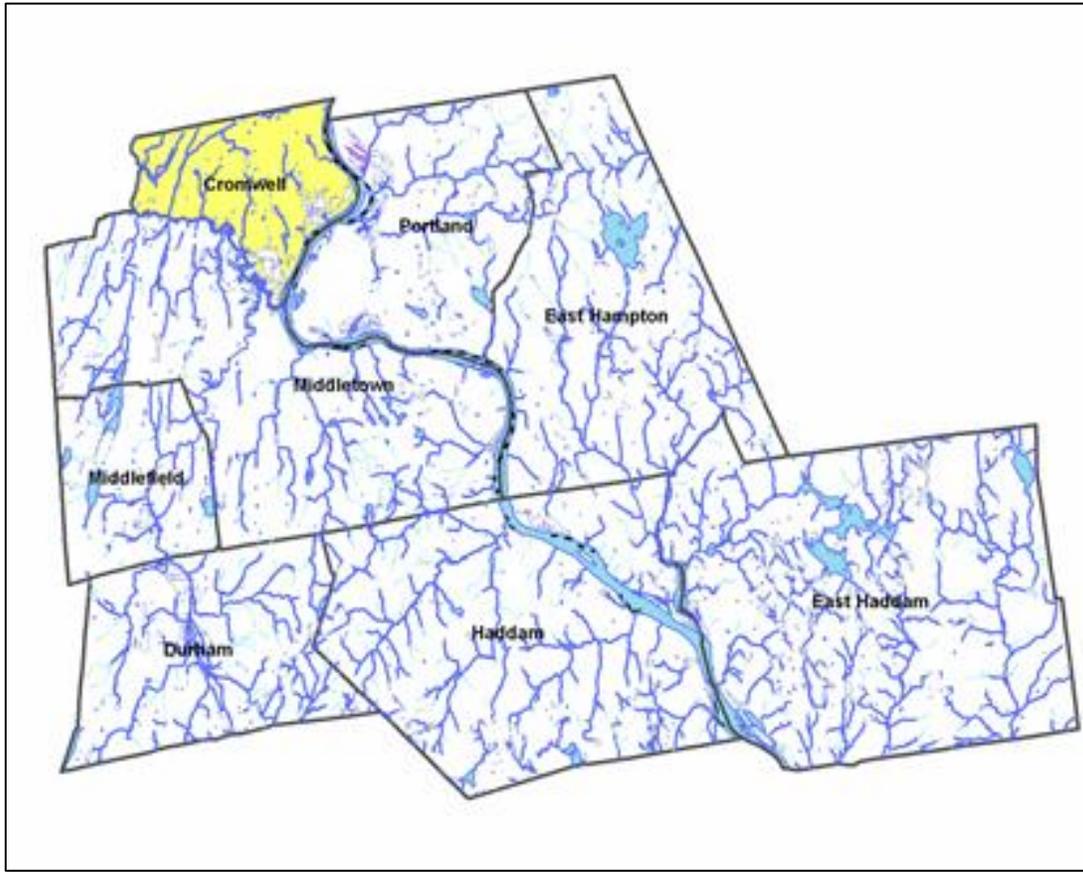


**June 2014**

Prepared by:

**Lower Connecticut River Valley Council of Governments**

*[www.rivercog.org](http://www.rivercog.org)*



**Map 1:** Cromwell within the former Midstate Planning Region

Source: RiverCOG

*On the cover:*

**Photo 1:** Buildings shifted as a result of 1938 Hurricane in Cromwell.

Source: Russell Library

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**i PURPOSE**

Funding these plans and projects reduces overall risks to the population and structures, while also reducing reliance on funding from actual disaster declarations. Pre Disaster Mitigation grants are to be awarded on a competitive basis and without reference to state allocations, quotas, or other formula-based allocation of funds. Source: FEMA

The purpose of this Natural Hazard Mitigation Plan is to identify the natural hazards most likely to affect the area, to locate the vulnerabilities, assess the risks and estimate corrective actions to protect life, limb, and property loss. This Plan is also meant to supplement other local plans, regional and State land use; clean water, wetland, debris management plans.

This Plan could be considered a long term strategy to reduce the loss of life, limb and property.

Bottom line: The most likely event, considered to be hazardous to the population and properties in the region is a natural disaster. Since the tragic events of September 11<sup>th</sup>, 2001 municipal administrations, planners and emergency responders have overlaid terrorist attacks onto their chemical, biological, radiological, nuclear, and explosive (including fires) standard operating procedures and guidelines. The focus of this plan is mitigating the effects of natural hazards.

**ii SCOPE OF PROJECT**

This pre-disaster risk and vulnerability assessment is designed and scoped to identify those areas that are vulnerable to specific or multiple severe weather related events. The Planning Team has evaluated history, current conditions and or state of repair and future potential conditions to develop a prioritized list of structures, utilities, roadways including bridges and culverts that are in need of repair, strengthening or replacement to prevent or minimize loss of life, limb or property. Dam failure (potential) and repetitive loss properties are a good example of areas the Planning Team looked closely at to predict the future. Historical data provides valuable references for future risk. Subject matter experts were contracted by the former MRPA to investigate and report on the repetitive loss properties and hazardous dams in the region.

All natural hazards were evaluated and categorized according to the “likelihood” of an occurrence. Flooding was by far the highest on our priority list. Hurricanes could, and historically have, happened and we are overdue for “a big one”. We are particularly vulnerable to the wind and flooding effects of a strong Category 1 and above magnitude hurricane. As you will see throughout this Natural Hazard Mitigation Plan **we anticipate 80% of our mature growth trees will be knocked down in the event of a major hurricane.** Earthquakes could happen; but are not likely.

Strategies for mitigation, within this Plan are best guess estimates by professionals.

**The following is a summary of the local content with highlights for a quick review.**

The Federal Emergency Management Agency (FEMA) in the Department of Homeland Security recognized the need for more robust “natural hazard” planning and mitigation at the local level. The purpose was to bring the need for proper preparation to the

attention of local jurisdictions and regions<sup>22</sup>. A benefit of a natural hazard planning process is to identify those areas, buildings or infrastructure that can be “fixed” to minimize or prevent damage from a major storm. Another benefit of this planning process is if a project is identified in the plan, then the municipality or region can request a grant under the Natural Hazard Mitigation Grant Program to mitigate the risk. Another benefit is; if a project is identified in this Plan and it is damaged or destroyed in a storm, funding can be obtained, under this program to replace the damage to what it should have been, as identified in the Plan. Otherwise disaster relief funding will only allow for rebuilding to: as it was.

A benefit of this planning process is an awareness of a need to revisit these other plans.

**Planning Process Benefit:** Throughout the NHMP planning process all departments and vulnerable stakeholders were reminded of; or became aware of, local vulnerabilities that mitigation projects could protect them from loss of life, limb or property. This is particularly true of critical infrastructures. The interest/awareness level here is high; given the DEMHS and DEEP activities in the last ten years.

This Annex and mitigation strategies takes into consideration the following potential major natural weather events causes: flood, hurricanes, winter storms, wildfire, drought, earthquakes, wind storms, extreme cold, and extreme heat.

Each natural hazard and subsequent risk has been evaluated to set-up the vulnerabilities of the municipality and region.

The impact of these events was evaluated based on: presence of vulnerable populations; well-being of the residents and businesses; vulnerable structures; vulnerable infrastructure and financial exposure to the municipality.

Event	RISK*						Total
	Potential	Value	Loss Potential	Value	Financial Impact	Value	
Earthquakes	L	1	M	2	L	1	1
Extreme Heat	H	3	L	1	L	1	1
Fires	M	2	M	2	L	1	2
Flood	H	3	H	3	H	3	3
Hurricane	M	3	H	3	H	3	3
Landslide	L	1	L	1	L	1	1
Thunderstorm	H	3	L	1	L	1	2
Tornado	M	1	H	3	M	2	2
Winter Storm	H	3	M	2	L	1	2
* Risk: Risk of life, limb, property, and/or financial impact H=High, M=Medium, L=Low 3= High Priority, 2 = Medium Priority, 1 = Low Priority							

<sup>22</sup> In Connecticut we have regional planning agencies, organizations or councils of governments performing the planning functions traditionally done by county governments in other states.

Also followed are guidelines from the National Flood Insurance Program under the Federal Insurance Administration, which enables property owners to purchase insurance protection against losses from flooding. Generally if a property does not have a mortgage, where the lender requires flood insurance, they may not have a policy. Where known we have listed them.

### **Highlights of this Regional/Local Natural Hazard Mitigation Annex**

The document includes historic photos documenting the local needs for mitigation, plus other locally valuable information and documentation not required under the FEMA NHMP Guidelines.

**Project Input:** Information was gathered through the direct involvement of staff people and the close relationship with MRPA on different projects. This input including past and present projects contributed to ongoing mitigation strategies; which will result in future mitigation projects. All these activities provided an opportunity for public input. Mitigation planning was often incorporated into the planning initiatives; such as DOT roadwork.

Residents also offered-up their vulnerability concerns at Selectmen Meetings; which carried forward to our Plan input.

**Meetings and participation:** Meetings, throughout the planning period, were held with Town employees, the administration, the public, individual department heads and local historic society representatives. Additionally a great deal of historic information came from regional and state libraries.

Participants in the planning process can be found in the Planning Process part in the Regional Section of this Plan, and here in Section II.

**Key Departments in planning:** The two key departments contributing to the Plan were Public Works and Emergency Management. The CEO will agree to bring the Plan through the adoption process. Cromwell is currently in a transition phase. As of November 1, the Town will move to a Town Manager/ Town Council form of government. The Town is currently in the process of interviewing Town Manager applicants.

### **Fixed Populations:**

- ✚ There are no long term incarceration facilities in Cromwell... only holding cells.
- ✚ In neighboring Middletown there is a large State Mental hospital
- ✚ Emergency Management, Public Health and Social Services work closely with local Convalescent hospitals, rest homes and senior citizen housing clusters in evacuation and shelter planning. Health Department personnel actively participate in local and regional public health emergency planning. This includes the statewide emergency management regions. At this time the Regions (2&3) are working on a Regional Support Plan addressing mitigation plans for protecting the public.

**Regional Pet Sheltering:** Grant monies have been and will continue to be sought for funding a regional pet holding area. Historically these were called “dog pounds”. These facilities can “back-up” the Pet Shelters adjacent to People Shelters.

**Non-FIRM flooding vulnerable areas:** Non flood plain areas vulnerable to flooding are within the scope of this planning exercise; though not in the FIRM plan.

**Non-Disclosure; Repetitive Loss Properties:** The Federal Privacy Act 1974 prohibits public release of the names of policy holders or recipients of financial assistance and the amount of the claim payment or assistance. Therefore only the highlights are listed in this plan

**Hazard Monitoring:** Because we have frequent floods in recent years our monitoring activities are real-time. Throughout this Plan appropriate photographs are shown.

**Funding Opportunities:** The local budgeting process is the primary source of funding for mitigation projects. Through adoption of this Plan it is hoped additional funding and grants will be available. Funding sources are discussed in Section I of the Regional section of this Plan

**Planning Process:** Town planners’ engaged in this project range from local planning departments, to this Agency and to outside engineering firms. In all cases they participated in this Project. See the Section II for participants and the planning process in the Region Part of this Plan and sections I, II & III of this Annex. Also Section VIII for ongoing NHMP Actions and Planning

**Mitigation Actions:** Prioritization of mitigation actions has been settled in each jurisdiction; simply put ... the CEO made the decision.

The progression of the mitigation actions is a function of cost-benefit studies and availability of funding. It is also understood that local budget spending is subject to conflicting interests in the available budget \$\$\$. E.g. school projects versus a particular road repair. Infrastructure mitigation projects can be a balancing act... by the Director of Public Works, subject to the administration’s wishes.

**Updating current NHMP:** There are no current NHMPs in place to update. After Plan adoption, if the need arises, elements can be updated annually.

**Public Outreach:**

For emergencies we have a FEMA/DEMHS Crisis Communications Plan in effect. It is outlined in our EMERGENCY OPERATIONS PLANS which MRPA assisted in the writing of. Notifications include postings on the local websites, the DEMHS 211 site and Press Releases.

For the development of this Plan the Mayor of Middletown issued a regional press release, advising the public of the Plan being in the works and requested they contact their local authorities and to watch for public workshops being held. For Public Outreach content, see Regional part of this Plan, Section IV and this local Annex Section IV

**Natural Resource Protection:** Advocates for protection of natural resources are ever present at meetings where projects are discussed that have the potential to affect natural resources. This also includes State Projects. Cromwell officials are very aware of protecting the environment. If areas are reclaimed during the hazard mitigation process, the space will be left as open space.

**Goals and Objectives:** Staff and planners, very early on in the process established goals and objectives to accomplish them. A brief synopsis of the Goals and Objectives can be found in the Regional and local sections of this Plan.

**Loss Reductions:** Mitigation goals are to reduce losses to life, limb and property and reduce chances for reductions in municipal services. Throughout the Plan there are references to actions to be taken to reduce losses. Also see the Regional part of this Plan, Section IV and this local Annex, Section, VIII.

**Actions monitoring:** Section III Part 6 Mitigation Action Plan is the spreadsheet of prioritized projects in need of repair and/or replacement. This is the working playbook by which the municipality will work going forward. Section III, this Annex, indicates the department or agency responsibility for these actions.

**Municipal Approval:** In order for Cromwell to qualify for future funding opportunities under the Natural Hazard Grant Program, this Plan must be adopted. See Section XIII.

**I DEMOGRAPHICS**

**A. Cromwell Profile**

The Town of Cromwell has a Selectmen and a Town Meeting form of government. The First Selectman is the Chief Elected Official and serves as Chairman of a three-member Board of Selectmen, who collectively serves as the executive branch. The Town Meeting is the legislative body and is comprised of all residents who are registered voters or who own property assessed at \$1,000 or more. However, beginning in November 2013, the town will move to a Town manager-mayor/council style of government. The Town of Cromwell is a chartered municipality and enjoys home rule authority as provided by the Connecticut General Statutes. There are also numerous other specialized boards and commissions of elected or appointed residents who participate in governing the community.

The Town comprises 13.5 square miles in the approximate geographical center of the State. It is 14 miles south of Hartford and 28 miles northeast of New Haven. The Connecticut River forms the eastern boundary of the Town.

A major north/south highway, Interstate 91, with two Cromwell exits, runs through the Town. The Central Connecticut Expressway (Route 9), opened at the end of 1989, enhancing the Town’s location as it connects I-95 in Old Saybrook, I-91 in Cromwell and I-84, the State’s major east/west highway in New Britain.

The Town’s position as a residential community is illustrated by the fact that approximately 70% of the fiscal 2011-2011 grand list was residential. The 7.2% unemployment rate compares favorably with the area’s rate of 9.9% and the State’s unemployment rate of 8.9%. The Town’s median household income in 2011 was \$83,670 as estimated by the Connecticut Economic Resource Center.

***Population Density***

Area	Population (2000)	Housing Units	Area (sq. miles)	Water Area (sq. miles)	Land Area (sq. miles)	Density per Square Mile of Land Area	
						Population	Housing Units
Middlesex County	155,071	67,285	43	70	36	420	182
Cromwell	12,871	5,365	12.9	0.5	12.4	1,038	432

**Figure 1:** Population of Cromwell  
Source: Census 2010

Year	2005	2010	2015	2020	2025	2030
Cromwell Population	13,390	13,497	13,604	13,763	13,972	14,163

**Figure 2:** UConn Population Study Estimates  
Source: State Data Center at UCONN

**B. From HAZUS-MH<sup>23</sup> Report:**

Due to the fact that this individual town Annex is part of the larger Former Midstate Regional Natural Hazards Mitigation Plan, HAZUS-MH was generated on a regional scale. Please see Appendices A, B, and C of this NHMP for the full HAZUS – MH Flood, Hurricane, and Earthquake Event Summary Reports, respectively, for the former Midstate Planning Region.

**II THE LOCAL PLANNING TEAM**

The Cromwell Natural Hazard Mitigation Planning Team leads were Emergency Management Director Fred Curtin, Public Works Director Richard Kelsey and Town Engineer Bob Niesyn.

Sources utilized to identify the local vulnerabilities at risk:

Cromwell is a relatively small town in Connecticut where town officials are able to keep a close watch on areas that need special planning and monitoring to maintain the character of the municipality and safety of its residents and visitors.

In keeping with the Goals and Objectives; and mitigation plans, the following agencies are actively engaged (as of 2009):

- Administration; Board of Selectmen, First Selectman Jeremy Shingleton  
Replaced by Mertie Terry)

Overall management of the Town including development of this Plan and ongoing updates plus overseeing mitigation plans.

- Office of Emergency Management; Director Fred Curtin (replaced by Wesley Bell)

Responsible for overall emergency management in the Town including sourcing grant money for improving the municipality's protection and response capability

- Public Works and Sewer: Director Eric Hood

Has direct responsibility for assessments and managing the mix of funding sources for mitigation actions. His goal is to minimize the financial impact locally by utilization of regional, State and Federal grants.

- Department of Public Health, Health Director, Wesley Bell

The Health Department staff is working on the local and regional plan for evacuations and sheltering with attention paid to special needs clusters and fixed populations. Director Bell is active in regional planning and exercising.

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<sup>23</sup> *Hazards United States-Multi Hazards*

- Building Department: Town Engineer, Joe Mazurek & Bob Niesyn Engineering Technician

Responsible for administration and enforcement of building permits. Joe also participates on the regional planning team.

- Planning and Zoning and Wetlands:

Primarily responsible for the coordination, review and processing of all development applications ... also the Plan of Conservation and Development (updated and adopted this year)

Local data was collected by the Team from a wide variety of State sources including: the State Departments of: Environmental Protection<sup>24</sup>, Transportation and Emergency Management & Homeland Security. Federal resources included; National Weather Service, US Geodetic Service and the Federal Emergency Management Agency. The latter (FEMA) is the authority behind this Project.

As an important part of the Team, the Public Works Department has an aggressive infrastructure ongoing mitigation strategy that is only constrained by budgetary limitations.

Cromwell uses State and Federal funding sources where possible. For example applying for the Stimulus Program for “shovel ready” projects

Planning, Zoning and Land Use Planners utilized historical records and the FIRM (Federal Insurance Maps)<sup>25</sup> to evaluate building in flood plains.

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<sup>24</sup> Now Department of Energy and Environmental Protection

<sup>25</sup> As updated August of 2008

**III MITIGATION ACTION RESPONSIBILITIES**

Cromwell RISK	Responsibility	Responsibility, Local		Action
	State/Federal	Assessment	Mitigation	
Flash floods	DOT	PW	PW	Operations & Capital Budget/* /NHMP
Floods	DEEP	PW, EM. MA	PW	Assessment (Owner) /reporting requirements Local Admin) see Hazardous Dam Report
Snow	NFPA	Fire/Fire Marshal	Owner	Admin Ordinance
Flood, Draught	DPH	PW Water/Sewer/HD	PW Water/Sewer/HD	HD ordinances and monitoring
Floods	EPA	Admin	Admin	Admin Manage
Thunder Storms, Floods	DEEP	Fire/Fire Marshal/EM	Fire/Fire Marshal/EM	Manage with DEEP
Wildfire	DEEP	Fire	Fire Marshall	P&Z - restricting building/ Fire Plan and practice (with DEEP, Forestry)
Floods, power outages	DEEP	EMD/PW/PH	PW	PW Loss of Power Plan current
Hurricane/Ice Storm/Wind Storm	DEEP/DEMHS	PW	Management Plan	ADMIN/PW facilitate the writing of a DMP plan
All storms	DPH	Health Department	Health Department	PH Plan
All storms	DPH	Social Services/HD/EM	Social Services/HD/EM	EOP, & PH Plan maintenance and Shelter exercising
Flood	NFIP	P&Z	Owners	Owners have NFIP coverage (Elevate/relocate/flood proofing)
Flood	NFIP	P&Z/ RIVERCOG	Owners	Owners continue coverage (Elevate/relocate/flood proofing)
Flood	NFIP	Admin/PW/EM	Admin	Elevate/relocate/flood proofing
Flood	DEEP/DEMHS	EM	PW	Develop a Plan of prevention
All storms	DEMHS	EM & LUO	All disciplines in EM	Participation in regional planning - REPT
All storms	NU/CL&P	EM & Responders	NU/CL&P	Public Notices (Crisis Communications Plan)

Figure 3: Mitigation Action Item Responsible Parties

## IV PUBLIC OUTREACH

There are a variety of modes of communication with the public.....Go To the Regional part of this Plan, Section IV.

Municipal responsibility to the public:

- People in vulnerable areas should monitor Flood Warnings:
- People with structures in vulnerable areas; specifically in flood plains should have a flood evacuation plan and participate in the National Flood Insurance Program. They should flood proof their buildings
- The municipalities will post storm info on their websites including proper preparations and warnings. DPH and DEMHS seasonally post info on their websites.

FEMA and the American Red Cross have extensive information and checklists for preparing for a major storm. Go To [READY.gov](https://www.ready.gov). Section IV of the Regional Section of this Plan, the PUBLIC OUTREACH part, highlights information sources available.

## V Public Assistance

A funding source option for mitigation projects is FEMA, Public Assistance. This is for repair, restoration or replacement of municipal facilities damaged by a storm...if a disaster has been declared.

The following excerpts are directly from FEMA regarding Public Assistance grant:

*FEMA Public Assistance (PA)*

**Public Assistance** The Department of Homeland Security (DHS) Appropriations Act, 2007, Public Law 109-295, directs the Federal Emergency Management Agency (FEMA) to conduct a Public Assistance (PA) Pilot Program. The legislation sets forth three goals for the PA Pilot Program: reducing the costs to the Federal Government of providing assistance to State and local governments, increasing flexibility in grant administration, and expediting the provision of assistance to States and local governments. The PA Pilot specifically addresses the provision of assistance under sections 403(a)(3)(A), 406 and 407 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, 42 U.S.C. 1570b(a)(3)(A), 5172, 5173 (Stafford Act). These sections relate to debris removal and the repair, restoration, and replacement of damaged facilities.

**Public Assistance Grant Program** The mission of the Federal Emergency Management Agency's (FEMA) Public Assistance (PA) Grant Program is to provide assistance to State, Tribal and local governments, and certain types of Private Nonprofit organizations so that communities can quickly respond to and recover from major disasters or emergencies declared by the President.

Through the PA Program, FEMA provides supplemental Federal disaster grant assistance for debris removal, emergency protective measures, and the repair, replacement, or restoration of disaster-damaged, publicly owned facilities and the facilities of certain Private Non-Profit (PNP) organizations. The PA Program also encourages protection of these damaged facilities from future events by providing assistance for hazard mitigation measures during the recovery process.

The Federal share of assistance is not less than 75% of the eligible cost for emergency measures and permanent restoration. The [grantee](#) (usually the State) determines how the non-Federal share (up to 25%) is split with the [sub-grantees](#) (eligible applicants).

- [Eligibility](#) - Overview of eligibility criteria and definitions
- [Roles and Responsibilities](#) - Information on the duties of Federal, State, and local partners
- [Public Assistance Grant Program Process](#) - Step by step description of the PA grant life cycle
- [Policy and Guidance](#) - 9500 series policies and other publications
- [Frequently Asked Questions \(FAQ\)](#) - Top 10 questions pertaining to the Public Assistance Program

- [Resource and Tools](#) - Appeal database, equipment rates, cost estimating format, performance goals, funding trends, and other resources

[Office of Equal Rights](#) - Information about the Office of Equal Rights and [how to file a discrimination complaint](#)

### CHAPTER 3

#### APPLYING FOR PUBLIC ASSISTANCE

Following a disaster declaration by the President, FEMA makes assistance for recovery from the disaster available to eligible applicants. This chapter describes the process through which this assistance becomes available.

##### Process Overview

The PA Program is implemented through the steps listed below, each of which is described in detail in this chapter.

- An Applicants' Briefing is held.
- Potential applicants submit the Request for Public Assistance.
- A PAC is assigned to each applicant.
- The PAC holds a Kickoff Meeting with the applicant.
- The applicant's specific needs are identified and cost estimates developed through the project formulation process.
- Cost estimates for small projects that have been prepared by the applicant are checked through the validation process.
- FEMA approves and processes grants for the applicant's projects.

**Projects.** A project is a logical method of performing work required as a result of the declared event. A project may consist of one item of work, such as repairs to a single structure, or work that occurs at multiple sites, such as repairs to several washouts along a road. The applicant is responsible for identifying all work that is required as a result of the disaster. The PAC may assist the applicant in combining various recovery efforts into projects.

## VI INDIVIDUAL ASSISTANCE

The following is an excerpt from FEMA Individual Assistance guidance:

### FEMA Individual Assistance (IA)

FEMA and other federal, state, local and volunteer agencies offer disaster assistance in several forms:

**Low-Interest Loans.** Most, but not all, federal assistance is in the form of low interest loans to cover expenses not covered by state or local programs, or private insurance. People who do not qualify for loans may be able to apply for a cash grant. If you qualify, your check will be issued in about three weeks.

The Farm Service Agency (FMHA) and the Small Business Administration (SBA), offer low interest loans to eligible individuals, farmers and businesses to repair or replace damaged property and personal belongings not covered by insurance.

Cash Grants for up to \$13,400 adjusted (annually for inflation). Individuals who do not qualify for a loan from SBA may be eligible for these grants from FEMA and the state to help recover uninsured property losses. Home inspections are normally conducted before a check is issued. FEMA funds 75% of the grant program's eligible costs with the remaining 25% covered by the state. The state administers the program.

Housing Assistance. FEMA's Disaster Housing Assistance Program (DHA) makes funds and temporary housing available to individuals whose home is unlivable because of a disaster.

Veterans Benefits. The Department of Veterans' Affairs provides death benefits, pensions, insurance settlements and adjustments to home mortgages for veterans.

Tax Refunds. The Internal Revenue Service (IRS) allows certain casualty losses to be deducted on Federal income tax returns for the year of the loss or through an immediate amendment to the previous year's return.

Unemployment Benefits. Unemployment benefits may be available through the state unemployment office and supported by the U.S. Department of Labor.

Crisis Counseling. Local and state health agencies, the American Red Cross, as well as churches and synagogues may offer counseling to people who have experienced a disaster.

Free Legal Counseling. The Young Lawyers Division of the American Bar Association, through an agreement with FEMA, provides free legal advice for low-income individuals regarding cases that will not produce a fee (i.e., those cases where attorneys are paid part of the settlement which is awarded by the court). Cases that may generate a fee are turned over to the local lawyer referral service.

Independent Study Programs. FEMA offers an Independent Study Program through the Emergency Management institute.

Individuals, families and businesses may be eligible for federal assistance if they live, own a business, or work in a county declared a Major Disaster Area, incur sufficient property damage or loss, and, depending on the type of assistance, do not have the insurance or other resources to meet their needs.

Source: FEMA

## VII NATURAL HAZARDS

The profiling of hazards in Cromwell is based on a variety of sources and personal observations of recent events and discussions with “the older generation”. At Town meetings we also heard of other concerns...other than the ones we already were aware of.

Natural disasters can often be predicted. And damage can be anticipated. Crumbling infrastructure does require continuing R & R to minimize costly damage. Utilizing budget allocations and available State grants the current mitigation process is ongoing. Repetitive damage, due to storms, generally puts a vulnerable project as a top priority “fix” on Public Works “Wish List”.

Storm damage tends to occur repeatedly in the same geographical locations because they are related to weather patterns or physical characteristics of the area (flooding). However; all areas of the community are vulnerable to one or another type of natural disaster (hurricanes, wind and ice storms, tornados).

Source: FEMA, State and Local Governments (SLG – 101, Hazard Specific Annex).

### **Note:**

This Cromwell Natural Hazard Mitigation Plan contains a variety of; localized details complementing the Natural Hazard Section in the Regional Section of this Plan. Go To: the Regional Section of this Plan: Section III.B

Of interest and available to the residents are the following sources of information: FEMA Directives on NFIP, USGS Floods, WATERWATCH [a Hydrologic Science and Data-Floods],USGS Flood Definitions, FLOWING Waters, Danger from Chevron –LEARN Cars website, DEMHS Hurricane Fact Sheet, NOAA Hurricane Definitions, Hurricane Grace – the PERFECT STORM story, The Great White Hurricane story, NWS Winter storm Advisories, FEMA Risk Prioritization Tool for Dams, NOAA, DEMHS Heat & Cold Advisor, USA Flood victims, WHEN THUNDER ROARS...GO INDOORS, EF Scale for Tornados, etc. Most of these info documents are suitable for posting for Public Outreach.

Cromwell is vulnerable to many types of natural hazards. Flooding is by far the most significant natural hazard with the potential to do harm to people, places, and infrastructure and to cause financial losses. The second greatest threat is from hurricanes. Therefore the focus of this Plan is on these two weather events.

Hurricane damage is not localized as is flooding. Generally the effects are town wide. Wet hurricanes also create flooding problems.

Wind and snow storms do regularly occur; but the results are not as catastrophic as flooding and hurricanes. The other potential threats are discussed extensively in the Regional Section of this Plan.

Spring flooding threats happen along the Connecticut River; particularly on River Road (see below photograph). In significant Spring Flooding Main Street businesses are vulnerable (see below photograph). Hurricane damage is not

localized and generally the effects are town wide. Wet hurricanes also create flooding problems.

**CROMWELL Emergency Operations Plan**

Excerpt from Cromwell Emergency Operations Plan (EOP) Hazard Specific Annex (HSA)

**Introduction to Hazard Specific Annexes (HSA)**

Information contained within the Cromwell Emergency Operations Plan is only intended to be a guide to emergency planners... it's a Plan. Each municipal discipline defined therein is responsible for their own Standard Operating Procedures.

For additional information on the weather Hazard Specific Annexes (HSAs) in this Book, Go To the following website HAZARDOUS WEATHER FRESPONSE GUIDE: <http://www.fema.gov/doc/hazards/g271rg.doc>.

Specifically; access this website for detailed information on the following:

Thunderstorms	Tsunamis\Tidal Waves
Tornadoes	Winter Storms
Flash Floods	Excessive Cold
Riverine Floods	Fog
Coastal Floods	Excessive Heat
Hurricanes	Windstorms"

**A. Floods**

**1. Introduction**

**NOTE: For an extensive discussion on flooding in the Region and State Go To the Regional Section of this Plan: Section III.B.1.c.1)**

There are two types of floods that may affect Cromwell; flash floods and Spring Flooding. Flash Floods and Spring Flooding are discussed in detail in the Regional part of this Plan, Section III.1

Land use planners and regulators take into serious consideration restrictions on the building of, and or winterizing of buildings in designated or known flood risk areas.

Emergency management also continues to monitor DEMHS, DEEP, local press, radio and TV for flood warnings.

The State activates its flood prediction centers (DEEP & DEMHS) when conditions are right for a riverine or small stream flood potential. The DEEP also

has a dam risk program for monitoring dams' vulnerability. Some dams are physically monitored when a threat exists.

Through legislation change, pressure should be put on the DEEP to allow banking protection from erosion.

Our local problem is the USGS is discontinuing utilization of the Bodkin Rock Tide Gage on the Connecticut River in Middletown. The loss of this early warning data source will increase our vulnerability to flood damage. This author was advised there will be a privately owned station installed elsewhere. We must pressure USGS to not deactivate the Bodkin Rock Tide Gage. [water.data.usgs.gov/nws](http://water.data.usgs.gov/nws).

## 2. Spring Flooding

Spring Flooding are the second flooding condition with the potential for causing damage in Cromwell. Yet they are the most likely, given its proximity to the low points from Main Street to the River.

Spring Flooding is the result thawing snow pack in northern New England in early spring. The flooding can be made worse when a large rain storm adds rain water to the melting snow.

Spring Flooding comes with plenty of advance warnings. DEEP and DEMHS as well as the radio and TV stations broadcast warnings with time lines for when a crest will reach a certain point.

The two most severe Spring Flooding events in memory are 1936 and 1984. The 1936 flood stage reached 31', by far the greatest flood in our recorded history. The automobile bridge was closed due to a buildup of debris on the upstream side as well as a concern that the River would cover the roadway. The Bridge clearance, above the River, was only 28ft. The bridge was replaced in 1938 by the Arrigoni Bridge, which has a clearance of 90 feet. It opened August 6<sup>th</sup>, a month before the Great Hurricane of 1938.

The 1984 crest was measured at the Bodkin Rock tide gage at 22 feet.





**Photos 2-4:** Downtown Cromwell, During 1936 Flooding

Source: Middlesex County Historical Society Library

### 3. Flash Floods

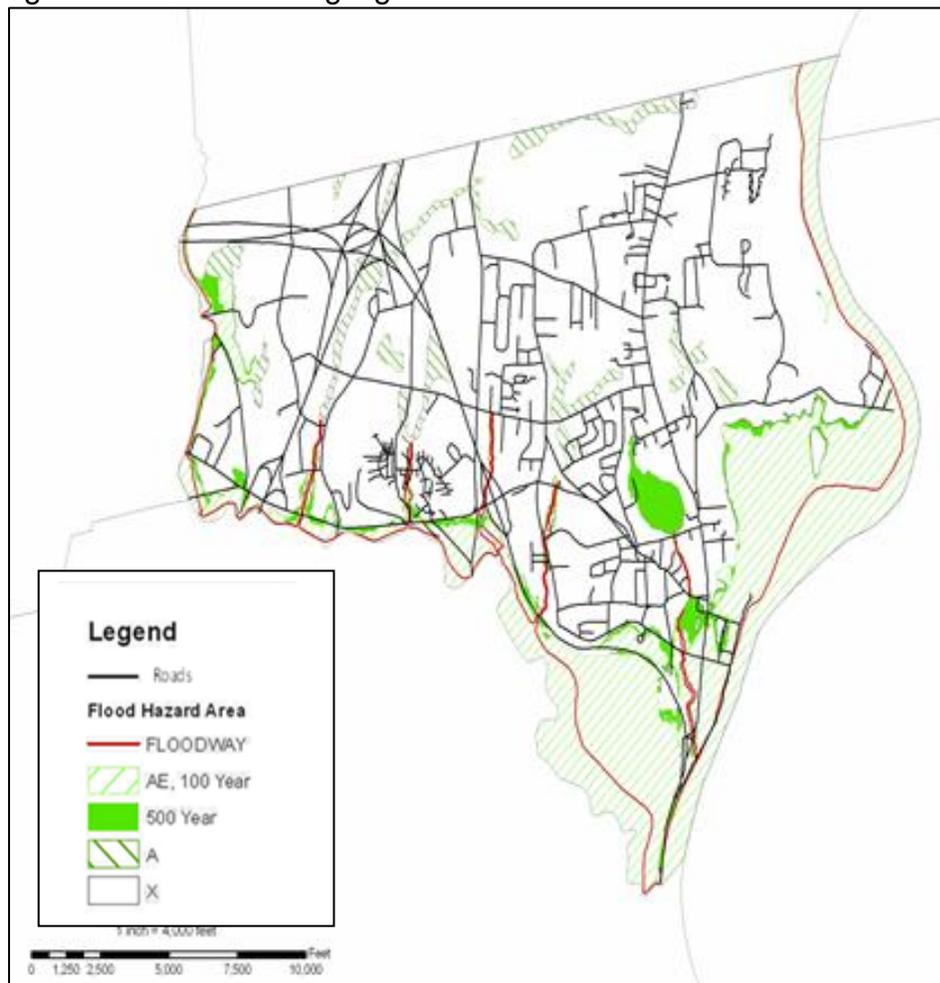
The first flood condition, caused by significant rain events, is when we receive a lot of precipitation from a major rain storm. These floods can be violent and come without any advance warning. Flash floods are characterized by high velocity flowing water often accompanied with debris. Flash floods cause significantly greater damage than riverine flooding. The streams passing through Cromwell and low lying roads are a cause of concern during significant rain events.

Flash floods are a particular threat for damaging dams (See Dam Section).

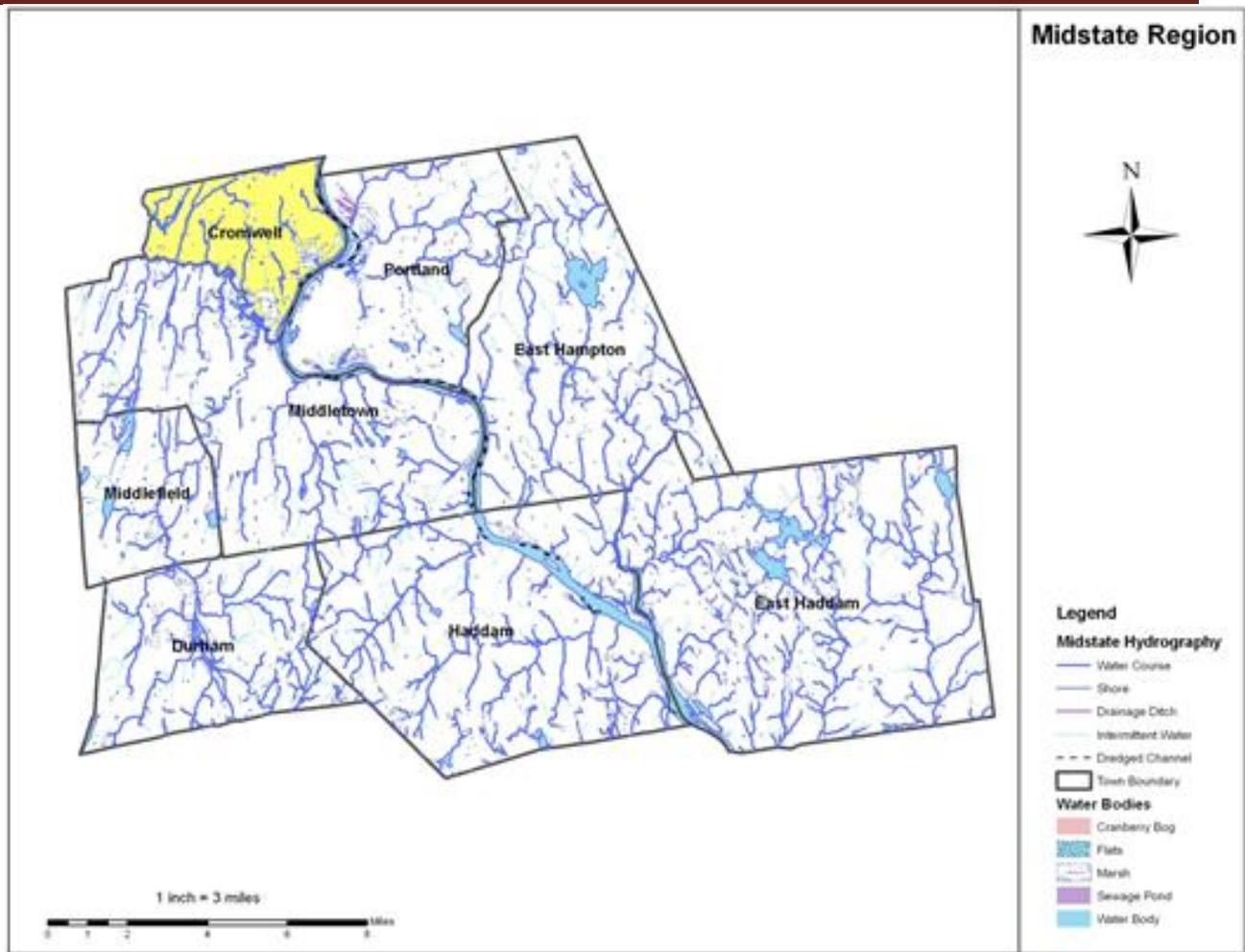
See Cromwell Detailed Mitigation Action Plan for a list of those areas in need of mitigation.

### 4. Cromwell Flood Zones and Regional Hydrography

The following maps depict the flood zones within Cromwell and the Hydrography of the region with Cromwell highlighted.



**Map 2: Cromwell Flood Zones**  
Source: RiverCOG



**Map 3: Cromwell Hydrography**  
Source: RiverCOG

### 5. Cromwell Flood Plain Management

According to FEMA "Flood plain management is the operation of a community program of corrective and preventative measures for reducing flood damage." These measures take a variety of forms and generally include requirements for zoning, subdivision or building, and special-purpose flood plain ordinances.

A community's agreement to adopt and enforce flood plain management ordinances, particularly with respect to new construction, is an important element in making flood insurance available to home and business owners. Currently over 20,100 communities voluntarily adopt and enforce local flood plain management ordinances that provide flood loss reduction building standards for new and existing development.

To help State and local officials in implementing the NFIP, see our

1. Adoption of Flood Insurance Rate Maps by Participating Communities

- 2. NFIP Flood plain Management Requirements
- 3. NFIP Policy Keyword Index

To encourage communities to establish sound flood plain management programs that recognize and encourage community flood plain management activities that exceed the minimum NFIP requirements, the Community Rating System (CRS) was created. This program provides communities with discounts to flood insurance rates. Additional flood plain management resources are available to download or can be ordered from the FEMA Publication Distribution Center by calling 1-800-480-2520 and requesting the publication by its FEMA number.

**Cromwell Planning and Zoning Regulations**

Town	NFIP Participant?	Latest FIRM Adoption	Flood Zone Regulation Adoption	Enforcement of Flood Zone
Cromwell, CT	Yes	August 28,2008	July 1, 2008	By Permit

**FLOODING – UPDATED Cromwell PLANNING & ZONING REGULATION**

Section XII defines the SPECIAL FLOOD HAZARD AREA REGULATIONS

The Legislature of the State of Connecticut has in Title 7, Chapter 98, Section 7-148(c)(7)(A) and in Title 8, Chapter 124, Section 8-2 of the General Statutes delegated the responsibility to local governmental units to adopt regulations designed to promote the public health, safety, and general welfare of its citizenry. Therefore, the Planning and Zoning Commission of the Town of Cromwell, Connecticut, does ordain as follows:

**1.2 FINDING OF FACT**

The flood hazard areas of the Town of Cromwell are subject to periodic flood inundation which results in the loss of life and property, health and safety hazards, disruption of commerce and governmental services, extraordinary public expenditures for flood protection and relief, and impairment of the tax base, all of which adversely affect the public health, safety and general welfare.

These flood losses are caused by the cumulative effect of obstructions in the flood plains causing increases in flood heights and velocities, and by the occupancy in flood hazard areas by uses vulnerable to floods or hazards to other lands which are inadequately elevated, flood proofed, or otherwise unprotected from flood damage. Uncontrolled development and use of the flood plains can adversely affect the community.

Within the zoning regulations, section 4.2.G is the Basis for Establishing The Special Flood Hazard Areas (SFHA) and section 4.3 defines the Riparian Protection District (RPD).

## **CROMWELL PLAN OF CONSERVATION AND DEVELOPMENT**

The following sections are taken from the POCD:

### ***Infrastructure***

*According to the latest update to the Plan of Conservation and Development, the town of Cromwell is intensively developed. Infrastructure throughout town includes Interstate 91, Ct Route 9, a railroad, the Buckeye Petroleum Pipeline, and the Mattabassett Multiple Town Sewer Treatment Plant. Municipal sewer and water is provided throughout much of the town.*

*Existing development is concentrated within sewer treatment and/or water service areas which are also identified in the State POCD as Growth and Neighborhood Conservation Areas. Commercial development is occurring within the strip adjacent to Route 372 between Route 9 and I-91. This area is zoned for business development.*

*In October 2008, the Water Pollution Control Authority gave approval to extend a sewer line to Riverfront Park located at the southern end of Main Street. This pipe will be extended 1300 feet along River Road, allowing businesses in that portion of town to connect.*

### ***Open Space***

*Open space and state identified Conservation and Preservation areas are generally located along the Connecticut and Mattabassett Rivers. Smaller parcels of dedicated and managed open space, conservation, and preservation areas are scattered throughout the town in all zones. The town is in the process of developing Riverfront Park in the southern end of town.*

### ***Development***

*The corridor adjacent to Route 372 is intensively developed as is the corridor adjacent to the Shunpike. Several areas are zoned for low density residential use and have State "Growth Area" designations. Riverfront and Old Town Center areas are primarily identified as "Neighborhood Conservation" areas, a state designation acceptable for the receipt of state funds for development. The Industrial Zone, along the Connecticut River near Main Street is identified for Conservation and Preservation.*

### ***Flooding and Erosion***

*According to the POCD, the major flood plains in the town are located around the Mattabassett and Connecticut Rivers, especially in the southeast corner of town. There are smaller flood plain areas scattered around the town corresponding with major brooks. The town zoning regulations designate the Flood Plain District. The district includes the two major flood plains in the southeast corner of the town. Within these two areas, the uses are restricted to farming, recreation, public utility wire and pipe lines, storage of materials and equipment, flood protective uses and recreational or cultural events of a limited duration.*

*The Town of Cromwell has 1,472 acres of un- developed vacant land. Much of this land is located on the east side of the Town along the Connecticut River. Development potential is limited in this area because it is subject to flooding.*

*The Flood Plain District represents 28.6% of the vacant land and 5.7% of the total land mass in Town.*

**Flood Plain District**

*The Flood Plain Zoning District encompasses all land east of the Connecticut River Stream Channel Encroachment Line established by the Connecticut Department of Environmental Protection in accordance with Sec.22a-342 of the Connecticut General Statutes, as well as certain other lands in close proximity to the Connecticut River. The district accounts for 17.3 of the zoned area of the Town. The purpose of the Flood Plain District is to allow for some limited development, while reducing the potential for human and economic loss in the event of a flood.*

**2.1.1 Land Use**

GOAL 3 - Promote a sensitively protected, accessible natural environment

Objective 6 - To minimize the negative impacts of development on the natural environment  
Policy 20 - Protect Cromwell's numerous flood plains and flood areas from future development

**2.4 Future Land Use Plan**

Conservation Areas

The Conservation areas were designated by the Connecticut statewide plan for development and conservation. These areas are primarily derived from wetlands and flood plains. While it is not mandated, every effort should be made to avoid building in these areas.

**6. National Flood Plain Management**

The Town of Cromwell has voluntarily participated in the National Flood Insurance Program (NFIP) since 1974. The town is committed to continuing NFIP compliance in the future. Flood Plain regulations are included in the Towns Zoning Regulations.

**Cromwell Natural Hazard Mitigation Annex**

	Initial Hazard Boundary Map FHEM	Initial Flood Insurance Rate map	Date entered the NFIP regular Program	Current Effective FIRM Map (Date Current Mapping Adopted)	Date Planning & for Zoning Updated
MUNICIPALITY	(i)FHEM	(i)FIRM	(r)FIRM	(c)FIRM	(l) Regulations updated
Cromwell	22-Mar-74	15-Jun-78	15-Jun-78	28-Aug-08	11/09 Attached Section IV.P.a

**Figure 4:** Cromwell Adoption Dates

**7. Repetitive Loss Properties**

Located north of Middletown, Cromwell has two repetitive loss properties in the same AE zone along the west side of the Connecticut River.

As of February 29, 2012				
Location:	Town:	# of Claims:	Total Claims:	Claim Projection
CT River	CROMWELL	3	\$27,489.40	\$ 33,275.00
CT River	CROMWELL	2	\$21,387.40	\$ 17,350.00

**Figure 5:** Cromwell Repetitive Loss Claims

*Data as of 02/29/2012 The information contained in this transmittal is legally privileged and confidential. Its use is protected under the privacy act of 1974, 5 U.S.C. section 552(a). Use of the information provided should be restricted to applicable routine use cited in the systems notice published in 56 FR 26415.*

Local

- Both properties are within the floodway of the River. They are located in a residential area just outside the west edge of the Connecticut River floodway. They have had two past losses of which 80 % were “Building”.
- Mitigation measures; recommended the homeowner include: flood proofing, developing a response plan and staying attentive to alerts and warnings.
- These properties and the 8 neighbors have a major flood event exposure.

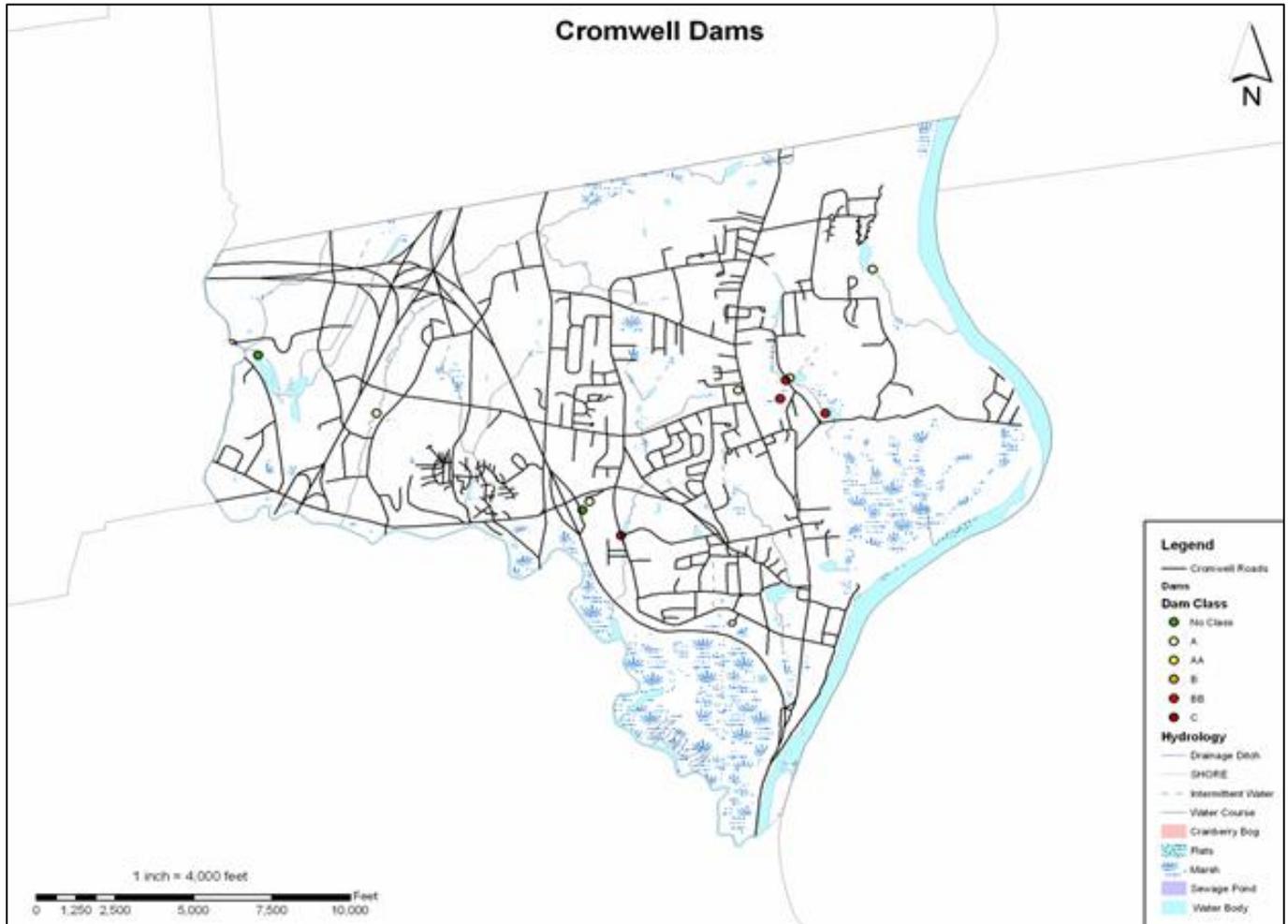
Town

- Cromwell has few requests for new construction in the flood plains; those that come in must comply with FEMA standards.
- Reconstruction of more than 50% of structure value in flood zones requires the entire structure comply with FEMA standards.

## 8. HAZUS-MH Flood Event Report

Due to the fact that this individual town Annex is part of the larger Former Midstate Regional Natural Hazards Mitigation Plan, HAZUS-MH was generated on a regional scale. Please see Appendix A of this NHMP for the full HAZUS – MH Flood Event Summary Report for the Midstate Planning Region.

## 9. Cromwell Dams



**Map 4: Cromwell Dams**

Source: RiverCOG

In the Town of Cromwell, the Connecticut Department of Energy and Environmental Protection (CT/DEEP) has 17 dams in their dam inventory. The Town does not have a High Hazard dam (Class-C) or a Significant Hazard dam (Class-B) in the town. There are three municipally owned dams in the Town of Cromwell.

The hazard classification of a dam is determined by the CT/DEEP. The hazard classification for a specific dam is based upon the potential damage to life or property downstream of the dam if the dam were to fail. The hazard

classification of a dam is not an indication of the condition of the dam. The dam must be inspected by the CT/DEEP or the dam owner’s engineer to determine the current condition of the dam. The conditions of the High Hazard and Significant Hazard Dams in this report were obtained from the CT/DEEP dam Safety Files located at 79 Elm St., Hartford, CT.

DAM ID #	DAM NAME	HAZARD CLASS	OWNERSHIP
3303	Fire Pond Dam	BB – Moderate Hazard	Cromwell Fire District
3304	Northern Pond Dam	A – Low Hazard	Town of Cromwell
3306	New Pond Dam	A- Low Hazard	Town of Cromwell

**Figure 6: Cromwell Dams**

**Inspection/Reporting Requirements**

The State of Connecticut General Statutes (CGS §22a-402(b)-(f)) were recently revised, giving the chief executive official or his designee the ability to inspect dams if they reasonably believe that a public safety concern exists. Inspection of any such dam owned or operated by a water company or of a dam that is a hydroelectric generating facility shall be controlled by the provisions of subsection (c) of CGS §22a-402.

The chief executive official or designee shall have the right to enter private property, within constitutional limits, to undertake such inspection provided such official or designee shall in accordance with CGS §22a-402(b) 2:

- a) Notify the Commissioner of the DEEP prior to conducting such inspection.
- b) Make reasonable attempt to notify the owner of the dam prior to such inspection.
- c) File a report with the Commissioner of DEEP in accordance with the provisions of subsection (f) of CGS §22a-402.

**10. Flood Mitigation Strategies**

Mitigation Strategies are detailed in section VIII of this Annex. The following is a general list of strategies the Town could pursue:

- Purchase flood prone properties and create open space
- Maintain culverts, bridges and other restricted flow streams of debris
- Maintain dams (municipally owned) and caution private dam owners
- When a storm is pending early warn residents of fast flowing waters,
- Advise homeowners at risk to flood proof the structure
- Remind residents of evacuation and sheltering procedures.
- Advise residents where to go for weather notifications.
- Advise the public of the dangers of driving through moving flood waters

## **B. Hurricanes**

For an extensive discussion on hurricanes in the Region and State see the Regional Section of this Plan: Section III.B.1.c.2)

### **1. Introduction**

Hurricanes pose the most catastrophic damage potential of any natural disaster phenomenon. As indicated in the Regional part of this Plan, Section III.1 they come in various shapes and sizes; some are wind events, some rain and some...the worst kind have... both e.g. 1938 Hurricane.

Cromwell departments and administration will continue to monitor National Weather Service, NOAA, local media, and DEMHS extreme weather announcements.

Because hurricanes are the event we here in the Northeast are most apt to encounter in catastrophic proportions, the section in the Emergency Operations Plan...HSA Annex A ... contains excerpts from the HAZARDOUS WEATHER RESPONSE GUIDE.

Also available to the Emergency Management Director is the CD **NEW ENGLAND HURRICANE ARE YOU READY?** ([www.fema.gov](http://www.fema.gov)). Most EMDs received one in 2003.

Typically hurricanes cross Long Island Sound before arriving in the region; but traditionally this does not "slow" them down.

The State has an agreement with CNTV for use as a source of current information during an emergency. The State also has an arrangement for utilization 211 for a dial in info line. Local responders frequently train and exercise for major hurricane events.

*"Hurricane Irene August 2011 was a Tropical Storm when it made landfall in Connecticut. It has caused 45 deaths and \$7billion in damage to the Eastern Seaboard." - Earthworks*

### **2. HAZUS – MH Hurricane Event Report**

Due to the fact that this individual town Annex is part of the larger Former Midstate Regional Natural Hazards Mitigation Plan, HAZUS-MH was generated on a regional scale. Please see Appendix B of this NHMP for the full HAZUS – MH Hurricane Event Summary Report for the Midstate Planning Region.

### **3. Hurricane Mitigation Strategies**

Mitigation Strategies are detailed in section VIII of this Annex. The following is a general list of strategies the Town could pursue:

- Purchase flood prone properties and create open space
- Tree Warden to work with Public Works and CL&P on an aggressive tree trimming program.
- Maintain culverts, bridges and other restricted flow streams of debris

- Maintain dams (municipally owned) and caution private dam owners
- When a storm is pending early warn residents of fast flowing waters,
- Advise homeowners at risk to flood proof the structure
- Advise residents to secure any loose objects in the yard.
- Advise homeowners to “stock up” on food, water and medications (including the animals)
- Remind residents AND RESPONDERS of dangers of handling anything in the vicinity of a downed wire.
- Remind residents of evacuation and sheltering procedures.
- Advise residents where to go for weather notifications.

### C. Winter Storms

NOTE: For an extensive discussion on winter storms in the Region and State Go To the Regional Section of this Plan: Section III



**Photo 5:** 1888 Snow Storm, Middletown  
Source: Middletown Historical Society

**1. Snow Storms**

The Public Works Department has and can handle snow storms. However if a storm of the magnitude of 1888, which left 50 inches of snow and massive drifts was to occur Public Works and contractors would have difficulty in not only clearing the roads; but where to put the snow. This was an issue during the February 2011 snow storm, when we had a major storm which also caused significant building structure failures throughout the county. This situation occurred again after the February 2013 Blizzard, in which many towns in the area were struggling with snow removal after close to 40 inches of snow fell during the overnight hours.

Reported Roof Collapse or Structure Damage, January/February 2011 combination Snow Storms		
Municipality	Address	Structure
Cromwell	Route 372	K Mart
Cromwell	Cromwell Hills Drive	Cromwell Gardens

**Figure 7:** Roof Collapses and Damage from 2011 Winter Storms.

Source: DEMHS

Building officials, the Fire Marshal and Fire Department should require truss roofed buildings be marked, on the roadside exterior, with a large “T”. This is a significant responder safety issue.

Though not technically the winter, an October Nor’easter snow storm hit the area in 2011. See following Windstorm section.

Due to the weight of the wet snow, there was significant damage to one of the buildings in the Cromwell Gardens complex on Drive Cromwell

In a severe cold winter ice jams can be a problem. Public Works is prepared for breaking up ice above vulnerable culverts that have a history of ice cake clogging.

In a severe cold winter ice jams can be a problem. Public Works is prepared for breaking up ice above vulnerable culverts that have a history of ice cake clogging.

Major snow storms have occurred in the area:

- 1978 (disaster Declaration 3060)
- 1992 (disaster Declaration 972)
- 1993 (disaster Declaration 3098)
- 1996 (disaster Declaration 1092)
- 2003 (disaster Declaration 3176)
- 2004 (disaster Declaration 3192)
- 2005 (disaster Declaration 3200)

- 2006 (disaster Declaration 3266)
- 2011 (disaster Declaration 1958)
- 2011 (disaster Declaration 3342/4046)
- 2013 (disaster Declaration 4106)

## 2. Ice Storms

A major ice storm can cause major road closures and power outages. See Regional part of this Plan, Section III Tables 21, 22 & 23 for a historic storm record including major ice storms.

A major ice storm occurred December 17, 1973 (Ice Storm Felix)

### **Hartford Courant**

#### ***Dark Days: Remembering The Ice Storm Of '73***

*By Peter Kushkowski, November 20, 2002*

*Widespread power outages this week in the hills of northwest Connecticut reminded me of when my hometown of Haddam was in the grips of a similarly devastating ice storm almost 30 years ago. The memory of "Felix" still strikes terror in my heart whenever an ice storm threatens. Winter came to Haddam four days early, on Dec. 17, 1973, when a freezing rain started coating everything with a thick, heavy crust of ice. It wasn't long before the electricity began to go out as ice-laden power lines and tree branches fell.*

## 3. Winter Storm Mitigation Strategy

Mitigation Strategies are detailed in section VIII of this Annex. The following is a general list of strategies the Town could pursue:

- Having in place a Vegetation Maintenance Plan.
- Hopefully, after the October Nor'easter of 2011, CL&P will put into place a more robust power restoration plan.
- Have in place an Evacuation and Sheltering Plan

## D. Wind Storms

NOTE: For an extensive discussion on wind storms in the Region and State Go To the Regional Section of this Plan: Section III

### 1. Nor'easters

During the unusual October Nor'easter of 2011 power outages and blocked roads were major issues. Because the leaves were still on the trees when the snow came accompanied by strong winds, many trees and limbs came down taking power lines with them. Many Town roads were closed and there were extensive power outages.

### 2. Tornadoes

Tornados can happen anytime, anywhere in Town. As referenced in the Regional part of this Plan, Section III, they have happened in nearby East Hampton and Wethersfield. In recent years there have been major, damaging tornados in Bridgeport and West Springfield.

When tornado danger is most present the National Weather Service and CT Division of Emergency Management and Homeland Security notify emergency management and the Administration of the potential. But; they can happen anytime and sometimes without warning; though the local weather forecasters are getting better.

### **3. Wind Shear**

See Regional Section III.B.1.c.4 for a discussion on the difference between the winds of a tornado and those in a wind shear.

### **4. Wind Storm Mitigation Strategy**

Mitigation Strategies are detailed in section VIII of this Annex. The following is a general list of strategies the Town could pursue:

- Public Notifications: Issue warnings to the public (and responders) to not go near downed power lines until the power company gives the OK.
- Cromwell does have a plan for managing debris as a result of a major wind storm. Hurricanes, ice storms, tornados, wind shear are considered debris generating storms. Cromwell is the only former MRPA community with a Debris Management Plan in place.

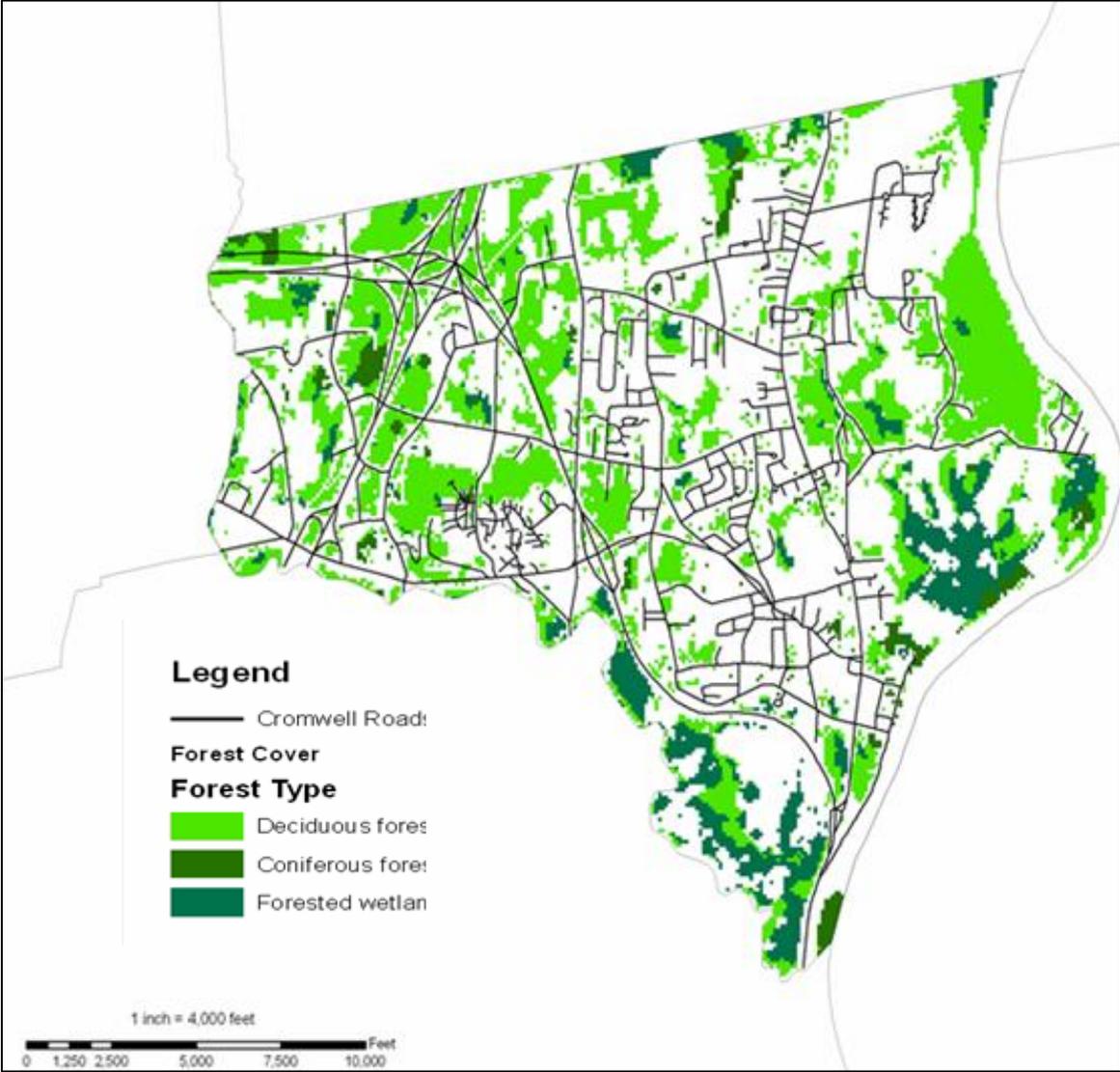
## **E. Other Natural Hazards**

An extensive list of other natural hazards are listed in the Region Plan Section III.C.

### **1. Forest Fires**

As shown in the following illustration of forest coverage in Cromwell, forest fire risk is ever present especially during droughts. The problem is exacerbated by the ever encroachment into woodlands by developments and individual residential units.

Homes along the forests edge are at the greatest risk to forest and wildfire. Typically forest fire is not a significant problem in Connecticut; however, during particularly dry periods, the state is susceptible.



**Map 5:** Cromwell Forest Coverage

Source: RiverCOG

## VIII CROMWELL MITIGATION ACTIONS

### A. Authorities, Policies, Programs, Resources

The town of Cromwell has many available policies and resources at its disposal for mitigating effects of natural disasters. For example, its flood plain regulations allow the Town to control growth and expansion within flood zones. The town has the authority to order parking bans in the event of a snow storm and is well prepared for all but the very worst of snow storms. The Town of Cromwell uses the State Building Code for code compliance to ensure safe structures which withstand 110 mph wind speed and appropriate snow load. The town also has the authority to order backup water supplies to be installed in new subdivisions when water for firefighting is not sufficient. In additions, the town can set up and often does set up shelters, cooling centers, and heating centers when needed for residents.

#### ***Highlights:***

##### **Storms**

- Land use planners and regulators have taken into serious consideration restrictions on the building of, and or winterizing of buildings in designated or known flood risk areas.
- Continue monitoring DEMHS, DEEP, local press and radio and TV for storm warnings.
- When a serious flash flood warning is issued, advise the public of the dangers of driving through moving flood waters.

##### **Crisis Communications Plan**

- ✚ Following Crisis Communications Plan guidelines, keep public and responders aware of “what is going on” and certain storm specific warnings; e.g.; “don’t touch downed power lines”, “don’t drive through flowing water”, availability of shelters, etc..

### B. NFIP and Community Rating System

See the Flood section of this Annex and Regional Section III.C.1 for information on the National Flood Insurance Program.

Cromwell currently participates in the NFIP and is committed to doing so in the future. Cromwell does not participate in the CRS; but should consider it.

The Community Rating System (CRS) is a part of the NFIP. When communities go beyond the NFIP’s minimum standards for flood plain management and participate in the CRS, discounts may be available on flood insurance premiums for policy holders in those communities.

### **C. Cromwell Goals and Objectives**

Goals and Objectives can be found in the Cromwell Mitigation Action Plan Section of this local Plan Section VIII.C and (overall) in the Regional part of this Plan, Section IV.3.

### **D. Identification of mitigation actions and projects including buildings and infrastructure**

Prioritized mitigation actions with costs (where known) can be found in the CROMWELL Detailed Mitigation Action Plan Section J.

**Administration:** Current and future loss prevention is, and will continue to be sourced through local, regional, State and Federal efforts for updating maps, local regulatory actions, and insurance efforts (National Flood Insurance Program). Also capital improvement funding made available from State and Federal sources for infrastructure improvements.

#### **Public Works:**

- Continues to monitor culverts and bridges that clog by maintaining debris collections above and for prevention of ice damming.
- Continues to look for funding for culvert and bridge maintenance considering local budget restraints and State grants availability.
- Cromwell is the only municipality in former MRPA region with a Debris Management Plan in place.
- Continue monitoring Flood Warnings from DEEP and DEMHS.
- Currently requiring private compliance with CGS §22a-402(b)-(f); dam inspection requirements. Local dam owners including the municipality are responsible for periodic evaluations of their dams and making repairs as needed.
- Is continuing its historic responsibilities and new ones as a designated responder. And they are aware of the herculean responsibilities a major hurricane will bring.
- Assumes the primary responsibility for municipal building and critical infrastructure.
- The Public Works Crew will stabilize unstable stream and road bed bankings to the fullest extent allowable by DEEP, and local agencies.

#### **Emergency Services:**

- Continue to use mutual aid agreements in place with neighboring municipalities. There is also a statewide mutual aid agreement in place. These will be kept current.

#### *Emergency Management:*

- Will continue to enhance EOC capabilities.
- Public health employees are now designated as responders<sup>26</sup>
- Public Works employees are now designated as responders<sup>27</sup>

---

<sup>26</sup> Responders Vs First Responders

<sup>27</sup> Responders Vs First Responders

- CROMWELL has always had a very strong Emergency Management program in place. Annually they practice/drill/exercise their capabilities locally, regionally and statewide.
- They offer direct assistance at training and or exercise sessions to the fire department, police department, public health and administration when needed.
- The CROMWELL Emergency Management Director is a leader statewide in emergency notification technology.

*Emergency Operations Center*

- The EOC management continues to have access to WEBEOC for current information and assets available (mitigation actions) for the emergency response and recovery modes.

**Funding:**

- Through local direct assistance to fire fighter, law enforcement, call center improvement, emergency management grants, EMS assistance, etc. emergency responders are continuing to seek funding to enhance their response capability.
- The direct to the regional planning agency grants have gone away. Now the Department of Emergency Management and Homeland Security (DEMHS) passes on FEMA grants to the five regions they have designated. Cromwell is in Region 3.
- The primary funding source for local infrastructure mitigation is through the local budgeting process. This is supplemented through regional, State and Federal grants. See Alternative Funding Sources, Regional Sections of this Plan, Section I.B.3&4.

**Notifications:**

- The emergency management team does and will continue to maintain multimedia communications to stay tuned to local media and DEMHS (e-mail) for bulletins.
- NOAA broadcasts the potential when conditions are right to, say spawn a tornado. When the threat exists, EM will monitor the early warning system.
- Public Notifications: The Public will continue to be notified to stay tuned to local media for severe weather bulletins.
- Reminders will also be sent out about the dangers of driving through rushing waters and going near downed wires.
- Residents and vulnerable businesses will be reminded to continue in their efforts of flood proofing.
- Social Services Department is in a position to continue in assisting in notifications of people with functional and other special needs.

**Public Health and Social Services:**

- Works closely with the State in preparing for the needs of people with functional needs
- Continue to enhance, and exercise shelter activities; both short and long term, for citizens during power outages, hurricanes, wind storms, ice storms, heat waves, and extreme cold.
- Sheltering activities includes participating in local and regional exercises.

- The CROMWELL Health Department is active in local regional (Middletown area) and Region 3 planning and exercises. There is a focus on enhancing exercise shelter activities; short and long term for citizens during power outages and evacuations. This is also particularly true of working with Special Needs and Fixed Populations:

**NGOs:**

- *Emergency management works with **Non-Governmental Organizations** in preparing for storm emergencies. These include the American Red Cross, faith based agencies, Salvation Army, senior centers, Rotary, etc.*

**Land Use Planners:**

Regional and Cromwell land use planners have worked with FEMA and its contractors on flood plain development planning. We began working on the revised FIRM maps at a workshop May 17, 2005. CROMWELL signed off on the maps August 2008.

The planners are aware of flood hazards throughout the Town particularly in designated flood plains. They will continue to:

1. Monitor trends in number of permit requests in vulnerable areas
2. Monitor evolving vulnerable areas where development may occur
3. Encourage open space in vulnerable areas
4. Encourage municipal acquisition of buildings in flood plains and creation of open space.
5. Monitor expected growth or development over the next 10, 20 years.

**Schools:**

The Schools, working with Emergency Management have severe weather plans in place, modeled after: Snow Days. They also have a NOAA provided weather alert radio for monitoring weather events.

**Special Situations**

- **People with Functional Needs (formerly; Special Needs) clusters:** The CROMWELL Health Department and Emergency Management shall continue to participate regularly in sheltering exercises. This includes handling people with disabilities. DEMHS Regions are working on enhancing programs for working with people with disabilities.
- **Fixed Populations:** These initiatives are ongoing including activities: locally, regionally and Statewide. This population includes those individuals unable to evacuate due to a physical disability or clusters of elderly or those with functional medical needs that shelter-in-place. Emergency management is also aware of the local State facilities that they are responsible for. However it may fall on the responsibility of the municipality; such as a group home.
- **Pet Evacuation and Sheltering:** Municipal officials should continue to make a special effort to identify, at risk local animal population pets and livestock. They should be aware of owner notification requirements (e.g. sheltering available) and transportation needs.

**Current Mitigation Efforts Underway**

- The Town of Cromwell Emergency Operations Plan, as updated in 2006, addresses in detail the evacuation and sheltering of animals.
- Emergency management and animal control authorities have available (from Region 2 & 3) portable pet shelters to be set-up adjacent to human shelters.
- Under the latest Americans with Disabilities Act (ADA) guidelines Service Animals are now specifically defined as Service Dogs. The only allowable exception is miniature horses. They have specific qualifiers. UPDATE: as of this writing there is an issue with the horses not being able to be house trained.
- The Region 2 Animal Evacuation and Sheltering sub-committee Coordinator is a veterinarian that lives in CROMWELL.

**E. Incorporation of Other Plans**

Go To Regional Section of this Plan for authorities, responsibilities and other<sup>28</sup> plans incorporated into the natural hazard planning; past and future. (Sections I, II and particularly IV)

Local land use plans apropos to natural hazard protection will be watched for ramifications to the natural hazard planning process. These plans include regional, State and Federal plans. See Section I, Part E.2

The following Figure shows the potential changes that could be made to various local plan and regulations as a result of findings in this Regional NHMP and local annex.

<b>Regulation or Plan Status Relative to Hazard Mitigation</b>	<b>Changes to Potentially Be Made</b>	<b>Responsible Party</b>
Zoning Regulations	Incorporate suggested changes from NHMP into ZR.	Planning & Zoning Commission
Subdivision Regulations	Incorporate suggested changes from NHMP into SR.	Planning & Zoning Commission
Inland Wetland Regulations	Incorporate suggested changes into IWR including prevention of runoff near waterways.	Inland Wetlands Commission
Plan of Conservation and Development	Consider adding NHMP as an appendix.	Planning & Zoning Commission
Capital Improvement Plan	Consider new projects listed in this NHMP.	BOS, BOF

**Figure 8:** Local Plans to Potentially Modified Based on this NHMP

<sup>28</sup> *Meaning other than natural hazard mitigation planning*

**F. Proposed Mitigation Strategies**

The municipality of Cromwell has a variety of mitigation actions currently in place. They are not limited to brick and mortar.

Go To this local Annex, Section III

**1. Events and Actions in Place**

**Land Use Planning:** Cromwell officials, led by Public Works Director Eric Hood, and Town land use planners worked with former MRPA staff on Land Use. Cromwell signed off on the FIRM maps August 2008.

Event	Likelihood	Loss Potential	Comprehensive Range of Actions and Projects in Place?
Floods	H	H	Y
Hurricanes	H	H	Y
Thunderstorms	H	L	P
Tornadoes	M	H	P
Nor'easter	H	M	Y
Extreme Cold	H	L	Y
Heavy Snow	H	M	Y
Ice Storm	M	H	Y
Fires,	M	H	Y
Extreme Heat	H	L	Y
Earthquakes	L	H	N
Landslides	L	L	N/A
Y = yes, N= no, P = Partial, N/A = Does not apply			

**Figure 9:** Natural Hazards potentially Affecting Cromwell.

**2. Planning Team Recommendations**

**TDSR (Temporary Debris Storage and Reduction Site Plan)**

Cromwell is the only final Debris management Plan in Place. It does; however, need to have a current plan in place for managing the massive amount of debris as a result of a hurricane hitting the area. 100 MPH winds and up would cause major destruction to our trees and in many cases power, cable and telephone lines. Again 100MPH an up winds will blow down 80% of our mature growth trees ... many hanging over power lines ... on local and state roadways. CROMWELL should include a temporary debris storage site in their DMP.

**Erosion Protection:**

Through legislation change, require the DEEP to allow banking protection from erosion.

**COOP/COG**

Develop a Continuity of Operations Plan/Continuity of Government Plan.

**Community Rating System**

Cromwell should consider participating in the Community Rating System (CRS).

**Weather Awareness:**

All **municipal departments and local agencies** will continue to listen for NOAA broadcasts and other emergency broadcasts, when conditions are right for a severe storm: significant rain event, heavy wind, tornado, hurricane, etc. They will then activate their emergency plans.

**3. Cromwell Mitigation Action Plan**

a. Prevention

Cromwell town planners, P&Z, the building department and emergency management, working with RiverCOG continuously monitors growth trends and vulnerable sites and has enhanced its land use regulations designed to protect natural resources and restrict development in flood zones and other hazard-prone areas.

These regulations help prevent the loss of life, limb and property by preventing inappropriate development in flood zones and other high risk areas by reducing the amount of damage caused by river and flash flooding.

The Zoning Regulations update in August of 2009 restrict select new construction in the 100-year flood plain as depicted on the most recent revision of the Flood Insurance Rate Map (FIRM)

In some cases all residential construction in areas that periodically flood (other than those in the FIRM areas, must be elevated to or above the flood risk elevation. Likewise, all non-residential construction must be elevated or flood proofed to or above the base flood elevation. The buildings vulnerable to wildfires must have at least two access routes.

The Zoning Regulations offer additional preventive measures during the site plan submittal process. The regulations require the protection of natural features including those that contribute to the natural functioning of the natural drainage system.

Wherever possible utility lines are required to be buried for new subdivisions and are encouraged for certain projects such as major road projects. These land use regulations are described in detail in the Zoning Regulations and Subdivision Regulations available through Cromwell Town Hall.

The Building Department ensures conformance with the Connecticut State Building Code including flood resistant construction.

The Inland Wetlands Commission, through its Inland Wetlands and Watercourses regulations, works toward the conservation of wetland resources through avoiding impacts from development on functional wetlands and watercourses.

Whenever possible, Public Works examines and clears public storm drains and grates of debris and as-needed tree maintenance. They tree trim where appropriate. And monitor dams at risk. Public works is also responsible for maintaining Town owned dams.

b. Emergency Services

Cromwell PD is in need for implementation of the CT Alert notification system in the PSAP for the notification of residents of emergencies affecting their area.

The School District has its own “snow notification” list.

The Office of Emergency Management is very active in emergency planning to help protect life, limb and property. The Emergency Management Director monitors the River forecasts very closely when there is a threat of river flooding.

c. Natural Resource Protection

Cromwell has an aggressive open space acquisition policy that helps protect areas prone to flooding and other natural hazards from future development. For example, the Cromwell Plan of Conservation and Development lists desired public open space acquisitions including properties with demonstrable mitigation benefits.

Mattabassett River Watershed Initiative: Cromwell supports the goals of the Mattabassett River Watershed Plan. MRWI organizes workshops and provides outreach materials on storm water and flood plain management materials. In addition, LRWI actively promoted open space preservation and protection adjacent to the Local River and other critical areas to ensure the proper functioning of the watershed.

Local repetitive loss property owners were interviewed by a subject matter expert, under contract with the former MRPA, as a part of this NHMP process. The RLP report can be found in section III.C.1.g on page 65.

Local dams have been evaluated as a part of this Plan process. Again, a dam subject matter expert was contracted for this effort. At risk dams were looked at by a dam expert. The dam report can be found in this Plan.

d. Challenges

- Cromwell regularly receives proposals for commercial and multi-family housing projects in or near the flood plains. Cromwell regulations, the cumulative effect of relatively intense land use that may increase the likelihood of flooding in commercial and densely populated areas in flood plains.
- Installation of a robust notification system; ideally the State adopted CT Alert. Then the education of the citizens re the value of “opting-in”.
- The Cromwell Sewer Commission needs to stay on top of activities at the Mattabassett Wastewater Treatment plant and protect the Town’s interests.
- Tree debris often results in street closures. In addition, tree debris creates blockages in the local streams and in culverts.
- Cromwell has only one emergency shelter with limited capacity.
- Cromwell needs additional emergency generators to supply electricity to emergency shelters and the Town Hall in the event of an extended power outage.
- Obtaining Federal Mitigation and Financial Assistance

Definitions for Priority, Schedule, and Responsible Party, and Cost can be found in Section IV.F on page 111.

e. Goal and Objectives

Definitions for Schedule, Priority and Cost Estimate can be found in Section IV.F. on page 111.

**Goal** of this Plan: Reduce the loss of life, limb and property of residents as a result of natural disasters.

**Objective 1** Improve the ability of Cromwell residents to prepare and respond to approaching severe weather.

Supporting Task	Responsible Party	Schedule	Priority	Potential Funding Source	Cost Estimate
Installation and implementation of the State recommended emergency alert notification system (CT Alert).	Cromwell PD, Fire Dispatch	A	High	PDM, HMGP, CIP, OP	\$\$
“Recruit” residents and business to register for CT Alert.	BOS	A	High	CIP, OP	\$

**Cromwell Natural Hazard Mitigation Annex**

Find funding for installation of generators in infrastructure and shelters.	BOS, EMD	A	High	HMGP, OP	\$\$
Provide additional cots, blankets, food supplies, etc. for emergency shelters.	EMD	A	Medium	HMGP, PDM, CIP	\$\$
Fund an engineering study for the raising of River Road or the building of a levee.	BOS, PW	A	Medium	HMGP, CIP, OP	\$\$

**Objective 2.** Reduce the amount of debris from severe storms through preventive tree maintenance.

<b>Supporting Task</b>	<b>Responsible Party</b>	<b>Schedule</b>	<b>Priority</b>	<b>Potential Funding Source</b>	<b>Cost Estimate</b>
Update the existing debris management plan.	Public Works	A	Medium	CIP, HMGP	\$
Budget appropriate money necessary to maintain and remove dead, dying, dangerous, and diseased trees in rights-of-way and on other town land	Public Works	A	Low	CIP	\$\$

**Objective 3.** Reduce property loss along the River

<b>Supporting Task</b>	<b>Responsible Party</b>	<b>Schedule</b>	<b>Priority</b>	<b>Potential Funding Source</b>	<b>Cost Estimate</b>
Support municipal purchase and creation of open space.	Administration	A	Medium	HMGP, CIP	\$\$\$
Support residents search for funding for elevation and flood proofing their property.	Administration	A	Medium	HMGP, RFC, SRL	\$\$\$

**G. Cromwell Detailed Mitigation Action Items**

Supporting Task	Responsible Party	Schedule	Priority	Funding Sources	Cost Estimate
Rebuilding sidewalks on Main Street between Wall and West Streets.	BOS, PW, BOF	B	Low	CIP, OP	\$\$
Raymond Place, near the Middle School and Grove Road: Raise road or build levee	BOS, PW, BOF, FM, EMD	B	Low	NHMP, CIP, OP	\$\$\$
Nooks Hill Road by the R.R. Overpass: Study to evaluate mitigation possibilities	BOS, PW, BOF, FM, EMD	B	Medium	NHMP, CIP, OP	\$\$
South Street near the R.R Overpass: Study to evaluate mitigation possibilities	BOS, PW, BOF, FM, EMD	B	Medium	NHMP, CIP, OP	\$\$
Shadow Lane near Amy Lane: Study to evaluate mitigation possibilities	BOS, PW, BOF, FM, EMD	B	High	NHMP, CIP, OP	\$\$
Riverside Drive: Need engineering study of bank stabilization and support of State to stop erosion.	BOS,, CT DEEP, PW, BOF, FM, EMD	C	Medium	NHMP, CIP, OP	\$\$

***Hurricanes***

Supporting Task	Responsible Party	Schedule	Priority	Funding Sources	Cost Estimate
Update Debirs Management Plan	PW	A	Medium	CIP, OP	\$

***Spring Flooding***

Supporting Task	Responsible Party	Schedule	Priority	Funding Sources	Cost Estimate
Work with Treatment Plant engineers to support their mitigation efforts See Section III.B.1.b.17)	BOS, EMD	A	Low	OP	\$
Riverside Dr. Erosion: move house further away from the "edge	LUO, BO, EMD, FM, PZC	B	Low	NHMP, OP	\$\$\$
Riveredge Dr Erosion: install heavy rain drains to stop rainfall erosion	BOS, PW	B	Medium	NHMP, CIP, OP	\$
Riversedge Dr. Erosion: Stabilize the bank.	DEEP	C	Medium	NHMP, CIP, OP	\$\$\$
Riversedge Dr. Erosion: Engineering Study.	BOS, LUO	A	Medium	NHMP, CIP, OP	\$

**IX PLAN MAINTENANCE**

FEMA Regulations – 44 CFR §201.6d3: The Town of Cromwell, working with the former MRPA will conduct a complete review and do a revision if needed and submit it for approval in 5-years. Even if there are no changes, it must be reported, in order to continue being eligible for Natural Hazard Mitigation Grants.

In accordance with Section 201.6c4 of 44 CFR Cromwell will assure the Plan remains an active and relevant document. RiverCOG municipality officials will continue working with Cromwell in the mitigation planning process.

Changes to the Plan can be made at any time to this Plan; however any change will require a submission to FEMA for approval either as an amendment or as a Plan update requiring re-adoption of the plan by the affected jurisdiction. If there are regional implications, then the entire Plan would need to be re-adopted by all jurisdictions.

Please see the Regional Section V.E. for the maintenance schedule which will be followed by all eight towns.

See Appendix Q for a sample mitigation planning tool.

**X PLAN APPROVAL AND ADOPTION**

Upon FEMA Approval Pending Adoption of this Plan, it requires adoption by the municipal governing body. CEO signatures are required in the Regional Section of this Plan. The following page contains the adoption certificate for the Town of Cromwell.

Cromwell Natural Hazard Mitigation Annex

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**THE LOWER CONNECTICUT RIVER VALLEY COUNCIL OF GOVERNMENTS  
MULTI-JURISDICTION NATURAL HAZARD MITIGATION PLAN  
CERTIFICATE OF ADOPTION  
Town of Cromwell, Connecticut**

WHEREAS, the Town of Cromwell has historically experienced severe damage from natural hazards and it continues to be vulnerable to the effects of - only those natural hazards profiled in the plan (i.e. flooding, thunderstorm, high wind, winter storms, earthquakes, and dam failure), resulting in loss of property and life, economic hardship, and threats to public health and safety; and

WHEREAS, the Town of Cromwell, has developed and received conditional approval from the Federal Emergency Management Agency (FEMA) for its Hazard Mitigation Plan under the requirements of 44 CFR 201.6; and

WHEREAS, public and committee meetings were held between June 16, 2009 and December 1, 2011 regarding the development and review of the Multi-Jurisdiction Natural Hazard Mitigation Plan; and

WHEREAS, the Plan specifically addresses hazard mitigation strategies and Plan maintenance procedure for the Town of Cromwell; and

WHEREAS, the Plan recommends several hazard mitigation actions/projects that will provide mitigation for specific natural hazards that impact the Town of Cromwell, with the effect of protecting people and property from loss associated with those hazards; and

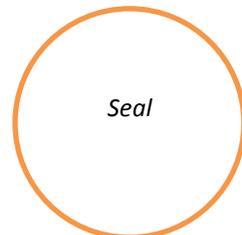
WHEREAS, adoption of this Plan will make the Town of Cromwell eligible for funding to alleviate the impacts of future hazards; now therefore be it

RESOLVED by the Board of Selectmen:

1. The Plan is hereby adopted as an official plan of the Town of Cromwell
2. The respective officials identified in the mitigation strategy of the Plan are hereby directed to pursue implementation of the recommended actions assigned to them;
3. Future revisions and Plan maintenance required by 44 CFR 201.6 and FEMA are hereby adopted as a part of this resolution for a period of five (5) years from the date of this resolution.
4. An annual report on the progress of the implementation elements of the Plan shall be presented to the Board of Selectmen by the Planning and Zoning Commission.

IN WITNESS WHEREOF, the undersigned has affixed his/her signature and the corporate seal of the Town of Cromwell this \_\_\_ day of \_\_\_\_\_, (year).

\_\_\_\_\_  
(Name, Title)



**NATURAL HAZARD MITIGATION ANNEX**  
**TOWN OF DURHAM CONNECTICUT**



**June 2014**

Prepared by:

**Lower Connecticut River Valley Council of Governments**

*[www.rivercog.org](http://www.rivercog.org)*

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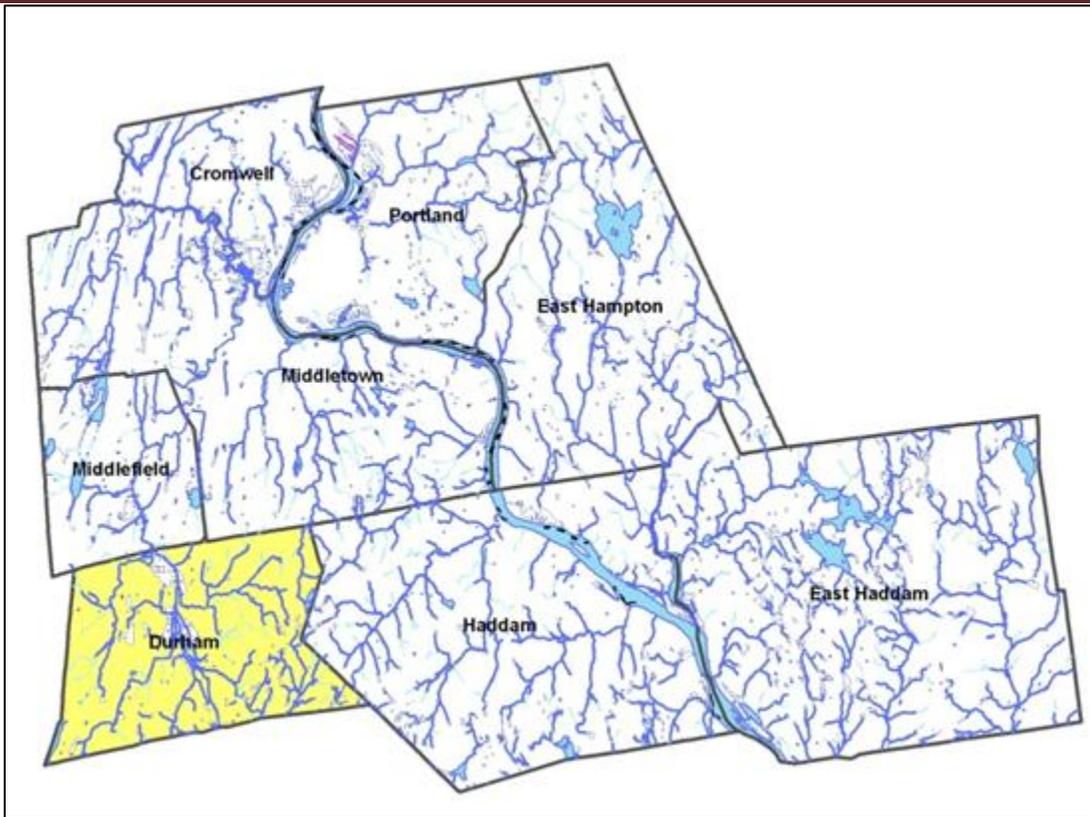
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**Map 1:** Durham within the former Midstate Planning Region.

Source: RiverCOG

*On the cover:*

**Photo 1:** Main Street Durham after the 1938 Hurricane.

Source: Russell Library

**i PURPOSE**

The purpose of this Natural Hazard Mitigation Plan is to identify the natural hazards most likely to affect the area, to locate the vulnerabilities, assess the risks and estimate corrective actions to protect life, limb, property and financial loss. Also, to synchronize this Plan with other local, regional and State; land use, transportation, clean water, wetlands and debris management plans. This Plan will compliment traditional emergency response plans.

See Appendix A for a list of related plans.

This Plan could be considered a long term strategy to reduce the economic consequences of a natural disaster.

**Bottom line:** The most likely event, considered to be hazardous to the population and properties in the region is a natural disaster. Since the tragic events of September 11<sup>th</sup>, 2001 municipal administrations, planners and emergency responders have overlaid terrorist attacks onto their chemical, biological, radiological, nuclear, and explosive (including fires) standard operating procedures and guidelines. Time has passed and now our focus is on natural hazards ... storms.

Funding these plans and projects reduces overall risks to the population and structures, while also reducing reliance on funding from actual disaster declarations. Pre Disaster Mitigation grants are to be awarded on a competitive basis and without reference to state allocations, quotas, or other formula-based allocation of funds.

**ii SCOPE OF PROJECT**

This pre-disaster risk and vulnerability assessment is designed and scoped to identify those areas that are vulnerable to specific or multiple severe weather related events. The Planning Team has evaluated history, current conditions and or state of repair and future potential conditions to develop a prioritized list of structures, utilities, roadways including bridges and culverts that are in need of repair, strengthening or replacement to prevent or minimize loss of life, limb or property. Dam failure (potential) and repetitive loss properties are a good example of areas the Planning Team looked closely at to predict the future. Historical data provides valuable references for future risk. Subject matter experts were contracted by the former MRPA to investigate and report on the repetitive loss properties and hazardous dams in the region.

We looked at all possible natural hazards and categorized them according to the “likelihood” of an occurrence. Flooding was by far the highest on our priority list. Hurricanes could, and historically have happened and we are overdue for “a big one”. We are particularly vulnerable to the wind and flooding effects of a strong Category 1 and up hurricane. As you will see throughout this Natural Hazard Mitigation Plan **we anticipate 80% of our mature growth trees will come down in a major hurricane.** Earthquakes could happen; but are not likely.

Strategies for mitigation, within this Plan are best guess estimates by professionals.

The following is a summary of the local content with highlights for a quick review:

**Benefit:** The Federal Emergency Management Agency (FEMA) in the Department of Homeland Security recognized the need for more robust “natural hazard” planning and mitigation at the local level. The purpose was to bring the need for proper preparation to the attention of local jurisdictions and regions<sup>29</sup>. A benefit of a natural hazard planning process is to identify those areas, buildings or infrastructure that can be “fixed” to minimize or prevent damage from a major storm. Another benefit of this planning process is if a project is identified in the plan, then the municipality or region can request a grant under the Natural Hazard Mitigation Grant Program to mitigate the risk. Another benefit is; if a project is identified in this Plan and it is damaged or destroyed in a storm, funding can be obtained under this program to replace the damage to what it should have been, as identified in the Plan. Otherwise disaster relief funding will only allow for rebuilding to: as it was.

A benefit of this planning process is an awareness of a need to revisit other plans.

Planning Process Benefit: Throughout the NHMP planning process all departments and vulnerable stakeholders were reminded of, or became aware of local vulnerabilities that mitigation projects could protect them from loss of life, limb or property. This is particularly true of critical infrastructures. The interest/awareness level here is high; given the DEMHS and DEEP activities in the last ten years.

This Plan and mitigation strategies take into consideration the following potential major natural weather events: flood, hurricane, winter storms, extreme cold, wildfire, earthquake, extreme heat, extreme cold, drought, and wind storms.

Event	RISK*						Total
	Potential	Value	Loss Potential	Value	Financial Impact	Value	
Earthquakes	L	1	M	2	L	1	1
Extreme Heat	H	3	L	1	L	1	1
Fires	M	2	M	2	L	1	2
Flood	H	3	H	3	H	3	3
Hurricane	M	3	H	3	H	3	3
Landslide	L	1	L	1	L	1	1
Thunderstorm	H	3	L	1	L	1	2
Tornado	M	1	H	3	M	2	2
Winter Storm	H	3	M	2	L	1	2
* Risk: Risk of life, limb, property, and/or financial impact H=High, M=Medium, L=Low 3= High Priority, 2 = Medium Priority, 1 = Low Priority							

**Figure 1: Risk of Natural Hazards in Durham**

<sup>29</sup> In Connecticut we have regional planning agencies, organizations or councils of governments performing the planning functions traditionally done by county governments in other states.

The impact of these events was evaluated based on: presence of vulnerable populations; well-being of the residents and businesses; vulnerable structures; vulnerable infrastructure and financial exposure to the municipality.

Also followed are guidelines from the National Flood Insurance Program under the Federal Insurance Administration, which enables property owners to purchase insurance protection against losses from flooding. Generally if a property does not have a mortgage, where the lender requires flood insurance, they may not have a policy. Where known we have listed them.

**Highlights of this Regional/Local Natural Hazard Mitigation Plan:**

That document includes historic photos documenting the local needs for mitigation, plus other locally valuable information and documentation not required under the FEMA NHMP Guidelines.

**Project Input:** Input for this Plan was gathered through the direct involvement of municipal staff, the public and the close relationship with the former MRPA. This input, including past and present projects, contributed to ongoing mitigation strategies which will result in future mitigation projects.

All these activities provided an opportunity for public input.

**Meetings and participation:** Meetings, throughout the planning period, were held with governing boards, the administration, the public, individual department heads and local historic society representatives. Additionally a great deal of historic information came from regional and state libraries. Residents also offered-up their vulnerabilities at Public Meetings; which carried forward to our Plan input.

Attendees can be found in Section I Part D and local in Section III, Part A.I.

**Key Departments in planning:** The two key departments contributing to the Plan were Public Works and Emergency Management. The First Selectwoman, Laura Francis was also heavily involved in the planning process. As indicated in the planning team section contributions were excellent. The First Selectwoman will bring the Plan through adoption when appropriate.

**Fixed Populations:**

- There are no long term incarceration facilities in Durham.
- In neighboring Middletown there is a large State Mental hospital
- Emergency Management, Public Health and Social Services work closely with local Convalescent hospitals, rest homes and senior citizen housing clusters in evacuation and shelter planning. Health Department personnel actively participate in local and regional public health emergency planning. This includes the statewide emergency management regions.

**Regional Pet Sheltering:**

Grant monies have been and will continue to be sought for funding a regional pet holding area. Historically these were called “dog pounds”. In case of sheltering needs, these facilities can hold the pets that regional shelters cannot facilitate.

**Non-FIRM flooding vulnerable areas:** Non flood plain areas vulnerable to flooding are within the scope of this planning exercise; though not in the FIRM plan.

**Non-Disclosure; Repetitive Loss Properties:** The Federal Privacy Act 1974 prohibits public release of the names of policy holders or recipients of financial assistance and the amount of the claim payment or assistance. Therefore only the highlights are listed in this plan

**Hazard Monitoring:** Because we have frequent floods in recent years our monitoring activities are real-time. Throughout this Plan appropriate flooding photographs are shown.

**Funding Opportunities:** The local budgeting process is the primary source of funding for mitigation projects. Through adoption of this Plan it is hoped additional funding and grants will be available. Funding sources are discussed in Section I of the Regional section of this Plan.

**Planning Process:** Town planners’ engaged in this project range from local planning departments, to this Agency and to outside engineering firms. In all cases they participated in this Project. See the Section II for participants and the planning process in the Region Part of this Plan and sections I, II & III of this Annex. Also Section VIII for ongoing NHMP Actions and Planning

**Mitigation Actions:** Prioritization of mitigation actions has been settled in each jurisdiction; simply put ... the CEO made the decision. BUT, we acknowledge a current failure can move a project to the head of the list

The creation of the mitigation actions is a function of cost-benefit studies and availability of funding. It is also understood that local budget spending is subject to conflicting interests in the available budget \$\$\$. E.g. school projects versus a particular road repair. Infrastructure mitigation projects can be a balancing act... by the Director of Public Works, subject to the administration’s wishes.

**Updating current NHMP:** There currently are no NHMPs in place to update. After Plan adoption, if the need arises, elements can be updated annually.

### **Public Outreach:**

For emergencies we have a FEMA/DEMHS Crisis Communications Plan in effect. It is outlined in our EMERGENCY OPERATIONS PLANS which MRPA assisted in the writing of. Notifications include postings on the local websites, the DEMHS 211 site and Press Releases.

For the development of this Plan the Mayor of Middletown issued a regional press release, advising the public of the Plan being in the works and requested they contact their local authorities and to watch for public workshops being held. For Public Outreach content, see Regional part of this Plan, Section IV and this local Annex Section IV

**Natural Resource Protection:** Advocates for protection of natural resources are ever present at meetings where projects are discussed that have the potential to affect natural resources. This also includes State Projects. Durham officials are very aware of protecting the environment. If areas are reclaimed during the hazard mitigation process, the space will be left as open space.

**Goals and Objectives:** Staff and planners, very early on in the process established goals and objectives to accomplish them. A brief synopsis of the Goals and Objectives can be found in the Regional and local sections of this Plan.

**Loss Reductions:** Mitigation goals are to reduce losses to life, limb and property ... and costly reductions in municipal services. Throughout the Plan there are references to actions to be taken to reduce losses; see Regional Section IV and this local Annex, Section, VIII.

**Loss Reductions:** Mitigation goals are to reduce losses to life, limb and property ... and costly reductions in municipal services. Throughout the Plan there are references to actions to be taken to reduce losses; see Regional Section IV and this local Annex, Section, VIII.

**Municipal Approval:** In order for Durham to qualify for future funding opportunities under the Natural Hazard Grant Program, this Plan must be “adopted”. See Section XIII.

**I DEMOGRAPHICS**

**A. Town Profile**

The Town of Durham has a Selectmen / Town Meeting form of government. The First Selectman is the Chief Elected Official and serves as Chairman of a three-member Board of Selectmen, which collectively serves as the executive branch. The Town Meeting is the legislative body and is comprised of all residents who are registered voters or who own property assessed at \$1,000 or more. The Town of Durham is a chartered municipality and enjoys home rule authority as provided by the Connecticut General Statutes. There are also numerous other specialized boards and commissions of elected or appointed residents who participate in governing our community.

Median Age 42.8  
 Households 2,610  
 Med. Household income \$105,417

Largest Employer (Grand List) Hobson & Motzer Inc.  
 School Enrollment 1,428

**B. Population Density**

Geographic Area	Population	Housing Units	Total Area (sq. miles)	Water Area (sq. miles)	Land Area (Sq. Miles)	Density per Square Mile of Land Area	
						Population	Housing Units
<u>County</u>	<b>(2000)</b>						
Middlesex	165,626	74,837	439	70	369	448	203
<u>Town</u>	<b>Population</b>	<b>Area (sq. miles)</b>	<b>Population Density</b>				
Durham	7,338	23.66	23.8	0.2	23.6	310	114

**Figure 2:** Population in Durham vs. Middlesex County

Source: US Census

Year	Census Population	CT DSC43 Projected Population					
		2000	2005	2010	2015	2020	2025
Durham	6,627	7,038	7,524	7,980	8,422	8,878	9,306

**Figure 3:** Population Projection

Source: State Data Center at UCONN

## II THE LOCAL PLANNING TEAM

Durham is a small rural community in Connecticut where town officials are able to monitor areas that need special planning and maintain the character of the municipality and safety of its residents and visitors.

The Durham working group was led by First Selectwoman Laura Francis. Contributors were: Emergency Management Director, Francis Willett, Town Engineer Brian Curtis, Public Works Director Kurt Bober, Building Official Ellen Mauro and (our own, and town resident) Town Planner Geoff Colegrove.

They were largely responsible for the gathering of local input for this Plan. The initial meeting was an informational session to define the scope of work. Subsequent meetings and many e-mails resulted in the information, goals and objectives reflected in this Plan.

The following agencies are actively engaged:

First Selectman; Laura Francis

1. Overall management of the Project
2. Acted as the focal point for arranging meetings.
3. Was able to gather together attendees for the Public Workshop.
4. Also a key member of the Regional Planning Team

Building Official; Ellen Mauro

1. Provided assistance with the vulnerabilities.

Emergency Management: Francis Willett

2. Assisted in coordinating meetings and provided input from a current prospective to the Plan.

Public Works: Director Kurt Bober

3. Direct responsibility for assessments and managing the mix of funding sources for mitigation actions. His goal is to minimize the financial impact locally by utilization of regional, State and Federal grants.

Planning and Zoning; Frank DeFelice

4. P&Z perspective ... applicant's issues

Town Engineer; Brian Curtis, NLJ Associates

Town Planner; Geoff Colegrove

The main artery through Durham is a State road. It is one of the municipal vulnerabilities to floods, due to insufficient culvert size. This is the State's responsibility.

Local data was collected by the Team from a wide variety of State sources including: the State Departments of: Energy and Environmental Protection, Transportation and the DESPP Division of Emergency Management & Homeland Security. Federal resources included; National Weather Service, US Geodetic Service and the Federal Emergency Management Agency. The latter (FEMA) is the authority behind this Project.

As an important part of the Team, the Public Works Department has an aggressive infrastructure ongoing mitigation strategy that is only constrained by budgetary limitations.

Durham does capitalize on the State and Federal funding sources where possible. For example applying for the Stimulus Program for “shovel ready” projects

Planning, Zoning and Land Use Planners utilized historical records and the FIRM which was updated in August 2008 to evaluate building in flood plains.

The public Workshop regarding the planning process resulted in considerable input from residents. See Appendix L for a summary of all meetings, and Appendix M for Minutes.

**III MITIGATION ACTIONS RESPONSIBILITIES**

TOWN OF DURHAM				
RISK ASSESSMENT				
ASSET	RISK	Local Responsible Party		Mitigation Strategy
		Assessment	Mitigation	
Roadways & Bridges/Culverts	Flash floods	PW	PW	Operations & Capital Budget/* /NHMP
Dams	Floods	PW, EM	PW	Assessment (Owner) /reporting requirements Local Admin) see Hazardous Dam Report
Truss Buildings	Snow	Fire/Fire Marshal	Owner	Admin Ordinance
Drinking water sources	Flood, Draught	PW Water/Sewer/HD	PW Water/Sewer/HD	HD ordinances and monitoring
Superfund Site	Floods	Admin	Admin	Admin Manage
Hazardous Storage	Thunder Storms, Floods	Fire/Fire Marshal/EM	Fire/Fire Marshal/EMD	Manage with DEEP
Forest	Wildfire	Fire	Fire Marshall	P&Z - restricting building/ Fire Plan and practice (with DEEP, Forestry)
Sewage pumping stations & /or septic systems	Floods, power outages	EMD/PW/PH	PW	PW Loss of Power Plan current
Debris	Hurricane/Ice Storm/Wind Storm	PW	Management Plan	ADMIN/PW facilitate the writing of a DMP plan
Food Contamination	All storms	Health Department	Health Department	PH Plan
Special Needs & Fixed Populations	All storms	Social Services/HD/EM	Social Services/HD/EM	EOP,& PH Plan maintenance and Shelter exercising
Residences in flood plain	Flood	P&Z	Owners	Owners have NFIP coverage (Elevate/relocate/flood proofing)
Repetitive Loss Properties	Flood	P&Z	Owners	Owners continue coverage (Elevate/relocate/flood proofing)
Commercial Buildings in flood plain	Flood	P&Z	Owners	Owners continue coverage (Elevate/relocate/flood proofing)
Municipal facilities in flood plain	Flood	Admin/PW/EM	Admin	Elevate/relocate/flood proofing
Ice Dams	Flood	EM	PW	Develop a Plan of prevention
Overall	All storms	EM & LUO	All disciplines in EM	Participation in regional planning - REPT
Overall	All storms	EM & Responders	NU/CL&P	Public Notices (Crisis Communications Plan)

**Figure 4:** Mitigation Action Responsible Parties

#### IV PUBLIC OUTREACH

There are a variety of modes of communication with the public.....Go To the Regional part of this Plan, Section IV. Also See Appendix L and M for Meetings held and Minutes.

Municipal responsibility to the public:

- People in vulnerable areas should monitor Flood Warnings:
- People with structures in vulnerable areas; specifically in flood plains should have a flood evacuation plan and participate in the National Flood Insurance Program. They should flood proof their buildings
- The municipality will post storm info on their websites including proper preparations and warnings. DPH and DEMHS seasonally post info on their websites.
- DPH and DEMHS seasonally post info on their websites.
  
- Make public aware that *FEMA* and the American Red Cross have extensive information and checklists for preparing for a major storm. Go To **READY.gov**. Section IV of the Regional Section of this Plan, the PUBLIC OUTREACH part, highlights information sources available.  
 Of interest and available to the residents are the following sources of information: FEMA Directives on NFIP, USGS Floods, WATERWATCH [a Hydrologic Science and Data-Floods], USGS Flood Definitions, FLOWING Waters, Danger from Chevron –LEARN Cars website, DEMHS Hurricane Fact Sheet, NOAA Hurricane Definitions, Hurricane Grace – the PERFECT STORM story, The Great White Hurricane story, NWS Winter storm Advisories, FEMA Risk Prioritization Tool for Dams, NOAA, DEMHS Heat & Cold Advisor, USA Flood victims, WHEN THUNDER ROARS...GO INDOORS, EF Scale for Tornados, etc. Most of these info documents are suitable for posting for Public Outreach.
- Issuing press releases is a good vehicle to get and keep the public, and businesses attention re we are watching out for them and want to hear from them re their concerns. Releases were also sent out advising of workshops. They were also posted on the municipal website.
- *People in vulnerable areas will be advised to monitor storm warnings:*
- People with structures in vulnerable areas; specifically in flood plains also have been and will be advised they should have a flood evacuation plan and participate in the National Flood Insurance Program. They should flood proof their buildings

**V PUBLIC ASSISTANCE**

A funding source option for mitigation projects is FEMA, Public Assistance. This is for repair, restoration or replacement of municipal facilities damaged by a storm...if a disaster has been declared.

The following is an excerpt from FEMA Public Assistance (PA) guidance:

**Public Assistance** The Department of Homeland Security (DHS) Appropriations Act, 2007, Public Law 109-295, directs the Federal Emergency Management Agency (FEMA) to conduct a Public Assistance (PA) Pilot Program. The legislation sets forth three goals for the PA Pilot Program: reducing the costs to the Federal Government of providing assistance to State and local governments, increasing flexibility in grant administration, and expediting the provision of assistance to State and local governments.

The PA Pilot specifically addresses the provision of assistance under sections 403(a) (3) (A), 406 and 407 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, 42 U.S.C. 1570b (a) (3) (A), 5172, 5173 (Stafford Act). These sections relate to debris removal and the repair, restoration, and replacement of damaged facilities.

**Public Assistance Grant Program** The mission of the Federal Emergency Management Agency's (FEMA) Public Assistance (PA) Grant Program is to provide assistance to State, Tribal and local governments, and certain types of Private Nonprofit organizations so that communities can quickly respond to and recover from major disasters or emergencies declared by the President.

Through the PA Program, FEMA provides supplemental Federal disaster grant assistance for debris removal, emergency protective measures, and the repair, replacement, or restoration of disaster-damaged, publicly owned facilities and the facilities of certain Private Non-Profit (PNP) organizations. The PA Program also encourages protection of these damaged facilities from future events by providing assistance for hazard mitigation measures during the recovery process.

The Federal share of assistance is not less than 75% of the eligible cost for emergency measures and permanent restoration. The grantee (usually the State) determines how the non-Federal share (up to 25%) is split with the sub-grantees (eligible applicants).

- Eligibility - Overview of eligibility criteria and definitions
- Roles and Responsibilities - Information on the duties of Federal, State, and local partners
- Public Assistance Grant Program Process - Step by step description of the PA grant life cycle
- Policy and Guidance - 9500 series policies and other publications
- Frequently Asked Questions (FAQ) - Top 10 questions pertaining to the Public Assistance Program
- Resource and Tools - Appeal database, equipment rates, cost estimating format, performance goals, funding trends, and other resources
- Office of Equal Rights - Information about the Office of Equal Rights and how to file a discrimination complaint

### CHAPTER 3: APPLYING FOR PUBLIC ASSISTANCE

Following a disaster declaration by the President, FEMA makes assistance for recovery from the disaster available to eligible applicants. This chapter describes the process through which this assistance becomes available.

#### Process Overview

The PA Program is implemented through the steps listed below, each of which is described in detail in this chapter.

- a. An Applicants' Briefing is held.
- b. Potential applicants submit the Request for Public Assistance.
- c. A PAC is assigned to each applicant.
- d. The PAC holds a Kickoff Meeting with the applicant.
- e. The applicant's specific needs are identified and cost estimates developed through the project formulation process.
- f. Cost estimates for small projects that have been prepared by the applicant are checked through the validation process.
- g. FEMA approves and processes grants for the applicant's projects.

**Projects.** A project is a logical method of performing work required as a result of the declared event. A project may consist of one item of work, such as repairs to a single structure, or work that occurs at multiple sites, such as repairs to several washouts along a road. The applicant is responsible for identifying all work that is required as a result of the disaster. The PAC may assist the applicant in combining various recovery efforts into projects.

Source: FEMA

## VI INDIVIDUAL (residents and businesses) ASSISTANCE

The following is an excerpt from FEMA Individual Assistance Guidance:

### FEMA Individual Assistance (IA)

FEMA and other federal, state, local and volunteer agencies offer disaster assistance in several forms:

**Low-Interest Loans.** Most, but not all, federal assistance is in the form of low interest loans to cover expenses not covered by state or local programs, or private insurance. People who do not qualify for loans may be able to apply for a cash grant. If you qualify, your check will be issued in about three weeks.

The [Farm Service Agency \(FMHA\)](#) and the [Small Business Administration \(SBA\)](#), offer low interest loans to eligible individuals, farmers and businesses to repair or replace damaged property and personal belongings not covered by insurance.

**Cash Grants** for up to \$13,400 adjusted (annually for inflation). Individuals who do not qualify for a loan from SBA may be eligible for these grants from FEMA and the state to help recover uninsured property losses. Home inspections are normally conducted before a check is issued. FEMA funds 75% of the grant program's eligible

costs with the remaining 25% covered by the state. The state administers the program.

**Housing Assistance.** FEMA's Disaster Housing Assistance Program (DHA) makes funds and temporary housing available to individuals whose home is unlivable because of a disaster.

**Veterans Benefits.** The Department of Veterans' Affairs provides death benefits, pensions, insurance settlements and adjustments to home mortgages for veterans.

**Tax Refunds.** The [Internal Revenue Service \(IRS\)](#) allows certain casualty losses to be deducted on Federal income tax returns for the year of the loss or through an immediate amendment to the previous year's return.

**Unemployment Benefits.** Unemployment benefits may be available through the state unemployment office and supported by the U.S. Department of Labor.

**Crisis Counseling.** Local and state health agencies, the American Red Cross, as well as churches and synagogues may offer counseling to people who have experienced a disaster.

**Free Legal Counseling.** The Young Lawyers Division of the American Bar Association, through an agreement with FEMA, provides free legal advice for low-income individuals regarding cases that will not produce a fee (i.e., those cases where attorneys are paid part of the settlement which is awarded by the court). Cases that may generate a fee are turned over to the local lawyer referral service.

**Independent Study Programs.** FEMA offers an Independent Study Program through the Emergency Management Institute.

Individuals, families and businesses may be eligible for federal assistance if they live, own a business, or work in a county declared a Major Disaster Area, incur sufficient property damage or loss, and, depending on the type of assistance, do not have the insurance or other resources to meet their needs.

Source: FEMA

## VII NATURAL HAZARDS

This Durham section of the Natural Hazard Mitigation Plan contains a variety of; localized details complementing the Natural Hazard Section in the Regional Section of this Plan. For overall information on potential natural hazards, Go To: the Regional Section of this Plan: Section III.B

The profiling of hazards in Durham is based on a variety of sources and personal observations of recent events and discussions with “the older generation”. At the Public Workshop we also heard of other concerns, other than the ones we already were aware of.

*Natural disasters can often be predicted. And damage can be anticipated. Crumbling infrastructure does require continuing R & R to minimize costly damage. Utilizing budget allocations and available State grants the current mitigation process is ongoing. Repetitive damage due to storms generally puts a vulnerable project as a top priority “fix” on Public Works “Wish List”.*

*Storm damage tends to occur repeatedly in the same geographical locations because they are related to weather patterns or physical characteristics of the area (flooding). However; all areas of the community are vulnerable to one or another type of natural disaster (hurricanes, wind and ice storms, tornados).*

Durham is vulnerable to many types of natural hazards. Flooding is by far the most significant with the potential to do harm to people, places, and things and to cause financial losses. The second greatest threat is from hurricanes. Therefore the focus of this Plan is on these two weather events. Wind and snow storms do regularly occur; but the results are not as catastrophic as flooding and hurricanes<sup>30</sup>. The other potential threats are discussed extensively in the Regional Section of this Plan.

Durham (along with Middlefield) differs from the other former MRPA municipalities in that Connecticut River floods are not a factor.

Hurricane damage is not localized as is flooding. Generally the effects are town wide. Wet hurricanes also create flooding problems.

### **DURHAM Emergency Operations Plan**

The following is an excerpt from the Durham Emergency Operations Plan (EOP) Hazard Specific Annex (HSA)

#### **Introduction to Hazard Specific Annexes (HSA)**

Information contained within the Durham Emergency Operations Plan is only intended to be a guide to emergency planners... it's a Plan. Each municipal discipline defined therein is responsible for their own Standard Operating Procedures.

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<sup>30</sup> The October Nor'easter with snow is an exception to this rule.

For additional information on the weather Hazard Specific Annexes (HSAs) in this Book, Go To the following website HAZARDOUS WEATHER FRESPONSE GUIDE : <http://www.fema.gov/doc/hazards/g271rg.doc>.

Specifically; access this website for detailed information on the following: thinderstorms, tornadoes, flash floods, riverine floods, coastal floods, hurricanes, tsunamis, tidal waves, winter storms, excessive cold, excessive heat, fog, and windstorms.

Because hurricanes are the event we here in the Northeast are most apt to encounter in catastrophic proportions, this section of the EOP-HSA Annex A contains exerts from the HAZARDOUS WEATHER FRESPONSE GUIDE. Also available to the Emergency Management Director is the CD **NEW ENGLAND HURRICANE ARE YOU READY?** ([www.fema.gov](http://www.fema.gov)). Most EMDs received one in 2003.

## A. Floods

### 1. Introduction

NOTE: For an extensive discussion on flooding in the Region and State; Go To the Regional Section of this Plan: Section III.C.1.

**Flash flooding** is a real threat in Durham. This type of flood is the most dangerous flooding condition as is evidenced by our history of flooding. They are the most likely natural hazard with the potential to do harm to people, places and things... and to cause financial burden to the community.

Flash floods are caused by significant rain events. They are characterized by high velocity flossing water often accompanied by debris.

A major issue in Durham is State roads that flood during major rain events due to inadequate drainage. This is out of local control; but it affects us locally.

Land use planners and regulators take into serious consideration restrictions on the building of, and or winterizing of buildings in designated or known flood risk areas.

The State activates its flood prediction centers (DEEP & DEMHS) when conditions are right for a riverine or small stream flood potential. The DEEP also has a dam risk program for monitoring dam's vulnerability. Some dams are physically monitored when a threat exists.

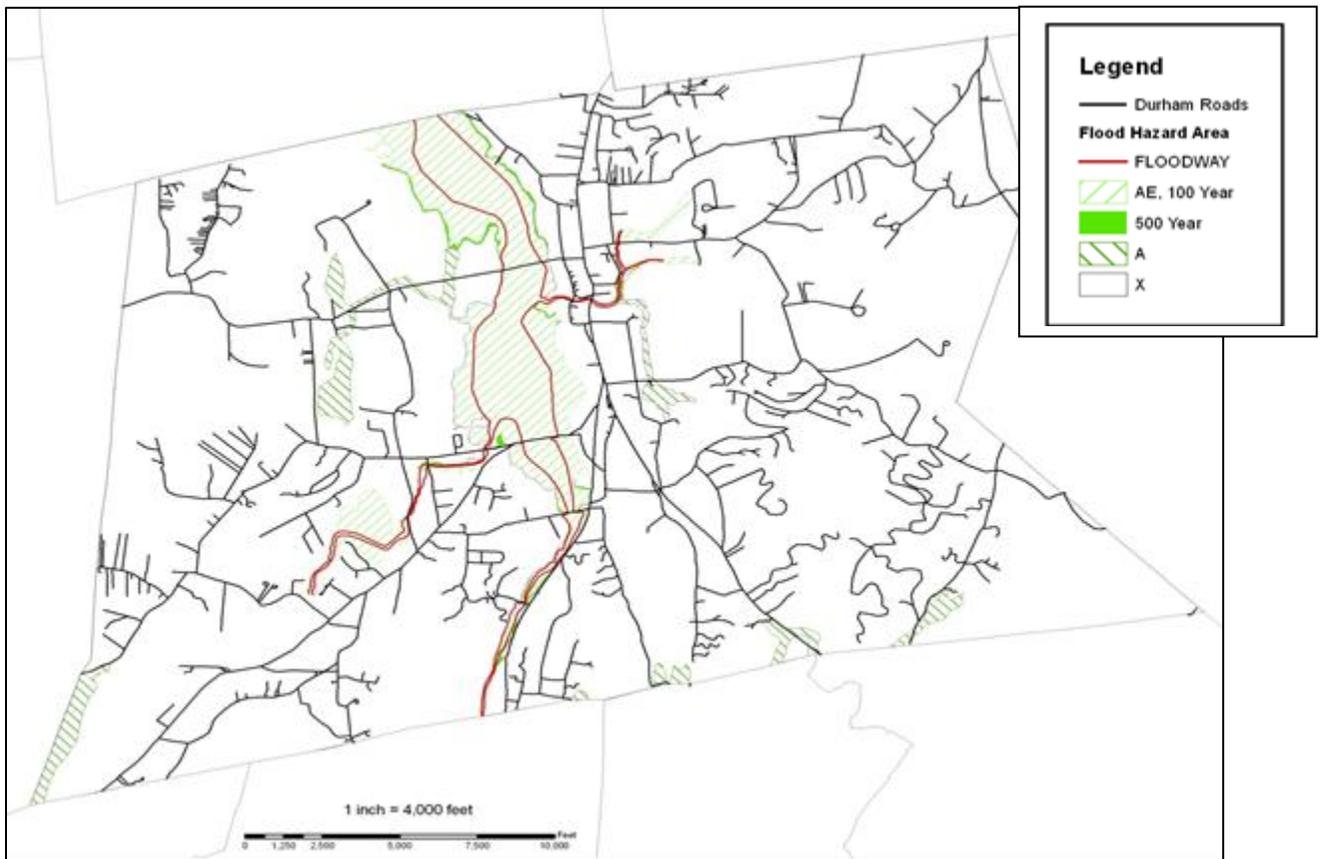
The streams passing through Durham and under low lying roads are a cause of concern during significant rain events. (See Durham Mitigation Action Plan for a list of those areas in need of mitigation.) Particularly vulnerable is Pickett Lane between Main Street and Maiden Lane. It is subject to frequent flooding and is the access road to the Sr. High School and Korn School. The flooding of Allyn and Herzig Brooks are the problem.

During research for this plan in 2007, flooding was reported in several places throughout town, including:

- Higganum Road near Cherry Hill Road
- Meetinghouse Hill Road near Guilford Court
- Haddam Quarter Road west of Cesna Lane
- Stagecoach Road on South End near Route 17
- Parmelee Hill Road at Route 17

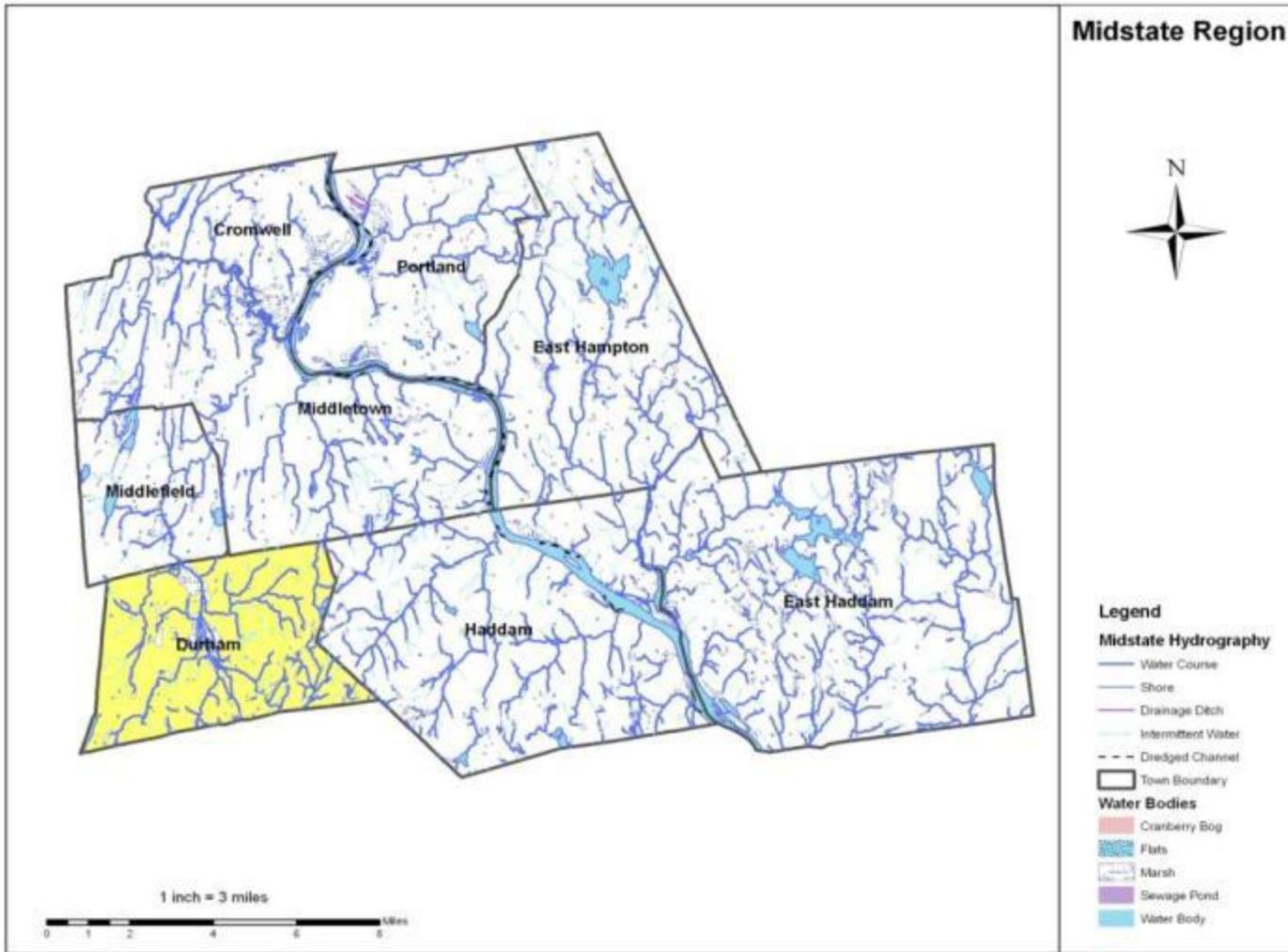
## 2. Durham Flood Zones and Regional Hydrography

The following maps depict the flood plains in Durham and hydrography within the region with Durham highlighted.



**Map 2:** Durham Flood Zones

Source: RiverCOG



**Map 3:** Durham Hydrography

Source: RiverCOG

**3. Durham Flood Plain Management:**

a. FEMA Guideline

Flood plain management is the operation of a community program of corrective and preventative measures for reducing flood damage. These measures take a variety of forms and generally include requirements for zoning, subdivision or building, and special-purpose flood plain ordinances.

A community's agreement to adopt and enforce flood plain management ordinances, particularly with respect to new construction, is an important element in making flood insurance available to home and business owners. Currently over 20,100 communities

voluntarily adopt and enforce local flood plain management ordinances that provide flood loss reduction building standards for new and existing development.

To help State and local officials in implementing the NFIP, see subsections:

4. Adoption of Flood Insurance Rate Maps by Participating Communities
5. NFIP Flood plain Management Requirements
6. NFIP Policy Keyword Index

To encourage communities to establish sound flood plain management programs that recognize and encourage community flood plain management activities that exceed the minimum NFIP requirements, the Community Rating System (CRS) was created. This program provides communities with discounts to flood insurance rates. Additional flood plain management resources are available to download or can be ordered from the FEMA Publication Distribution Center by calling 1-800-480-2520 and requesting the publication by its FEMA number.

Source: FEMA, NFIP

b. Durham Planning and Zoning Regulations

Town	NFIP Participant?	Latest FIRM Adoption	Flood Zone Regulation Adoption	Enforcement
Durham, CT	Yes	August 28, 2008	2008	By Permit

The Durham Zoning Regulations create a special flood hazard area in Section XII. Below is an excerpt of those regulations detailing the Special Flood Hazard Area.

*Section XII Special Flood Hazard Area Regulations*

*1.1 Statutory Regulation*

*The Legislature of the State of Connecticut has in Title 7, Chapter 98, Section 7-148(c)(7)(A) and in Title 8, Chapter 124, Section 8-2 of the General Statutes delegated the responsibility to local governmental units to adopt regulations designed to promote the public health, safety, and general welfare of its citizenry. Therefore, the Planning and Zoning Commission of the Town of Durham, Connecticut, does ordain as follows:*

*1.2 Finding of Fact*

*The flood hazard areas of the Town of Durham are subject to periodic flood inundation which results in the loss of life and property, health and safety hazards, disruption of commerce and governmental services, extraordinary public expenditures for flood protection and relief, and*

*impairment of the tax base, all of which adversely affect the public health, safety and general welfare.*

*These flood losses are caused by the cumulative effect of obstructions in the flood plains causing increases in flood heights and velocities, and by the occupancy in flood hazard areas by uses vulnerable to floods or hazards to other lands which are inadequately elevated, flood proofed, or otherwise unprotected from flood damage. Uncontrolled development and use of the flood plains can adversely affect the community.*

Furthermore, section 12.06 of the Zoning regulations defines the Special Flood Hazard Area Regulations while section 12.12.06.10.21 defines the Flood plain regulations.

Section D.2.4 Special Flood Hazard Area:

- Defines Flood plains
- Details the Coginchaug River
- Flood Insurance Rate Map detailed
- “Durham’s Special Flood hazard Area Zoning Regulations prohibit any development in the floodway and severely restrict development in the flood hazard areas”.

**iii. Durham Plan of Conservation and Development (March 1, 2003)**

The following is an excerpt of Page 1 of a Durham POCD Summary:

***Infrastructure and Open Space***

*Farmland, Dedicated Open Space, Managed Open Space, and Existing Open Space (State Owned Primarily) dominate the town. There are no major highways, and the only major infrastructure is the Buckeye Pipeline in the Northwest section of town and a Community Water System in Durham Center.*

***Commercial & Industrial Development***

*Durham has one centrally located state identified Growth Area; a Rural Community Center. The State has identified the area more intensively than Durham has provided. In particular, the area east of Route 17 and bounded on the North by Maiden Lane is a relatively large area which is zoned FR but has been identified as Rural Community Center.*

*There are several vacant parcels in the C-1 and C-2 Commercial Districts located along Main Street. The zone districts are fully developed. In the Industrial Districts along Wallingford Road there are several vacant parcels. However, the industrial and Design District area along Wallingford Road has been identified for Conservation and Preservation by the State POCD*

*Commercial and Industrial Growth potential appears to be minimal. Several properties may be targets for re-use. A regulatory change toward expanded Mixed Use may be warranted.*

*A significant development issue exists along a portion of Main Street; the need for potable drinking water. The town is aware of the issue and remedies*

**4. National Flood Plain Management**

The Town of Durham has voluntarily participated in the National Flood Insurance Program (NFIP) since 1974. Balance of Regulation can be found in the Town Hall.

<i>Initial Hazard Boundary Map FHBM</i>	<i>Initial Flood Insurance Rate map</i>	<i>Date Durham entered the NFIP regular Program</i>	<i>Date current FIRM adopted</i>	<i>Date Planning &amp;/or zoning Updated</i>
<i>(i)FHBM</i>	<i>(i)FIRM</i>	<i>(r)FIRM</i>	<i>(c) FIRM</i>	<i>(l) Regulations updated</i>
<i>29-Nov-74</i>	<i>1-Apr-82</i>	<i>1-Apr-82</i>	<i>28-Aug-08</i>	<i>8/08</i>

**Figure 5:** Adoption Dates pertaining to NFIP

**5. Repetitive Loss Properties**

A Repetitive Loss Property (RLP) is any insurable building for which two or more claims of more than \$1,000 were paid by the National Flood Insurance Program (NFIP) within any rolling ten-year period, since 1978. Located inland from Middletown, Durham has had one repetitive loss claims in an AE zone along a stream.

Local

- Mitigation measures; recommend the homeowner include: flood proofing, developing a response plan and staying attentive to alerts and warnings.
- Durham has few requests for new construction in the flood plains; those that come in must comply with FEMA standards.

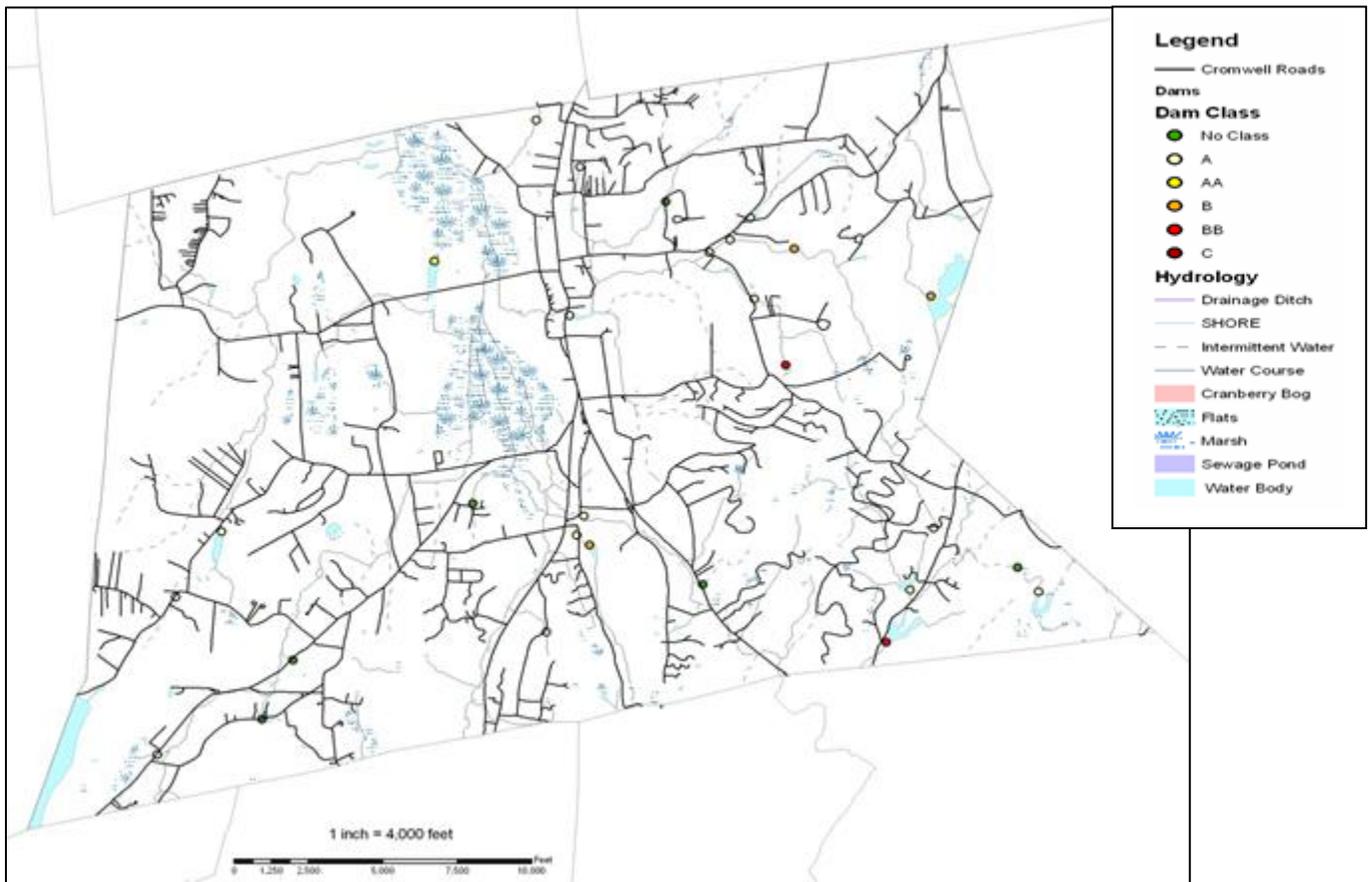
- Reconstruction of more than 50% of structure value in flood zones requires the entire structure comply with FEMA standards.

## 6. HAZUS-MH Summary Flood Event Report

Due to the fact that this individual town Annex is part of the larger Former Midstate Regional Natural Hazards Mitigation Plan, HAZUS-MH was generated on a regional scale. Please see Appendix A of this NHMP for the full HAZUS – MH Flood Event Summary Report for the Midstate Planning Region.

## 7. Durham Dams

In the Town of Durham, the Connecticut Department of Environmental Protection (CT/DEP) has 31 dams in their dam inventory. Of those 31 dams, 2 (two) dams are rated as Significant Hazard Dams (Class B). There are no High Hazard (Class C) rated dams in Durham. The Hazard Classification for the individual dams are from the CT/DEP website database “High Hazard and Significant Hazard Dams in CT” revised to 8/11/2007. A Dam Study was conducted by a subject matter expert Gene Robida, RED Construction, LLC



**Map 4:** Dams in Durham

Source: RiverCOG

<b>DAM ID#</b>	<b>DAM NAME</b>	<b>HAZARD CLASS</b>	<b>OWNERSHIP</b>
3801	YMCA Pond Dam	B – Significant Hazard	Farnam Neighborhood House, Inc.
3802	Millers Pond Dam	B – Significant Hazard	CT/DEP

**Figure 6:** Dams of significant Hazard in Durham.

A Class B dam is significant hazard potential dam, which, if it were to fail, would result in any of the following:

- i. possible loss of life;
- ii. minor damage to habitable structures, residences, hospitals, convalescent homes, schools, etc.;
- iii. damage to or interruption of the use of service of utilities;
- iv. damage to primary roadways (less than 1500 ADT) and railroads;
- v. significant economic loss.

The YMCA Pond Dam is a concrete gravity dam 80-foot in length and 26-feet high. The abutments of the dam consist of ledge rock. The spillway is centrally located on the dam and is 23-feet wide. YMCA Pond Dam is located approximately 2000-feet upstream of Maiden Lane in Durham. The dam is privately owned by the Farnam Neighborhood House, Inc. The dam was inspected by the CT/DEP on June 6, 2000. The inspection report states the dam is in fair condition and requires work to be performed on the dam.

The following recommendations were made in the 6/6/00 inspection report:

1. Remove the wooden weir boards in the low flow spillway notch.
2. Remove the wooden steps and footbridge from the abutment and the spillway crest. If the footbridge is to be replaced have a CT professional engineer set the elevation to insure that the spillway flows are not impeded.
3. Fix all the deteriorated concrete. Fill all the voids and patch all the spalled areas. Seal all the joints as needed.
4. Lubricate and operate the gate valve at least twice a year. Repair as needed.
5. Remove the wood, debris and trash from the downstream channel and right downstream channel bank.
6. Remove the trees from within 25' of the toe of the dam.
7. Provide erosion protection at the downstream toe of the dam.
8. Provide an emergency operation plan in accordance with DEP's operation plan guidelines.
- 9.

A reminder letter dated 6/10/2005 to the dam's owner indicates that the dam has not been repaired to date.

The Millers Pond Dam (Class B) is owned and operated by the State of Connecticut/ DEP. There are three structures that impound Millers Pond. There is an earth embankment dike 20-feet high and 200-feet long. This dike section has a draw-down structure. There is a separate concrete spillway 56-feet wide and a small earth dike. The three structures underwent substantial repairs in 1993. Both dikes were reconstructed and buttressed and a new draw-down structure was installed. A new concrete spillway was installed during the 1993 repair.

A recent inspection of the dam by the CT/DEP revealed the dam to be in good condition requiring no work to be performed on the dams.

The Millers Pond Dam (Class B) is located in the eastern border of Durham near the Haddam town line. The dams are located approximately 700-feet upstream of Foot Hill Road.

The Cream Pot Pond Dam (Class A) is located 200-feet to the east of Cream Pot Road. There is no file information on this dam in the DEEP Dam Safety Files.

## **8. Flood Mitigation Strategies**

A detailed list of mitigation actions can be found in Section VIII of this Annex. A general list of mitigation ideas for Durham includes:

- Purchase flood prone properties and create open space
- Maintain culverts, bridges and other restricted flow streams of debris
- Maintain dams (municipally owned) and caution private dam owners to do the same
- When a storm is pending early warn residents of fast flowing waters,
- Remind residents of evacuation and sheltering procedures.
- Advise residents where to go for weather notifications.
- Advise the public of the dangers of driving through moving flood waters
- Work with the State DOT to increase the size of the culverts under State roads; particularly Route 17.
- Monitor DEMHS, DEEP, local press and radio and TV for flood warnings.
- Through legislation change, pressure should be put on the DEEP to allow banking protection from erosion.
- Roadway elevation
- Structure (public/private) elevation
- Structure (public/private) relocation
- Structure (public/private) flood proofing
- Sewer/septic system (public/private) upgrades
- Levee/embankment improvement
- Stream modification (unlikely due to DEP restrictions)

- Storm water runoff improvements
- Acquisition of storm debris managing equipment

## B. Hurricanes

NOTE: For an extensive discussion on hurricanes in the Region and State Go To the Regional Section of this Plan: Section III.B.1.c.2)

### 1. Introduction

Hurricanes pose the most catastrophic damage potential of any natural disaster phenomenon. As indicated in the Regional Section II, Part C they come in various shapes and sizes; some are wind events, some rain and some...the worst kind... have both e.g. 1938 Hurricane (CAT II with gusts to Cat III [Gusts to Cat IV on the shoreline]) and torrential rains.

Durham officials are aware that although major rain storms cause more frequent flooding and more annual damage, a single major hurricane (Category I - III) can cause 3 - 10 times that amount of damage<sup>31</sup>. Consider the damage of Tropical Storm Irene in October of 2011. Irene hit the area with sustained 40 - 50 MPH winds with gusts to 67.

In a large Category II or Category III we can expect 80% of our mature growth trees to be felled. Irene only caused 2% (statewide).

Here in Southern New England hurricanes do not occur often; but when they do, the consequences could be dire. A hurricane brings with it wide spread destruction, and not just to vegetation.



**Photo 2:** Durham Main Street after the Hurricane of 1938  
Source: Russell Library

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<sup>31</sup> CT Hazard Mitigation Plan

The Hazard Specific Annex (HSA) of the Durham Emergency Operations Plan (HSA Annex A) contains excerpts from the HAZARDOUS WEATHER RESPONSE GUIDE.

Also available to the Emergency Management Director is the *NEW ENGLAND HURRICANE ARE YOU READY?* Found online at [www.fema.gov](http://www.fema.gov). Most EMDs received this publication in 2003.

Typically hurricanes affecting the region cross Long Island Sound before arriving here; but traditionally this does not “slow” them down.

The Hurricane of '38 is listed as with winds of Cat III strength (111 – 130). But a wind gust of 161 MPH was recorded, on the shoreline, in Clinton. That's a Cat IV. For the record; it came ashore as a Category III, went inland Connecticut as a Cat II and was still a Cat I when it went into Canada

Local responders frequently train and exercise for major hurricane events.

## **2. HAZUS-MH Hurricane Summary Event Report**

Due to the fact that this individual town Annex is part of the larger Former Midstate Regional Natural Hazards Mitigation Plan, HAZUS-MH was generated on a regional scale. Please see the Appendix B of this NHMP for the full HAZUS – MH Hurricane Event Summary Report for the Midstate Planning Region.

## **3. Hurricane Mitigation Strategies**

A detailed list of mitigation actions can be found in Section VIII of this Annex. A general list of mitigation ideas for Durham includes:

- Purchase flood prone properties and create open space
- Tree Warden to work with Public Works and CL&P on an aggressive tree trimming program.
- Maintain culverts, bridges and other restricted flow streams of debris
- Maintain dams (municipally owned) and caution private dam owners
- When a storm is pending early warn residents of fast flowing waters,
- Advise homeowners at risk to flood proof the structure
- Advise residents to secure any loose objects in the yard.
- Advise homeowners to “stock up” on food, water and medications (including the animals)
- Remind residents AND RESPONDERS of dangers of handling anything in the vicinity of a downed wire.
- Remind residents of evacuation and sheltering procedures.
- Advise residents where to go for weather notifications.
- The State has an agreement with CNTV for use as a source of current information during an emergency.
- The State also has an arrangement for utilization 211 as a dial in info line.

### C. Winter Storms

NOTE: For an extensive discussion on winter storms in the Region and State Go To the Regional Section of this Plan: Section III.B.1.c.3) This would be a minor section of the Plan if it were not for the 2011 October Nor'easter Snow Storm.

#### 1. Snow Storms

Although out of the winter season, the region experienced a winter storm in October 2011. During this unusual October Nor'easter power outages and blocked roads were major issues. Because the leaves were still on the trees when the snow came accompanied by strong winds, many trees and limbs came down taking power lines with them. Many Town roads were closed and there were extensive power outages.



**Photo 3:** A Letter Carrier Clearing Snow during the January 2011 Snowstorm  
Source: Hartford Courant

In a severe cold winter ice jams can be a problem. Public Works is prepared for breaking up ice above vulnerable culverts that have a history of ice cake clogging.

Major snow storm disasters that have occurred in the area:

- 1978 (disaster Declaration 3060)
- 1992 (disaster Declaration 972)
- 1993 (disaster Declaration 3098)
- 1996 (disaster Declaration 1092)
- 2003 (disaster Declaration 3176)

- 2004 (disaster Declaration 3192)
- 2005 (disaster Declaration 3200)
- 2006 (disaster Declaration 3266)
- 2011 (disaster Declaration 1958)
- 2011 (disaster Declaration 3342/4046)
- 2013 (disaster Declaration 4106)

## **2. Ice Storms**

A major ice storm can cause major road closures and power outages. See the Regional section of this Plan, Tables 21, 22 & 23 for a historic record including major ice storms.

A major ice storm occurred December 17, 1973 (Ice Storm Felix).

## **3. Winter Storm Mitigation Strategy**

A detailed list of mitigation actions can be found in Section VIII of this Annex. A general list of mitigation ideas for Durham includes:

- Having in place a Vegetation Maintenance Plan.
- Hopefully, after the October Nor'easter of 2011, CL&P will put into place a more robust power restoration plan.
- Have in place an Evacuation and Sheltering Plan
- Building officials, the Fire Marshal and Fire Department should require truss roofed buildings be marked, on the roadside exterior, with a large "T". In a major winter storm, this is a significant responder safety issue.

## **D. Wind Storms**

NOTE: For an extensive discussion on wind storms in the Region and State Go To the Regional Section of this Plan: Section III.B.1.c.4)

### **1. Nor'easters**

During the unusual October Nor'easter of 2011 power outages and blocked roads were major issues. Because the leaves were still on the trees when the snow came accompanied by strong winds, many trees and limbs came down taking power lines with them. Many Town roads were closed and there were extensive power outages.

### **2. Thunder Storms**

Thunder storms are the most likely wind event to occur and the strongest ones can create considerable damage when strong imbedded winds accompany them. For our planning purposes we have further broken thunder storms into tornado activity and microbursts/wind shear. See Section II Part E

In 2005 within ten days the area was hit by two violent thunder storms registering winds of 58 and 60 miles per hour

**3. Tornadoes**

Tornados can happen anytime, anywhere in Town. As referenced the Regional Section of this Plan Section III they have happened in nearby East Hampton and Wethersfield. In recent years there have been major, damaging tornados in Bridgeport and West Springfield.

The good news is when the conditions are right, the National Weather Service and CT Division of Emergency Management and Homeland Security notify emergency management and the administration of the potential. But; they can happen anytime and sometimes without much warning; though the local weather forecasters are getting better.

**4. Wind Shear**

See Regional Section B.1.c.4 for a discussion on the difference between the winds of a tornado and those in a wind shear.

**5. Wind Storm Mitigation Strategies:**

- Public Notifications: Issue warnings to the public (and responders) to not go near downed power lines until the power company gives the OK.
- Durham does have a plan for managing debris as a result of a major wind storm. Hurricanes, ice storms, tornados, wind shear are considered debris generating storms.

**E. Other Natural Disasters**

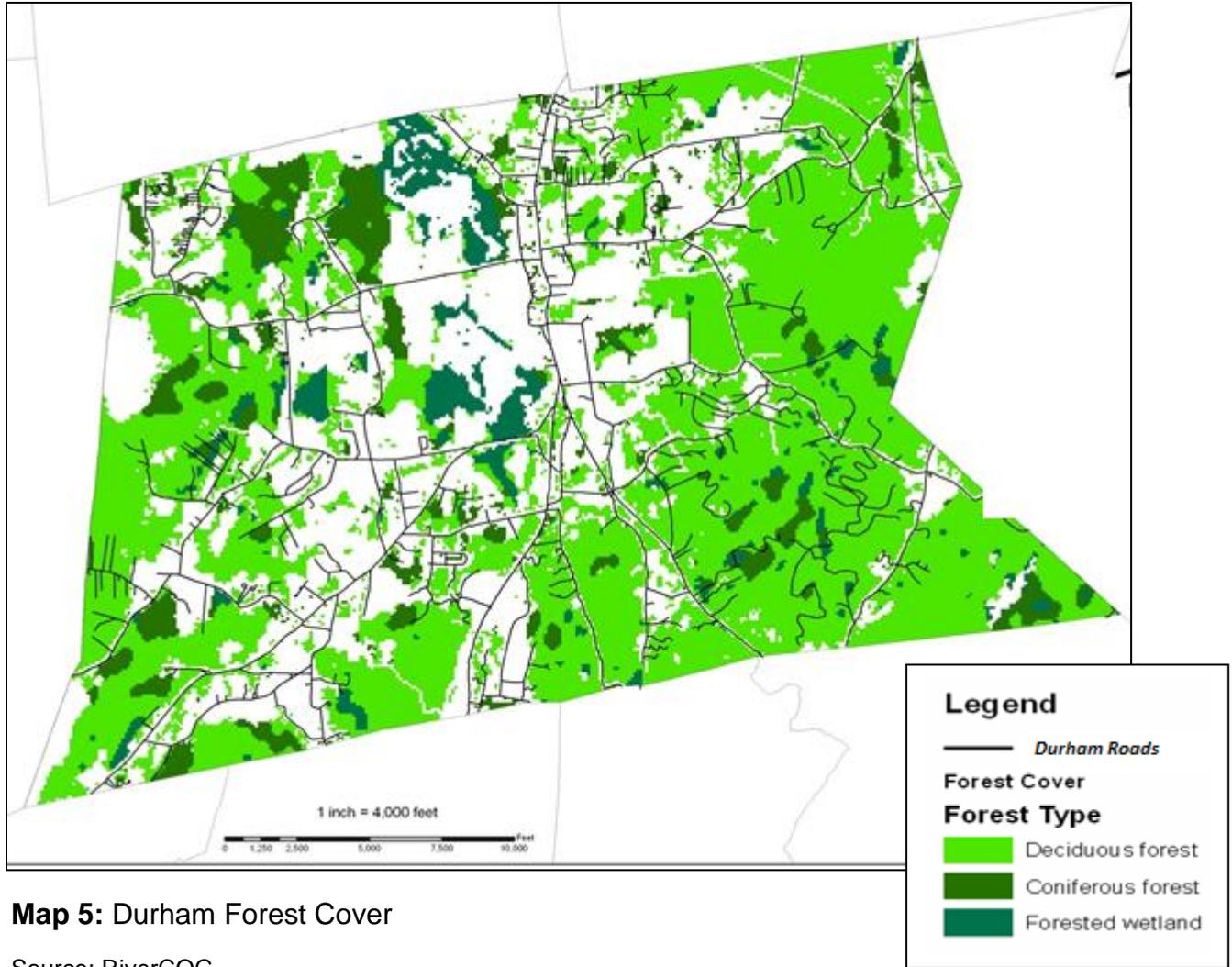
**1. Forest Fire Risk**

Durham is heavily forested which means there are several areas of the Town that are vulnerable to major forest fires. If the conditions are right; drought, hot windy weather, a wildfire could happen.

<b>State Forests</b>	<b>Towns</b>	<b>Acres</b>	<b>Camping</b>	<b>Day Use</b>	<b>Recommended Use</b>
<i>Cockaponset</i>	<i>Middletown, Haddam, and Durham</i>	<i>17,186</i>		<i>X</i>	<i>None</i>

**Figure 7:** State Forest within Durham, showing other towns in which the forest is present and its use.

As shown in the following illustration of forest coverage in Durham, forest fire risk is ever present especially during droughts. The problem is exacerbated by the ever encroachment into woodlands by developments and individual residential units.



**Map 5:** Durham Forest Cover

Source: RiverCOG

## VIII DURHAM MITIGATION STRATEGIES

### A. Authorities, Policies, Programs, and Resources

The town of Durham has many available policies and resources at its disposal for mitigating effects of natural disasters. For example, its flood plain regulations allow the Town to control growth and expansion within flood zones. The town has the authority to order parking bans in the event of a snow storm and is well prepared for all but the very worst of snow storms. The Town of Cromwell uses the State Building Code for code compliance to ensure safe structures which withstand 110 mph wind speed and appropriate snow load. The town also has the authority to order backup water supplies to be installed in new subdivisions when water for firefighting is not sufficient. In additions, the town can set up and often does set up shelters, cooling centers, and heating centers when needed for residents.

#### ***Highlights:***

##### **Storms**

Land use planners and regulators have taken into serious consideration restrictions on the building of, and or winterizing of buildings in designated or known flood risk areas.

Continue monitoring DEMHS, DEP, local press and radio and TV for storm warnings.

When a serious flash flood warning is issued, advise the public of the dangers of driving through moving flood waters.

##### **Crisis Communications Plan**

Following Crisis Communications Plan guidelines, keep public and responders aware of “what is going on” and certain storm specific warnings; e.g.; “don’t touch downed power lines”, “don’t drive through flowing water”, availability of shelters, etc.

### B. NFIP and Community rating System

See the Flood section of this Annex and the Regional Section III.C.1 for information on the National Flood Insurance Program.

Durham does not participate in the CRS; but should consider it

The Community Rating System (CRS) is a part of the NFIP. When communities go beyond the NFIP’s minimum standards for flood plain management and participate in the CRS, discounts may be available on flood insurance premiums for policy holders in those communities.

### C. Durham Goals and Objectives

Goals and Objectives can be found in the DURHAM Mitigation Action Plan Section of this local Plan Section VIII.C and (overall) in the Regional part of this Plan, Section IV.3.

#### **D. Mitigation Actions**

*Prioritized mitigation actions with costs (where known) can be found in the Durham Detailed Mitigation Action Plan Section J.*

**Administration:** *Current and future loss prevention is, and will continue to be sourced through local, regional, State and Federal efforts for updating maps, local regulatory actions, and insurance efforts (National Flood Insurance Program). Also capital improvement funding made available from State and Federal sources for infrastructure improvements.*

#### **Public Works:**

- Continues to monitor culverts and bridges that clog by maintaining debris collections above and for prevention of ice damming.
- Continues to look for funding for culvert and bridge maintenance considering local budget restraints and State grants availability.
- The Town should have a Debris Management Plan in place.
- Continue monitoring Flood Warnings from DEEP and DEMHS.
- Currently requiring private compliance with CGS §22a-402(b)-(f); dam inspection requirements. Local dam owners including the municipality are responsible for periodic evaluations of their dams and making repairs as needed.
- Is continuing its historic responsibilities and new ones as a designated responder. And they are aware of the herculean responsibilities a major hurricane will bring.
- Assumes the primary responsibility for municipal building and critical infrastructure.
- The Public Works Crew will stabilize unstable stream and road bed bankings to the fullest extent allowable by DEEP, and local agencies.
- Continue in efforts to eliminate or reduce flooded access to the schools.

**Emergency Services:** *have mutual aid agreements in place with neighboring municipalities. There is also a statewide mutual aid agreement in place. These will be kept current.*

#### **Emergency Management:**

- Will continue to enhance EOC capabilities.
- Public health employees are now designated as responders<sup>32</sup>
- Public Works employees are now designated as responders<sup>33</sup>
- Durham has always had a very strong Emergency management program in place. Annually they practice/drill/exercise their capabilities at the Durham Fair. Annually they practice/drill/exercise their capabilities regionally and statewide.
- They offer direct assistance in training/exercise sessions to the fire department, police department, public health and administration when needed.

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<sup>32</sup> Responders Vs First Responders

<sup>33</sup> Responders Vs First Responders

- The Durham Emergency Management Director is a leader statewide in public emergency notification technology.
- Durham has a very active CERT (Community Emergency Response Team). A team of volunteers that assists in mitigation activities such as planning, training and exercising of sheltering, Points of Distribution (emergency medication distribution) and other responder activities.
- **Emergency Operations Center.** The EOC management continues to have access to WEBEOC for current information and assets available (mitigation actions) for the emergency response and recovery modes.

**Funding:**

- Through local direct assistance to fire fighter, law enforcement, call center improvement, emergency management grants, EMS assistance, etc. emergency responders are continuing to seek funding to enhance their response capability.
- The direct to the regional planning agency grants have gone away. Now the Department of Emergency Management and Homeland Security passes on FEMA grants to the five regions they have designated. RiverCOG municipalities are spread between DEMHS Regions 2 and 3.
- The primary funding source for local infrastructure mitigation is through the local budgeting process. This is supplemented through regional, State and Federal grants. See Alternative Funding Sources, Regional Sections of this Plan, Section I.B.3&4.

**Notifications:**

- The emergency management team does and will continue to maintain multimedia communications to stay tuned to local media and DEMHS (e-mail) for bulletins.
- NOAA broadcasts the potential when conditions are right to, say spawn a tornado. When the threat exists, EM will monitor the early warning system.
- Public Notifications: The Public will continue to be notified to stay tuned to local media for severe weather bulletins. Durham has arguably the most robust notification system in the State.
- Reminders will also be sent out about the dangers of driving through rushing waters and going near downed wires.
- **Residents and vulnerable businesses** will be reminded to continue in their efforts of flood proofing.

**Social Services:** Social services are in a position to continue in assisting in notifications of people with functional and other special needs.

**Public Health and Social Services:**

- Works closely with the State in preparing for the needs of people with functional needs

- Continue to enhance, and exercise shelter activities; both short and long term, for citizens during power outages, hurricanes, wind storms, ice storms, heat waves, and extreme cold.
- Sheltering activities includes participating in local and regional exercises.
- The Durham Health Department is active in local regional (Middletown area) and Region 2 and 3 planning and exercises. There is a focus on enhancing exercise shelter activities; short and long term for citizens during power outages and evacuations. This is also particularly true of working with Special Needs and Fixed Populations:

**NGOs:** Emergency management works with **Non-Governmental Organizations** in preparing for storm emergencies. These include the Exchange Club, American Red Cross, faith based agencies, Salvation Army, senior centers, Rotary, etc.

**Land Use Planners:**

- A. Regional and Durham land use planners have worked with FEMA and its contractors on flood plain development planning. We began working on the revised FIRM maps at a workshop May 17, 2005. Durham signed off on the maps August 2008.
- B. The planners are aware of flood hazards throughout the Town particularly in designated flood plains. They will continue to:
  1. Monitor trends in number of permit requests in vulnerable areas
  2. Monitor evolving vulnerable areas where development may occur
  3. Encourage open space in vulnerable areas
  4. Encourage municipal acquisition of buildings in flood plains and creation of open space.
  5. Monitor expected growth or development over the next 10, 20 years.

**Schools:** The Schools, working with Emergency Management have severe weather plans in place, modeled after: Snow Days. They also have a NOAA provided weather alert radio for monitoring weather events.

**Special Situations**

- **People with Functional Needs (formerly; Special Needs) clusters:** The Durham Health Department and Emergency Management shall continue to participate regularly in sheltering exercises. This includes handling people with disabilities. DEMHS Regions are working on enhancing programs for working with people with disabilities.
- **Fixed Populations:** These initiatives are ongoing including activities: locally, regionally and Statewide. This population includes those individuals unable to evacuate due to a physical disability or clusters of elderly or those with functional medical needs that shelter-in-place. Emergency management is also aware of the local State facilities that they are responsible for. However it may fall on the responsibility of the municipality; such as a group home.

- **Pet Evacuation and Sheltering:** Municipal officials should continue to make a special effort to identify, at risk local animal population pets and livestock. They should be aware of owner notification requirements (e.g. sheltering available) and transportation needs.
- The Town of Durham Emergency Operations Plan, as updated in 2006, addresses in detail the evacuation and sheltering of animals.
- Emergency management and animal control authorities have available (from Region 2 & 3) portable pet shelters to be set-up adjacent to human shelters. Durham has its own well equipped DART (Durham Animal Response Team).
- Under the latest Americans with Disabilities Act (ADA) guidelines Service Animals are now specifically defined as Service Dogs. The only allowable exception is miniature horses. They have specific qualifiers. UPDATE: as of this writing there is an issue with the horses not being able to be house trained.
- The Region 2 Animal Evacuation and Sheltering sub-committee Coordinator is a veterinarian that lives in Durham. Durham has the advantage that no other municipality has in the area has. There are many large barns (for the Durham Fair) available for sheltering animals.

**E. Incorporation of Other Plans**

The mitigation action items in this Plan will be considered when other documents are updated, such as Zoning Regulations and the POCD.

Below is a table showing the potential changes to local plans and regulations as a result of this NHMP and Annex.

<b>Regulation or Plan Status Relative to Hazard Mitigation</b>	<b>Changes to Potentially Be Made</b>	<b>Responsible Party</b>
Zoning Regulations	Incorporate suggested changes from NHMP into ZR.	Planning & Zoning Commission
Subdivision Regulations	Incorporate suggested changes from NHMP into SR.	Planning & Zoning Commission
Inland Wetland Regulations	Incorporate suggested changes into IWR including prevention of runoff near waterways.	Inland Wetlands Commission
Plan of Conservation and Development	Consider adding NHMP as an appendix.	Planning & Zoning Commission
Capital Improvement Plan	Consider new projects listed in Figure 15 of this NHMP.	BOS, BOF

**Figure 8:** Plans and Regulations to Potentially Be Changed

**F. Proposed Mitigation Strategies**

See Regional Section IV and Annex B Section VIII.

**1. Weather Events and Actions in Place**

The town of Durham has a variety of mitigation actions currently in place. They are not limited to infrastructure improvements.

Event	Likelihood	Loss Potential	Comprehensive Range of Actions and Projects in Place?
Floods	H	H	Y
Hurricanes	H	H	Y
Thunderstorms	H	L	P
Tornadoes	M	H	P
Nor'easter	H	M	Y
Extreme Cold	H	L	Y
Heavy Snow	H	M	Y
Ice Storm	M	H	Y
Fires,	M	H	Y
Extreme Heat	H	L	Y
Earthquakes	L	H	N
Landslides	L	L	N/A
Y = yes, N= no, P = Partial, N/A = Does not apply			

**Figure 9:** Natural Hazards Potentially Affecting Durham

**Land Use Planning:** Durham officials, led by First Selectwoman Laura Francis works with RiverCOG on Land Use. Durham signed off on the FIRM maps August 2008.

**2. Planning Team Recommendations**

**TDSR (Temporary Debris Storage and Reduction Site Plan)**

Durham needs to have a current plan in place for managing the massive amount of debris as a result of a hurricane hitting the area. 100 MPH winds and up would cause major destruction to our trees and in many cases power, cable and telephone lines. Again 100MPH an up winds will blow down 80% of our mature growth trees ... many hanging over power lines ... on local and state roadways.

Durham should develop a Debris Management Plan, especially including a temporary debris storage site.

**Erosion Protection:**

Through legislation change, require the DEEP to allow banking protection from erosion.

**COOP/COG**

Develop a Continuity of Operations Plan/Continuity of Government Plan.

**Community Rating System**

Durham should consider participating in the CRS.

**Weather Awareness:**

All **municipal departments and local agencies** will continue to listen for NOAA broadcasts and other emergency broadcasts, when conditions are right for a severe storm: significant rain event, heavy wind, tornado, hurricane, etc. They will then activate their emergency plans.

**3. Durham Mitigation Action Plan**

**Prevention**

Town of Durham officials including the town planner, Planning & Zoning Commission, the building department, emergency management department, public works department, and the First Selectman's office continuously monitors growth trends and vulnerable sites and have enhanced land use regulations designed to protect natural resources and restrict development in flood zones and other hazard-prone areas. These regulations help prevent the loss of life, limb and property by preventing inappropriate development in flood zones and other high risk areas reducing the amount of damage caused by flash flooding and other natural disasters.

The Zoning Regulations updated in August of 2008 restrict select new construction in the 100-year flood plain as depicted on the most recent revision of the Flood Insurance Rate Map (FIRM). Substantial improvements mean any combination of repairs, reconstruction, alteration, or improvements to a structure taking place during a ten-year period, the cost of which equals or exceeds 50% of the market value either before the improvement or repair is started or, if the structure has been damaged, before the damage occurred. In these cases, all residential construction must be elevated to or above the base flood elevation. Likewise, all non-residential construction must be elevated or flood proofed to or above the base flood elevation. In regards to elevated buildings, the areas below the base flood elevation must allow floodwater to flow in all directions, and the building must have at least one access route above the base flood elevation. In

addition, the regulations prohibit all encroachments in regulated floodways. The Zoning Regulations offer additional preventive measures during the site plan submittal process. The regulations require the protection of natural features including those that contribute to the natural functioning of the natural drainage system.

The Subdivision Regulations build upon the Zoning Regulations to offer additional preventive measures during the subdivision submittal process. Specifically, the regulations require a storm water management plan that minimizes runoff and maximizes infiltration before discharging storm water into wetlands and watercourses. If storm water discharge will overload existing downstream drainage facilities, the storm drainage plan must provide adequate detention of the runoff to match pre-development conditions. Furthermore, the regulations require the protection of natural features including those that contribute to the natural functioning of the natural drainage system. The regulations require that utility lines be placed underground for new subdivisions and underground utilities are encouraged for certain projects such as major road projects. These land use regulations are described in detail in the Zoning Regulations and Subdivision Regulations available through Durham Town Hall and on the town's website [www.townofdurhamct.org](http://www.townofdurhamct.org).

The Building Department, the Inland Wetland Agency, and Public Works Department carries out additional activities that help prevent the loss of life and property as a result of natural disasters. The Building Department ensures conformance with the Connecticut State Building Code including flood resistant construction and with elevation certification. The Inland Wetlands Agency, through its Inland Wetlands and Watercourses regulations, works toward the conservation of wetland resources through avoiding impacts from development on functional wetlands and watercourses. The Commission also seeks to restore and enhance wetlands that have been degraded. Durham implements an as-needed program for tree maintenance. Whenever possible, Public Works examines and clears public storm drains and grates of debris before and during periods of rainfall, snowfall, and storms and works with the town Tree Warden in regular tree maintenance.

### **Emergency Services**

The Town of Durham is committed to the safety and security of its residents. The Emergency Management Department is responsible for providing emergency preparedness and response services to the residents and businesses within our town. The Emergency Management Department provides the following key responsibilities to the Town of Durham:

- 1) Emergency Preparedness Plans
- 2) Emergency Operations Center
- 3) Emergency Shelter Management
- 4) Safer Durham – Emergency Notification System

- 5) Ready Durham, CT - Online Preparedness Resource Guides
- 6) Durham Animal Response Team (D.A.R.T.)

The Town of Durham utilizes CT Alert and its own local warning system, Safer Durham to notify residents of emergencies affecting the town. Both warning systems are provided by Everbridge. Durham is part of Regional School District #13 which also utilizes the Everbridge product to notify parents, students and staff of school closings and other emergencies.

The Emergency Management Director monitors weather and other warnings of natural disasters utilizing several online weather services.

### **Natural Resource Protection**

The Town of Durham has an aggressive open space acquisition policy that helps protect areas prone to flooding and other natural hazards from future development. For example, the Durham Plan of Conservation and Development lists desired public open space acquisitions including properties with demonstrable mitigation benefits.

**Coginchaug River Watershed Based Plan:** The Town of Durham supports the goals of the Coginchaug River Watershed Based Plan. Implementing the measures outlined in this report, in whole or in part, will help to improve and maintain the health of the Coginchaug River and the surrounding landscape. Improving the health of the Coginchaug River has been a long term goal of local stakeholders.

The largest water body in Durham with associated dams is Millers Pond located in the eastern portion of Town. The pond and dams are owned and operated by the Connecticut Department of Energy and Environmental Protection. Other smaller dams in Durham are privately owned.

### **Challenges**

- Tree debris often results in street closures.
- Failure of an upstream privately owned dam on Allyn Brook has caused sediment deposition within Allyn Brook on the Town owned White's Farm open space parcel. This has resulted in portions of the brook becoming completely filled in with sediment causing the brook to leave its banks resulting in widespread flooding of the parcel. In particular, the municipal well field has been impacted by this flooding. Stream restoration is required to correct the flooding problem.
- A number of road culverts in Durham are undersized causing periodic road flooding and damage during heavy rainfall events. In some cases residential neighborhoods are completely isolated from normal passenger or ambulance travel during these events.

- Durham needs additional backup electrical generators to supply electricity to all municipal buildings in the event of an extended power outage, particularly Town Hall and the Public Works Department.

**G. Proposed Mitigation Strategies**

The following list is a list of general items for the town to consider when planning mitigation projects:

- Town of Durham and RiverCOG personnel will meet regularly to review the potential natural hazards that may cause loss of life, limb or property especially to review the list of town vulnerabilities.
- This review will be used in the development of the goals, objectives, proposed mitigation strategies and implementation schedule. The following criteria were used to assign each supporting task a priority rating of “High,” “Medium” or “Low”.
- Does the supporting task benefit a large number of residents?
- Does the supporting task mitigate multiple natural hazards?
- Does the cost of the supporting task seem reasonable for the size of the problem and likely benefits?
- Is there enough political and public support to ensure the success of the supporting task?
- Does the supporting task improve upon existing programs or support other municipal priorities?
- Does the supporting task entail additional staff time that the municipality is unable to commit immediately?

Definitions for Priority, Schedule, and Responsible Party, and Cost can be found in Section IV.F on page 111.

**Goals and Objectives**

Goal 1: Reduce the loss of life and property and economic consequences as a result of flooding, high winds, severe winter storms and dam failure.

Objective 1 - Improve the ability of Durham residents to prepare and respond to approaching severe weather.

Supporting Task	Responsible Party	Schedule	Priority	Funding Sources	Cost Estimate
Continue use of the Town notification system and Town website to notify residents of approaching severe weather and update residents during storm events.	Emergency Management	2013	High	CIP, OP	\$

## Durham Natural Hazard Mitigation Annex

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Acquire emergency generators for Town Hall and the Public Works Department.	Emergency Management, Public Works	2014	High	HMGP, CIP	\$\$
Find funding for installation of generators in infrastructure and shelters.	BOS, BOF	2013	High	HMGP, CIP	\$\$

Objective 2 - Reduce the amount of debris from severe storms through preventive tree maintenance.

<b>Supporting Task</b>	<b>Responsible Party</b>	<b>Schedule</b>	<b>Priority</b>	<b>Funding Sources</b>	<b>Cost Estimate</b>
Update the existing debris management plan.	Public Works	2013-2014	High	CIP, OP	\$
Budget appropriate money necessary to maintain and remove dead, dying, dangerous, and diseased trees in rights-of-way and on other town land	Public Works	2014	Medium	CIP, OP	\$\$

**Durham Detailed Mitigation Action Plan**  
***Flood Mitigation Projects***

<b>Mitigation Action Item</b>	<b>Responsible Party</b>	<b>Schedule</b>	<b>Priority</b>	<b>Funding Sources</b>	<b>Cost Estimate</b>
Pickett Lane between Mains St and Maiden Lane. Design nearing completion for culvert replacement, construction required.	BOS, PW, BOF	A	High	HMGP, CIP, OP	\$\$\$
Pickett Lane between Mains St and Maiden Lane. Drainage study, replace with larger culverts	BOS, PW, BOF	B	Medium	HMGP, CIP, OP	\$\$
Guire Road. Drainage Study, replace with larger culverts	BOS, PW, BOF	B	High	HMGP, CIP, OP	\$\$
Indian Lane. Drainage Study, replace with larger culverts	BOS, PW, BOF	B	Medium	HMGP, CIP, OP	\$\$\$
Higganum Road. Drainage Study, replace with larger culverts	BOS, PW, BOF	B	Medium	HMGP, CIP, OP	\$\$
Haddam Quarter Road. Drainage Study, replace with larger culverts	BOS, PW, BOF	B	Low	HMGP, CIP, OP	\$\$\$
Meeting House Hill Rd (east end). Drainage Study, replace with larger culverts	BOS, PW, BOF	B	Low	HMGP, CIP, OP	\$\$\$
Parmelee Hill Road (east end). Drainage Study, replace with larger culverts	BOS, PW, BOF	B	Low	HMGP, CIP, OP	\$\$\$
Seward Road. Drainage Study, replace with larger culverts	BOS, PW, BOF	B	Low	HMGP, CIP, OP	\$\$\$
Allyn Brook, Maple Ave to Route 68. Channel Restoration to eliminate frequent flooding	BOS, PW, BOF	B	High	HMGP, CIP, OP	\$\$\$
Stagecoach Road near Route 17. Drainage study, replace with larger culverts	BOS, PW, BOF	B	Medium	HMGP, CIP, OP	\$\$
Durham Water Company Well. Drainage study to determine increase of surrounding grade	BOS, PW, BOF	B	High	HMGP, CIP, OP	\$\$
Dam in Allyn Brook at Mill Pond Lane and Route 17. Drainage study to determine dam repair or sediment removal	BOS, PW, BOF	B	Low	HMGP, CIP, OP	\$\$

***Hurricane Mitigation Projects***

<b>Supporting Task</b>	<b>Responsible Party</b>	<b>Schedule</b>	<b>Priority</b>	<b>Funding Sources</b>	<b>Cost Estimate</b>
Update the Debris Management Plan	PW	A	High	CIP, OP	\$
Relocate Emergency Operations Center to Town Hall and provide backup electrical generator	PW	A	High	CIP, OP	\$

**IX PLAN MAINTENANCE**

FEMA Regulations – 44 CFR §201.6(d) (3): The Town of Durham, working with RiverCOG will conduct a complete review and do a revision if needed and submit it for approval in 5-years. Even if there are no changes, it must be reported, in order to continue being eligible for Natural Hazard Mitigation Grants.

In accordance with Section 201.6(c) (4) of 44 CFR Durham will assure the Plan remains an active and relevant document. RiverCOG municipality officials will continue working with Durham in the mitigation planning process.

Changes to the Hazard mitigation Plan can be made at any time prior to FEMA’s approval pending adoption; however any changes thereafter will require a submission to FEMA for approval either as an amendment or as a Plan update requiring re-adoption of the plan by the affected jurisdiction(s). If there are regional implications, then the entire Plan would need to be re-adopted by all jurisdictions. If the changes do impact the substance of the Planning Process, Risk Assessment, Strategy or Maintenance components of the existing plan, a plan Update would be required, necessitating an opportunity and means for input by stakeholders as well as re-adoption.

See Appendix Q for a sample mitigation planning tool.

**X PLAN APPROVAL AND ADOPTION**

Upon FEMA Approval Pending Adoption of this Plan, it requires a signature by the municipal CEO. The adoption certificate follows. CEO signatures are required on the Regional Section of this Plan in addition to this local Annex.

**THE LOWER CONNECTICUT RIVER VALLEY COUNCIL OF GOVERNMENTS  
MULTI-JURISDICTION NATURAL HAZARD MITIGATION PLAN  
CERTIFICATE OF ADOPTION  
Town of Durham, Connecticut**

WHEREAS, the Town of Durham has historically experienced severe damage from natural hazards and it continues to be vulnerable to the effects of - only those natural hazards profiled in the plan (i.e. flooding, thunderstorm, high wind, winter storms, earthquakes, and dam failure), resulting in loss of property and life, economic hardship, and threats to public health and safety; and

WHEREAS, the Town of Durham, has developed and received conditional approval from the Federal Emergency Management Agency (FEMA) for its Hazard Mitigation Plan under the requirements of 44 CFR 201.6; and

WHEREAS, public and committee meetings were held between June 16, 2009 and December 1, 2011 regarding the development and review of the Multi-Jurisdiction Natural Hazard Mitigation Plan; and

WHEREAS, the Plan specifically addresses hazard mitigation strategies and Plan maintenance procedure for the Town of Durham; and

WHEREAS, the Plan recommends several hazard mitigation actions/projects that will provide mitigation for specific natural hazards that impact the Town of Durham, with the effect of protecting people and property from loss associated with those hazards; and

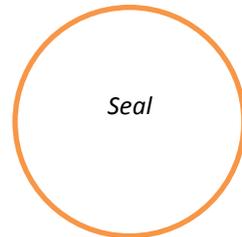
WHEREAS, adoption of this Plan will make the Town of Durham eligible for funding to alleviate the impacts of future hazards; now therefore be it

RESOLVED by the Board of Selectmen:

1. The Plan is hereby adopted as an official plan of the Town of Durham
2. The respective officials identified in the mitigation strategy of the Plan are hereby directed to pursue implementation of the recommended actions assigned to them;
3. Future revisions and Plan maintenance required by 44 CFR 201.6 and FEMA are hereby adopted as a part of this resolution for a period of five (5) years from the date of this resolution.
4. An annual report on the progress of the implementation elements of the Plan shall be presented to the Board of Selectmen by the Planning and Zoning Commission.

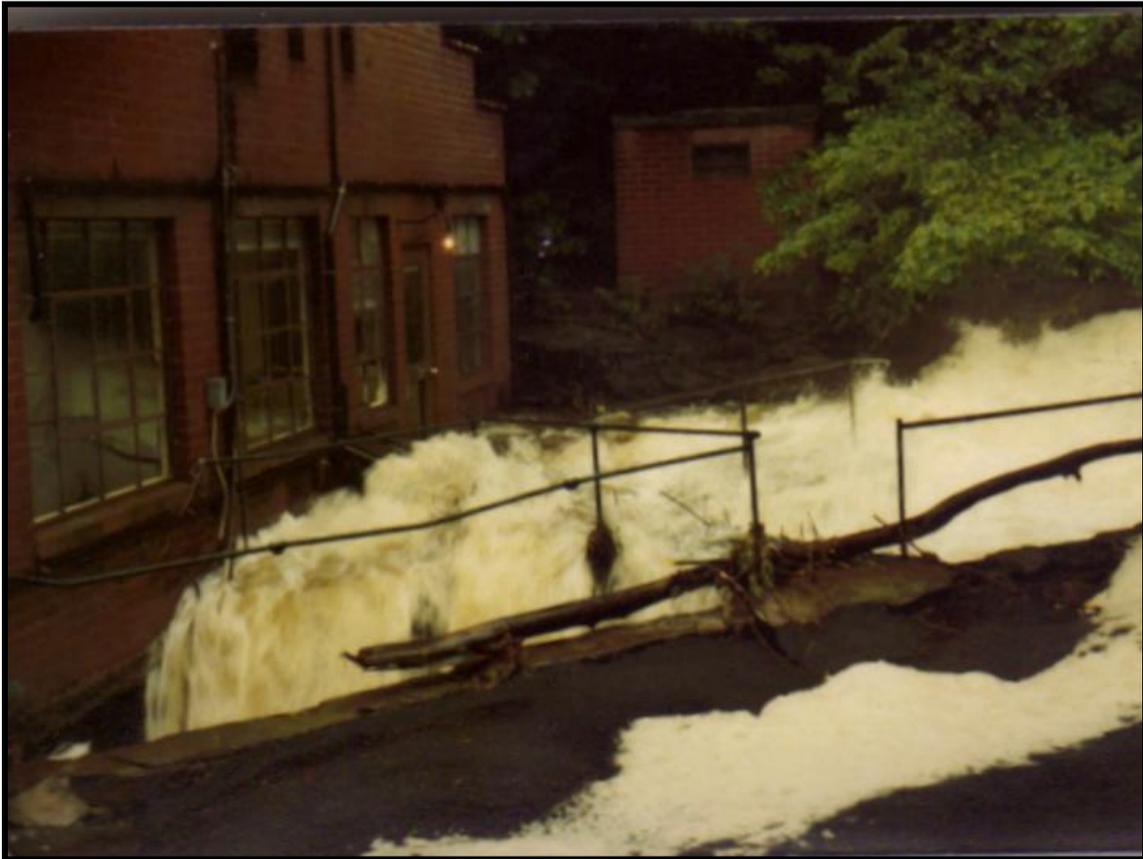
IN WITNESS WHEREOF, the undersigned has affixed his/her signature and the corporate seal of the Town of Durham this \_\_\_ day of \_\_\_\_\_, (year).

\_\_\_\_\_  
(Name, Title)



**Annex C**  
**East Haddam Natural Hazard Mitigation Annex**

**NATURAL HAZARD MITIGATION ANNEX**  
**TOWN OF EAST HADDAM CONNECTICUT**



**June 2014**

Prepared by:

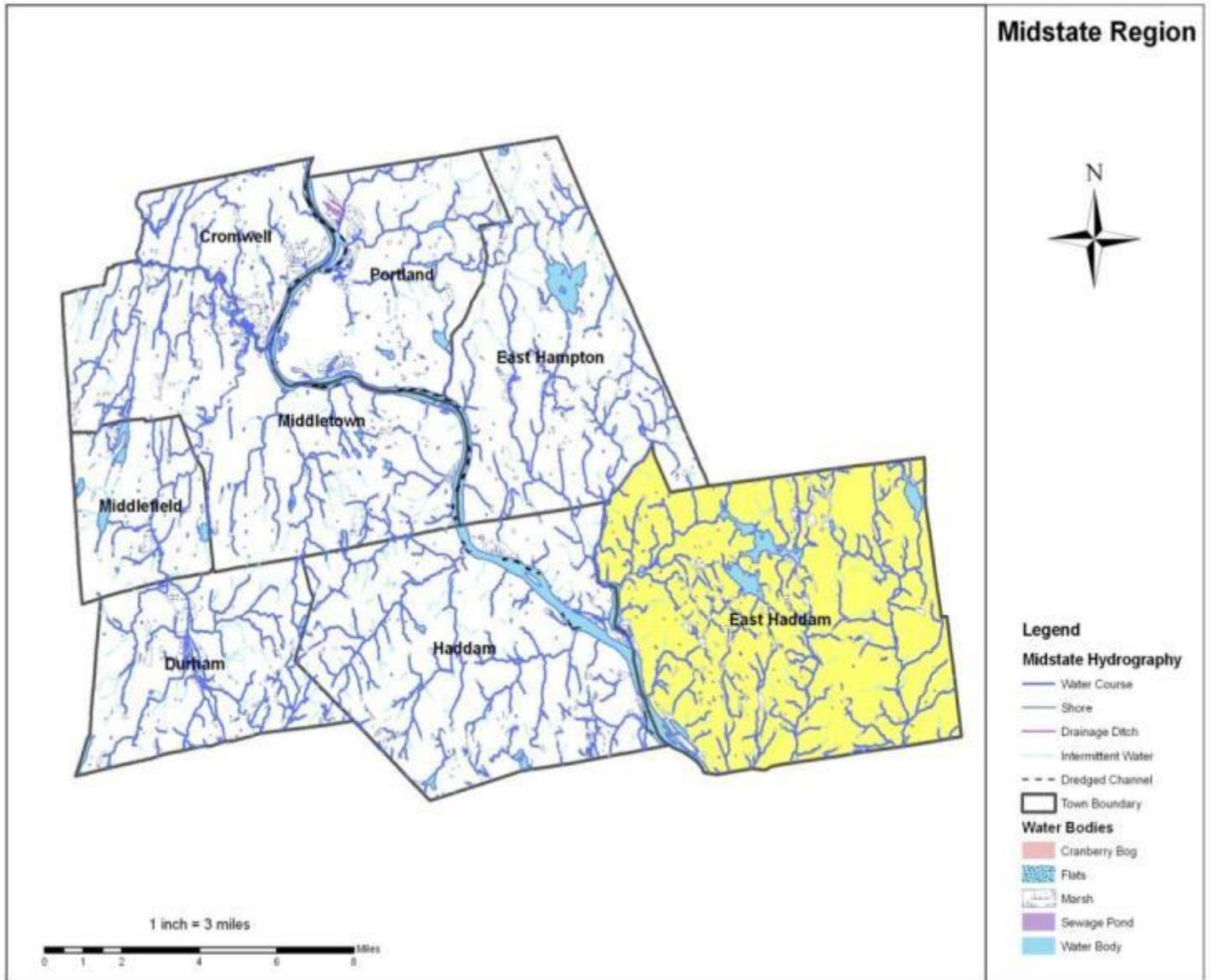
**Lower Connecticut River Valley Council of Governments**

*[www.rivercog.org](http://www.rivercog.org)*

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**Map 1:** East Haddam within the former Midstate Region.

*On the cover:*

**Photo 1:** Main Street, Tax Day Flash Flood, 2007

Source: Craig Mansfield, East Haddam EMD

**i PURPOSE**

The purpose of this Natural Hazard Mitigation Plan is to identify the natural hazards most likely to affect the area, to locate the vulnerabilities, assess the risks and estimate corrective actions to protect life, limb, property and financial loss. Also, to synchronize this Plan with other local, regional and State; land use, transportation, clean water, wetlands and debris management plans. This Plan will compliment traditional emergency response plans.

See Appendix A for a list of related plans.

This Plan could be considered a long term strategy to reduce the economic consequences of a natural disaster.

**Bottom line:** The most likely event, considered to be hazardous to the population and properties in the region is a natural disaster. Since the tragic events of September 11<sup>th</sup>, 2001 municipal administrations, planners and emergency responders have overlaid terrorist attacks onto their chemical, biological, radiological, nuclear, and explosive (including fires) standard operating procedures and guidelines. Time has passed and now our focus is on natural hazards ... storms.

Funding these plans and projects reduces overall risks to the population and structures, while also reducing reliance on funding from actual disaster declarations. Pre Disaster Mitigation grants are to be awarded on a competitive basis and without reference to state allocations, quotas, or other formula-based allocation of funds.

Source: FEMA

**ii SCOPE OF PROJECT**

**Scope of Project**

This pre-disaster risk and vulnerability assessment is designed and scoped to identify those areas that are vulnerable to specific or multiple severe weather related events. The Planning Team has evaluated history, current conditions and or state of repair and future potential conditions to develop a prioritized list of structures, utilities, roadways including bridges and culverts that are in need of repair, strengthening or replacement to prevent or minimize loss of life, limb or property. Dam failure (potential) and repetitive loss properties are a good example of areas the Planning Team looked closely at to predict the future. Historical data provides valuable references for future risk. Subject matter experts were contracted by the former MRPA to investigate and report on the repetitive loss properties and hazardous dams in the region.

We looked at all possible natural hazards and categorized them according to the “likelihood” of an occurrence<sup>34</sup>. Flooding was by far the highest on our priority list. Hurricanes could, and historically have happened and we are overdue for “a big one”. We are particularly vulnerable to the wind and flooding effects of a strong Category 1 and up hurricane. As you will see throughout this Natural Hazard Mitigation Plan **we anticipate 80% of our mature growth trees will come down in a major hurricane.** Earthquakes could happen; but are not likely.

Strategies for mitigation, within this Plan are best guess estimates by professionals.

**To readers and stakeholders to this Plan, following is a summary of the local content with highlights for a quick review.**

**Benefit:** The Federal Emergency Management Agency (FEMA) in the Department of Homeland Security recognized the need for more robust “natural hazard” planning and mitigation at the local level. The purpose was to bring the need for proper preparation to the attention of local jurisdictions and regions<sup>35</sup>. A benefit of a natural hazard planning process is to identify those areas, buildings or infrastructure that can be “fixed” to minimize or prevent damage from a major storm. Another benefit of this planning process is if a project is identified in the plan, then the municipality or region can request a grant under the Natural Hazard Mitigation Grant Program to mitigate the risk. Another benefit is; if a project is identified in this Plan and it is damaged or destroyed in a storm, funding can be obtained under this program to replace the damage to what it should have been, as identified in the Plan. Otherwise disaster relief funding will only allow for rebuilding to: as it was.

Another benefit of this planning process is an awareness of a need to revisit other related plans.

Planning Process Benefit: Throughout the NHMP planning process all departments and vulnerable stakeholders were reminded of; or became aware of, local vulnerabilities that

<sup>34</sup> *It should be noted that we had not anticipated the “Hugh” beaver dam system failure above Shagbark, that caused the Main Street flooding of 2007*

<sup>35</sup> *In Connecticut we have regional planning agencies, organizations or councils of governments performing the planning functions traditionally done by county governments in other states.*

East Haddam Natural Hazards Mitigation Annex

mitigation projects could protect them from loss of life, limb or property. This is particularly true of critical infrastructures. The interest/awareness level here is high; given the DEMHS and DEEP activities in the last ten years.

This Plan and mitigation strategies take into consideration the following potential major natural weather events:

Floods	Drought	Earthquake
Hurricanes	Wildfire	Extreme Cold
Winter Storms	Erosion	Wind Storms

Each natural hazard and subsequent risk has been evaluated to set-up the vulnerabilities of the municipality and region.

<i>RISK*</i>							
<i>EVENT</i>	<i>LIKELIHOOD</i>	<i>VALUE</i>	<i>LOSS POTENTIAL</i>	<i>VALUE</i>	<i>Financial Impact</i>	<i>VALUE</i>	<i>TOTAL</i>
<i>Earthquakes,</i>	<i>L</i>	<i>1</i>	<i>M</i>	<i>2</i>	<i>L</i>	<i>1</i>	<i>4</i>
<i>Extreme heat,</i>	<i>H</i>	<i>3</i>	<i>L</i>	<i>1</i>	<i>L</i>	<i>1</i>	<i>5</i>
<i>Fires,</i>	<i>M</i>	<i>2</i>	<i>M</i>	<i>2</i>	<i>L</i>	<i>1</i>	<i>5</i>
<i>Floods,</i>	<i>H</i>	<i>3</i>	<i>H</i>	<i>3</i>	<i>H</i>	<i>3</i>	<i>9</i>
<i>Hurricanes,</i>	<i>H</i>	<i>3</i>	<i>H</i>	<i>3</i>	<i>H</i>	<i>3</i>	<i>9</i>
<i>Landslides,</i>	<i>L</i>	<i>1</i>	<i>L</i>	<i>1</i>	<i>L</i>	<i>1</i>	<i>3</i>
<i>Thunderstorms,</i>	<i>H</i>	<i>3</i>	<i>L</i>	<i>1</i>	<i>L</i>	<i>1</i>	<i>5</i>
<i>Tornadoes,</i>	<i>L</i>	<i>1</i>	<i>H</i>	<i>3</i>	<i>M</i>	<i>2</i>	<i>6</i>
<i>Winter storms (extreme cold)</i>	<i>H</i>	<i>3</i>	<i>M</i>	<i>2</i>	<i>L</i>	<i>1</i>	<i>6</i>

\* Risk: risk of life, limb, property and/or financial impact H=High (3); high priority, M=Medium (2); medium priority, L=Low priority (1); a priority; but not high or medium.

Table II-3

**Figure 1:** Potential hazards and associated risks within East Haddam.

The impact of these events was evaluated based on: presence of vulnerable populations; well-being of the residents and businesses; vulnerable structures; vulnerable infrastructure and financial exposure to the municipality.

Also followed are guidelines from the National Flood Insurance Program under the Federal Insurance Administration, which enables property owners to purchase insurance protection against losses from flooding. Generally if a property does not have a mortgage, where the lender requires flood insurance, they may not have a policy. Where known we have listed them.

**Highlights of this Regional/Local Natural Hazard Mitigation Plan**

That document includes historic photos documenting the local needs for mitigation, plus other locally valuable information and documentation not required under the FEMA NHMP Guidelines.

**Project Input:** Input for this Plan was gathered through the direct involvement of municipal staff, the public and the close relationship with former MRPA. This input, including past and present projects, contributed to ongoing mitigation strategies which will result in future mitigation projects.

All these activities provided an opportunity for public input.

**Meetings and participation:** Meetings, throughout the planning period, were held with Town employees, the administration, the public, individual department heads and local historic society representatives. Additionally a great deal of historic information came from regional and state libraries.

Participants in the planning process can be found in the Planning Process part in the Regional Section of this Plan, and here in Section II.

**Key Departments in planning:** The two key departments contributing to the Plan were Public Works and Emergency Management. The First Selectman was also highly involved in the planning process. As indicated in the planning team section contributions were excellent. The First Selectman will carry the Plan through the adoption process.

**Fixed Populations:**

- There are no long term incarceration facilities in East Haddam... only holding cells.
- In neighboring Middletown (across the River) there is a large State Mental hospital
- Emergency Management, Public Health and Social Services work closely with local Convalescent hospitals, rest homes and senior citizen housing clusters in evacuation and shelter planning. Health Department personnel actively participate in local and regional public health emergency planning. This includes the statewide emergency management regions. At this time the Regions (2&3) are working on a Regional Support Plan addressing mitigation plans for protecting the public.

**Regional Pet Sheltering:** Grant monies have been and will continue to be sought for funding a regional pet holding area. Historically these were called “dog pounds”. These facilities can “back-up” the Pet Shelters adjacent to People Shelters.

**Non-FIRM flooding vulnerable areas:** Non flood plain areas vulnerable to flooding are within the scope of this planning exercise; though not in the FIRM plan.

**Non-Disclosure; Repetitive Loss Properties:** The Federal Privacy Act 1974 prohibits public release of the names of policy holders or recipients of financial assistance and the amount of the claim payment or assistance. Therefore only the highlights are listed in this plan

**Hazard Monitoring:** Because we have frequent floods in recent years our monitoring activities are real-time. Throughout this Plan appropriate flooding photographs are shown.

**Funding Opportunities:** The local budgeting process is the primary source of funding for mitigation projects. Through adoption of this Plan it is hoped additional funding and grants will be available. Funding sources are discussed in Section I of the Regional section of this Plan.

**Planning Process:** Town planners' engaged in this project range from local planning departments, to this Agency and to outside engineering firms. In all cases they participated in this Project. See the Section II for participants and the planning process in the Region Part of this Plan and sections I, II & III of this Annex. Also Section VIII for ongoing NHMP Actions and Planning

**Mitigation Actions:** Prioritization of mitigation actions has been settled in each jurisdiction; simply put ... the CEO made the decision. BUT, we acknowledge a current failure can move a project to the head of the list

The carrying-out of the mitigation actions is a function of cost-benefit studies and availability of funding. . It is also understood that local budget spending is subject to conflicting interests in the available budget \$\$\$. E.g. school projects versus a particular road repair. Infrastructure mitigation projects can be a balancing act... by the Director of Public Works, subject to the administration's wishes.

**Updating current NHMP:** There are no current NHMPs in place to update. After Plan adoption, if the need arises, elements can be updated annually.

**Public Outreach:**

For emergencies we have a FEMA/DEMHS Crisis Communications Plan in effect. It is outlined in our EMERGENCY OPERATIONS PLANS which MRPA assisted in the writing of. Notifications include postings on the local websites, the DEMHS 211 site and Press Releases.

For the development of this Plan the Mayor of Middletown issued a regional press release, advising the public of the Plan being in the works and requested they contact their local authorities and to watch for public workshops being held. For Public Outreach content, see Regional part of this Plan, Section IV and this local Annex Section IV

**Natural Resource Protection:** Advocates for protection of natural resources are ever present at meetings where projects are discussed that have the potential to affect natural resources. This also includes State Projects. East Haddam officials are very aware of protecting the environment. If areas are reclaimed during the hazard mitigation process, the space will be left as open space.

**Goals and Objectives:** Staff and planners, very early on in the process established goals and objectives to accomplish them. A brief synopsis of the Goals and Objectives can be found in the Regional and local sections of this Plan.

**Loss Reductions:** Mitigation goals are to reduce losses to life, limb and property ... and costly reductions in municipal services. Throughout the Plan there are references to actions to be taken to reduce losses. See Regional Section IV and this local Annex, Section, VIII.

**Actions monitoring:** Section III Part 6 Mitigation Action Plan is the spreadsheet of prioritized projects in need of repair and/or replacement. This is the working playbook by which the municipality will work going forward. Section III, this Annex, indicates the department or agency responsibility for these actions.

**Municipal Approval:** In order for East Haddam to qualify for future funding opportunities under the Natural Hazard Grant Program, this Plan must be “adopted”. See Section XIII.

**I DEMOGRAPHICS**

**A. Town Profile**

*East Haddam, Incorporated in 1734, is a small rural town on the eastern shore of the Connecticut River. The population in 1990 was 6,676; 2000 - 8,333 and 2010 - 9,126. Our net Grand List in 2009 was \$900,399,070. School enrollment is 1,439.*

*East Haddam is a Board of Selectmen form of government with a First Selectman as the chief elected official.*

**B. Population Density**

Geographic Area	Population (2000)	Housing Units	Total Area (sq. miles)	Water Area (sq. miles)	Land Area (Sq. Miles)	Density per Square Mile of Land Area	
						Population	Housing Units
County							
Middlesex	165,626	74,837	439	70	369	448	203
Town							
East Haddam	9,126	4,508	56.7	2.3	54.4	153	73

**Figure 2:** Population density in East Haddam

Source: Census 2010

Year	Census Population	CT DSC43 Projected Population					
		2005	2010	2015	2020	2025	2030
Durham	8333	8858	9184	9507	9845	10165	10441

**Figure 3:** Population Projection

Source: State Data Center at UCONN

---

## **II THE LOCAL PLANNING TEAM**

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The East Haddam working group was led by Emergency Management Director; Craig Mansfield. Land Use Planner Jim Ventres was also supportive as was Fred Thumm, Public Works Director. The Team was largely responsible for the gathering of local input for this Plan. The initial meetings were informational sessions to define the scope of work. Subsequent meetings and many e-mails resulted in the information, goals and objectives reflected in this Plan.

Local contributions came from Town officials, contract engineers, volunteers, historical societies, (local and County) and the public. Jim was very helpful working on the Repetitive Loss Properties.

A source of historic documentation was the Russell Library and the Middlesex County Historical Society Library.

Photographs were provided by Craig Mansfield

Sources utilized to identify the local vulnerabilities at risk:

Personal knowledge: RiverCOG staff; municipal elected and appointed officials, emergency management director, public works officials, municipal planners, P&Zs, FEMA HAZUS-MH, State CT Disaster History; FIRM Flood plain Maps (revised to August 2008), CCM Historic Connecticut Scenarios CEO Workshop (2004); a subject matter experts on National Flood Insurance and another on hazardous dams, the local historical society and public input. Also utilized was information from State DEEP and DEMHS interviews. A major contributing factor is the RiverCOG staff has an in-depth knowledge of local DOT plans, emergency operations plans, potential risk assessments and debris management planning efforts.

East Haddam Natural Hazards Mitigation Annex

**III MITIGATION ACTION RESPONSIBILITIES**

Local Responsible Party				
Asset	Risk	Assessment	Mitigation	Mitigation Strategy
Roadways & Bridges/Culverts	Flash floods	PW	PW	Operations & Capital Budget/*/NHMP
Dams	Floods	PW, EM	PW	Assessment (Owner) /reporting requirements Local Admin) see Hazardous Dam Report
Truss Buildings	Snow	Fire/Fire Marshal	Owner	Admin Ordinance
Drinking water sources	Flood, Draught	PW Water/Sewer/HD	PW Water/Sewer/HD	HD ordinances and monitoring
Superfund Site	Floods	Admin	Admin	Admin Manage
Hazardous Storage	Thunder Storms, Floods	Fire/Fire Marshal/EM	Fire/Fire Marshal/EM	Manage with DEEP
Forest	Wildfire	Fire	Fire Marshall	P&Z - restricting building/ Fire Plan and practice (with DEEP, Forestry)
Sewage pumping stations & /or septic systems	Floods, power outages	local Emergency Manager/PW/PH	PW	PW Loss of Power Plan current
Debris	Hurricane/Ice Storm/Wind Storm	PW	Management Plan	ADMIN/PW facilitate the writing of a DMP plan
Food Contamination	All storms	Health Department	Health Department	PH Plan
Special Needs & Fixed Populations	All storms	Social Services/HD/EM	Social Services/HD/EM	EOP,& PH Plan maintenance and Shelter exercising
Residences in flood plain	Flood	P&Z	Owners	Owners have NFIP coverage (Elevate/relocate/flood proofing)
Repetitive Loss Properties	Flood	P&Z	Owners	Owners continue coverage (Elevate/relocate/flood proofing)
Commercial Buildings in flood plain	Flood	P&Z	Owners	Owners continue coverage (Elevate/relocate/flood proofing)
Municipal facilities in flood plain	Flood	Admin/PW/EM	Admin	Elevate/relocate/flood proofing

Ice Dams	Flood	EM	PW	Develop a Plan of prevention
Overall	All storms	EM & LUO	All disciplines in EM	Participation in regional planning - REPT
	All storms	EM & Responders	NU/CL&P	Public Notices (Crisis Communications Plan)

**Figure 4:** Mitigation Action Item Responsible Parties

#### IV PUBLIC OUTREACH

There are a variety of modes of communication with the public.....Go To the Regional part of this Plan, Section IV.

Municipal responsibility to the public:

- People in vulnerable areas should monitor Flood Warnings:
- People with structures in vulnerable areas; specifically in flood plains should have a flood evacuation plan and participate in the National Flood Insurance Program. They should flood proof their buildings
- The municipalities will post storm info on their websites including proper preparations and warnings. DPH and DEMHS seasonally post info on their websites.

FEMA and the American Red Cross have extensive information and checklists for preparing for a major storm. Go To **READY.gov**. Section IV of the Regional Section of this Plan, the PUBLIC OUTREACH part, highlights information sources available.

Of interest and available to the residents are the following sources of information: FEMA Directives on NFIP, USGS Floods, WATERWATCH [a Hydrologic Science and Data-Floods],USGS Flood Definitions, FLOWING Waters, Danger from Chevron –LEARN Cars website, DEMHS Hurricane Fact Sheet, NOAA Hurricane Definitions, Hurricane Grace – the PERFECT STORM story, The Great White Hurricane story, NWS Winter storm Advisories, FEMA Risk Prioritization Tool for Dams, NOAA, DEMHS Heat & Cold Advisor, USA Flood victims, WHEN THUNDER ROARS...GO INDOORS, EF Scale for Tornadoes, etc. Most of these info documents are suitable for posting for Public Outreach.

#### V PUBLIC ASSISTANCE

A funding source option for mitigation projects is FEMA, Public Assistance. This is for repair, restoration or replacement of municipal facilities damaged by a storm...if a disaster has been declared.

There are two avenues of Public Assistance: Pre-Disaster Mitigation and Disaster Mitigation.

Property Acquisition and Relocation for Open Space is an example of pre-disaster mitigation. FEMA Pre Disaster Mitigation Program (PDM). Section 404

Damaged property reimbursement, after a disaster declaration is the other (Stafford Disaster Relief and Emergency Assistance Act, 42 U.S.C §5121, et seq. Section 406). Under this program Individual Assistance (includes residences and businesses). It should also be noted that low interest SBA loans for rebuilding are also available. There is also an ONA assistance program available if all the above fail.... (Other Needs Assistance)

The later has a crossover PA element to the other; causing confusion CT March 2010 is an example. Disaster Mitigation will only allow a rebuild to “the way it was”. Pre-Disaster Mitigation allows for rebuilding to the “way it should be”.

- 1) FEMA - Hazard Mitigation Assistance (HMA)
  - ✚ Guidance on Property Acquisition and Relocation for the Purpose of Open Space
  - ✚ Recent amendments to Title 44 of the Code of Federal Regulations added a new Part 80,
  - ✚ Property Acquisition and Relocation for Open Space. More detailed guidance to assist with implementation of the provisions found in Part 80 has also been developed. This property acquisition and relocation guidance applies to all FEMA hazard mitigation grant programs. It is included in the FY09 Hazard Mitigation Assistance (HMA) Program Guidance at Section 2.3.13 and also governs this project type under the Hazard Mitigation Grant Program (HMGP) in place of previous desk reference sections. The property acquisition guidance section must be read in conjunction with the overall requirements for each grant program including the HMGP.
  
- 2) The Part 80 rule and implementing property acquisition guidance are effective for all disasters declared on or after December 3rd, 2007 (12/03/2007).

The following is an excerpt from the FEMA Public Assistance guidance:

*FEMA Public Assistance (PA)*

**Public Assistance** *The Department of Homeland Security (DHS) Appropriations Act, 2007, Public Law 109-295, directs the Federal Emergency Management Agency (FEMA) to conduct a Public Assistance (PA) Pilot Program. The legislation sets forth three goals for the PA Pilot Program: reducing the costs to the Federal Government of providing assistance to State and local governments, increasing flexibility in grant administration, and expediting the provision of assistance to States and local governments. The PA Pilot specifically addresses the provision of assistance under sections 403(a) (3) (A), 406 and 407 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, 42*

U.S.C. 1570b (a) (3) (A), 5172, 5173 (Stafford Act). These sections relate to debris removal and the repair, restoration, and replacement of damaged facilities.

**Public Assistance Grant Program** The mission of the Federal Emergency Management Agency's (FEMA) Public Assistance (PA) Grant Program is to provide assistance to State, Tribal and local governments, and certain types of Private Nonprofit organizations so that communities can quickly respond to and recover from major disasters or emergencies declared by the President.

Through the PA Program, FEMA provides supplemental Federal disaster grant assistance for debris removal, emergency protective measures, and the repair, replacement, or restoration of disaster-damaged, publicly owned facilities and the facilities of certain Private Non-Profit (PNP) organizations. The PA Program also encourages protection of these damaged facilities from future events by providing assistance for hazard mitigation measures during the recovery process.

The Federal share of assistance is not less than 75% of the eligible cost for emergency measures and permanent restoration. The [grantee](#) (usually the State) determines how the non-Federal share (up to 25%) is split with the sub-grantees (eligible applicants).

- *Eligibility - Overview of eligibility criteria and definitions*
- *Roles and Responsibilities - Information on the duties of Federal, State, and local partners*
- *Public Assistance Grant Program Process - Step by step description of the PA grant life cycle*
- *Policy and Guidance - 9500 series policies and other publications*
- *Frequently Asked Questions (FAQ) - Top 10 questions pertaining to the Public Assistance Program*
- *Resource and Tools - Appeal database, equipment rates, cost estimating format, performance goals, funding trends, and other resources*
- *Office of Equal Rights - Information about the Office of Equal Rights and how to file a discrimination complaint*

## CHAPTER 3

### APPLYING FOR PUBLIC ASSISTANCE

Following a disaster declaration by the President, FEMA makes assistance for recovery from the disaster available to eligible applicants. This chapter describes the process through which this assistance becomes available.

#### Process Overview

*The PA Program is implemented through the steps listed below, each of which is described in detail in this chapter.*

- An Applicants' Briefing is held.*
- Potential applicants submit the Request for Public Assistance.*
- A PAC is assigned to each applicant.*
- The PAC holds a Kickoff Meeting with the applicant.*
- The applicant's specific needs are identified and cost estimates developed through the project formulation process.*
- Cost estimates for small projects that have been prepared by the applicant are checked through the validation process.*
- FEMA approves and processes grants for the applicant's projects.*

### **Projects**

*A project is a logical method of performing work required as a result of the declared event. A project may consist of one item of work, such as repairs to a single structure, or work that occurs at multiple sites, such as repairs to several washouts along a road. The applicant is responsible for identifying all work that is required as a result of the disaster. The PAC may assist the applicant in combining various recovery efforts into projects.*

**VI INDIVIDUAL (residents and businesses) ASSISTANCE**

The following is an excerpt from FEMA Individual Assistance (IA) guidance:

*FEMA and other federal, state, local and volunteer agencies offer disaster assistance in several forms:*

*Low-Interest Loans. Most, but not all, federal assistance is in the form of low interest loans to cover expenses not covered by state or local programs, or private insurance. People who do not qualify for loans may be able to apply for a cash grant. If you qualify, your check will be issued in about three weeks.*

*The Farm Service Agency (FMHA) and the Small Business Administration (SBA), offer low interest loans to eligible individuals, farmers and businesses to repair or replace damaged property and personal belongings not covered by insurance.*

*Cash Grants for up to \$13,400 adjusted (annually for inflation). Individuals who do not qualify for a loan from SBA may be eligible for these grants from FEMA and the state to help recover uninsured property losses. Home inspections are normally conducted before a check is issued. FEMA funds 75% of the grant program's eligible costs with the remaining 25% covered by the state. The state administers the program.*

*Housing Assistance. FEMA's Disaster Housing Assistance Program (DHA) makes funds and temporary housing available to individuals whose home is unlivable because of a disaster.*

*Veterans Benefits. The Department of Veterans' Affairs provides death benefits, pensions, insurance settlements and adjustments to home mortgages for veterans.*

*Tax Refunds. The Internal Revenue Service (IRS) allows certain casualty losses to be deducted on Federal income tax returns for the year of the loss or through an immediate amendment to the previous year's return.*

*Unemployment Benefits. Unemployment benefits may be available through the state unemployment office and supported by the U.S. Department of Labor.*

*Crisis Counseling. Local and state health agencies, the American Red Cross, as well as churches and synagogues may offer counseling to people who have experienced a disaster.*

*Free Legal Counseling. The Young Lawyers Division of the American Bar Association, through an agreement with FEMA, provides free legal advice for low-income individuals regarding cases that will not produce a fee (i.e., those cases where attorneys are paid part of the settlement which is awarded by the court). Cases that may generate a fee are turned over to the local lawyer referral*

service.

*Independent Study Programs. FEMA offers an Independent Study Program through the Emergency Management institute.*

*Individuals, families and businesses may be eligible for federal assistance if they live, own a business, or work in a county declared a Major Disaster Area, incur sufficient property damage or loss, and, depending on the type of assistance, do not have the insurance or other resources to meet their needs.*

## VII NATURAL HAZARDS

This East Haddam section of the Natural Hazard Mitigation Plan contains a variety of localized details complementing the Natural Hazard Section in the Regional Section of this Plan. For overall information on potential natural hazards, Go To: the Regional Section of this Plan: Section III.B

The profiling of natural hazards in East Haddam is based on a variety of sources and personal observations of recent events and discussions with “the older generation”. During Selectmen’s Meetings we also heard of other concerns...other than the ones we already were aware of.

Natural disasters can often be predicted. And damage can be anticipated. Crumbling infrastructure does require continuing R & R to minimize costly damage. Utilizing budget allocations and available State grants the current mitigation process is ongoing. Repetitive damage due to storms generally puts a vulnerable project as a top priority “fix” on Public Works “Wish List”.

Storm damage tends to occur repeatedly in the same geographical locations because they are related to weather patterns or physical characteristics of the area (flooding). However; all areas of the community are vulnerable to one or another type of natural disaster (hurricanes, wind and ice storms, tornados).

East Haddam is vulnerable to many types of natural hazards. Flooding is by far the most significant natural hazard with the potential to do harm to people, places and things and to cause financial losses. The second greatest threat is from hurricanes. Therefore the focus of this Plan is on these two weather events.

A core team of Town officials contributed to the input for this Plan (Craig Mansfield; Jim Ventres and Fred Thumm).

Hurricane damage is not localized as is flooding. Generally the effects are town wide. Wet hurricanes also create flooding problems.

Wind and snow storms do regularly occur; but the results are not as catastrophic as flooding and hurricanes. The other potential threats are discussed extensively in the Regional Section of this Plan.

Spring flooding events happen along the Connecticut River. In significant Spring Flooding the private Airport and cottages along the River are at risk.

### **East Haddam Emergency Operations Plan**

The following is an excerpt from East Haddam Emergency Operations Plan (EOP) Hazard Specific Annex (HSA):

### **Introduction to Hazard Specific Annexes (HSA)**

*Information contained within the East Haddam Emergency Operations Plan is only intended to be a guide to emergency planners... it's a Plan. Each municipal discipline defined therein is responsible for their own Standard Operating Procedures.*

*For additional information on the weather Hazard Specific Annexes (HSAs) in this Book, Go To the following website HAZARDOUS WEATHER FRESPONSE GUIDE: <http://www.fema.gov/doc/hazards/g271rq.doc>.*

*Specifically; access this website for detailed information on the following: thunderstorms, tornadoes, flash floods, riverine floods, coastal floods, hurricanes, tsunamis/tidal waves, winter storms, excessive cold, excessive heat, and windstorms.*

*Because hurricanes are the event we here in the Northeast are most apt to encounter in catastrophic proportions, this section of the EOP-HSA Annex A contains excerpts from the HAZARDOUS WEATHER FRESPONSE GUIDE. Also available to the Emergency Management Director is the CD **NEW ENGLAND HURRICANE ARE YOU READY?** ([www.fema.gov](http://www.fema.gov)). Most EMDs received one in 2003.*

## **A. Floods**

### **1. Introduction**

For East Haddam, flash floods are the most dangerous flooding condition as is evidenced by our history of flooding. They are the most significant natural hazard with the potential to do harm to people, places and things.

As mentioned they come with minimal, if any warning. There are 71 dams in East Haddam. Many of which could be breached by a sudden surge of a large amount of runoff (flash flooding) Two are classified as being significant hazards.

### **2. Spring Flooding**

Spring flooding is a condition where the Connecticut River overflows its banks here in Town and overflows onto flood plains and sometimes beyond. As indicated in the repetitive loss section of this Plan the areas along the River, downstream of the bridge are particularly vulnerable to Spring Flooding.

### **3. Flash Floods**

Flash Floods are caused by significant rain events; which means, when we receive a lot of precipitation from a major rain storm. These floods can be violent and come without any advance warning. Flash floods are characterized by high velocity flowing water often accompanied with debris.

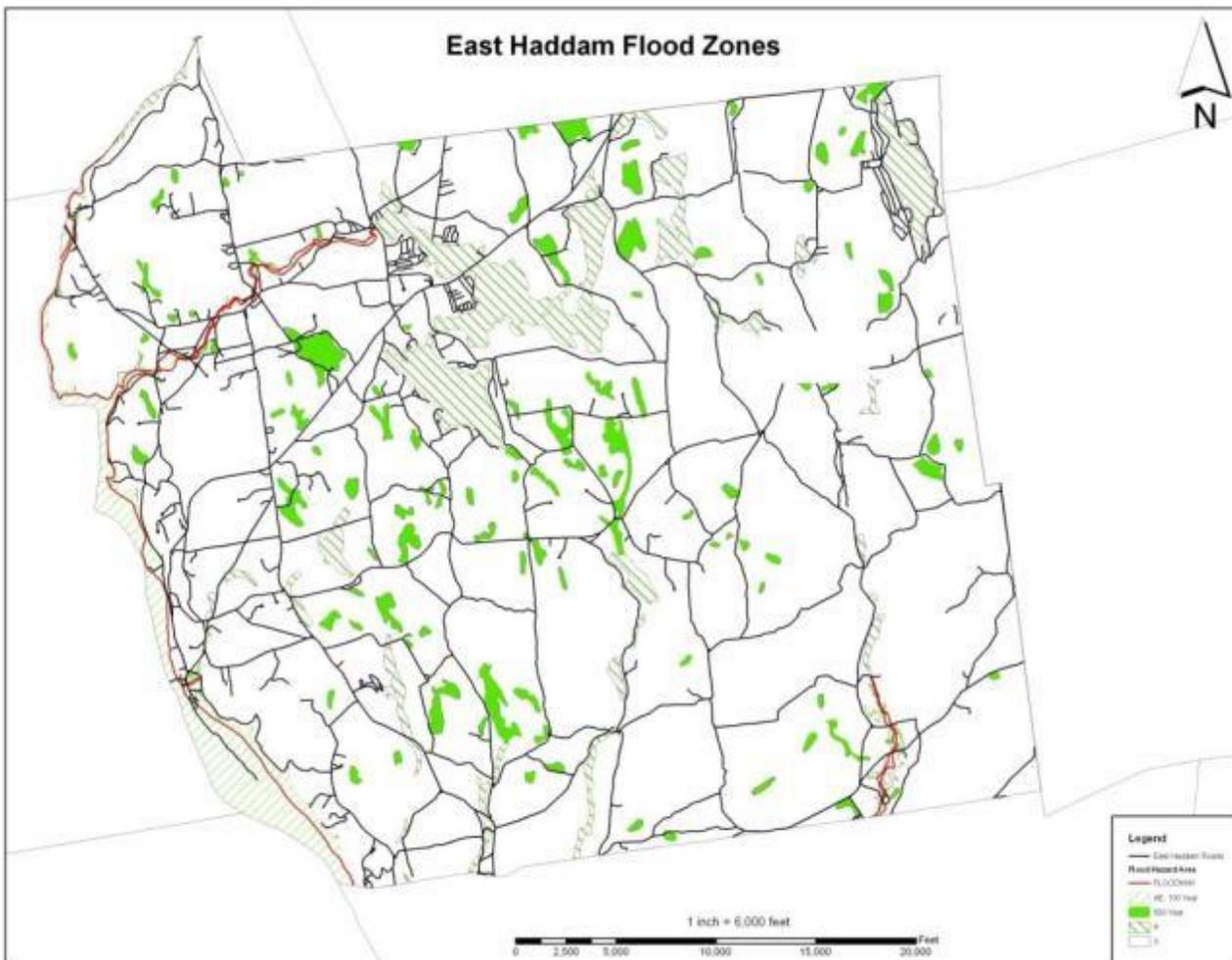
The streams passing through East Haddam and low lying roads are a cause of concern during significant rain events. See East Haddam Vulnerabilities for a list of those areas in need of mitigation.

One of the most interesting... and unexpected dam failures was the failure of a major beaver dam complex... unauthorized by the DEEP... that resulted in flooding Main Street and resulting in damage to several buildings including those of Good Speed.

Flash Floods and Spring Flooding are discussed in detail in the Regional Section of this Plan in Section III.B.1

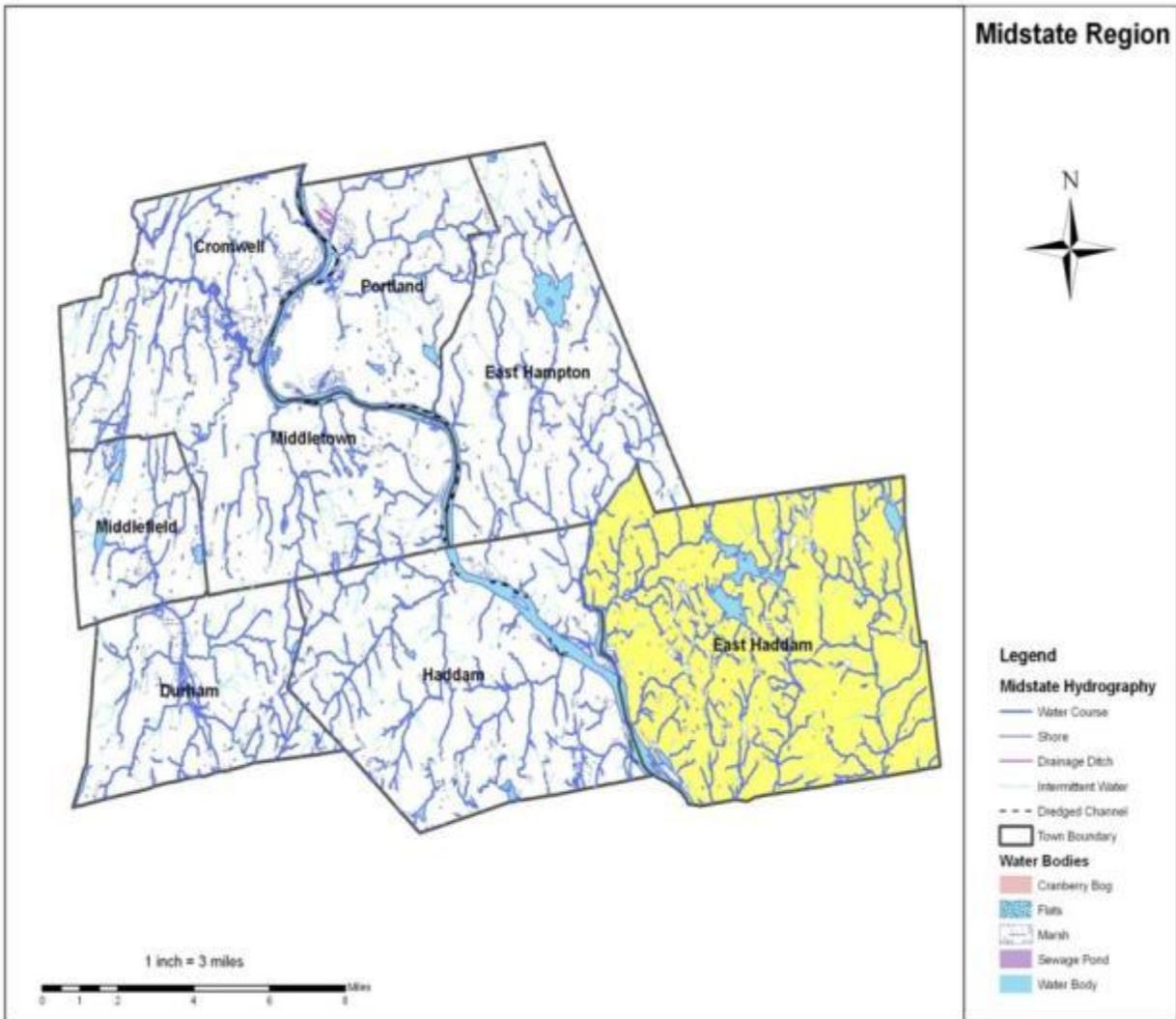
#### 4. East Haddam Flood Zones and Regional Hydrography

The following maps depict the flood zones in town and the hydrography throughout the region highlighting East Haddam.



**Map 2:** East Haddam Flood Zones

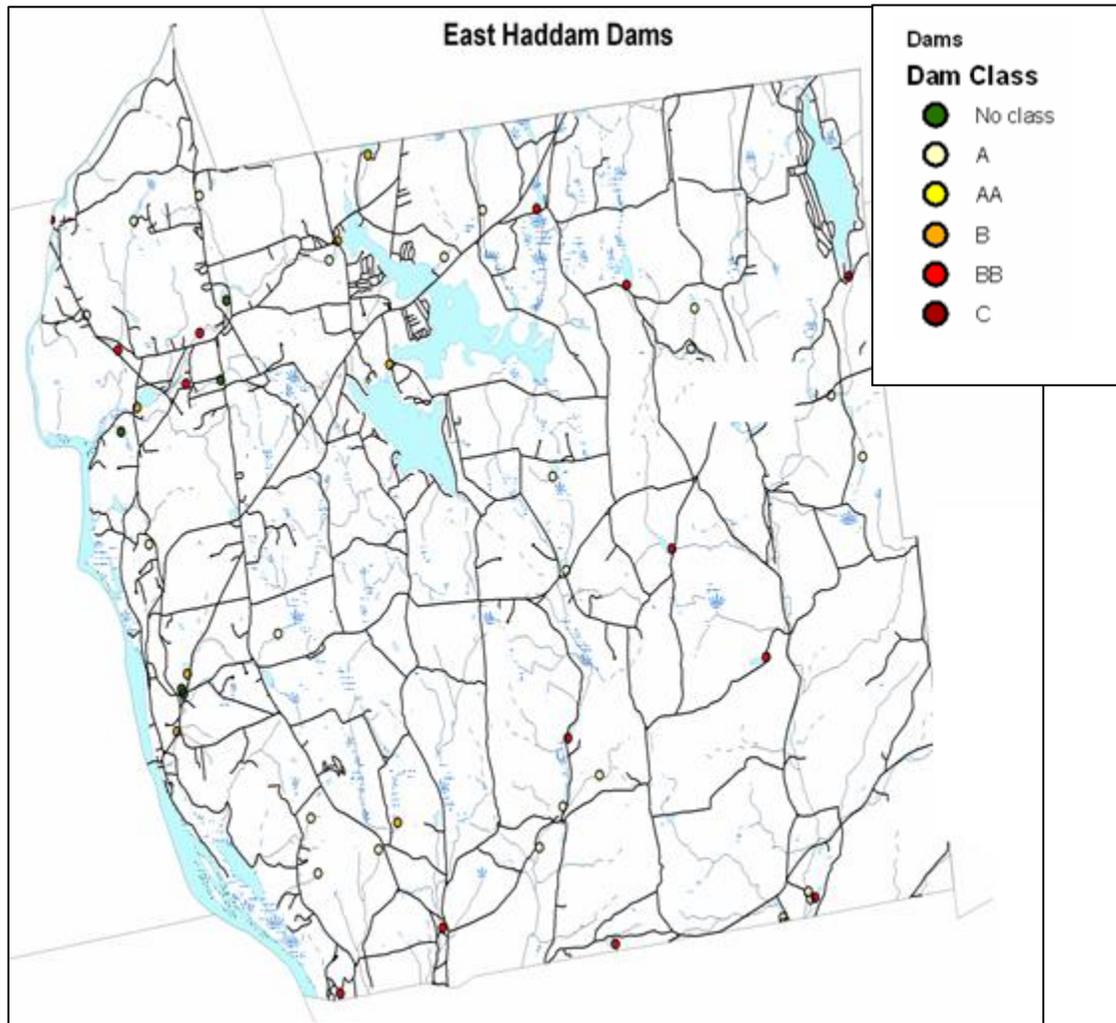
Source: RiverCOG



**Map 3:** East Haddam Hydrography

Source: RiverCOG

5. East Haddam Dams



**Map 4:** East Haddam Dams

Source: RiverCOG

The State Department of Environmental Protection requires the registration of all dams over the height of six feet. The Dam Safety Section of the Inland Water Resources Division of the Connecticut Department of Environmental Protection (DEP) is responsible for administering and enforcing Connecticut’s dam safety laws. The existing statutes require that permits be obtained to construct, repair or alter dams, dikes and similar structures and that existing dams, dikes and similar structures be registered and periodically inspected to assure that their continued operation and use does not constitute a hazard to life, health or property.

DEEP assigns dams to one of five classes according to their hazard potential:

Class AA: negligible hazard potential dam which, if it were to fail, would result in no measurable damage to roadways, land and structures, and negligible economic loss.

Class A: low hazard potential dam which, if it were to fail, would result in damage to agricultural land, damage to unimproved roadways, or minimal economic loss.

Class BB: moderate hazard potential dam which, if it were to fail, would result in damage to normally unoccupied storage structures, damage to low volume roadways, or moderate economic loss.

Class B: significant hazard potential dam which, if it were to fail, would result in possible loss of life; minor damage to habitable structures, residences, hospitals, convalescent homes, schools, etc.; damage to or interruption of the use or service of utilities; damage to primary roadways and railroads; or significant economic loss.

Class C: high hazard potential dam which, if it were to fail, would result in the probable loss of life; major damage to habitable structures, residences, hospitals, convalescent homes, schools, etc; damage to main highways; or great economic loss.

The classification of a dam can change due to changes in downstream development. 83% of dams in Connecticut fall within the negligible to moderate hazardous categories while only 17% fall within the significant and high hazard categories. Map 11 depicts which Hazard Class each dam in Chester is.

DEEP keeps track of which dams have emergency plans but not all of them would be up to date and not all dam owners will want those plans shared publically. Only the larger significant and high hazard dams would typically have an emergency plan with inundation areas but not all do as it is not yet mandated by state statute or regulation. The following chart lists the high and significant hazard potential dams located in East Haddam:

DAM ID #	DAM NAME	HAZARD CLASS	OWNERSHIP
4103	Leesville Dam	C	CT DEEP
4102	Moodus Reservoir Dam	B	CT DEEP
4113	Bashan Lake Dam	B	CT DEEP
4114	Pickerel Lake Dam	B	CT DEEP

**Figure 5:** Hazardous Dams in East Haddam

**Leesville Dam #4103**

Hazard Classification – C – High Hazard Dam

Owner: State of Connecticut – DEEP

The Leesville Dam is owned and operated by the State of Connecticut Department of Environmental Protection. The Leesville Dam is a 12 foot-high concrete dam founded on bedrock. A 12-foot wide concrete fish ladder is located at the left abutment contact of the dam. The dam is located on the Salmon River 700-feet upstream of the Rt. 151 Bridge over the Salmon River. The Leesville Dam was lowered in 1982 as part of the fish ladder installation project. A recent inspection of the Leesville Dam by the CT/DEEP indicates the dam is in good condition.

There are 5 residential homes located on Powerhouse Road that will be impacted by the failure of the Leesville Dam. The Rt. 151 Bridge over the Salmon River has the potential to be damaged by the failure of the dam.

**Moodus Reservoir Dam #4102**

Hazard Classification – B – Significant Hazard Dam

Owner – State of Connecticut – DEEP

The Moodus Reservoir Dam is owned and operated by the State of Connecticut Department of Environmental Protection. The Moodus Reservoir Dam is a homogeneous earth embankment dam 275-feet long and 17.5-feet high. The dam consists of a 135-foot long earth embankment and a 140-foot long masonry spillway located near the right abutment of the dam. The spillway discharges into a stone and concrete lined channel leading to a box culvert under Falls Bashan Road which is immediately downstream of the dam. Moodus Reservoir Dam is located on the Moodus River immediately upstream of Falls Bashan Road. The dam retains Moodus Reservoir.

The Moodus Reservoir Dam was recently inspected by the CT/DEEP. The dam is in good condition.

The CT/DEEP obtained a dam construction permit to perform repairs to the Moodus Reservoir Dam in the spring of 2009. The work included repairing the earth embankment, reconstructing the dam's spillway, and a new fuse-plug emergency spillway, and the construction of a new concrete gatehouse.

**Boardman Pond Dam #4109**

Hazard Classification – B – Significant Hazard Dam

Owner: Paul H. Miller

Boardman Pond Dam is an earth fill dam with a masonry spillway located on Succor Brook in the Town of East Haddam. Boardman Pond Dam was last inspected in 1985 and on May 30, 1985, an engineering request was sent to the owner outlining the following deficiencies in the dam:

- a) Cut and remove brush growing on the dam embankment.
- b) Repair stone masonry which has become dislodged and requires re-chinking at left end of dam, including top stones which are missing; right upstream wall of dam; training wall of the spillway (principal); and right training wall of the emergency spillway.
- c) Restore eroded areas of the embankment, particularly adjacent to the left upstream spillway training wall.
- d) Remove debris impeding flow from the pool below to the emergency spillway.
- e) Bring any low areas on the dam embankment up to grade to provide a uniform crest elevation.

Boardman Pond Dam is overdue for an inspection since it has not been inspected since 1985.

#### **Pickerel Lake Dam #4114**

Hazard Classification – B – Significant Hazard Dam

Owner: State of Connecticut – DEEP

Pickerel Lake Dam is a 440-foot earth embankment dam with a 78-foot concrete rectangular weir spillway. The dam has a maximum height of 15 feet. Pickerel Lake Dam is located on Pickerel Lake Brook and retains Pickerel Lake. The dam is owned and operated by the State of Connecticut/DEEP.

Pickerel Lake Dam underwent substantial repairs in 1994, which consisted of repairing spalled concrete, repairing the spillway and replacing riprap. A recent inspection by the CT/DEEP indicates that the dam is currently in good condition.

Pickerel Lake Dam is located on the north border of East Haddam near the Colchester town line, approximately 2000-feet upstream of Rt. 149 (Sipple Hill Rd.) in East Haddam.

#### **Bashan Lake Dam #4113**

Hazard Classification – B – Significant Hazard Dam

Owner: State of Connecticut- DEEP

Bashan Lake Dam is a 169-foot long, 23-foot high earth fill dam with a granite rock retaining wall as the downstream face of the dam and a concrete retaining wall as the upstream face of the dam. The dam's spillway consists of a 29-foot wide broad crested weir of granite blocks with a concrete cap.

Bashan Lake Dam is located on the Moodus River approximately 400-feet upstream of Bashan Road. The dam retains Bashan Lake.

A recent inspection by the CT/DEEP indicates the dam is in good condition. The following minor maintenance work is required to be performed on the dam per the DEEP files:

- a) Chink the vertical downstream stone face of the dam.
- b) Repair the minor spilling on the concrete surface on the spillway.

### **Moderate/Low Hazard Potential Dams**

The following is the criteria utilized to determine the hazard class of moderate hazard and low hazard potential dams.

### **CT DEEP Hazard Classification (22a-409-2(d))**

A Class A dam is a low hazard potential dam which, if it were to fail, would result in any of the following:

- i. damage to agricultural land;
- ii. damage to unimproved roadways (less than 100 ADT);
- iii. minimal economic loss.

The following low hazard dams are listed as being owned by the Town of East Haddam:

Lower Hazard Dams owned by the Town of East Haddam:

#### **Moodus Sportsmen Pond Dam**

Hazard Classification – A – Low Hazard Dam

Owner: Town of East Haddam

Moodus Sportsmen Pond Dam is a low hazard dam located 200-feet from the East Haddam Colchester Turnpike. There is no data on this dam in the CT/DEEP Dam Safety files.

### **Inspection/Reporting Requirements**

The State of Connecticut General Statutes (CGS §22a-402(b)-(f)) were recently revised, giving the chief executive official or his designee the ability to inspect dams if they reasonably believe that a public safety concern exists. Inspection of any such dam owned or operated by a water company or of a dam that is a hydroelectric generating facility shall be controlled by the provisions of subsection (c) of CGS §22a-402.

The chief executive official or designee shall have the right to enter private property, within constitutional limits, to undertake such inspection provided such official or designee shall in accordance with CGS §22a-402(b) 2:

- d) Notify the Commissioner of the DEEP prior to conducting such inspection.

- e) Make reasonable attempt to notify the owner of the dam prior to such inspection.
- f) File a report with the Commissioner of DEEP in accordance with the provisions of subsection (f) of CGS §22a-402.

**6. Ice Jams a.k.a. Ice Dams**

**a) Ice jam history: East Haddam**

**State Road Route 151 crossing over the Salmon River:**

Ice jam related flooding has historically been a problem along the lower reach of the Salmon River in the Leesville area of East Haddam. Ice Dams have occurred here in: 2007, 2000, 1994, 1982, 1940, and 1910.

1. In the ice jam event in February 1982 ice flowed over the dam and jammed at the Route 151 Bridge. Many residents in the area believe the lowering of the dam and removal of its control gates has resulted in increased ice jam activity in the area below the dam. Historical evidence supports this presumption as similar winter jams occurred in January 1910 and 1940 when structural damage to the dam allowed ice to flow out of the impoundment.
2. In 1994 a similar event occurred as a result of a break-up of thick river ice in response to a sudden increase in discharge by snow melt and rainfall. The ice jam formed about a half mile downstream of the Route 151 Bridge and progressed back to about 500 feet downstream of the dam. This jam caused water levels in the river to rise even more, flooding several homes and Powerhouse Road.
3. The ice dam in 2000 resulted in local road closures.
4. 2007: The Department of Environmental Protection and Department of Transportation completed a total rebuild of the Route 151 Bridge (DOT) and the Leesville Dam (DEEP). However in the April 2007 (Tax Day Storm of 07) a major ice dam situation occurred. The bridge construction equipment still on site was utilized to break-up the ice cakes that caused the damming of the River.

**6. Local Flood Plain Management**

The following excerpt is from FEMA News re Flood Plain Management July 11, 2007:

***Lack of Flood Insurance Puts Connecticut Residents at Risk.***

*Less than Two Percent are insured*

***WINDSOR, Conn.*** – *The shore and many inland bodies of water make Connecticut an attractive place to live. They also make the entire state a flood hazard area, according to experts from the National Flood Insurance Program.*

*“There is water everywhere,” said Certified Flood plain Manager Ron Lansverk of the U.S. Department of Homeland Security's Federal Emergency Management Agency. “At any time a storm could strike and thousands of residents would find themselves burdened with the costs of major repairs from flooding.”*

*Homeowners insurance will not pay for flooding damage. Yet, less than 2 percent of Connecticut residents have flood insurance.*

*Flooding from severe storms in April – leading to a presidential disaster declaration for seven out of eight counties – is but the latest in a long history of destructive inundations in the Constitution State.*

*“Both the history of flooding in our state and the many floods we are seeing recently in other parts of the country are reminders that flooding is a serious risk to our citizens and economy,” said Governor M. Jodi Rell.*

*In 1935, 17 inches of rain caused some of the worst river flooding ever experienced in parts of Connecticut and Massachusetts.*

*Connecticut was the hardest hit victim of the worst flood in the history of the eastern United States in 1955 – leaving 1,100 families homeless and 20,000 properties damaged.*

*Hurricane Bob struck in 1991 and Hurricane Gloria in 1985. Presidents declared flooding disasters in 2005, 1999, 1992, 1984 and 1982.*

*It's not just “big” disasters that cause damage, however. Every year, rivers can flood.*

*Yet in spite of the risk to many of the state's 1.7 million households, less than 35,000 are insured.*

**i. FEMA Guidance:**

Flood plain management is the operation of a community program of corrective and preventative measures for reducing flood damage. These measures take a variety of forms and generally include requirements for zoning, subdivision or building, and special-purpose flood plain ordinances.

A community's agreement to adopt and enforce flood plain management ordinances, particularly with respect to new construction, is an important element in making flood insurance available to home and business owners. Currently over 20,100 communities voluntarily adopt and enforce local flood plain management ordinances that provide flood loss reduction building standards for new and existing development.

To encourage communities to establish sound flood plain management programs that recognize and encourage community flood plain management activities that exceed the minimum NFIP requirements, the Community Rating System (CRS) was created. This program provides communities with discounts to flood insurance rates.

Additional flood plain management resources are available to download or can be ordered from the FEMA Publication Distribution Center by calling 1-800-480-2520 and requesting the publication by its FEMA number.

Location	Event
Bogue Lane	Wash out resulting in overnight closure. Reopened Thurs. a.m.
Olmsted Road	Failure of steel culvert. Road closed Thursday a.m. KX notified. Road closed signs posted. Temporary repair to wait until water recedes.
Daniels Road	Wash out edge of southeast shoulder. Repaired Thursday a.m.
Sims Lane	Wash out requiring gravel.
Mitchell Road	Severe wash out/road impassable.
Salem Road	Wash out at culvert end.
Babcock Road	Wash out Pending for Friday.
Sheepskin Hollow	Wash out. Status Pending.
Ackley Cemetery Road	Wash out.

**Figure 6:** Flooding events during the creation of this plan in 2007.





**Photos 2 & 3:** Damage to local roads from 2007 flooding

Source: Craig Mansfield, East Haddam EMD

**ii. East Haddam Planning and Zoning Regulations**

Town	NFIP Participant?	Last FIRM Adoption	Flood Zone Regulation Adoption	Enforcement
East Haddam	Yes	August 28, 2008	2008	By Permit

**Figure 7:** East Haddam regulations regarding flood.

**iii. East Haddam Planning and Zoning Regulations:**

Section 18.3.0 define the general provisions of the flood plain area and sections 18.3.2 through 18.9.0 spell out the specific Special Flood Hazard Areas regulations

**iv. East Haddam Plan of Conservation and Development**

“Uniformly throughout the Town development trends are consistent. Our flood plains are desirable; visual and physical access to the water. Our forests are good neighbors; quiet and picturesque.

The revised Plans of Development reflect our planner’s efforts to manage development in vulnerable areas. For example; we do not allow Riverfront residents in the flood plain, winterize their buildings.

As a result of the revised NFIP maps in August of 08 building in flood plains has been modified as appropriate. As discussed in the natural Hazards section of

this Plan, there are risks as homeowners are building closer into “risky” wooded areas.” Town Website

An additional benefit of this (NHMP) process is a more vivid awareness of municipal vulnerabilities of vital infrastructure to floods, dams at risk, crumbling roads, bridges and culverts. The trend to just “fix” aging facilities in “at risk areas” is being reconsidered. See Section IV, Part A

**v. Flood Plain (Special Flood Hazard Areas) planning was adopted August 27, 2008**

The Town is divided up into four management areas. Wetlands and Watercourse planning and regulations play a prominent role in protecting the areas:

- d) Existing Open Space
- e) Preservation Areas
- f) Conservation Areas
- g) Rural Areas

**8. National Flood Plain Insurance**

**a) East Haddam participates in the NFIP**

	<i>Initial Hazard Boundary Map FHBM</i>	<i>Initial Flood Insurance Rate map</i>	<i>Date East Haddam entered the NFIP regular Program</i>	<i>Date current FIRM adopted</i>	<i>Date Planning &amp;/or zoning Updated</i>
	<i>(i)FHBM</i>	<i>(i)FIRM</i>	<i>(r)FIRM</i>	<i>(c) FIRM</i>	<i>(l) Regulations updated</i>
<i>East Haddam</i>	<i>23-Aug-74</i>	<i>1-Nov-79</i>	<i>1-Nov-79</i>	<i>28-Aug-08</i>	<i>8/08</i>

**Figure 8:** East Haddam Regulation Adoption Dates.

**9. Repetitive Loss Properties**

A Repetitive Loss Property (RLP) is any insurable building for which two or more claims of more than \$1,000 were paid by the National Flood Insurance Program (NFIP) within any rolling ten-year period, since 1978. Along the east side of the Connecticut River, most of the village buildings occupy a narrow land area that is

above the flood level of the river. Losses have occurred along Succor Brook which enters the Connecticut River south of the Goodspeed Opera House.

In an X Zone northeast of the Succor Brook undercrossing of CT RT. 82 there have been 2 claims, 88% of which were for “contents”. Blockage of the floodway on the north side of Norwich Road has been a problem.

Flood proofing, having a pre-event plan and being attentive to weather events and watershed activities could mitigate future losses.

## **10. HAZUS – MH Flood Event Summary Report**

Due to the fact that this individual town Annex is part of the larger Former Midstate Regional Natural Hazards Mitigation Plan, HAZUS-MH was generated on a regional scale. Please see Appendix A of this NHMP for the full HAZUS – MH Flood Event Summary Report for the Midstate Planning Region.

## **11. Flood Mitigation Strategies**

For a detailed list of mitigation project, see Section VIII. Below is a general list that the town should consider:

- Purchase flood prone properties and create open space
- Maintain culverts, bridges and other restricted flow streams of debris
- Maintain dams (municipally owned) and caution private dam owners to do the same
- When a storm is pending early warn residents of fast flowing waters,
- Remind residents of evacuation and sheltering procedures.
- Advise residents where to go for weather notifications.
- Advise the public of the dangers of driving through moving flood waters
- Work with the State DOT to improve drainage under Main Street.
- Monitor DEMHS, DEEP, local press and radio and TV for flood warnings.
- Through legislation change, pressure should be put on the DEEP to allow banking protection from erosion.
- Roadway elevation
- Structure (public/private) elevation
- Structure (public/private) relocation
- Structure (public/private) flood proofing
- Sewer/septic system (public/private) upgrades
- Levee/embankment improvement
- Stream modification (unlikely due to DEEP restrictions)
- Storm water runoff improvements
- Acquisition of storm debris managing equipment.

## **B. Hurricanes and Tropical Storms**

### **1. Introduction**

Hurricanes and Tropical Storms have the ability to cause damage to the area. High wind and heavy rain can cause trees to topple causing power outages and flooding of small streams and rivers. Typically a hurricane is thought of as a higher impact storm due to their higher wind speed; however, tropical storms are increasingly becoming a concern.

As seen with Tropical Storm Irene in August 2011, tropical storms have the potential to cause significant damage to the infrastructure throughout the area.

Hurricanes pose the most wide ranging catastrophic damage threat of any natural storms. They do not only affect the shoreline areas, but as indicated in Section II Part C they come in all shapes and sizes and intensity. There are dry (wind and no rain, wet (a lot of moisture) and both (wind and rain).

East Haddam responders plan for and exercise response to hurricanes as Storm Ready.

### **2. HAZUS-MH Hurricane Summary Event Report**

Due to the fact that this individual town Annex is part of the larger RiverCOG Regional Natural Hazards Mitigation Plan, HAZUS-MH was generated on a regional scale. Please see Appendix B of this NHMP for the full HAZUS – MH Hurricane Event Summary Report for the eight northern towns of the RiverCOG region (Formerly Midstate Regional Planning Area)

### **3. Hurricane Mitigation Strategies**

For a detailed list of mitigation project, see Section VIII. Below is a general list that the town should consider:

- Tree Warden to work with Public Works and CL&P on an aggressive tree trimming program.
- Maintain culverts, bridges and other restricted flow streams of debris
- Maintain dams (municipally owned) and caution private dam owners
- When a storm is pending early warn residents of fast flowing waters,
- Advise homeowners at risk to flood proof the structure
- Advise residents to secure any loose objects in the yard.
- Advise homeowners to “stock up” on food, water and medications (including the animals)
- Remind residents AND RESPONDERS of dangers of handling anything in the vicinity of a downed wire.
- Remind residents of evacuation and sheltering procedures.
- Advise residents where to go for weather notifications.
- Purchase flood prone properties and create open space.

**C. Winter Storms**

**NOTE:** For an extensive discussion on winter storms in the Region and State Go To the Regional Section of this Plan: Section III.B.1.c.3)

**1. History**

Although technically not during the winter season, the area experienced a winter storm in October 2011. During this unusual October Nor’easter power outages and blocked roads were major issues. Because the leaves were still on the trees when the snow came accompanied by strong winds, many trees and limbs came down taking power lines with them. Many Town roads were closed and there were extensive power outages.

The National Oceanic and Atmospheric Administration (NOAA) has recorded an estimated 2,092 severe weather events for the State of Connecticut during the time period of 1950-March 2007.2 Table 2.2 provides the total number of severe weather events recorded for each county. The events recorded by NOAA include such events as droughts, floods, hailstorms, severe lighting Precipitation, snow & ice storms, and extreme temperatures. Following is the winter storm record:

<b>Middlesex County Winter Weather Events 1950-2013</b>					
<b>Blizzard</b>	<b>Ice Storm</b>	<b>Heavy Snow</b>	<b>High Wind</b>	<b>Snow</b>	<b>Total</b>
5	16	11	12	24	68

**Figure 9:** Severe weather events in Middlesex County between 1950 and 2013.

Source: SHELDUS

Connecticut is no stranger to large snow storm with damaging effects. Past Snow Storm Disaster Declaration in the area include:

- 1978 disaster Declaration 3060
- 1992 disaster Declaration 972
- 1993 disaster Declaration 3098
- 1996 disaster Declaration1092
- 2003 disaster Declaration 3176
- 2004 disaster Declaration 3192
- 2005 disaster Declaration 3200
- 2006 disaster Declaration 3266
- 2011 disaster Declaration 1958
- 2011 disaster Declaration 3342/4046

In addition, due to the tremendous weight of the “wet” snow in the January/February 2011 storms there was considerable damage to structures throughout the Town,

**2. Ice Storm**

A major ice storm can cause major road closures and power outages. See the Regional section of this Plan, Tables 21, 22 & 23 for a historic record including major ice storms.

**3. Winter Storm Mitigation Strategy:**

- Having in place a Vegetation Maintenance Plan.
- Hopefully, after the October Nor'easter of 2011, CL&P will put into place a more robust power restoration plan.
- Have in place an Evacuation and Sheltering Plan

**D. Wind Storms**

For additional wind storm histories go to Regional Section of this Plan, Section III.B.1.c.4)

**1. Nor'easters**

During the unusual October Nor'easter of 2011 power outages and blocked roads were major issues. Because the leaves were still on the trees when the snow came accompanied by strong winds, many trees and limbs came down taking power lines with them. Many Town roads were closed and there were extensive power outages.

**2. Thunder Storms**

Thunder storms are the most likely wind event to occur and the strongest ones can create considerable damage when strong imbedded winds accompany them. For our planning purposes we have further broken thunder storms into tornado activity and microbursts/wind shear. See Section II Part E

In 2005 within ten days Portland was hit by two violent thunder storms registering winds of 58 and 60 miles per hour:

**3. Tornadoes**

Tornados. Tornados can happen anytime, anywhere in Town. As referenced in the Regional Plan Section III.B.1.c.4). Tornadoes have happened in neighboring East Hampton and Wethersfield. In recent years there have also been major, damaging tornados in Bridgeport and West Springfield.

The good news is when the conditions are right the National Weather Service and CT Division of Emergency Management and Homeland Security notify emergency management and the administration of the potential. But; they can happen anytime and sometimes without much warning; though the local weather forecasters are getting better.

**4. Wind Shear**

Go To the Regional Section B.1.c.4 for a discussion on the difference between the winds of a tornado and those in a wind shear.

## 5. Wind Storm Mitigation Strategies

For a detailed list of mitigation project, see Section VIII. Below is a general list that the town should consider:

- Public Notifications: Issue warnings to the public and responders to not go near downed power lines until the power company gives the OK.
- An aggressive vegetation management program in place along Town roadways.

## E. Earthquakes

The following is from former DEMHS Commissioner Skip Thomas, January 2007:

### ***“Earthquakes:***

*Believe it or not Connecticut has the oldest record of earthquakes in the United States. The earliest settlers learned of seismic activity in this area, dating back to 1568 in Moodus. This area is still very active today. We are located near the middle of the North American Tectonic Plate which is subject to intra-plate earthquakes, as opposed to inter-plate earthquakes which afflict California.*

*While we are not near a plate boundary, there are numerous fault lines formed hundreds of millions of years ago.*

*The magnitude of an earthquake is a measure of the amount of energy released. Each earthquake has a unique magnitude assigned to it. This is based on the amplitude of seismic waves measured at a number of seismograph sites, after being corrected for distance from the earthquake.*

*The USGS has determined that Connecticut has a 1 in 10 chance that at some point during a 50-year period an earthquake would cause ground shaking of 4 to 8 percent of the force of gravity. This amount of shaking may cause minor damage resulting from items falling from shelves and very minor damage to buildings (broken windows, doors jamming shut.”*

### **1. HAZUS- MH Earthquake Event Report for East Haddam**

Due to the fact that this individual town Annex is part of the larger Former Midstate Regional Natural Hazards Mitigation Plan, HAZUS-MH was generated on a regional scale. Please see Appendix C of this NHMP for the full HAZUS – MH Earthquake Event Summary Report for the Midstate Planning Region.

### **2. Risk and Vulnerability**

The risk is low but earthquakes are possible. Rumbings do occur though periodically throughout in the Moodus area of Town.

### 3. Earthquake History in Connecticut

According to a USGS Earthquake Bulletin from January/ February 1971:

*Describing that earthquake an observer said: "It began at 8 o'clock p.m., with two very heavy shocks in quick succession. The first was the most powerful; the earth appeared to undergo very violent convulsions. The stone walls were thrown down, chimneys were toppled, doors which were latched were thrown open, and a fissure in the ground of several rods in extent was afterwards discovered. Thirty lighter ones followed in a short time, and upwards of one hundred were counted in the course of the night.*

*"The shock was felt at a great distance. It was so severe at Clinton, about 12 miles south, that a Capt. Benedict, walking the deck of his vessel, then lying in the harbor at that place, observed the fish to leap out of the water in every direction as far as his eyes could reach."*

*Still another report states: "the day after the earthquake in 1791, it is said that apertures and fissures were observed in the earth and rocks near Moodus River Falls, and that stones of several tons in weight were thrown from their places."*

Other events in Connecticut include:

- The record shows a moderate tremor occurred at Hartford in April 1837. It jarred loose articles, set lamps swinging, and rang bells. Alarmed residents rushed from their homes into the streets.
- In August 1840, an earthquake of similar intensity centered a few miles southwest of the 1837 tremor. It shook Hartford quite strongly, and was felt at many points in Connecticut. No damage resulted, however. At Chester, not far from East Haddam, observers compared the tremor "to the rumble of thunder." Its origin was apparently 10 to 20 miles north of New Haven.
- On June 30, 1858, New Haven was shaken by a moderate tremor at 10:45 in the evening. Residents reported rattling of glasses and a noise "like carriages crossing a bridge." Derby residents were also shaken strongly by this earthquake.
- Seventeen years later, on July 28, an early morning tremor shook 2,000 square miles of Connecticut and Massachusetts. Rumbling noises were heard during this intensity V earthquake.
- The strongest tremor since that in 1791 hit near Hartford on November 14, 1925, at about 8 a.m. Plaster was knocked from walls, and many residents were frightened. At Windham, dishes were shaken from shelves, and at East Haddam, the familiar "Moodus" rumblings were noted.
- In March 1953, Stamford sustained a minor tremor that alarmed many. "Radiators beat a weird tattoo against the floor of the police station," notes one report. Houses were jarred, and earth noises were heard. The tremor caused no damage.
- An intensity V earthquake in southern Connecticut occurred on November 3, 1968, at about 3:30 in the morning. Plaster cracked at Madison, furniture shifter at Chester, and small items fell and broke.

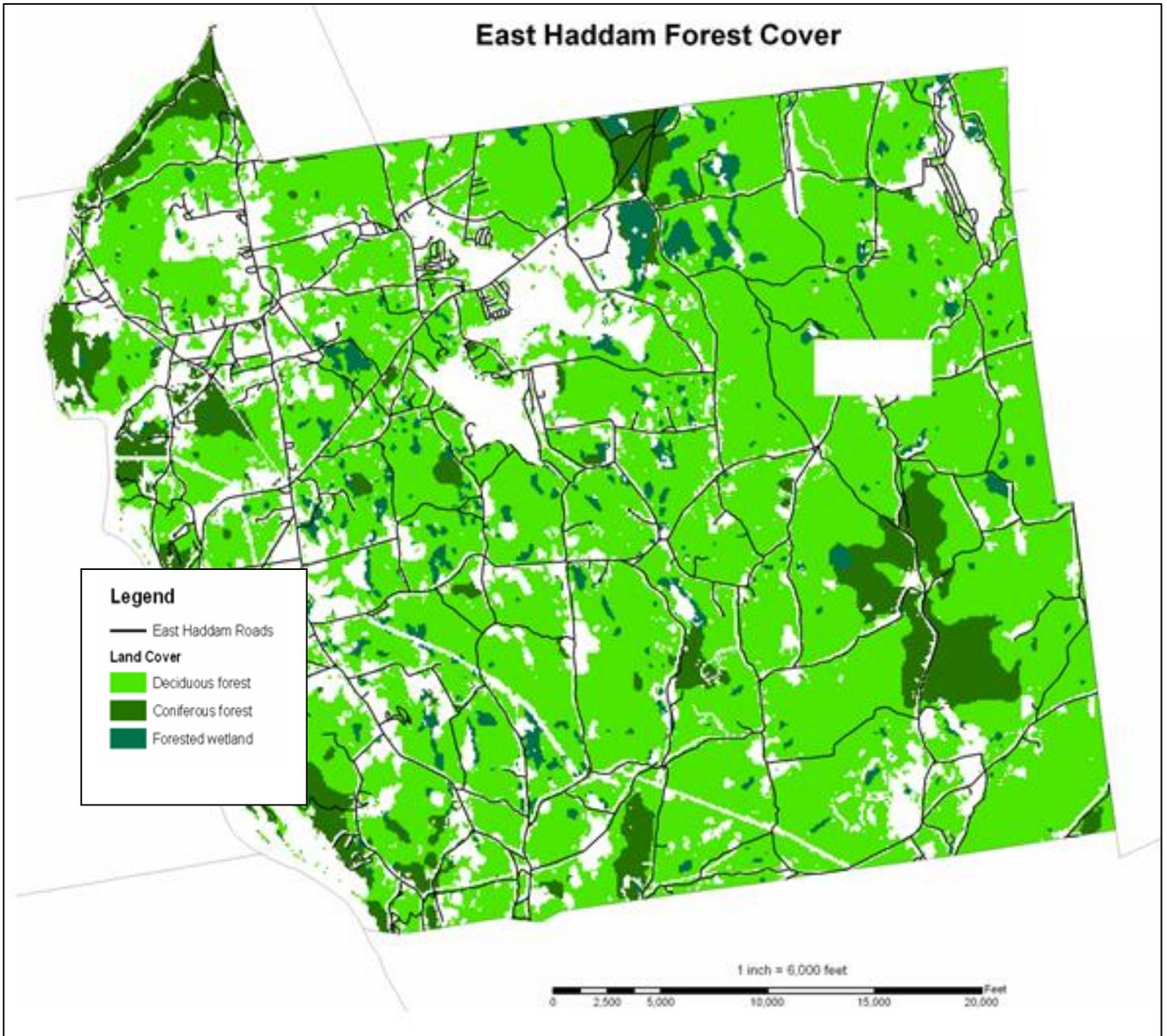
Loud earth noises accompanied the tremor. The Moodus noises were noted once again at East Haddam.

- A few damaging shocks centered in neighboring States, and several Canadian tremors, have been noted by Connecticut citizens in the past 300 years.

## **F. Other Natural Hazards**

### **1. Forest Fire**

East Haddam is heavily forested which means there are several areas of the Town that are vulnerable to major forest fires. If the conditions are right; drought, hot windy weather a wildfire could happen. The risk is exacerbated by the encroachment of residents “deeper” into the woodlands. The following illustration shows the forest cover in Town.



**Map 5:** East Haddam Forest Cover

Source: RiverCOG

Homes in East Haddam are susceptible to wildfire as a result of the dense forest cover throughout much of the town.

## VIII EAST HADDAM MITIGATION STRATEGIES

### A. Authorities, Policies, Programs, and Resources

The town of East Haddam has many available policies and resources at its disposal for mitigating effects of natural disasters. For example, its flood plain regulations allow the Town to control growth and expansion within flood zones. The town has the authority to order parking bans in the event of a snow storm and is well prepared for all but the very worst of snow storms. The Town of Cromwell uses the State Building Code for code compliance to ensure safe structures which withstand 110 mph wind speed and appropriate snow load. The town also has the authority to order backup water supplies to be installed in new subdivisions when water for firefighting is not sufficient. In additions, the town can set up and often does set up shelters, cooling centers, and heating centers when needed for residents.

#### Highlights:

##### Storms

- Land use planners and regulators have taken into serious consideration restrictions on the building of, and or winterizing of buildings in designated or known flood risk areas.
- Continue monitoring DEMHS, DEEP, local press and radio and TV for storm warnings.
- When a serious flash flood warning is issued, advise the public of the dangers of driving through moving flood waters.

##### Crisis Communications Plan

- Following Crisis Communications Plan guidelines, keep public and responders aware of “what is going on” and certain storm specific warnings; e.g.; “don’t touch downed power lines”, “don’t drive through flowing water”, availability of shelters, etc.

### B. NFIP and Community Rating System

See Flood section of this Annex (pg. 241) and the Regional Flood Section (pg. 52) for information on the National Flood Insurance Program

East Haddam does not participate in the CRS; but should considerate.

The Community Rating System (CRS) is a part of the NFIP. When communities go beyond the NFIP’s minimum standards for flood plain management and participate in the CRS, discounts may be available on flood insurance premiums for policy holders in those communities.

## **C. East Haddam Mitigation Action Plan**

### **1. Prevention**

East Haddam, town planners, P&Z, the building department and emergency management, working with RiverCOG continuously monitors growth trends and vulnerable sites and has enhanced its land use regulations designed to protect natural resources and restrict development in flood zones and other hazard-prone areas.

These regulations help prevent the loss of life, limb and property by preventing inappropriate development in flood zones and other high risk areas reducing the amount of damage caused by spring and flash flooding.

The Zoning Regulations updates in August of 2009 restrict select new construction in the 100-year flood plain as depicted on the most recent revision of the Flood Insurance Rate Map (FIRM).

In some cases all residential construction in areas that periodically flood (other than those in the FIRM areas, must be elevated to or above the flood risk elevation. Likewise, all non-residential construction must be elevated or flood proofed to or above the base flood elevation. The buildings vulnerable to wildfires must have at least two access routes.

The Zoning Regulations offer additional preventive measures during the site plan submittal process. The regulations require the protection of natural features including those that contribute to the natural functioning of the natural drainage system.

Wherever possible utility lines are required to be buried for new subdivisions and are encouraged for certain projects such as major road projects. These land use regulations are described in detail in the Zoning Regulations and Subdivision Regulations available through East Haddam Town Hall.

The Building Department ensures conformance with the Connecticut State Building Code including flood resistant construction.

The Inland Wetlands Commission, through its Inland Wetlands and Watercourses regulations, works toward the conservation of wetland resources through avoiding impacts from development on functional wetlands and watercourses.

Whenever possible, Public Works examines and clears public storm drains and grates of debris and as-needed tree maintenance.

## **2. Emergency Services**

East Haddam utilizes the State CT Alert notification system based on the EVERBRIDGE platform warning systems for the notification of residents of emergencies affecting their area.

The Office of Emergency management is very active in emergency planning to help protect life, limb and property. The Emergency Management Director monitors the River forecasts very closely when there is a threat of significant spring flooding.

The School Board has its own “snow notification” list.

## **3. Natural Resource Protection**

East Haddam has an aggressive open space acquisition policy that helps protect areas prone to flooding and other natural hazards from future development. For example, the East Haddam Plan of Conservation and Development lists desired public open space acquisitions including properties with demonstrable mitigation benefits.

Local repetitive loss property, along with non- RLP property owners who have also had damage were interview as a part of this NHMP process.

Local dams have been evaluated as a part of this Plan process. At risk dams were looked at by a dam expert. The dam report can be found in Section III of this Plan.

## **4. Challenges**

- a) East Haddam regularly receives proposals for commercial and multi-family housing projects in or near the flood plains. East Haddam regulations, the cumulative effect of relatively intense land use may increase the likelihood of flooding in commercial and densely populated areas in the River flood plain.
- b) The Everbridge notification system is underutilized meaning the public needs to be educated re the value of “opting-in”.
- c) Falling tree debris often results in street closures. In addition, tree debris creates blockages in the local streams and in culverts.
- d) East Haddam has only one emergency shelter with limited capacity.
- e) East Haddam needs additional emergency generators to supply electricity to emergency shelters and Town Hall in the event of an extended power outage.
- f) Obtaining Federal Mitigation and Financial Assistance

## **5. Proposed Mitigation Strategies**

East Haddam personnel met with former MRPA staff on several occasions to review the potential natural hazards that may cause loss of life, limb or property.

The list of vulnerabilities can be found in this Section. These are the East Haddam priority projects that need addressing.

Based on the many reviews of the content of this Plan, the Planning Teams developed basic goals, objectives, proposed mitigation strategies. Risk factors were classified as “High, “Medium” or “Low”. Also listed is who is or are the responsible agencies. Realistically, timing of mitigation projects is a function of a cost/benefit analysis and criticality of the risk.

Definitions for Priority, Schedule, and Responsible Party, and Cost can be found in Section IV.F on page 111.

**D. Goals and Objectives**

Goal of this Plan: Reduce the loss of life, limb and property as a result of natural disasters.

Objective 1 Improve the ability of East Haddam residents to prepare and respond to approaching severe weather.

Supporting Task	Responsible Party	Schedule	Priority	Funding Source	Cost Estimate
Improve the number of residents and businesses on the State and local emergency notification system	Valley Shore Dispatch	A	High	HMGP, CIP	\$
Find funding for installation of generators in infrastructure and shelters.	BOS, Police, Fire	A	High	HMGP, CIP	\$
Provide cots, blankets, food supplies, etc. for emergency shelters.	Health Department, Emergency Management	A	Medium	HMGP, CIP	\$
Find funding for a study of flood prone properties for or acquisition along the CT River.	Public Works	A	Medium	HMGP, CIP	\$

Objective 2. Reduce the amount of debris from severe storms through preventive tree maintenance.

Supporting Task	Responsible Party	Schedule	Priority	Funding Source	Cost
Update the existing debris management plan.	Public Works	2013-2014	Medium	CIP	\$
Budget appropriate money necessary to maintain and remove dead, dying, dangerous, and diseased trees in rights-of-way and on other town land	Public Works	2014	Low	CIP	\$\$

**A successful result of this Plan will be:**

- a) Eligibility for Public Assistance funding for mitigation of identified projects,
- b) Funding source Individual Assistance for business and residential repairs due to storm damage.
- c) Rebuilding to what is identified in this Plan established as a need.
- d) Data to support local updating of plans and ordinances.
- e) FEMA Assistance after a declared disaster

**E. East Haddam Detailed Mitigation Action Plan**

The parties responsible for the following projects include the Public Works Department (on State roads, State DOT) and the Board of Finance for funding.

Supporting Task	Responsible Party	Schedule	Priority	Funding Sources	Cost Estimate
Power House Rd Flood Prone Properties. Study to determine best solutions to Flooding and Icing.	PW, BOS, BOF	B	Medium	HMGP, FMA, PDM, CIP, OP	\$\$
Mott Lane, Moodus Reservoir and Pickerel Lake Brook. Need engineering study to determine mitigation needs.	PW, BOS, BOF	B	Medium	HMGP, FMA, PDM, CIP, OP	\$\$

## East Haddam Natural Hazards Mitigation Annex

Moodus Reservoir/East Haddam Colchester Turnpike Causeway. Need engineering study to determine mitigation needs.	PW, BOS, BOF	B	Medium	HMGP, FMA, PDM, CIP, OP	\$\$
Lake Hayward Dam. Need engineering study to determine mitigation needs.	PW, BOS, BOF	B	Medium	HMGP, FMA, PDM, CIP, OP	\$\$
Lake Shore Drive (north end of Lake Hayward). Need engineering study to determine mitigation needs.	PW, BOS, BOF	B	Medium	HMGP, FMA, PDM, CIP, OP	\$\$
Johnson Mill Road-Johnsonville Road. Need engineering study to determine mitigation needs.	PW, BOS, BOF	B	Medium	HMGP, FMA, PDM, CIP, OP	\$\$
Joe Williams Rd. - Shady Brook. Needs engineering study to determine mitigation needs.	PW, BOS, BOF	B	Medium	HMGP, FMA, PDM, CIP, OP	\$\$
Creamery Road - Lumberyard Road (Rotary Pond Area). Need engineering study to determine mitigation needs.	PW, BOS, BOF	B	Medium	HMGP, FMA, PDM, CIP, OP	\$\$
Intersection of Town Street (Route 82) and Mt. Parnassus Road. Need engineering study to determine mitigation needs.	PW, BOS, BOF	B	Medium	HMGP, FMA, PDM, CIP, OP	\$\$
Route 82, Bridge over Succor Brook near Commerce Dr. Need engineering study to determine mitigation needs.	PW, BOS, BOF	B	Medium	HMGP, FMA, PDM, CIP, OP	\$\$
Martin Road/Mt. Parnassus Rd. Need engineering study to determine mitigation needs.	PW, BOS, BOF	B	Medium	HMGP, FMA, PDM, CIP, OP	\$\$
Urban Pond/Sheepskin Road. Need engineering study to determine mitigation needs.	PW, BOS, BOF	B	Medium	HMGP, FMA, PDM, CIP, OP	\$\$
Town Street (Rte. 82)/Hungerford Brook. Need engineering study to determine mitigation needs.	PW, BOS, BOF	B	Medium	HMGP, FMA, PDM, CIP, OP	\$\$
Bone Mill Road - Hungerford Brook. Need engineering study to determine mitigation needs.	PW, BOS, BOF	B	Medium	HMGP, FMA, PDM, CIP, OP	\$\$

## East Haddam Natural Hazards Mitigation Annex

Hemlock Valley Road (Hemlock Valley Brook). Need engineering study to determine mitigation needs.	PW, BOS, BOF	B	Medium	HMGP, FMA, PDM, CIP, OP	\$\$
Hopyard Road - Hedge Brook. Need engineering study to determine mitigation needs.	PW, BOS, BOF	B	Medium	HMGP, FMA, PDM, CIP, OP	\$\$
Norwich Salem Road and Route 82 (Eightmile River). Need engineering study to determine mitigation needs.	PW, BOS, BOF	B	Medium	HMGP, FMA, PDM, CIP, OP	\$\$
Three Bridges Road - Strongs Brook, Route 82/Norwich Salem Road (unnamed stream [no other outlet]). Need engineering study to determine mitigation needs.	PW, BOS, BOF	B	Medium	HMGP, FMA, PDM, CIP, OP	\$\$
Old Salem Road - Lake Hayward Brook. Need engineering study to determine mitigation needs.	PW, BOS, BOF	B	Medium	HMGP, FMA, PDM, CIP, OP	\$\$
Foxtown Road/Eight Mile River. Need engineering study to determine mitigation needs	PW, BOS, BOF	B	Medium	HMGP, FMA, PDM, CIP, OP	\$\$
Haywardville Road /Eight Mile River. Need engineering study to determine mitigation needs	PW, BOS, BOF	B	Medium	HMGP, FMA, PDM, CIP, OP	\$\$
Haywardville Rand Hopyard Road intersection. Need engineering study to determine mitigation needs.	PW, BOS, BOF	B	Medium	HMGP, FMA, PDM, CIP, OP	\$\$
Tater Hill Road/Will Cone Pond. Need engineering study to determine mitigation needs.	PW, BOS, BOF	B	Medium	HMGP, FMA, PDM, CIP, OP	\$\$
Norwich Salem Road 1 - Route 82 (Malt House Brook). Need engineering study to determine mitigation needs.	PW, BOS, BOF	B	Medium	HMGP, FMA, PDM, CIP, OP	\$\$
Norwich Salem Road 2 - Route 82 (Malt House Brook). Need engineering study to determine mitigation needs.	PW, BOS, BOF	B	Medium	HMGP, FMA, PDM, CIP, OP	\$\$

**East Haddam Natural Hazards Mitigation Annex**

Sims Road (no outlet). Need engineering study to determine mitigation needs.	PW, BOS, BOF	B	Medium	HMGP, FMA, PDM, CIP, OP	\$\$
Babcock Road. Need engineering study to determine mitigation needs.	PW, BOS, BOF	B	Medium	HMGP, FMA, PDM, CIP, OP	\$\$
Ackley Cemetery Road. Need engineering study to determine mitigation needs.	PW, BOS, BOF	B	Medium	HMGP, FMA, PDM, CIP, OP	\$\$
Grist Mill Road -Moodus River crossing. Need engineering Study to determine mitigation needs	PW, BOS, BOF	B	High	HMGP, FMA, PDM, CIP, OP	\$\$
Brownell factory - Moodus River. Need engineering Study to determine mitigation needs	PW, BOS, BOF	B	High	HMGP, FMA, PDM, CIP, OP	\$\$
Moodus Leesville Road/Route 151 - unnamed brook (east of St. Bridget's Church). Need engineering Study to determine mitigation needs	PW, BOS, BOF	B	High	HMGP, FMA, PDM, CIP, OP	\$\$
Clark Gates Road - unnamed brook (1000 feet off of North Moodus Road). Need engineering Study to determine mitigation needs	PW, BOS, BOF	B	High	HMGP, FMA, PDM, CIP, OP	\$\$
Great Hillwood Road (intermittent stream - 800 feet from Falls Bashan Road. Need engineering Study to determine mitigation needs	PW, BOS, BOF	B	High	HMGP, FMA, PDM, CIP, OP	\$\$
Olmstead Road/Post Road. Need engineering Study to determine mitigation needs.	PW, BOS, BOF	B	High	HMGP, FMA, PDM, CIP, OP	\$\$
Beebe Road - Molly Brook and Moodus Reservoir. Need engineering Study to determine mitigation needs.	PW, BOS, BOF	B	High	HMGP, FMA, PDM, CIP, OP	\$\$
Beebe Road - Pine Brook and Moodus Reservoir. Need engineering Study to determine mitigation needs.	PW, BOS, BOF	B	High	HMGP, FMA, PDM, CIP, OP	\$\$
East Shore Drive 1 -unnamed brook. Need engineering Study to determine mitigation needs.	PW, BOS, BOF	B	High	HMGP, FMA, PDM, CIP, OP	\$\$

## East Haddam Natural Hazards Mitigation Annex

East Shore Drive 2 -unnamed brook. Need engineering Study to determine mitigation needs.	PW, BOS, BOF	B	High	HMGP, FMA, PDM, CIP, OP	\$\$
East Shore Drive 3 -unnamed brook. Need engineering Study to determine mitigation needs.	PW, BOS, BOF	B	High	HMGP, FMA, PDM, CIP, OP	\$\$
Orchard Road - Pachs Pond (intersection of Route 151). Need engineering Study to determine mitigation needs.	PW, BOS, BOF	B	High	HMGP, FMA, PDM, CIP, OP	\$\$
Sheepskin Road - unnamed brooks (near New Inn Kennels). Need engineering Study to determine mitigation needs.	PW, BOS, BOF	B	High	HMGP, FMA, PDM, CIP, OP	\$\$
Daniels Road - Beaver Pond. Failure of beaver dam structure caused flooding and damage to business in Town Center. Need engineering Study to determine mitigation needs.	PW, BOS, BOF	B	High	HMGP, FMA, PDM, CIP, OP	\$\$
Old Town Road - Hungerford Brook. Need engineering Study to determine mitigation needs.	PW, BOS, BOF	B	High	HMGP, FMA, PDM, CIP, OP	\$\$
Florida Road - unnamed stream. Need engineering Study to determine mitigation needs.	PW, BOS, BOF	B	High	HMGP, FMA, PDM, CIP, OP	\$\$
Foxtown Cemetery Road (stream from Urbanik Pond. Need engineering Study to determine mitigation needs.	PW, BOS, BOF	B	High	HMGP, FMA, PDM, CIP, OP	\$\$
Bogue Lane. Need engineering Study to determine mitigation needs.	PW, BOS, BOF	B	High	HMGP, FMA, PDM, CIP, OP	\$\$
Mitchell Road. Need engineering Study to determine mitigation needs.	PW, BOS, BOF	B	High	HMGP, FMA, PDM, CIP, OP	\$\$
Lake Shore Drive (at bottom of Hilltop Road). Need engineering Study to determine mitigation needs.	PW, BOS, BOF	B	High	HMGP, FMA, PDM, CIP, OP	\$\$

East Haddam Natural Hazards Mitigation Annex

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*Ice Dams*

<b>Supporting Task</b>	<b>Responsible Party</b>	<b>Schedule</b>	<b>Priority</b>	<b>Funding Sources</b>	<b>Cost Estimate</b>
Salmon River above Route 151. Need to Evaluate additional solution to the new bridge over Salmon River.	PW, BOS, BOF	B	Medium	HMGP, FMA, PDM, CIP, OP	\$\$

*Extended Power Outages*

<b>Supporting Task</b>	<b>Responsible Party</b>	<b>Schedule</b>	<b>Priority</b>	<b>Funding Sources</b>	<b>Cost Estimate</b>
Develop a Debris Management Plan.	PW, FM, EMD, BO, LUO, BOS, BOF	A	High	CIP, OP	\$
Install generators at Critical Facilities	PW, FM, EMD, BO, LUO, BOS, BOF	A	High	HMGP, CIP, OP	\$\$

**IX PLAN MAINTENANCE**

FEMA Regulations – 44 CFR §201.6(d)(3): The East Haddam, working with RiverCOG will conduct a complete review and do a revision if needed and submit it for approval in 5-years. Even if there are no changes, it must be reported, in order to continue being eligible for Natural Hazard Mitigation Grants.

In accordance with Section 201.6(c)(4) of 44 CFR East Haddam will assure the Plan remains an active and relevant document. RiverCOG municipality officials will continue working with East Haddam in the mitigation planning process.

Changes to the Plan can be made at any time to this Plan; however, any change will require a submission to FEMA for approval either as an amendment or as a Plan update requiring re-adoption of the plan by the affected jurisdiction. If there are regional implications, then the entire Plan would need to be re-adopted by all jurisdictions.

Please see the Regional Section V.E. for the maintenance schedule that all towns will follow.

See Appendix Q for a sample mitigation planning tool.

**X. PLAN APPROVAL AND ADOPTION**

Upon FEMA Approval Pending Adoption of this Plan, it requires a sign-off by the municipal CEO. The adoption certificate follows. CEO signatures are required on the Regional Section of this Plan.

East Haddam Natural Hazards Mitigation Annex

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THE LOWER CONNECTICUT RIVER VALLEY COUNCIL OF GOVERNMENTS  
MULTI-JURISDICTION NATURAL HAZARD MITIGATION PLAN  
CERTIFICATE OF ADOPTION

Town of East Haddam, Connecticut

WHEREAS, the Town of East Haddam has historically experienced severe damage from natural hazards and it continues to be vulnerable to the effects of - only those natural hazards profiled in the plan (i.e. flooding, thunderstorm, high wind, winter storms, earthquakes, and dam failure), resulting in loss of property and life, economic hardship, and threats to public health and safety; and

WHEREAS, the Town of East Haddam, has developed and received conditional approval from the Federal Emergency Management Agency (FEMA) for its Hazard Mitigation Plan under the requirements of 44 CFR 201.6; and

WHEREAS, public and committee meetings were held between June 16, 2009 and December 1, 2011 regarding the development and review of the Multi-Jurisdiction Natural Hazard Mitigation Plan; and

WHEREAS, the Plan specifically addresses hazard mitigation strategies and Plan maintenance procedure for the Town of East Haddam; and

WHEREAS, the Plan recommends several hazard mitigation actions/projects that will provide mitigation for specific natural hazards that impact the Town of East Haddam, with the effect of protecting people and property from loss associated with those hazards; and

WHEREAS, adoption of this Plan will make the Town of East Haddam eligible for funding to alleviate the impacts of future hazards; now therefore be it

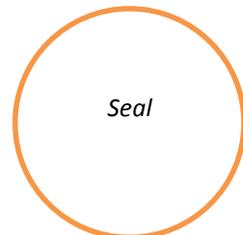
RESOLVED by the Board of Selectmen:

1. The Plan is hereby adopted as an official plan of the Town of East Haddam
2. The respective officials identified in the mitigation strategy of the Plan are hereby directed to pursue implementation of the recommended actions assigned to them;
3. Future revisions and Plan maintenance required by 44 CFR 201.6 and FEMA are hereby adopted as a part of this resolution for a period of five (5) years from the date of this resolution.
4. An annual report on the progress of the implementation elements of the Plan shall be presented to the Board of Selectmen by the Planning and Zoning Commission.

IN WITNESS WHEREOF, the undersigned has affixed his/her signature and the corporate seal of the Town of East Haddam this \_\_\_ day of \_\_\_\_\_, (year).

\_\_\_\_\_

(Name, Title)



**NATURAL HAZARDS MITIGATION ANNEX  
TOWN OF EAST HAMPTON CONNECTICUT**



**June 2014**

Prepared by:

**Lower Connecticut River Valley Council of Governments**

*[www.rivercog.org](http://www.rivercog.org)*

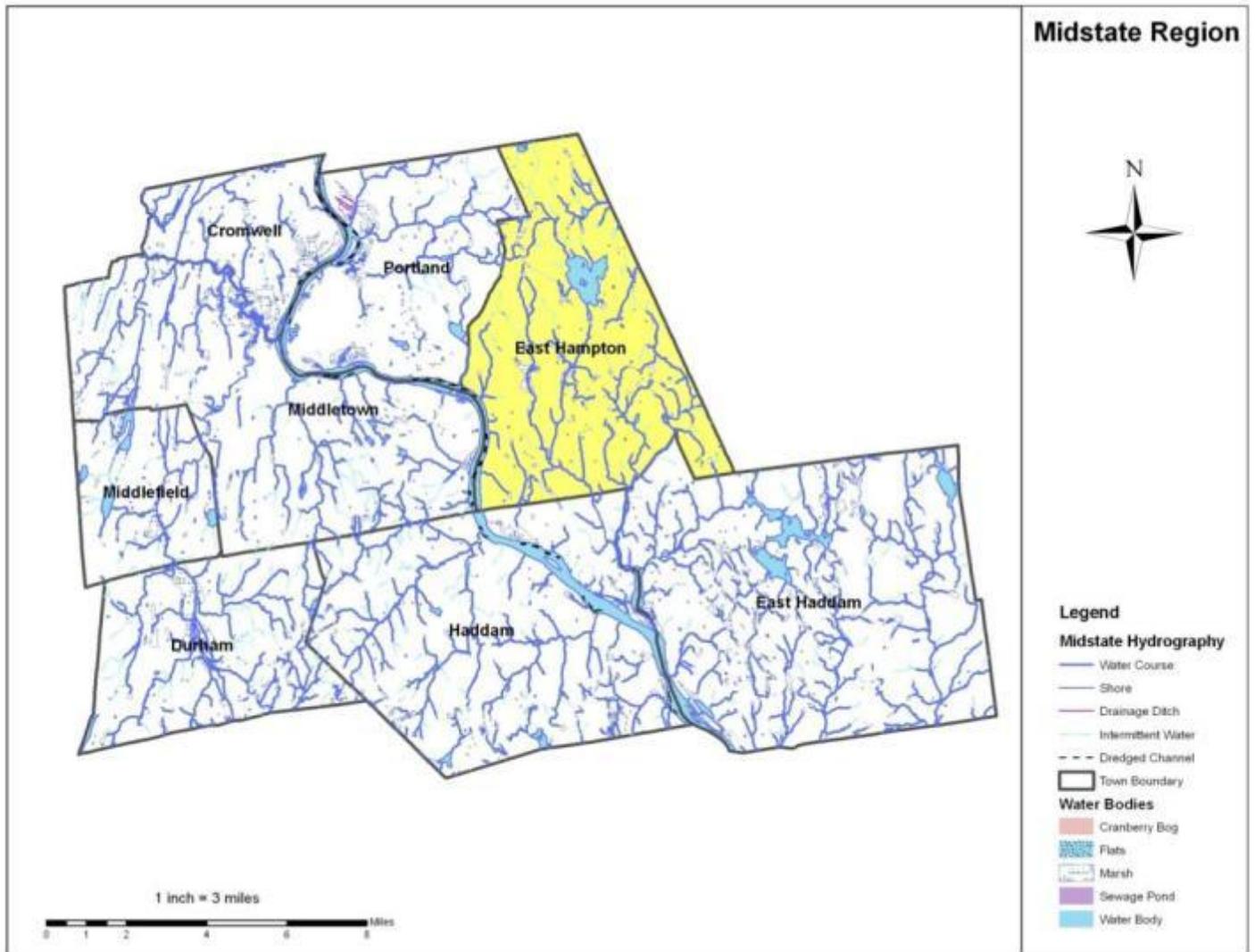
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**Map 1:** East Hampton within the former Midstate Region  
Source: RiverCOG

*On the cover:*

**Photo 1:** Damage after 1951 Tornado in East Hampton Center, near Center School.  
Source: Middlesex County Historical Society

**i PURPOSE**

The purpose of this Natural Hazard Mitigation Plan is to identify the natural hazards most likely to affect the area, to locate the vulnerabilities, assess the risks and estimate corrective actions to protect life, limb, property and financial loss. Also, to synchronize this Plan with other local, regional and State; land use, transportation, clean water, wetlands and debris management plans. This Plan will compliment traditional emergency response plans.

*Funding these plans and projects reduces overall risks to the population and structures, while also reducing reliance on funding from actual disaster declarations. Pre Disaster Mitigation grants are to be awarded on a competitive basis and without reference to state allocations, quotas, or other formula-based allocation of funds. - FEMA*

This Plan could be considered a long term strategy to reduce the economic consequences of a natural disaster.

**Bottom line:** The most likely event, considered to be hazardous to the population and properties in the region is a natural disaster. Since the tragic events of September 11<sup>th</sup>, 2001 municipal administrations, planners and emergency responders have overlaid terrorist attacks onto their chemical, biological, radiological, nuclear, and explosive (including fires) standard operating procedures and guidelines. Time has passed and now our focus is on natural hazards ... storms.

**ii SCOPE OF PROJECT**

This pre-disaster risk and vulnerability assessment is designed and scoped to identify those areas that are vulnerable to specific or multiple severe weather related events. The Planning Team has evaluated history, current conditions and or state of repair and future potential conditions to develop a prioritized list of structures, utilities, roadways including bridges and culverts that are in need of repair, strengthening or replacement to prevent or minimize loss of life, limb or property. Dam failure (potential) and repetitive loss properties are a good example of areas the Planning Team looked closely at to predict the future. Historical data provides valuable references for future risk. Subject matter experts were contracted by the former MRPA to investigate and report on the repetitive loss properties and hazardous dams in the region.

We looked at all possible natural hazards and categorized them according to the “likelihood” of an occurrence. Flooding was by far the highest on our priority list. Hurricanes could, and historically have happened and we are overdue for “a big one”. We are particularly vulnerable to the wind and flooding effects of a strong Category 1 and up hurricane, which could result in sever tree damage. Earthquakes could happen; but are not likely.

Strategies for mitigation, within this Plan are best guess estimates by professionals.

The following is a summary of the local content with highlights for a quick review:

**Benefit:** The Federal Emergency Management Agency (FEMA) in the Department of Homeland Security recognized the need for more robust “natural hazard” planning and mitigation at the local level. The purpose was to bring the need for proper preparation

East Hampton Natural Hazards Mitigation Annex

to the attention of local jurisdictions and regions<sup>36</sup>. A benefit of a natural hazard planning process is to identify those areas, buildings or infrastructure that can be “fixed” to minimize or prevent damage from a major storm. Another benefit of this planning process is if a project is identified in the plan, then the municipality or region can request a grant under the Natural Hazard Mitigation Grant Program to mitigate the risk. Another benefit is; if a project is identified in this Plan and it is damaged or destroyed in a storm, funding can be obtained under this program to replace the damage to what it should have been as identified in the Plan. Otherwise disaster relief funding will only allow for rebuilding to: as it was.

Another benefit of this planning process is an awareness of a need to revisit other related plans.

Planning Process Benefit: Throughout the NHMP planning process all departments and vulnerable stakeholders were reminded of; or became aware of, local vulnerabilities that mitigation projects could protect them from loss of life, limb or property. This is particularly true of critical infrastructures. The interest/awareness level here is high; given the DEMHS and DEEP activities in the last ten years.

This Plan and mitigation strategies take into consideration the following potential major natural hazard events: flood, hurricanes, winter storms, extreme cold, extreme heat, wind storms, earthquakes, drought, and wildfire.

Each natural hazard and subsequent risk has been evaluated to set-up the vulnerabilities of the municipality and region.

RISK*							
EVENT	LIKELIHOOD	VALUE	LOSS POTENTIAL	VALUE	Financial Impact	VALUE	TOTAL
Earthquakes,	L	1	M	2	L	1	4
Extreme heat,	H	3	L	1	L	1	5
Fires,	M	2	M	2	L	1	5
Floods,	H	3	H	3	H	3	9
Hurricanes,	H	3	H	3	H	3	9
Landslides,	L	1	L	1	L	1	3
Thunderstorms,	H	3	L	1	L	1	5
Tornadoes,	L	1	H	3	M	3	7
Winter storms (extreme cold)	H	3	M	2	L	1	6

\* Risk: risk of life, limb, property and/or financial impact H=High (3); high priority , M=Medium (2) ; medium priority, L=Low priority (1); a priority; but not high or medium.

Table II-3

**Figure 1:** Potential Natural Hazard Risk in East Hampton.

<sup>36</sup> In Connecticut we have regional planning agencies, organizations or councils of governments performing the planning functions traditionally done by county governments in other states.

The impact of these events was evaluated based on: presence of vulnerable populations; well-being of the residents and businesses; vulnerable structures; vulnerable infrastructure and financial exposure to the municipality.

Also followed are guidelines from the National Flood Insurance Program under the Federal Insurance Administration, which enables property owners to purchase insurance protection against losses from flooding. Generally if a property does not have a mortgage, where the lender requires flood insurance, they may not have a policy. Where known we have listed them.

### **Highlights of this Regional/Local Natural Hazard Mitigation Plan**

That document includes historic photos documenting the local needs for mitigation, plus other locally valuable information and documentation not required under the FEMA NHMP Guidelines.

**Project Input:** Input for this Plan was gathered through the direct involvement of municipal staff, the public and the close relationship with the former MRPA. This input, including past and present projects, contributed to ongoing mitigation strategies which will result in future mitigation projects.

All these activities provided an opportunity for public input.

**Meetings and participation:** Meetings, throughout the planning period, were held with Town employees, the administration, the public, individual department heads and local historic society representatives. Additionally a great deal of historic information came from regional and state libraries.

Participants in the planning process can be found in the Planning Process part in the Regional Section of this Plan, and here in Section II.

**Key Departments in planning:** The two key departments contributing to the Plan were Public Works and Emergency Management. The Town Managers worked with the former Midstate Agency during this planning process and were very supportive of this project. The CEO will carry the Plan through the adoption process.

### **Fixed Populations:**

- ✚ There are no long term incarceration facilities in East Hampton... only holding cells.
- ✚ In neighboring Middletown (across the River) there is a large State Mental hospital
- ✚ Emergency Management, Public Health and Social Services work closely with local Convalescent hospitals, rest homes and senior citizen housing clusters in evacuation and shelter planning. Chatham Health District personnel actively participate in local and regional public health emergency planning. This includes the statewide emergency management regions.

**Regional Pet Sheltering:** Grant monies have been and will continue to be sought for funding a regional pet holding area. Historically these were called “dog pounds”. These facilities can “back-up” the Pet Shelters adjacent to People Shelters.

**Non-FIRM flooding vulnerable areas:** Non flood plain areas vulnerable to flooding are within the scope of this planning exercise; though not in the FIRM plan.

**Non-Disclosure; Repetitive Loss Properties:** The Federal Privacy Act 1974 prohibits public release of the names of policy holders or recipients of financial assistance and the amount of the claim payment or assistance. Therefore only the highlights are listed in this plan

**Hazard Monitoring:** Because we have frequent floods in recent years our monitoring activities are real-time. Throughout this Plan appropriate flooding photographs are shown.

**Funding Opportunities:** The local budgeting process is the primary source of funding for mitigation projects. Through adoption of this Plan it is hoped additional funding and grants will be available. Funding sources are discussed in Section I of the Regional section of this Plan.

**Planning Process:** Town planners’ engaged in this project range from local planning departments, to this Agency and to outside engineering firms. In all cases they participated in this Project. See the Section II for participants and the planning process in the Region Part of this Plan and sections I, II & III of this Annex. Also Section VIII for ongoing NHMP Actions and Planning

**Mitigation Actions:** Prioritization of mitigation actions has been settled in each jurisdiction; simply put ... the CEO made the decision. BUT, we acknowledge a current failure can move a project to the head of the list

The carrying-out of the mitigation actions is a function of cost-benefit studies and availability of funding. . It is also understood that local budget spending is subject to conflicting interests in the available budget \$\$\$. E.g. school projects versus a particular road repair. Infrastructure mitigation projects can be a balancing act... by the Director of Public Works, subject to the administration’s wishes.

**Updating current NHMP:** There are no Natural Hazard Mitigation Plans in place to update. After Plan adoption, if the need arises, elements can be updated annually.

**Public Outreach:** For emergencies we have a FEMA/DEMHS Crisis Communications Plan in effect. It is outlined in our EMERGENCY OPERATIONS PLANS which MRPA assisted in the writing of. Notifications include postings on the local websites, the DEMHS 211 site and Press Releases.

For the development of this Plan the Mayor of Middletown issued a regional press release, advising the public of the Plan being in the works and requested they contact their local authorities and to watch for public workshops being held. For Public Outreach content, see Regional part of this Plan, Section IV and this local Annex Section IV

**Natural Resource Protection:** Advocates for protection of natural resources are ever present at meetings where projects are discussed that have the potential to affect natural resources. This also includes State Projects. East Hampton officials are very aware of protecting the environment. If areas are reclaimed during the hazard mitigation process, the space will be left as open space.

**Goals and Objectives:** Staff and planners, very early on in the process established goals and objectives to accomplish them. A brief synopsis of the Goals and Objectives can be found in the Regional and local sections of this Plan.

**Loss Reductions:** Mitigation goals are to reduce losses to life, limb and property ... and costly reductions in municipal services. Throughout the Plan there are references to actions to be taken to reduce losses. See Regional Section IV and this local Annex, Section VIII.

**Actions monitoring:** Section III Part 6 Mitigation Action Plan. is the spreadsheet of prioritized projects in need of repair and/or replacement. This is the working playbook by which the municipality will work going forward. Section III, this Annex, indicates the department or agency responsibility for these actions.

**Municipal Approval:** In order for East Hampton to qualify for future funding opportunities under the Natural Hazard Grant Program, this Plan must be “adopted”. See Section XIII.

**I. DEMOGRAPHICS**

**A. Town Profile**

The Town of East Hampton is located on the eastern bank of the Connecticut River in central Connecticut, approximately 20 miles southeast of Hartford and 12 miles east of Downtown Middletown. East Hampton is located in Middlesex County and is one of seventeen member towns served by the Lower Connecticut River Valley Council of Governments (RiverCOG).

Originally named Chatham in 1767, the Town was incorporated from Middletown in 1783. An act of General Assembly changed the name to East Hampton in 1915. The East Hampton form of government is Town Council with a Town Manager.

East Hampton's topography is dominated by numerous hills interspersed with streams, valleys, and wetland areas. Elevations range from a height of 916 feet above sea level on Meshomasic Mountain (part of the Bald Hill Range in the northwest corner of Town) to as low as 10 feet along the Connecticut River and the southern end of the Salmon River in the southeast corner of Town. Steep slopes (>15%) are scattered throughout Town, with concentrations in the Middle Haddam/Cobalt area as well as along the eastern Town boundary near Route 66.

**B. Population Density**

Area	Population (2010)	Housing Units	Area (sq. miles)	Water Area (sq. miles)	Land Area (sq. miles)	Density per Square Mile of Land Area	
						Population	Housing Units
Middlesex County	165,626	74,837	439	70	369	449	203
East Hampton	12,959	5,485	36.8	1.2	35.6	375	149

**Figure 2:** Population and Density in East Hampton

Source: 2010 Census

**C. HAZUS-MH Report:**

Due to the fact that this individual town Annex is part of the larger Former Midstate Regional Natural Hazards Mitigation Plan, HAZUS-MH was generated on a regional scale. Please see Appendices A, B, and C of this NHMP for the full HAZUS – MH Flood, Hurricane, and Earthquake Event Summary Reports respectively for the former Midstate Planning Region.

**D. Plan of Conservation and Development**

The following is an excerpt from the first page of a summary of the East Hampton Plan of Conservation and Development:

Future Land Use Plan

*The major element of this chapter is the Future Land Use Map. As with all things in life the map cannot be all things to all people. Any statements made with certitude as to what the future land use will be are risky at best, and foolish at worst. Nevertheless there is merit in attempting to project current trends into a land use guide for the Town’s future. Land use plans and maps will continue to be reviewed, and new ones produced.*

*Because of the compelling logic, that it is imperative to look ahead, to anticipate rather than to react, to coordinate rather than to compete and protect public health and safety.*

Protect Public Health and Safety

*Improve the Emergency Services Capacity by reviewing the NFPA standards and guide lines and making any necessary revisions to ensure effective emergency response capabilities.*

Relate Development Intensity to Land Capability

*While natural resources are often degraded over time due to pollution and other factors, development activity poses one of the most significant threats to both the quantity and quality of natural resources in East Hampton. Not all land is created equal and unless development regulations acknowledge that fact, development will continue to encroach upon environmentally sensitive areas; degrading or depleting natural resources.*

*Buildable land regulations can relate development potential to the capacity of the land to support development. Environmentally sensitive areas such as wetlands, steep slopes, and flood plain are less capable of supporting development than dry, flat land, yet are often treated equally in many regulations.*

*Development in and around these sensitive areas can lead to increased erosion and flooding as well as losses of biodiversity and personal property.*

**E. National Flood Insurance Program**

East Hampton participates in the NFIP and commits to adhere by the rules and regulations in order to continue being NFIP compliant.

	Initial Hazard Boundary Map FHBM	Initial Flood Insurance Rate map	Date East Hampton entered the NFIP regular Program	Current FIRM Map	Date Planning &/or zoning Updated
	(i)FHBM	(i)FIRM	(r)FIRM	(c) FIRM	(l) Regulations updated
East Hampton	29-Nov-74	1-Apr-82	1-Apr-82	28-Aug-08	8/08

**Figure 3:** East Hampton flood regulations and adoption dates.

## II. THE LOCAL PLANNING TEAM

The East Hampton Natural Hazard Mitigation Planning Team leads were; Keith Hayden and Richard Klotzbier. In the beginning of the Project we worked with then “acting” Town Manager Robert Drury and ended with Jeff O’keefe. Both offered their full support. Walter Olson from the Historical Society also provided most of the photographs contained within this plan.

Our Public Workshop was well attended and lively. As anticipated there were conflicts of interest in whose pet project should have a higher priority than others. The decision was made early on that the Town Manager has the final call on what project to move forward.

East Hampton is a small enough community in where town officials are able to keep a close watch on areas that need special planning and monitoring to maintain the character of the municipality and safety of its residents and visitors.

In keeping with the Goals and Objectives; and mitigation plans, the following agencies are actively engaged (as of 2009)

Town Manager; Jeff O’Keefe - Overall management of the Project

Administrative Assistant; Cathy Sirois - Arranged meetings including the Public Workshop

Emergency Management Director; Michael Scranton (now retired) - Richard Klotzbier - Provided input and a current perspective to the Plan.

Public Works Director Keith Hayden - Direct responsibility for assessments and managing the mix of funding sources for mitigation actions. His goal is to minimize the financial impact locally by utilization of regional, State and Federal grants. Keith had the lead in providing the Team with the info on vulnerabilities in this Plan.

Historical Society; Walter Olson provided photographs to support our assessments.

See Figure 4 for a list of responsibilities for mitigation items.

Other sources utilized to identify the local vulnerabilities:

Personal knowledge: RiverCOG staff; municipal elected and appointed officials, emergency management director, public works officials, municipal planners, P&Zs, FEMA HAZUS-MH, State CT Disaster History; FIRM Flood plain Maps (revised to August 2008), CCM Historic Connecticut Scenarios CEO Workshop (2004); a subject matter experts on National Flood Insurance and another on hazardous dams, the local historical society and public input. Information from State DEEP and DEMHS interviews was also used. A major contributing factor is the RiverCOG staff has an in-depth knowledge of local DOT plans, emergency operations plans, potential risk assessments and debris management planning efforts.

**III. MITIGATION ACTION RESPONSIBILITIES**

**East Hampton Risk Assessment Responsibilities**

There are a variety of vulnerabilities with any natural hazard event, therefore there is a wide array of responsible parties.

State owned roads running through town are of concern. These roads flood frequently causing local traffic problems. Below is a list of East Hampton vulnerabilities that need attention to a scale that is beyond the financial capability of the Town.

East Hampton	Responsibility	Responsibility Local		Mitigation
		RISK	State/Federal	
Flash floods	DOT	PW	PW	Operations & Capital Budget/*/NHMP
Floods	DEEP	PW,EM	PW	Assessment (Owner) /reporting requirements Local Admin) see Hazardous Dam Report
Snow	NFPA	Fire/Fire Marshal	Owner	Admin Ordinance
Flood, Draught	DPH	PW Water/Sewer/HD	PW Water/Sewer/HD	HD ordinances and monitoring
Floods	EPA	Admin	Admin	Admin Manage
Thunder Storms, Floods	DEEP/EPA	Fire/Fire Marshal/EM	Fire/Fire Marshal/EM	Manage with DEEP
Wildfire	DEEP	Fire	Fire Marshall	P&Z - restricting building/ Fire Plan and practice (with DEEP, Forestry)
Floods, power outages	DEEP	local Emergency Manager/PW/PH	PW	PW Loss of Power Plan current
Hurricane/Ice Storm/Wind Storm	DEEP/DEMHS	PW	Management Plan	ADMIN/PW facilitate the writing of a DMP plan
All storms	DPH	Chatham Health District	Chatham Health District	PH Plan
All storms	DPH	Social Services/HD/EM	Social Services/HD/EM	EOP,& PH Plan maintenance and Shelter exercising

East Hampton Natural Hazards Mitigation Annex

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Flood	NFIP	P&Z	Owners	Owners have NFIP coverage (Elevate/relocate/flood proofing)
Flood	NFIP	P&Z	Owners	Owners continue coverage (Elevate/relocate/flood proofing)
Flood	NFIP	P&Z	Owners	Owners continue coverage (Elevate/relocate/flood proofing)
Flood	NFIP	Admin/PW/EM	Admin	Elevate/relocate/flood proofing
Flood	DEEP/DEMHS	EM	PW	Develop a Plan of prevention
All storms	DEMHS	EM & LUO	All disciplines in EM	Participation in regional planning - REPT
All storms	NU/CL&P	EM & Responders	NU/CL&P	Public Notices (Crisis Communications Plan)

**Figure 4:** Mitigation Action Item Responsible Parties

#### **IV PUBLIC OUTREACH**

There are a variety of modes of communication with the public see Regional Section IV.

Municipal responsibility to the public:

- People in vulnerable areas should monitor Flood Warnings:
- People with structures in vulnerable areas; specifically in flood plains should have a flood evacuation plan and participate in the National Flood Insurance Program. They should flood proof their buildings
- The municipalities will post storm info on their websites including proper preparations and warnings. DPH and DEMHS seasonally post info on their websites.

FEMA and the American Red Cross have extensive information and checklists for preparing for a major storm. The website [READY.gov](http://READY.gov) has a lot of useful information. Section IV of the Regional Section of this Plan, the PUBLIC OUTREACH part, highlights information sources available.

Of interest and available to the residents are the following sources of information: FEMA Directives on NFIP, USGS Floods, WATERWATCH [a Hydrologic Science and Data-Floods], USGS Flood Definitions, FLOWING Waters, Danger from Chevron –LEARN Cars website, DEMHS Hurricane Fact Sheet, NOAA Hurricane Definitions, Hurricane Grace – the PERFECT STORM story, The Great White Hurricane story, NWS Winter storm Advisories, FEMA Risk Prioritization Tool for Dams, NOAA, DEMHS Heat & Cold Advisor, USA Flood victims, WHEN THUNDER ROARS...GO INDOORS, EF Scale for Tornadoes, etc. Most of these info documents are suitable for posting for Public Outreach.

#### **V PUBLIC ASSISTANCE**

A funding source option for mitigation projects is FEMA, Public Assistance. This is for repair, restoration or replacement of municipal facilities damaged by a storm...if a disaster has been declared.

The following is from FEMA Public Assistance (PA) guidance:

The Department of Homeland Security (DHS) Appropriations Act, 2007, Public Law 109-295, directs the Federal Emergency Management Agency (FEMA) to conduct a Public Assistance (PA) Pilot Program. The legislation sets forth three goals for the PA Pilot Program: reducing the costs to the Federal Government of

- providing assistance to State and local governments, increasing flexibility in grant administration, and expediting the provision of assistance to States and local governments. The PA Pilot specifically addresses the provision of assistance under sections 403(a)(3)(A), 406 and 407 of the Robert T. Stafford Disaster Relief
- and Emergency Assistance Act, 42 U.S.C. 1570b(a)(3)(A), 5172, 5173 (Stafford Act). These sections relate to debris removal and the repair, restoration, and
- replacement of damaged facilities.

Public Assistance Grant Program The mission of the Federal Emergency Management Agency's (FEMA) Public Assistance (PA) Grant Program is to provide assistance to

State, Tribal and local governments, and certain types of Private Nonprofit organizations so that communities can quickly respond to and recover from major disasters or emergencies declared by the President.

Through the PA Program, FEMA provides supplemental Federal disaster grant assistance for debris removal, emergency protective measures, and the repair, replacement, or restoration of disaster-damaged, publicly owned facilities and the facilities of certain Private Non-Profit (PNP) organizations. The PA Program also encourages protection of these damaged facilities from future events by providing assistance for hazard mitigation measures during the recovery process.

The Federal share of assistance is not less than 75% of the eligible cost for emergency measures and permanent restoration. The grantee (usually the State) determines how the non-Federal share (up to 25%) is split with the sub-grantees (eligible applicants).

- Eligibility - Overview of eligibility criteria and definitions
- Roles and Responsibilities - Information on the duties of Federal, State, and local partners
- Public Assistance Grant Program Process - Step by step description of the PA grant life cycle
- Policy and Guidance - 9500 series policies and other publications
- Frequently Asked Questions (FAQ) - Top 10 questions pertaining to the Public Assistance Program
- Resource and Tools - Appeal database, equipment rates, cost estimating format, performance goals, funding trends, and other resources

### CHAPTER 3

#### APPLYING FOR PUBLIC ASSISTANCE

Following a disaster declaration by the President, FEMA makes assistance for recovery from the disaster available to eligible applicants. This chapter describes the process through which this assistance becomes available.

##### Process Overview

The PA Program is implemented through the steps listed below, each of which is described in detail in this chapter.

- An Applicants' Briefing is held.
- Potential applicants submit the Request for Public Assistance.
- A PAC is assigned to each applicant.
- The PAC holds a Kickoff Meeting with the applicant.
- The applicant's specific needs are identified and cost estimates developed through the project formulation process.
- Cost estimates for small projects that have been prepared by the applicant are checked through the validation process.
- FEMA approves and processes grants for the applicant's projects.

**Projects.** A project is a logical method of performing work required as a result of the declared event. A project may consist of one item of work, such as repairs to a single structure, or work that occurs at multiple sites, such as repairs to several washouts along a road. The applicant is responsible for identifying all work that is required as a result of the disaster. The PAC may assist the applicant in combining various recovery efforts into projects.

**VI INDIVIDUAL (residents and businesses) ASSISTANCE**

The following is an excerpt from FEMA Individual Assistance (IA) guidance:

FEMA and other federal, state, local and volunteer agencies offer disaster assistance in several forms:

**Low-Interest Loans.** Most, but not all, federal assistance is in the form of low interest loans to cover expenses not covered by state or local programs, or private insurance. People who do not qualify for loans may be able to apply for a cash grant. If you qualify, your check will be issued in about three weeks.

The Farm Service Agency (FMHA) and the Small Business Administration (SBA), offer low interest loans to eligible individuals, farmers and businesses to repair or replace damaged property and personal belongings not covered by insurance.

**Cash Grants** for up to \$13,400 adjusted (annually for inflation). Individuals who do not qualify for a loan from SBA may be eligible for these grants from FEMA and the state to help recover uninsured property losses. Home inspections are normally conducted before a check is issued. FEMA funds 75% of the grant program's eligible costs with the remaining 25% covered by the state. The state administers the program.

**Housing Assistance.** FEMA's Disaster Housing Assistance Program (DHA) makes funds and temporary housing available to individuals whose home is unlivable because of a disaster.

**Veterans Benefits.** The Department of Veterans' Affairs provides death benefits, pensions, insurance settlements and adjustments to home mortgages for veterans.

**Tax Refunds.** The Internal Revenue Service (IRS) allows certain casualty losses to be deducted on Federal income tax returns for the year of the loss or through an immediate amendment to the previous year's return.

**Unemployment Benefits.** Unemployment benefits may be available through the state unemployment office and supported by the U.S. Department of Labor.

**Crisis Counseling.** Local and state health agencies, the American Red Cross, as well as churches and synagogues may offer counseling to people who have experienced a disaster.

**Free Legal Counseling.** The Young Lawyers Division of the American Bar Association, through an agreement with FEMA, provides free legal advice for low-income individuals regarding cases that will not produce a fee (i.e., those cases where attorneys are paid part of the settlement which is awarded by the court). Cases that may generate a fee are turned over to the local lawyer referral service.

**Independent Study Programs.** FEMA offers an Independent Study Program through the Emergency Management institute.

Individuals, families and businesses may be eligible for federal assistance if they live, own a business, or work in a county declared a Major Disaster Area, incur sufficient property damage or loss, and, depending on the type of assistance, do not have the insurance or other resources to meet their needs.

## VII. NATURAL HAZARDS

This East Hampton section of the Natural Hazard Mitigation Plan contains a variety of localized details complementing the Natural Hazard Section in the Regional Section of this Plan. For overall information on potential natural hazards, see Regional Section III.B.

At the conclusion of each natural hazard event section the reader will find mitigation strategies. It should be noted that many of the strategies apply to other events as well.

The profiling of hazards in East Hampton is based on a variety of sources and personal observations of recent events and discussions with “the older generation”. During Council Meetings we also heard of other concern; other than the ones we already were aware of.

Natural disasters can often be predicted. And damage can be anticipated. Crumbling infrastructure does require continuing R & R to minimize costly damage. Utilizing budget allocations and available State grants the current mitigation process is ongoing. Repetitive damage due to storms generally puts a vulnerable project as a top priority “fix” on Public Works “Wish List”.

Storm damage tends to occur repeatedly in the same geographical locations because they are related to weather patterns or physical characteristics of the area (flash and or spring flooding). However; all areas of the community are vulnerable to one or another type of natural disaster (hurricanes, wind, ice storms, tornados, etc.).

East Hampton is vulnerable to many types of natural hazards. Flooding is by far the most significant natural hazard with the potential to do harm to people, places and things and to cause financial losses. The second greatest threat is from hurricanes. Therefore the focus of this Plan is on these two weather events.

The town managers in place during the development of this Plan were very supportive. A core team of Town officials contributed to the input for this Plan including: Public Works Director Keith Hayden, Emergency Management Director; Michael Scranton (now retired), replaced by Richard Klotzbier, and particularly for photographic evidence and local knowledge East Hampton Historical Society member Walter Olson.

Hurricane damage is not localized as is flooding. Generally the effects are town wide. Wet hurricanes also create flooding problems.

Wind and snow storms do regularly occur; but the results are not as catastrophic as flooding and hurricanes. The other potential threats are discussed extensively in the Regional Section of this Plan.

Spring flooding events threaten the Connecticut River. Fortunately most of the structures along the River are on high ground.

The following table shows the potential for each of the Natural Hazards most likely to occur in Town.

Event	RISK*						Total
	Potential	Value	Loss Potential	Value	Financial Impact	Value	
Earthquakes	L	1	M	2	L	1	1
Extreme Heat	H	3	L	1	L	1	1
Fires	M	2	M	2	L	1	2
Flood	H	3	H	3	H	3	3
Hurricane	M	3	H	3	H	3	3
Landslide	L	1	L	1	L	1	1
Thunderstorm	H	3	L	1	L	1	2
Tornado	M	1	H	3	M	2	2
Winter Storm	H	3	M	2	L	1	2
* Risk: Risk of life, limb, property, and/or financial impact H=High, M=Medium, L=Low 3= High Priority, 2 = Medium Priority, 1 = Low Priority							

**Figure 5:** Risk potential for East Hampton

**A. Floods**

**1. Introduction**

For East Hampton, flash floods are the most dangerous flooding condition as is evidenced by our history of flooding. Floods are the most significant natural hazard with the potential to do harm to people, places and things.

As mentioned they come with minimal, if any warning. There are 31 dams in East Hampton. Many of which could be breached by a sudden surge of a large amount of runoff (flash flooding) Two are classified being of significant hazards.

The major, damage causing flood condition to affect East Hampton is a flash flood. Though there are residences along the River they are relatively high up.

**2. Spring Flooding**

Spring Flooding is an almost annual occurrence where the Connecticut River overflows its banks onto flood plains and sometimes beyond, the most severe in recent history being in 1936 and again 1984. This is a result of heavy snowpack in northern New England melting during a short period of time when the weather warms. Heavy rainstorms which often occur during spring months can exacerbate the flooding.



**Photo 2:** Summit and Bevin Streets during 1936 Flood.

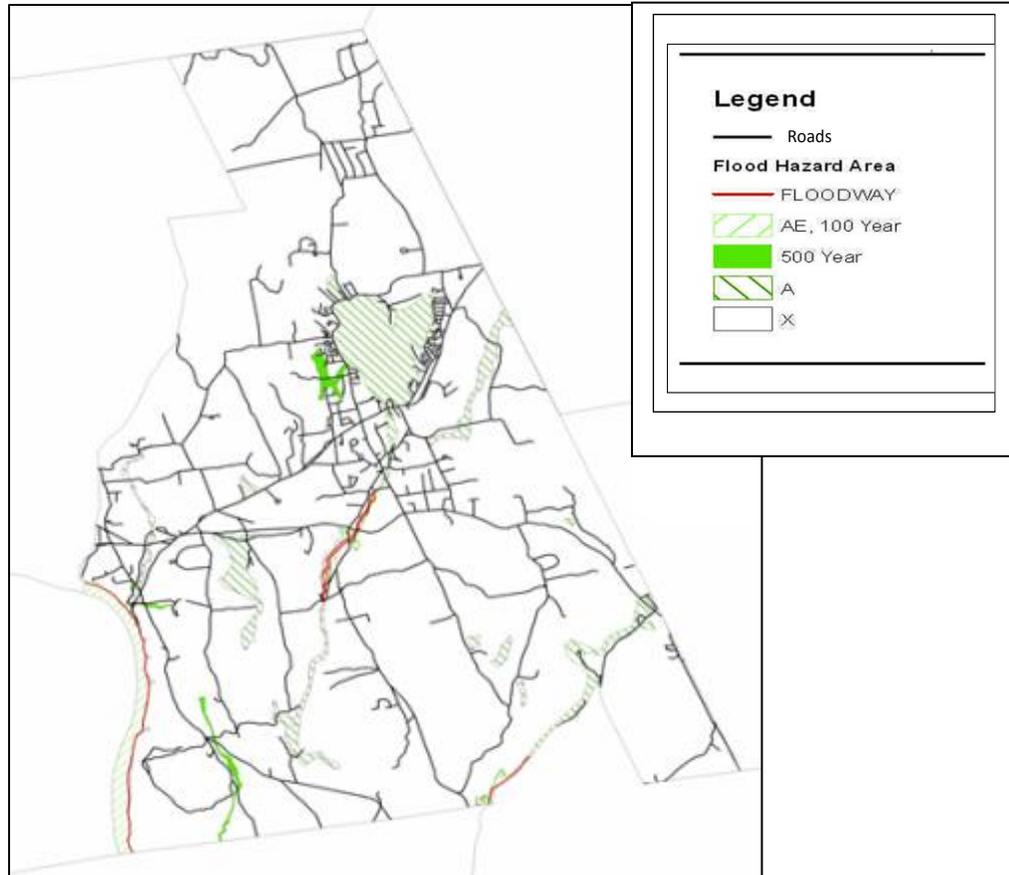


**Photo 3:** South Main Street during 1936 Flood



**Photo 4:** Water running off the Center School lawn after the Hurricane of 1938

Source for Photos 2-4: Middlesex County Historical Society



**Map 2: East Hampton Flood Zones**

Source: RiverCOG

### 3. Flash Floods

Flash Floods are caused by significant rain events; which means, when we receive a lot of precipitation from a major rain storm. Flash floods are characterized by high velocity flowing water often accompanied with debris.

The streams passing through East Hampton and low lying roads are a cause of concern during significant rain events. See East Hampton Mitigation

### 4. East Hampton Dams

One of the two serious flooding conditions in Town, referenced in Section III,G is the heavy rains from hurricanes, Nor'easters, or stalled major rain storms. Dam failures can be triggered suddenly, with little or no warning, by other natural disasters such as an earthquake.

Dam failures are caused by these significant rain events (a lot of rain over a short period of time) and are a very real possibility here in Southern New England. The DEEP watches our dams closely and rates them. They notify the towns and or owners of those that are most susceptible to failure.

In the Town of East Hampton, the Connecticut Department of Environmental Protection (CT/DEEP) has 28 dams in their dam inventory. Of those 28 dams, 2 (two) dams are rated as Significant Hazard Dams (Class B). There are no High Hazard (Class C) rated dams in East Hampton. There are no municipally owned dams in East Hampton.

The State Department of Environmental Protection requires the registration of all dams over the height of six feet. The Dam Safety Section of the Inland Water Resources Division of the Connecticut Department of Environmental Protection (DEP) is responsible for administering and enforcing Connecticut's dam safety laws. The existing statutes require that permits be obtained to construct, repair or alter dams, dikes and similar structures and that existing dams, dikes and similar structures be registered and periodically inspected to assure that their continued operation and use does not constitute a hazard to life, health or property.

DEEP assigns dams to one of five classes according to their hazard potential:

Class AA: negligible hazard potential dam which, if it were to fail, would result in no measurable damage to roadways, land and structures, and negligible economic loss.

Class A: low hazard potential dam which, if it were to fail, would result in damage to agricultural land, damage to unimproved roadways, or minimal economic loss.

Class BB: moderate hazard potential dam which, if it were to fail, would result in damage to normally unoccupied storage structures, damage to low volume roadways, or moderate economic loss.

Class B: significant hazard potential dam which, if it were to fail, would result in possible loss of life; minor damage to habitable structures, residences, hospitals, convalescent homes, schools, etc.; damage to or interruption of the use or service of utilities; damage to primary roadways and railroads; or significant economic loss.

Class C: high hazard potential dam which, if it were to fail, would result in the probable loss of life; major damage to habitable structures, residences, hospitals, convalescent homes, schools, etc; damage to main highways; or great economic loss.

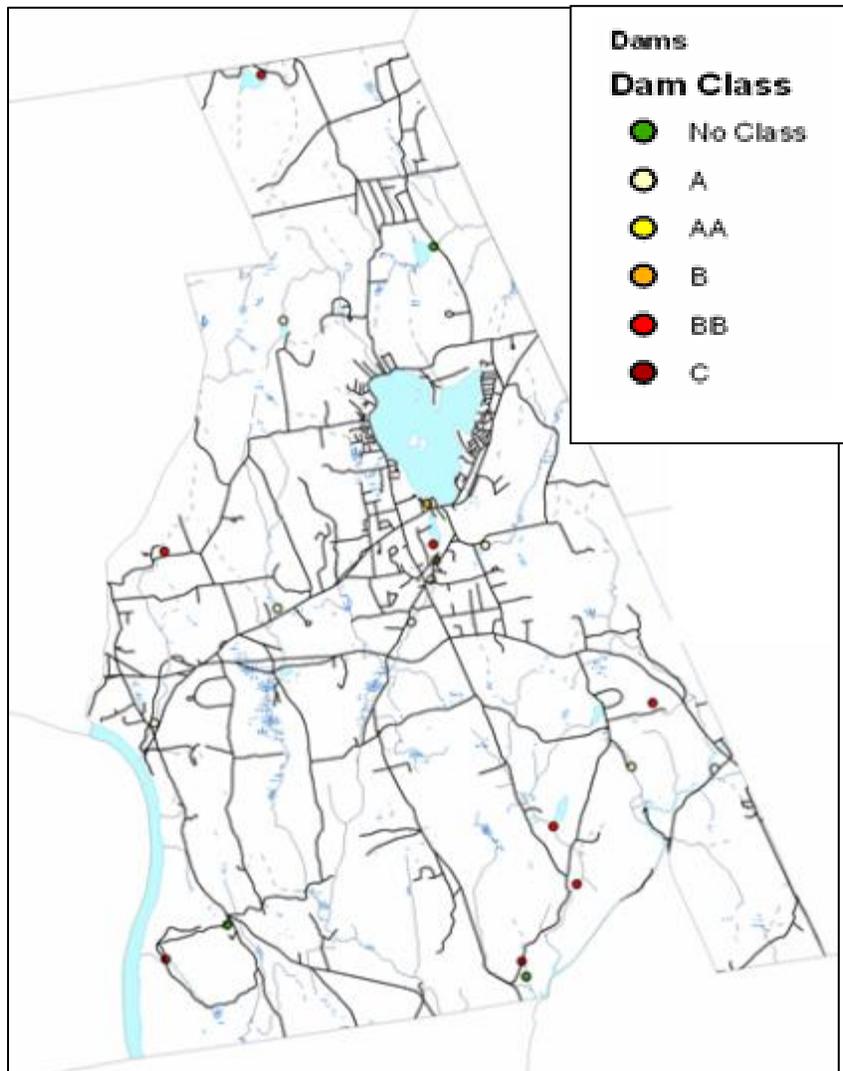
The classification of a dam can change due to changes in downstream development. 83% of dams in Connecticut fall within the negligible to moderate hazardous categories while only 17% fall within the significant and high hazard categories. Map 11 depicts which Hazard Class each dam in Chester is.

DEEP keeps track of which dams have emergency plans but not all of them would be up to date and not all dam owners will want those plans shared publically. Only the larger significant and high hazard dams would typically have

an emergency plan with inundation areas but not all do as it is not yet mandated by state statute or regulation.

DAM ID#	DAM NAME	HAZARD CLASS	OWNERSHIP
4204	Artistic Wire Company	B – Significant Hazard	William F. & Helen C. Anderson Trustees
4206	Lake Pocotopaug	B – Significant Hazard	Pocotopaug Water Power Company, c/o Bevin Bros. Mfg. Co.

**Figure 6:** Significant Hazard Dams in East Hampton



**Map 3:** East Hampton Dams  
Source: RiverCOG

The following dams lie within East Hampton:

**Lake Pocotopaug Dam #4206**

Hazard Classification – B – Significant Hazard Dam

Owner: Pocotopaug Water Power Company

The Lake Pocotopaug Dam is an earth embankment dam with a vertical concrete upstream wall. There is a concrete spillway located near the right abutment of the dam. The dam impounds Lake Pocotopaug and is located approximately 200-feet upstream of Rt. 66 in the center of East Hampton.

Just downstream of the dam is a concrete culvert, which transmits the flow under a building and then under State Rt. 66.

The dam was most recently inspected on April 7, 1995, and was rated in good condition. On January 10, 1996, a letter was sent to the dam owner outlining the following deficiencies:

5. Remove all debris from the downstream apron of the spillway and from the downstream channel.
6. Monitor the left downstream spillway training wall to insure the tie-back cable continues to perform adequately.
7. Monitor the decorative pine trees on the left crest to insure that the root systems do not begin to threaten the upstream concrete wall.

**Artistic Wire Dam #4204**

Hazard Classification – B – Significant Hazard Dam

Owner: William F. & Helen C. Anderson, Trustees

Artistic Wire Dam is an earth fill dam with masonry upstream and downstream walls and a masonry spillway. The dam is located approximately 75-feet upstream of State route 196 in the center of East Hampton.

On October 10, 1985, the DEEP sent the dam owners a correspondence outlining steps to take to submit an application to repair or breach the dam. There are no inspection reports for the Artistic Wire Dam.

The dam is overdue for an inspection since it has not been inspected since 1985.

**Inspection/Reporting Requirements**

The State of Connecticut General Statutes (CGS §22a-402(b)-(f)) were recently revised giving the chief executive official or his designee the ability to inspect dams if they reasonably believe that a public safety concern exists. Inspection of any such dam owned or operated by a water company or of a dam that is a

hydroelectric generating facility shall be controlled by the provisions of subsection (c) of CGS §22a-402.

The chief executive official or designee shall have the right to enter private property, within constitutional limits, to undertake such inspection provided such official or designee shall in accordance with CGS §22a-402(b)2:

Action Plan for a list of those areas in need of mitigation.

## **5. East Hampton Flood Plain Management**

The following is an excerpt from FEMA's NFIP:

Flood plain management is the operation of a community program of corrective and preventative measures for reducing flood damage. These measures take a variety of forms and generally include requirements for zoning, subdivision or building, and special-purpose flood plain ordinances.

A community's agreement to adopt and enforce flood plain management ordinances, particularly with respect to new construction, is an important element in making flood insurance available to home and business owners. Currently over 20,100 communities voluntarily adopt and enforce local flood plain management ordinances that provide flood loss reduction building standards for new and existing development.

To help State and local officials in implementing the NFIP, see our

1. Adoption of Flood Insurance Rate Maps by Participating Communities
2. NFIP Flood plain Management Requirements
3. NFIP Policy Keyword Index

To encourage communities to establish sound flood plain management programs that recognize and encourage community flood plain management activities that exceed the minimum NFIP requirements, the Community Rating System (CRS) was created. This program provides communities with discounts to flood insurance rates.

### **i. Zoning Regulations related to flood plain management**

Section 10 defines FLOOD PLAIN MANAGEMENT REGULATIONS (PLANNING & ZONING) as UPDATED May 21, 2012

Section 10.8 is PROVISIONS FOR FLOOD HAZARD REDUCTION

### **ii. Future Land Use Plan**

The major element of this chapter is the Future Land Use Map. As with all things in life the map cannot be all things to all people. Any statements made with certitude as to what the future land use will be are risky at best, and foolish at worst. Nevertheless there is merit in attempting to project current trends

into a land use guide for the Town's future. Land use plans and maps will continue to be reviewed, and new ones produced because of the compelling logic, that it is imperative to look ahead, to anticipate rather than to react, to coordinate rather than to compete,

iii. **Protect Public Health and Safety**

Improve the Emergency Services Capacity by reviewing the NFPA standards and guide lines and making any necessary revisions to ensure effective emergency response capabilities.

iv. **Protecting Important Resources**

While natural resources are often degraded over time due to pollution and other factors, development activity poses one of the most significant threats to both the quantity and quality of natural resources in East Hampton. Not all land is created equal and unless development regulations acknowledge that fact, development will continue to encroach upon environmentally sensitive areas; degrading or depleting natural resources. Buildable land regulations can relate development potential to the capacity of the land to support development. Environmentally sensitive areas such as wetlands, steep slopes, and flood plain are less capable of supporting development than dry, flat land, yet are often treated equally in many regulations. Development in and around these sensitive areas can lead to increased erosion and flooding as well as biodiversity and property loss.

v. **Plan of Conservation and Development (certain appropriate sections of the POCD) July 1, 2006**

- Town residents have identified protection water quality as one of the highest priorities in the Plan.
- The Town is dedicated to "Preserve More Meaningful Open Space." (through acquisition)

**6. National Flood Plain Management**

East Hampton has participated in the NFIP since October 16, 1979 and is committed to participating into the future.

**7. Repetitive Loss Property**

Located on and across the Connecticut River from Middletown, as of August 2013 East Hampton has one residential RLP along an inland stream.

**8. HAZUS-MH Flood Summary Event Report**

Due to the fact that this individual town Annex is part of the larger Former Midstate Regional Natural Hazards Mitigation Plan, HAZUS-MH was generated

on a regional scale. Please see Appendix A of this NHMP for the full HAZUS – MH Flood Event Summary Report for the Midstate Planning Region.

## **9. Flood Mitigation Strategies**

A detailed list of mitigation projects can be found in Section VIII. Below is a general list that the town can pursue:

- Purchase flood prone properties and create open space
- Maintain culverts, bridges and other restricted flow streams of debris
- Maintain dams (municipally owned) and caution private dam owners to do the same
- When a storm is pending early warn residents of fast flowing waters,
- Remind residents of evacuation and sheltering procedures.
- Advise residents where to go for weather notifications.
- Advise the public of the dangers of driving through moving flood waters
- Work with the State DOT to improve drainage under Summit and Bevin Street.
- Monitor DEMHS, DEEP, local press and radio and TV for flood warnings.
- Through legislation change, pressure should be put on the DEEP to allow banking protection from erosion.
- Roadway elevation
- Structure (public/private) elevation
- Structure (public/private) relocation
- Structure (public/private) flood proofing
- Sewer/septic system (public/private) upgrades
- Levee/embankment improvement
- Stream modification (unlikely due to DEEP restrictions)
- Storm water runoff improvements
- Acquisition of storm debris managing equipment

## **B. Hurricanes and Tropical Storms**

**NOTE:** For an extensive discussion on hurricanes in the Region, see the Regional Section of this Plan: Section III.B.1.c.2)

### **1. Introduction**

East Hampton departments and administration will continue to monitor National Weather Service, NOAA, local media, and DEMHS extreme weather announcements.

Because hurricanes are the event we here in the Northeast are most apt to encounter in catastrophic proportions, the section in the Emergency Operations Plan...HSA Annex A ... contains excerpts from the HAZARDOUS WEATHER RESPONSE GUIDE.

Also available to the Emergency Management Director is the CD **NEW ENGLAND HURRICANE ARE YOU READY?** ([www.fema.gov](http://www.fema.gov)). Most EMDs received one in 2003.

Typically hurricanes cross Long Island Sound before reaching Connecticut, but traditionally this does not “slow” them down.



**Photo 5:** Damage in East Hampton from 1938 Hurricane  
Source: Middlesex County Historical Society

## **2. HAZUS-MH Hurricane Summary Event Report**

Due to the fact that this individual town Annex is part of the larger Former Midstate Regional Natural Hazards Mitigation Plan, HAZUS-MH was generated on a regional scale. Please see Appendix B of this NHMP for the full HAZUS – MH Hurricane Event Summary Report for the Midstate Planning Region.

## **3. Hurricane Mitigation Strategies**

A detailed list of mitigation projects can be found in Section VIII. Below is a general list that the town can pursue:

- Tree Warden to work with Public Works and CL&P on an aggressive tree trimming program.
- Maintain culverts, bridges and other restricted flow streams of debris
- Maintain dams (municipally owned) and caution private dam owners
- When a storm is pending early warn residents of fast flowing waters,
- Advise homeowners at risk to flood proof the structure
- Advise residents to secure any loose objects in the yard.

- Advise homeowners to “stock up” on food, water and medications (including the animals)
- Remind residents AND RESPONDERS of dangers of handling anything in the vicinity of a downed wire.
- Remind residents of evacuation and sheltering procedures.
- Advise residents where to go for weather notifications.
- Purchase flood prone properties and create open space.

**C. Winter Storms**

Wind Storms and Other Natural Disaster history and scenarios can be found in Section I, Parts F& G and Section II B-F

The National Oceanic and Atmospheric Administration (NOAA) has recorded an estimated 2,092 severe weather events for the State of Connecticut during the time period of 1950-March 2007.<sup>2</sup> Figure 6 provides the total number of severe weather events recorded for each county. The events recorded by NOAA include such events as droughts, floods, hailstorms, severe lighting Precipitation, snow & ice storms, and extreme temperatures. Following is the winter storm record:

**1. Snow Storms and the October Nor’easter of 2011**

During the unusual October Nor’easter of 2011 power outages and blocked roads were major issues. Because the leaves were still on the trees when the snow came accompanied by strong winds, many trees and limbs came down taking power lines with them. Many Town roads were closed and there were extensive power outages.

See the Regional Natural Hazard Section of this plan for detailed snow storm and “other” Nor’easter information.

<b>Middlesex County Winter Weather Events 1950-2013</b>					
<b>Blizzard</b>	<b>Ice Storm</b>	<b>Heavy Snow</b>	<b>High Wind</b>	<b>Snow</b>	<b>Total</b>
5	16	11	12	24	68

**Figure 7:** Winter Weather Events in Middlesex County between 1950 and 2013.

Source: SHELDUS



**Photo 6:** Damage from the Nor'easter in October 2011.



**Photo 7:** Tree down in the Village Center from the October snowstorm.

Source for Photos 6&7: East Hampton-Portland Patch

## 2. Ice Storms

A major ice storm can cause major road closures and power outages. See the Regional section of this Plan, Tables 21, 22 & 23 for a historic record including major ice storms.

One such storm occurred December 17, 1973 Ice Storm Felix:  
Hartford Courant  
Dark Days: Remembering The Ice Storm Of '73

By Peter Kushkowski, November 20, 2002

Widespread power outages this week in the hills of northwest Connecticut reminded me of when my hometown of Haddam was in the grips of a similarly devastating ice storm almost 30 years ago. The memory of "Felix" still strikes terror in my heart whenever an ice storm threatens. Winter came to Haddam four days early, on Dec. 17, 1973, when a freezing rain started coating everything with a thick, heavy crust of ice. It wasn't long before the electricity began to go out as ice-laden power lines and tree branches fell.

## 3. Winter Storm Mitigation Strategy

- Having in place a Vegetation Maintenance Plan.
- Hopefully, after the October Nor'easter of 2011, CL&P will put into place a more robust power restoration plan.
- Have in place an Evacuation and Sheltering Plan

## D. Wind Storms

**NOTE:** For an extensive discussion on wind storms in the Region and State see Regional Section III.B.1.c.4 (pg. 78).

### 1. Nor'easters

During the unusual October Nor'easter of 2011 power outages and blocked roads were major issues. Because the leaves were still on the trees when the snow came accompanied by strong winds, many trees and limbs came down taking power lines with them. Many Town roads were closed and there were extensive power outages.

### 2. Thunder Storms

Thunder storms are the most likely wind event to occur and the strongest ones can create considerable damage when strong imbedded winds accompany them. For our planning purposes we have further broken thunder storms into tornado activity and microbursts/wind shear.

In 2005 within ten days East Hampton and Portland were hit by two violent thunder storms registering winds of 58 and 60 miles per hour:

7/19/2005	4:06 PM	T 'storm Wind	58 MPH
7/27/2005	5:29 PM	T 'storm Wind	66 MPH.

**Figure 8:** Wind speed From: NOAA Satellite Information Service - National Climatic Data Center

**3. Tornadoes**

East Hampton was hit by an EF 3 Tornado on AUG 21, 1951 EF3 Tornado (See Photo 1). It occurred at 5:30 PM and there were no deaths; but 8 people were injured. A fishnet factory was unroofed. Women on the second floor were injured.

Tornados can happen anytime, anywhere in Town, as referenced in the Regional Plan Section III.B.1.c.4. Tornadoes have also happened fairly recently in: Wethersfield, Bridgeport and West Springfield.

When the conditions are right the National Weather Service and CT Division of Emergency Management and Homeland Security notify emergency management and the administration of the potential. But; they can happen anytime and sometimes without much warning; though the local weather forecasters are getting better.

**4. Wind Shear**

See Regional Section B.1.c.4 for a discussion on the difference between the winds of a tornado and those in a wind shear.

**5. Wind Storm Mitigation Strategies**

A detailed list of mitigation projects can be found in Section VIII. Below is a general list that the town can pursue:

- Public Notifications: Issue warnings to the public and responders to not keep away from downed power lines until the power company gives the OK.
- An aggressive vegetation management program in place along Town roadways.

**E. Other Natural Hazards**

**1. Forest Fires**

East Hampton is heavily forested which means there are several areas of the Town that are vulnerable to major forest fires. If the conditions are right; drought, hot windy weather a wildfire could happen. The risk is exacerbated by the encroachment of residents “deeper” into the woodlands.

The Meshomasic Forest, which encompasses 17,500-acre Meshomasic State Forest, is New England’s oldest state forest. The name Meshomasic comes from rugged, rocky Meshomasic Mountain, habitat favored by rattlesnakes. Meshomasic is believed to be an Indian name for “the place of many snakes” or “the great snake.”

Partners include the Middlesex Land Trust, the Meshomasic Hiking Club, and others.

- The Nature Conservancy Connecticut Chapter in June protected in two purchases in East Hampton and Marlborough a total of 280 acres adjacent to Meshomasic State Forest, New England's oldest state forest. Read Press Release
- The chapter protected 65 acres adjacent to Meshomasic State Forest in southern Glastonbury, New England's oldest state forest, adding to the mosaic of protected land in the region. The Conservancy intends to transfer the property to the state Department of Environmental Protection as an addition to Meshomasic State Forest.

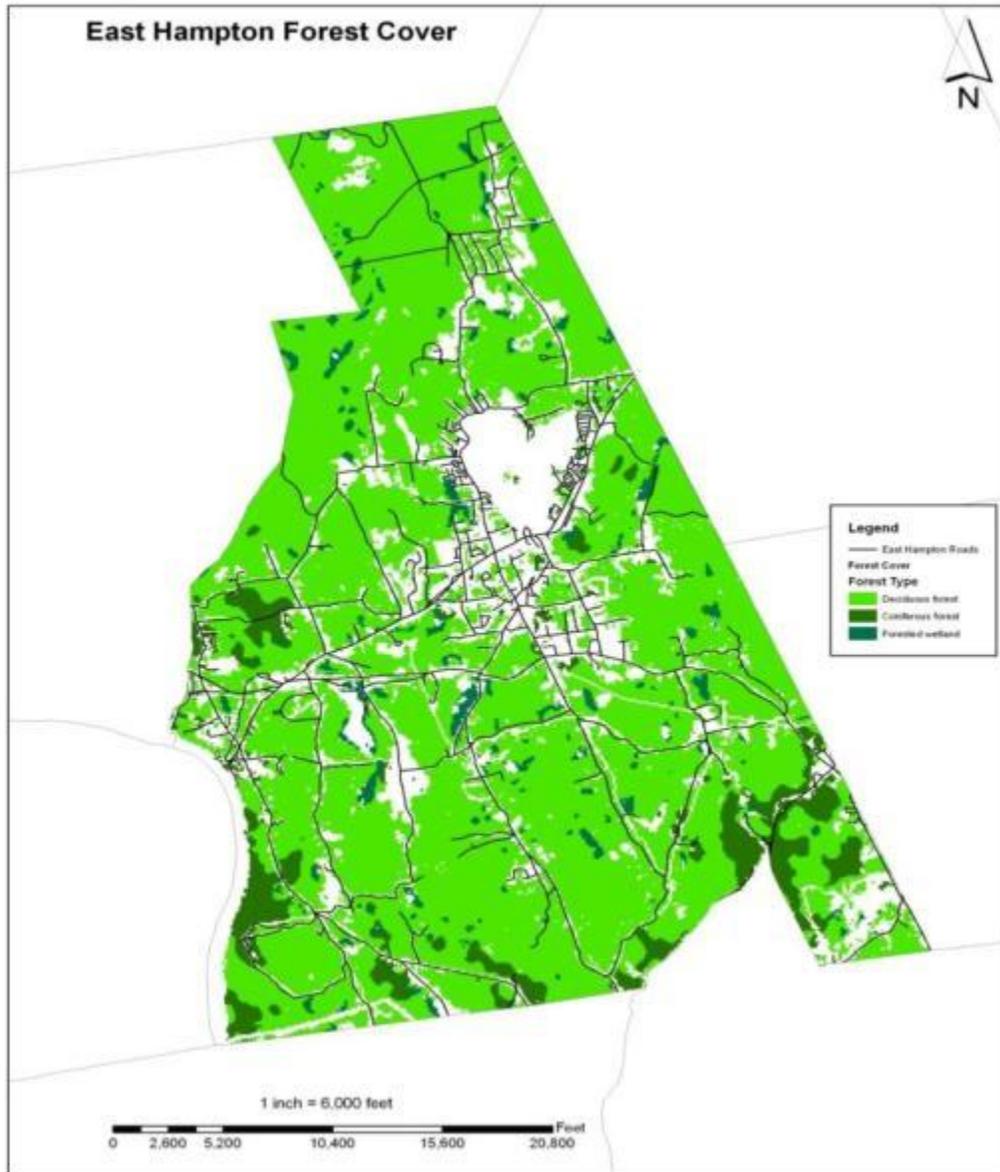
Residential dwellings are encroaching closer and closer into forest tracks. Our wildfire vulnerabilities are increasing. This issue came out during the Public Workshop. Because of financial cutbacks and limited resources, historic fire roads have been allowed to become overgrown and are no longer passable by local fire or brush trucks. This is particularly true of State forests.

The “Ten Curves Fire” was a large fire that Between May 4th and 6th, 1930, 2,300 acres of forest burned in Marlborough and East Hampton.

State Forests	Towns	Acres	Day Use
Meshomasic	East Hampton, Portland, Glastonbury & Marlborough	9,118	X

**Figure 9:** State Forests in East Hampton.

Source: DEEP, Forestry Division



**Map 4:** East Hampton Forest Coverage

Source: RiverCOG

## **VIII East Hampton MITIGATION STRATEGIES**

### **A. Authorities, Policies, Programs, and Resources**

The town of East Hampton has many available policies and resources at its disposal for mitigating effects of natural disasters. For example, its flood plain regulations allow the Town to control growth and expansion within flood zones. The town has the authority to order parking bans in the event of a snow storm and is well prepared for all but the very worst of snow storms. The Town of Cromwell uses the State Building Code for code compliance to ensure safe structures which withstand 110 mph wind speed and appropriate snow load. The town also has the authority to order backup water supplies to be installed in new subdivisions when water for firefighting is not sufficient. In additions, the town can set up and often does set up shelters, cooling centers, and heating centers when needed for residents.

#### **Storms**

- Land use planners and regulators have taken into serious consideration restrictions on the building of, and or winterizing of buildings in designated or known flood risk areas.
- Continue monitoring DEMHS, DEEP, local press and radio and TV for storm warnings.
- When a serious flash flood warning is issued, advise the public of the dangers of driving through moving flood waters.

#### **Crisis Communications Plan**

- Following Crisis Communications Plan guidelines, keep public and responders aware of “what is going on” and certain storm specific warnings; e.g.; “don’t touch downed power lines”, “don’t drive through flowing water”, availability of shelters, etc.

### **B. NFIP and Community rating System**

See the Flood section of this (local) Plan and the Regional Section for information on the National Flood Insurance Program

East Hampton does not participate in the CRS; but should consider it.

The Community Rating System (CRS) is a part of the NFIP. When communities go beyond the NFIP’s minimum standards for flood plain management and participate in the CRS, discounts may be available on flood insurance premiums for policy holders in those communities.

### **C. East Hampton Goals and Objectives**

Goals and Objectives can be found in the East Hampton Mitigation Action Plan Section of this local Plan Section VIII.C and (overall) in the Regional part of this Plan, Section IV.3.

#### **D. Mitigation Actions**

Prioritized mitigation actions with costs (where known) can be found in the East Hampton Detailed Mitigation Action Plan Section VIII.H. The following is a list of entities within the Town followed by some current mitigation activities and some others that are suggested for the future.

**Administration:** Current and future loss prevention is, and will continue to be sourced through local, regional, State and Federal efforts for updating maps, local regulatory actions, and insurance efforts (National Flood Insurance Program). Also capital improvement funding made available from State and Federal sources for infrastructure improvements.

#### **Public Works:**

- Continues to monitor culverts and bridges that clog by maintaining debris collections above and for prevention of ice damming.
- Continues to look for funding for culvert and bridge maintenance considering local budget restraints and State grants availability.
- The Town should have a Debris Management Plan in place.
- Continue monitoring Flood Warnings from DEEP and DEMHS.
- Currently requiring private compliance with CGS §22a-402(b)-(f); dam inspection requirements. Local dam owners including the municipality are responsible for periodic evaluations of their dams and making repairs as needed.
- Is continuing its historic responsibilities and new ones as a designated responder. And they are aware of the herculean responsibilities a major hurricane will bring.
- Assumes the primary responsibility for municipal building and critical infrastructure.
- The Public Works Crew will stabilize unstable stream and road bed bankings to the fullest extent allowable by DEEP, and local agencies.

**Emergency Services:** have mutual aid agreements in place with neighboring municipalities. There is also a statewide mutual aid agreement in place. These will be kept current.

#### **Emergency Management** will:

- Will continue to enhance EOC capabilities.
- Public health employees are now designated as responders<sup>37</sup>
- Public Works employees are now designated as responders<sup>38</sup>
- East Hampton has always had a very strong Emergency management program in place.
- Annually practice/drill/exercise their capabilities regionally and statewide.
- They offer direct assistance in training/exercise sessions to the fire department, police department, public health and administration when needed.

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<sup>37</sup> Responders Vs First Responders

<sup>38</sup> Responders Vs First Responders

- East Hampton has a very active CERT. (Community Emergency Response Team) A team of volunteers that assists in mitigation activities such as planning, training and exercising of sheltering, Points of Distribution (emergency medication distribution) and other responder activities.

**Emergency Operations Center** The EOC management continues to have access to WEBEOC for current information and assets available (mitigation actions) for the emergency response and recovery modes.

**Funding:**

- Through local direct assistance to fire fighter, law enforcement, call center improvement, emergency management grants, EMS assistance, etc. emergency responders are continuing to seek funding to enhance their response capability.
- The direct to the regional planning agency grants have gone away. Now the Department of Emergency Management and Homeland Security passes on FEMA grants to the five regions they have designated. East Hampton is a part of Region 3.
- The primary funding source for local infrastructure mitigation is through the local budgeting process. This is supplemented through regional, State and Federal grants. See Alternative Funding Sources, Regional Sections of this Plan, Section I I.B.3&4.

**Notifications:**

- The emergency management team does and will continue to maintain multimedia communications to stay tuned to local media and DEMHS (e-mail) for bulletins.
- NOAA broadcasts the potential when conditions are right to, say spawn a tornado. When the threat exists, EM will monitor the early warning system.
- Public Notifications: The Public will continue to be notified to stay tuned to local media for severe weather bulletins.
- Reminders will also be sent out about the dangers of driving through rushing waters and going near downed wires.
- **Residents and vulnerable businesses** will be reminded to continue in their efforts of flood proofing.

**Social Services:** Social services are in a position to continue in assisting in notifications of people with functional and other special needs.

**Public Health and Social Services:**

- Works closely with the State in preparing for the needs of people with functional needs
- Continue to enhance, and exercise shelter activities; both short and long term, for citizens during power outages, hurricanes, wind storms, ice storms, heat waves, and extreme cold.
- Sheltering activities includes participating in local and regional exercises.
- The East Hampton Health Department is part of the Chatham Health District....which is headquartered in East Hampton, is active in local regional

(Middletown area) and Region 2, 3 and 4 planning and exercises. There is a focus on enhancing exercise shelter activities; short and long term for citizens during power outages and evacuations. This is also particularly true of working with Special Needs and Fixed Populations:

**NGOs:** Emergency management works with **Non-Governmental Organizations** in preparing for storm emergencies. These include the American Red Cross, faith based agencies, Salvation Army, senior centers, Rotary, etc.

**Land Use Planners:**

- Regional and East Hampton land use planners have worked with FEMA and its contractors on flood plain development planning. We began working on the revised FIRM maps at a workshop May 17, 2005. East Hampton signed off on the maps August 2008.
- The planners are aware of flood hazards throughout the Town particularly in designated flood plains. They will continue to:
  - Monitor trends in number of permit requests in vulnerable areas
  - Monitor evolving vulnerable areas where development may occur
  - Encourage open space in vulnerable areas
  - Encourage municipal acquisition of buildings in flood plains and creation of open space.
- Monitor expected growth or development over the next 10, 20 years.

**Schools:** The Schools, working with Emergency Management have severe weather plans in place, modeled after: Snow Days. They also have a NOAA provided weather alert radio for monitoring weather events.

**Special Situations:**

**People with Functional Needs (formerly; Special Needs) clusters:** The East Hampton /Chatham Health District and Emergency Management shall continue to participate regularly in sheltering exercises. This includes handling people with disabilities. DEMHS Regions are working on enhancing programs for working with people with disabilities.

**Fixed Populations:** These initiatives are ongoing including activities: locally, regionally and Statewide. This population includes those individuals unable to evacuate due to a physical disability or clusters of elderly or those with functional medical needs that shelter-in-place. Emergency management is also aware of the local State facilities that they are responsible for. However it may fall on the responsibility of the municipality; such as a group home.

**Pet Evacuation and Sheltering:** Municipal officials should continue to make a special effort to identify, at risk local animal population pets and livestock. They should be aware of owner notification requirements (e.g. sheltering available) and transportation needs.

The Town of East Hampton Emergency Operations Plan, as updated in 2006, addresses in detail the evacuation and sheltering of animals.

Emergency management and animal control authorities have available (from Region 2 & 3) portable pet shelters to be set-up adjacent to human shelters.

Under the latest Americans with Disabilities Act (ADA) guidelines Service Animals are now specifically defined as Service Dogs. The only allowable exception is miniature horses. They have specific qualifiers.

**E. Incorporation of Other Plans**

See the Regional Section of this Plan for authorities, responsibilities and other<sup>39</sup> plans incorporated into the natural hazard planning; past and going forward. (Sections I, II and particularly IV)

Local land use plans apropos to natural hazard protection will be watched for ramifications to the natural hazard planning process. These plans include regional, State and Federal plans. See Section I, Part E.2

**F. Proposed Mitigation Strategies**

The municipality of East Hampton has a variety of mitigation actions currently in place. They are not limited to brick and mortar.

Go To this local Annex, Section III

**7. Events and Actions in Place**

Event	Potential	Loss Potential	Actions and Projects in Place?
Flood	H	H	Y
Hurricane	H	H	Y
Thunderstorms	H	L	P
Tornadoes	M	H	P
Nor'easter	H	M	Y
Extreme Cold	H	L	Y
Heavy Snow	H	M	Y
Ice Storm	M	H	Y
Forest Fires	M	H	Y
Extreme Heat	H	L	Y
Earthquakes	L	M	N
Landslides	L	L	N/A
Y=Yes, N=No, P=Partial, N/A = Does Not Apply			

**Figure 10:** Possible Events and Actions in Place.

<sup>39</sup> Meaning other than natural hazard mitigation planning

**Land Use Planning:** East Hampton officials, led by the Town Manager works with RiverCOG on Land Use. East Hampton signed off on the FIRM maps August 2008.

**G. Planning Team Recommendations**

The Planning team recommends the following:

*TDSR (Temporary Debris Storage and Reduction Site Plan*

East Hampton needs to have a current plan in place for managing the massive amount of debris as a result of a hurricane hitting the area. 100 MPH winds and up would cause major destruction to our trees and in many cases power, cable and telephone lines. A Category 2 or higher hurricane may take down 80% of the mature growth trees many hanging over power lines along local and state roadways. East Hampton should develop a Debris Management Plan, especially including a debris temporary storage site.

*Erosion Protection*

Through legislation change, require the DEEP to allow banking protection from erosion.

*COOP/COG*

Develop a Continuity of Operations Plan/Continuity of Government Plan.

*Community Rating System*

East Hampton should consider participating in the CRS.

*Weather Awareness:*

All municipal departments and local agencies will continue to listen for NOAA broadcasts and other emergency broadcasts, when conditions are right for a severe storm: significant rain event, heavy wind, tornado, hurricane, etc. They will then activate their emergency plan.

## H. East Hampton Mitigation Action Plan

### 1. Prevention

East Hampton has rigorous land use regulations designed to protect natural resources and restrict development in flood zones and other hazard-prone areas. These regulations help prevent the loss of life and property by preventing inappropriate development in flood zones and reducing the amount of storm water discharge that may exacerbate flooding.

The Zoning Regulations restrict all new construction and substantial improvements in the 100-year flood plain as depicted on the most recent revision of the Flood Insurance Rate Map (FIRM). Substantial improvements mean any combination of repairs, reconstruction, alteration, or improvements to a structure taking place during a ten-year period, the cost of which equals or exceeds 50% of the market value either before the improvement or repair is started or, if the structure has been damaged, before the damage occurred. In these cases, all residential construction must be elevated to or above the base flood elevation. Likewise, all non-residential construction must be elevated or flood proofed to or above the base flood elevation. In regards to elevated buildings, the areas below the base flood elevation must allow floodwater to flow in all directions, and the building must have at least one access route above the base flood elevation. In addition, the regulations prohibit all encroachments in regulated floodways.

The Subdivision Regulations build upon the Zoning Regulations to offer additional preventive measures during the site plan submittal process. Specifically, the regulations require a storm drainage plan that minimizes runoff and maximizes infiltration before discharging storm water into wetlands and watercourses. If storm water discharge will overload existing downstream drainage facilities, the storm drainage plan must provide adequate retention or detention of the runoff. Furthermore, the regulations require the protection of natural features including those that contribute to the natural functioning of the natural drainage system. In addition to flooding, the regulations address damaging winds as a result of severe storms. For instance, utility lines are required to be buried for new subdivisions and are encouraged for certain projects such as major road projects. These land use regulations are described in detail in the Zoning Regulations and Subdivision Regulations available at the East Hampton Town Hall.

The Building Department, the Inland Wetland Agency, and Public Works Department carries out additional activities that help prevent the loss of life and property as a result of natural disasters.

The Building Department ensures conformance with the Connecticut State Building Code including flood resistant construction and with elevation certification (Section 3107).

The Inland Wetlands Agency, through its Inland Wetlands and Watercourses regulations, works toward the conservation of wetland resources through avoiding impacts from development on functional wetlands and watercourses. The Commission also seeks to restore and enhance wetlands that have been degraded.

East Hampton implements an as-needed program for tree maintenance.

Whenever possible, Public Works examines and clears public storm drains and grates of debris during periods of rainfall, snowfall, and storms.

Public Works corrected a drainage problem to prevent icing on Gadpouch Road, removed sediment in catch basins throughout town to maintain unobstructed drainage.

## **2. Emergency Services**

East Hampton uses warning systems and emergency planning to help protect life and property before, during and after a natural disaster. For instance, the Town is in the process of developing a database of resident's contact information to be used with the Everbridge notification system. The Town will keep residents informed during emergencies with locations of shelters, hours of operation, availability of food, water and showers, locations of charging stations, road closures and special emergency instructions.

## **3. Natural Resource Protection**

Zoning and Inland Wetland regulations regulate activities that could have an adverse impact on natural resources.

### Salmon River Watershed Partnership

East Hampton worked with the Horsley Witten Group, Inc. to update the Subdivision Regulations and the Street Standards to reduce storm water runoff and help protect the Salmon River Watershed from adverse impacts from future development.

## **4. Challenges**

- East Hampton regularly receives proposals for commercial and multi-family housing projects along Route 66 and areas adjacent to Lake Pocotopaug. Even though storm water discharge is minimized through the municipality's regulations, the cumulative effect of relatively intense land use may increase the likelihood of the lake water quality being adversely affected by the cumulative effect of development adjacent to the lake.
- The Everbridge system is not fully operational since the resident contact information database is not fully populated.

- The business, privately and utility owned dams, even though the owners may have an emergency operating plan for each dam, the plans lack dependable protocols to contact property owners in the event of a dam emergency. A reverse 911 or similar system could provide rapid notification of property owners in the event of a dam emergency.
- Tree debris often results in street closures.
- East Hampton has only one emergency shelter with limited capacity.
- East Hampton needs additional emergency generators to supply electricity to all municipal buildings in the event of an extended power outage.

### **5. Proposed Mitigation Strategies**

East Hampton personnel will review the “Hazard Evaluation and Risk Assessment,” the strengths and weaknesses of its existing mitigation strategies, and the municipality’s challenges.

This review will be used in the development of the goals, objectives, proposed mitigation strategies and implementation schedule. The following criteria were used to assign each supporting task a priority rating of “High,” “Medium” or “Low”.

- Does the supporting task benefit a large number of East Hampton residents?
- Does the supporting task mitigate multiple natural hazards?
- Does the cost of the supporting task seem reasonable for the size of the problem and likely benefits?
- Is there enough political and public support to ensure the success of the supporting task?
- Does the supporting task improve upon existing programs or support other municipal priorities?
- Does the supporting task entail additional staff time that the municipality is unable to commit immediately (an answer of “No” satisfies this criterion)?

Definitions for Priority, Schedule, and Responsible Party, and Cost can be found in Section IV.F on page 111.

**6. Goals and Objectives**

Goal: Reduce the loss of life and property and economic consequences as a result of flooding, high winds, severe winter storms and dam failure.

Supporting Tasks Who When Priority

Objectives 1) Improve the ability of East Hampton residents to prepare and respond to approaching severe weather.

Supporting Task	Responsible Party	When	Priority (see end of section)
Improve the ability of East Hampton residents to prepare and respond to approaching severe weather.	Administration	Ongoing	High
Implement the Everbridge notification system that allows the town to alert various segments of the population depending on the nature of the emergency.	Town Manager	2013-14	High
Acquire emergency generators for Center School, Middle School, and Memorial School.	EMD, BOE	2014	Medium
Provide cots, blanket, food supplies etc. for emergency shelter.	EMD	2014	Medium
Develop a GIS application to assist personnel in the event of an emergency.	Police, Fire	2014-15	Medium

**Goal 2. Reduce the amount of debris from severe storms through preventive tree maintenance.**

Supporting Task	Responsible Party	When	Priority (see end of section)
Budget appropriate money necessary to maintain and remove dead, dying, dangerous, and diseased trees in rights-of-way and on other town land	Public Works	2014	Medium

**7. East Hampton Mitigation Action Items**

Definitions for Priority, Schedule, and Responsible Party, and Cost can be found in Section IV.F on page 111.

Hazard	Priority	Location	Vulnerability	Mitigation	Responsible Party	Schedule	Funding Source	Cost
Hurricanes, High Winds, Heavy Rains	High	Town wide	Hurricane force winds resulting in significant tree loss and road blockage	Develop Debris Management Plan	PW, BOS, BOF	A	CIP, OP	\$\$
Hurricanes, High Winds, Heavy Rains	High	Town wide	95 roads in town provide the only way in or out to residential areas. Access to these areas may be cut off due to downed trees, washed out roads, or traffic accidents.	Purchase additional equipment to clear roads of downed trees, disabled vehicles, or unforeseen obstacles. i.e. chain saws, lifting gear (chains & winches), bulldozer, chipper, wheeled excavator with grapple.	PW, BOS, BOF	B	HMGP, PDM, CIP, OP	\$\$\$
Flooding	High	North Main Street	Triple culverts carrying Christopher Brook under North Main Street are undersized.	Replace culverts with box culvert.	PW, BOS, BOF	B	HMGP, FMA, CIP	\$\$\$
Flooding	Medium	White Birch Road	Bridge on White Birch Road is vulnerable to damage from flood events from Fawn Mill Brook and Loos Pond.	Replace with new larger bridge.	PW, BOS, BOF	B	HMGP, CIP	\$\$\$
Flooding	Medium	Collie Brook Road	Undersized culvert results in roadway flooding	Replace with larger culvert	PW, BOS, BOF	B	HMGP, CIP	\$\$
Flooding	Medium	Route 151	Undersized 3' diameter culvert on Mine Brook results in roadway flooding	Replace with larger box culvert	CT DOT, PW, BOS, BOF	B	HMGP, CIP	\$\$

East Hampton Natural Hazards Mitigation Annex

<b>Flooding</b>	<b>Medium</b>	Wopowog Road	Undersized 24" culvert on Elbow Brook results in roadway flooding and erosion of gravel surfaced road.	Replace with 3' culvert.	PW, BOS, BOF	B	HMGP, CIP	\$
<b>Flooding</b>	<b>High</b>	Lake Drive	Undersized culvert on Hale Brook results in roadway flooding.	Replace with larger culvert.	PW, BOS, BOF	B	HMGP, CIP	\$
<b>Flooding</b>	<b>Low</b>	13 Summit Street	Pocotopaug Creek passes under the old factory building. At high flows the water flows around the building and into lower level windows flooding the lower floor of the building.	Construct high level bypass around the building and under Summit Street	PW, BOS, BOF	B	HMGP, CIP	\$\$
<b>Forest Fire</b>	<b>Medium</b>	Town wide	Proximity to Meshomasic State Forest - Forest Fire	Work with DEEP and Fire Department to develop a Wildfire Plan	Fire Dept., FM, EMD BOS, BOF	A	CIP, OP	\$
<b>Forest Fire</b>	<b>Medium</b>	Town wide	Destruction of structures adjacent to the forest	Need for wild fire and evacuation plan.	Fire Dept., FM, EMD BOS, BOF	A	CIP, OP	\$
<b>Extended Power Outage: hurricanes, Ice Storms etc.</b>	<b>High</b>	Town wide	Fuel shortage for emergency vehicles caused by massive electrical power outage and road blockage due to hurricane or ice storm preventing tanker trucks from delivering fuel.	Elevated, gravity fed 10,000 gallon diesel and gasoline tanks.	PW, BOS, BOF	B	CIP, OP	\$

**IX PLAN MAINTENANCE**

FEMA Regulations – 44 CFR §201.6(d)(3): The Town of East Hampton, working with RiverCOG will conduct a complete review and do a revision if needed and submit it for approval in 5-years. Even if there are no changes, it must be reported, in order to continue being eligible for Natural Hazard Mitigation Grants.

In accordance with Section 201.6(c)(4) of 44 CFR East Hampton will assure the Plan remains an active and relevant document. RiverCOG municipality officials will continue working with East Hampton in the mitigation planning process.

Changes to the Plan can be made at any time to this Plan; however, any change will require a submission to FEMA for approval either as an amendment or as a Plan update requiring re-adoption of the plan by the affected jurisdiction. If there are regional implications, then the entire Plan would need to be re-adopted by all jurisdictions.

Please see the Regional Section V.E. for the maintenance schedule.

See Appendix Q for a sample mitigation planning tool.

**X. PLAN APPROVAL AND ADOPTION**

Upon FEMA Approval Pending Adoption of this Plan, it requires a sign-off by the municipal CEO. The adoption certificate follows. CEO signatures are required on the Regional Section of this Plan.

**THE LOWER CONNECTICUT RIVER VALLEY COUNCIL OF GOVERNMENTS  
MULTI-JURISDICTION NATURAL HAZARD MITIGATION PLAN  
CERTIFICATE OF ADOPTION**

Town of East Hampton, Connecticut

WHEREAS, the Town of East Hampton has historically experienced severe damage from natural hazards and it continues to be vulnerable to the effects of - only those natural hazards profiled in the plan (i.e. flooding, thunderstorm, high wind, winter storms, earthquakes, and dam failure), resulting in loss of property and life, economic hardship, and threats to public health and safety; and

WHEREAS, the Town of East Hampton, has developed and received conditional approval from the Federal Emergency Management Agency (FEMA) for its Hazard Mitigation Plan under the requirements of 44 CFR 201.6; and

WHEREAS, public and committee meetings were held between June 16, 2009 and December 1, 2011 regarding the development and review of the Multi-Jurisdiction Natural Hazard Mitigation Plan; and

WHEREAS, the Plan specifically addresses hazard mitigation strategies and Plan maintenance procedure for the Town of East Hampton; and

WHEREAS, the Plan recommends several hazard mitigation actions/projects that will provide mitigation for specific natural hazards that impact the Town of East Hampton, with the effect of protecting people and property from loss associated with those hazards; and

WHEREAS, adoption of this Plan will make the Town of East Hampton eligible for funding to alleviate the impacts of future hazards; now therefore be it

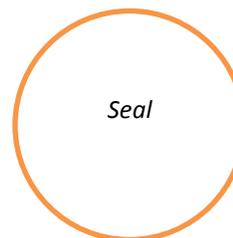
RESOLVED by the Board of Selectmen:

1. The Plan is hereby adopted as an official plan of the Town of East Hampton
2. The respective officials identified in the mitigation strategy of the Plan are hereby directed to pursue implementation of the recommended actions assigned to them;
3. Future revisions and Plan maintenance required by 44 CFR 201.6 and FEMA are hereby adopted as a part of this resolution for a period of five (5) years from the date of this resolution.
4. An annual report on the progress of the implementation elements of the Plan shall be presented to the Board of Selectmen by the Planning and Zoning Commission.

IN WITNESS WHEREOF, the undersigned has affixed his/her signature and the corporate seal of the Town of East Hampton this \_\_\_ day of \_\_\_\_\_, (year).

\_\_\_\_\_

(Name, Title)



**Annex E**  
**Haddam Natural Hazards Mitigation Annex**

**NATURAL HAZARDS MITIGATION ANNEX**  
**TOWN OF HADDAM CONNECTICUT**



**June 2014**

Prepared by:

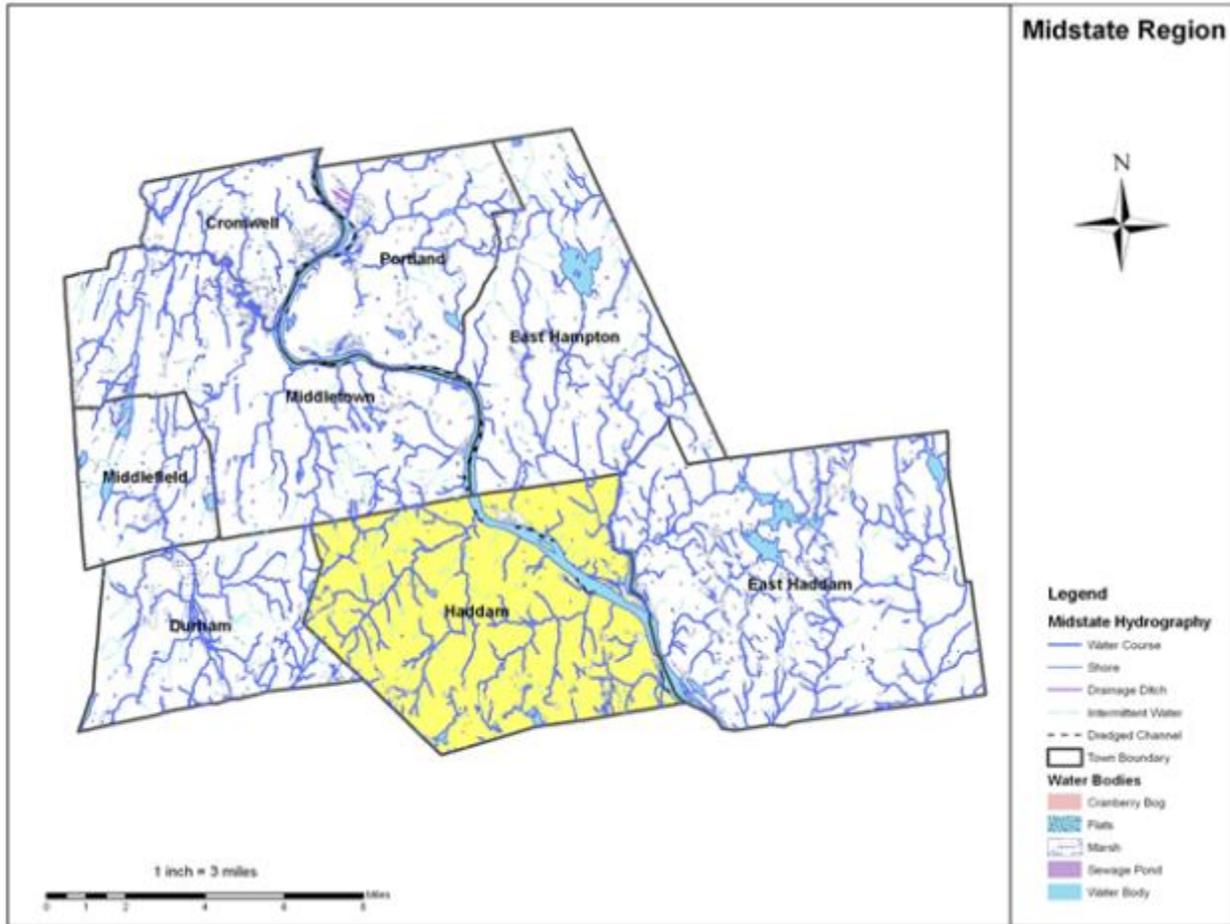
**Lower Connecticut River Valley Council of Governments**

*www.rivercog.org*

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**Map 1:** Haddam within the former Midstate Region  
Source: RiverCOG

*On the annex cover:*

**Photo 1:** Higganum Center during the 1936 flood.  
Source: Haddam Historical Society

**i PURPOSE**

The purpose of this Natural Hazard Mitigation Plan is to identify the natural hazards most likely to affect the area, to locate the vulnerabilities, assess the risks and estimate corrective actions to protect life, limb, property and financial loss. Also, to synchronize this Plan with other local, regional and State; land use, transportation, clean water, wetlands and debris management plans. This Plan will compliment traditional emergency response plans.

According to FEMA, funding these plans and projects reduces overall risks to the population and structures, while also reducing reliance on funding from actual disaster declarations. Pre Disaster Mitigation grants are to be awarded on a competitive basis and without reference to state allocations, quotas, or other formula-based allocation of funds.

See Appendix A for a list of related plans.

This Plan could be considered a long term strategy to reduce the economic consequences of a natural disaster.

**Bottom line:** The most likely event, considered to be hazardous to the population and properties in the region is a natural disaster. Since the tragic events of September 11<sup>th</sup>, 2001 municipal administrations, planners and emergency responders have overlaid terrorist attacks onto their chemical, biological, radiological, nuclear, and explosive (including fires) standard operating procedures and guidelines. Time has passed and now our focus is on natural hazards ... storms.

**ii SCOPE OF PROJECT**

This pre-disaster risk and vulnerability assessment is designed and scoped to identify those areas that are vulnerable to specific or multiple severe weather related events. The Planning Team has evaluated history, current conditions and or state of repair and future potential conditions to develop a prioritized list of structures, utilities, roadways including bridges and culverts that are in need of repair, strengthening or replacement to prevent or minimize loss of life, limb or property. Dam failure (potential) and repetitive loss properties are a good example of areas the Planning Team looked closely at to predict the future. Historical data provides valuable references for future risk. Subject matter experts were contracted by the former MRPA to investigate and report on the repetitive loss properties and hazardous dams in the region.

We looked at all possible natural hazards and categorized them according to the “likelihood” of an occurrence. Flooding was by far the highest on our priority list. Hurricanes could, and historically have happened and we are overdue for “a big one”. We are particularly vulnerable to the wind and flooding effects of a strong Category 1 and up hurricane. As you will see throughout this Natural Hazard Mitigation Plan **we anticipate 80% of our mature growth trees will come down in a major hurricane.** Earthquakes could happen; but are not likely.

Strategies for mitigation, within this Plan are best guess estimates by professionals.

**To readers and stakeholders to this Plan, following is a summary of the local content with highlights for a quick review.**

**Benefit:** The Federal Emergency Management Agency (FEMA) in the Department of Homeland Security recognized the need for more robust “natural hazard” planning and mitigation at the local level. The purpose was to bring the need for proper preparation to the attention of local jurisdictions and regions<sup>40</sup>. A benefit of a natural hazard planning process is to identify those areas, buildings or infrastructure that can be “fixed” to minimize or prevent damage from a major storm. Another benefit of this planning process is if a project is identified in the plan, then the municipality or region can request a grant under the Natural Hazard Mitigation Grant Program to mitigate the risk. Another benefit is; if a project is identified in this Plan and it is damaged or destroyed in a storm, funding can be obtained under this program to replace the damage to what it should have been, as identified in the Plan. Otherwise disaster relief funding will only allow for rebuilding to: as it was.

Another benefit of this planning process is an awareness of a need to revisit the other related plans.

Planning Process Benefit: Throughout the NHMP planning process all departments and vulnerable stakeholders were reminded of; or became aware of local vulnerabilities that mitigation projects could protect them from loss of life, limb or property. This is

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<sup>40</sup> *In Connecticut we have regional planning agencies, organizations or councils of governments performing the planning functions traditionally done by county governments in other states.*

particularly true of critical infrastructures. The interest/awareness level here is high; given the DEMHS and DEEP activities in the last ten years.

This Plan and mitigation strategies take into consideration the following potential major natural hazard events: floods, hurricanes, winter storms, wind storms, extreme cold, earthquakes, drought, wildfire, extreme heat, and extreme cold.

Each natural hazard and subsequent risk has been evaluated to set-up the vulnerabilities of the municipality and region.

<u>RISK*</u>							
EVENT	LIKELIHOOD	VALUE	LOSS POTENTIAL	VALUE	Financial Impact	VALUE	TOTAL
Earthquakes,	L	1	M	2	L	1	4
Extreme heat,	H	3	L	1	L	1	5
Fires,	M	2	M	2	L	1	5
Floods,	H	3	H	3	H	3	9
Hurricanes,	H	3	H	3	H	3	9
Landslides,	L	1	L	1	L	1	3
Thunderstorms,	H	3	L	1	L	1	5
Tornadoes,	L	1	H	3	M	2	6
Tsunamis,	0	0	N/A	0	N/A	0	0
Volcanoes,	0	0	N/A	0	N/A	0	0
Winter storms (extreme cold)	H	3	M	2	L	1	6
* Risk: risk of life, limb, property and/or financial impact H=High (3); high priority , M=Medium (2) ; medium priority, L=Low priority (1); a priority; but not high or medium. Table II-3							

**Figure 1:** Risks potentially facing the town of Haddam

The impact of these events was evaluated based on: presence of vulnerable populations; well-being of the residents and businesses; vulnerable structures; vulnerable infrastructure and financial exposure to the municipality.

Also followed are guidelines from the National Flood Insurance Program under the Federal Insurance Administration, which enables property owners to purchase insurance protection against losses from flooding. Generally if a property does not have a mortgage, where the lender requires flood insurance, they may not have a policy. Where known we have listed them.

**Highlights of this Regional/Local Natural Hazard Mitigation Plan**

That document includes historic photos documenting the local needs for mitigation, plus other locally valuable information and documentation not required under the FEMA NHMP Guidelines.

**Project Input:** Input for this Plan was gathered through the direct involvement of municipal staff, the public and the close relationship with the former MRPA. This input, including past and present projects, contributed to ongoing mitigation strategies which will result in future mitigation projects.

All these activities provided an opportunity for public input.

**Meetings and participation:** Meetings, throughout the planning period, were held with Town employees, the administration, the public, individual department heads and local historic society representatives. Additionally a great deal of historic information came from regional and state libraries.

Participants in the planning process can be found in the Planning Process part in the Regional Section of this Plan, and here in Section II.

**Key Departments in planning:** The two key departments contributing to the Plan were Public Works and Emergency Management. The First Selectman's office was very helpful in arranging for meetings and seeking sources of information. All employees and volunteers concurred there is a need for this planning exercise. The First Selectman will carry the Plan through adoption.

**Fixed Populations:**

- There are no long term incarceration facilities in Haddam... only holding cells.
- In neighboring Middletown there is a large State Mental Hospital
- Emergency Management, Public Health and Social Services work closely with local Convalescent hospitals, rest homes and senior citizen housing clusters in evacuation and shelter planning. Health Department personnel actively participate in local and regional public health emergency planning. This includes the statewide emergency management regions. At this time the Regions (2&3) are working on a Regional Support Plan addressing mitigation plans for protecting the public.

**Regional Pet Sheltering:** Grant monies have been and will continue to be sought for funding a regional pet holding area. Historically these were called "dog pounds". These facilities can "back-up" the Pet Shelters adjacent to People Shelters.

**Non-FIRM flooding vulnerable areas:** Non flood plain areas vulnerable to flooding are within the scope of this planning exercise; though not in the FIRM plan.

**Non-Disclosure; Repetitive Loss Properties:** The Federal Privacy Act 1974 prohibits public release of the names of policy holders or recipients of financial assistance and the amount of the claim payment or assistance. Therefore only the highlights are listed in this plan

**Hazard Monitoring:** Because we have frequent floods in recent years our monitoring activities are real-time. Throughout this Plan appropriate flooding photographs are shown.

**Funding Opportunities:** The local budgeting process is the primary source of funding for mitigation projects. Through adoption of this Plan it is hoped additional funding and grants will be available. Funding sources are discussed in Section I of the Regional section of this Plan.

**Planning Process:** Town planners' engaged in this project range from local planning departments, to this Agency and to outside engineering firms. In all cases they participated in this Project. See the Section II for participants and the planning process in the Region Part of this Plan and sections I, II & III of this Annex. Also Section VIII for ongoing NHMP Actions and Planning

**Mitigation Actions:** Prioritization of mitigation actions has been settled in each jurisdiction; simply put ... the CEO made the decision. BUT, we acknowledge a current failure can move a project to the head of the list

The carrying-out of the mitigation actions is a function of cost-benefit studies and availability of funding. . It is also understood that local budget spending is subject to conflicting interests in the available budget \$\$\$. E.g. school projects versus a particular road repair. Infrastructure mitigation projects can be a balancing act... by the Director of Public Works, subject to the administration's wishes.

**Updating current NHMP:** There are no current NHMPs in place to update. After Plan adoption, if the need arises, elements can be updated annually.

**Public Outreach:**

For emergencies we have a FEMA/DEMHS Crisis Communications Plan in effect. It is outlined in our EMERGENCY OPERATIONS PLANS which MRPA assisted in the writing of. Notifications include postings on the local websites, the DEMHS 211 site and Press Releases.

For the development of this Plan the Mayor of Middletown issued a regional press release, advising the public of the Plan being in the works and requested they contact their local authorities and to watch for public workshops being held. For Public Outreach content, see Regional part of this Plan, Section IV and this local Annex Section IV

**Natural Resource Protection:** Advocates for protection of natural resources are ever present at meetings where projects are discussed that have the potential to affect natural resources. This also includes State Projects. Haddam officials are very aware of protecting the environment. If areas are reclaimed during the hazard mitigation process, the space will be left as open space.

**Goals and Objectives:** Staff and planners, very early on in the process established goals and objectives to accomplish them. A brief synopsis of the Goals and Objectives can be found in the Regional and local sections of this Plan.

**Loss Reductions:** Mitigation goals are to reduce losses to life, limb and property ... and costly reductions in municipal services. Throughout the Plan there are references to actions to be taken to reduce losses.

**Actions monitoring:** Section III Part 6 Mitigation Action Plan. is the spreadsheet of prioritized projects in need of repair and/or replacement. This is the working playbook by which the municipality will work going forward. Section III, this Annex, indicates the department or agency responsibility for these actions.

**Municipal Approval:** In order for Haddam to qualify for future funding opportunities under the Natural Hazard Grant Program, this Plan must be “adopted”. See Section XIII.

**I DEMOGRAPHICS**

**A. Town Profile**

The Town of Haddam comprises 43.9 square miles just south of the geographical center of the state along the banks of the Connecticut River. It lies about 24 miles south of Hartford and about 22 miles northeast of New Haven.

Route 9 bisects the town in a north-south direction with 3 exits leading directly into the town (although the interchange of Exit 7 and Route 9 lies in Chester, the 2.5 mile off-ramp ends on Route 154 in Haddam).

Haddam has a Selectman-Town Meeting style of Government and shares a regional school district (#17) with neighboring Killingworth. Haddam is the only town in Connecticut separated by the Connecticut River without a bridge to connect the two parts. This leads to resident having to travel through two other towns to travel between the two parts of Haddam. This presents certain logistical challenges.

**B. Population Density**

Area	Population (2000)	Housing Units	Area (sq. miles)	Density per Square Mile of Land Area	
				Population	Housing Units
Middlesex County	165,626	74,837	439	449	203
Haddam	8,346	3,504	43.9	190	80

**Figure 2:** Population and density.  
Source: 2010 Census

Town	Population Group	Census 2000	CT State Data Center Projected Population					
			2005	2010	2015	2020	2025	2030
Haddam	Total Population	7,161	7,481	7,662	7,731	7,785	7,827	7,835

**Figure 3:** UConn Population Projection study.  
Source: CT State Data Center at UCONN

**II THE LOCAL PLANNING TEAM**

The Haddam Natural Hazard Mitigation Planning Team leads were; Alice Zanelli, Phil Goff, Jennifer Donset, Bruce Grotta, and Liz Glidden. Additional contributors can be found under Responsibilities, Part VII of this Section.

Sources utilized to identify the local vulnerabilities at risk:

Personal knowledge: RiverCOG staff; municipal elected and appointed officials, emergency management director, public works officials, municipal planners, P&Zs, FEMA HAZUS-MH, State CT Disaster History; FIRM Flood plain Maps (revised to August 2008), CCM Historic Connecticut Scenarios CEO Workshop (2004); a subject matter experts on National Flood Insurance and another on hazardous dams, the local historical society and public input. Also utilized was information from State DEEP (now DEEP) and DEMHS interviews. A major contributing factor is the RiverCOG staff has an in-depth knowledge of local DOT plans, emergency operations plans, potential risk assessments and debris management planning efforts

**III MITIGATION ACTION RESPONSIBILITIES**

**Haddam Risk Assessment Responsibilities**

There are many entities linked to various vulnerabilities throughout town.

Figure 4, below, details which parties are responsible for assessing damage and overseeing repairs that would be needed after the various natural hazards. Many of these same responsible parties can be found in the mitigation action items found at the end of this Haddam Annex.

HADDAM RISK	Responsible Party State/Federal	Responsible Party		
		Assessment	Mitigation	
Flash floods	DOT	PW	PW	Operations & Capital Budget/* /NHMP
Floods	DEEP	PW, EM. RiverCOG	PW	Assessment (Owner) /reporting requirements Local Admin) see Hazardous Dam Report

Haddam Natural Hazards Mitigation Annex

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Snow	NFPA	Fire/Fire Marshal	Owner	Admin Ordinance
Flood, Draught	DPH	PW Water/Sewer/HD	PW Water/Sewer/HD	HD ordinances and monitoring
Floods	EPA	Admin	Admin	Admin Manage
Thunder Storms, Floods	DEEP/EPA	Fire/Fire Marshal/EM	Fire/Fire Marshal/EM	Manage with DEEP
Wildfire	DEEP	Fire	Fire Marshall	P&Z - restricting building/ Fire Plan and practice (with DEEP, Forestry)
Floods, power outages	DEEP	local Emergency Manager/PW/PH	PW	PW Loss of Power Plan current
Hurricane/Ice Storm/Wind Storm	DEEP/DEMHS	PW	Management Plan	ADMIN/PW facilitate the writing of a DMP plan
All storms	DPH	Health Department	Health Department	PH Plan
All storms	DPH	Social Services/HD/EM	Social Services/HD/EM	EOP,& PH Plan maintenance and Shelter exercising
Flood	NFIP	P&Z	Owners	Owners have NFIP coverage (Elevate/relocate/flood proofing)
Flood	NFIP	P&Z	Owners	Owners continue coverage (Elevate/relocate/flood proofing)
Flood	NFIP	P&Z	Owners	Owners continue coverage (Elevate/relocate/flood proofing)
Flood	NFIP	Admin/PW/EM	Admin	Elevate/relocate/flood proofing
Flood	DEEP/DEMHS	EM	PW	Develop a Plan of prevention
All storms	DEMHS	EM & LUO	All disciplines in EM	Participation in regional planning - REPT
All storms	NU/CL&P	EM & Responders	NU/CL&P	Public Notices (Crisis Communications Plan)

**Figure 4:** Natural Hazards and Responsible Party

#### **IV PUBLIC OUTREACH**

There are a variety of modes of communication with the public, see Regional Section IV.

Municipal responsibility to the public:

- People in vulnerable areas should monitor Flood Warnings:
- People with structures in vulnerable areas; specifically in flood plains should have a flood evacuation plan and participate in the National Flood Insurance Program. They should flood proof their buildings
- The municipalities will post storm info on their websites including proper preparations and warnings. DPH and DEMHS seasonally post info on their websites.

FEMA and the American Red Cross have extensive information and checklists for preparing for a major storm. The website [READY.gov](http://READY.gov) has preparedness information. Section IV of the Regional Section of this Plan, the PUBLIC OUTREACH part, highlights information sources available.

#### **V PUBLIC ASSISTANCE**

A funding source option for mitigation projects is FEMA, Public Assistance. This is for repair, restoration or replacement of municipal facilities damaged by a storm...if a disaster has been declared.

There are two avenues of Public Assistance: Pre-Disaster Mitigation and Disaster Mitigation.

Property Acquisition and Relocation for Open Space is an example of pre-disaster mitigation. FEMA Pre Disaster Mitigation Program (PDM). Section 404

Damaged property reimbursement, after a disaster declaration is the other (Stafford Disaster Relief and Emergency Assistance Act, 42 U.S.C §5121, et seq. Section 406). Under this program Individual Assistance (includes residences and businesses). It should also be noted that low interest SBA loans for rebuilding are also available. There is also an ONA assistance program available if all the above fail....(Other Needs Assistance)

The later has a crossover PA element to the other; causing confusion CT March 2010 is an example. Disaster Mitigation will only allow a rebuild to “the way it was”. Pre-Disaster Mitigation allows for rebuilding to the “way it should be”.

FEMA - Hazard Mitigation Assistance (HMA)

- Guidance on Property Acquisition and Relocation for the Purpose of Open Space
- Recent amendments to Title 44 of the Code of Federal Regulations added a new Part 80,

- Property Acquisition and Relocation for Open Space. More detailed guidance to assist with implementation of the provisions found in Part 80 has also been developed. This property acquisition and relocation guidance applies to all FEMA hazard mitigation grant programs. It is included in the FY09 Hazard Mitigation Assistance (HMA) Program Guidance at Section 2.3.13 and also governs this project type under the Hazard Mitigation Grant Program (HMGP) in place of previous desk reference sections. The property acquisition guidance section must be read in conjunction with the overall requirements for each grant program including the HMGP.

The Part 80 rule and implementing property acquisition guidance are effective for all disasters declared on or after December 3rd, 2007 (12/03/2007).

The following excerpt is from FEMA Public Assistance (PA) guidance:

*FEMA Public Assistance (PA)*

**Public Assistance** The Department of Homeland Security (DHS) Appropriations Act, 2007, Public Law 109-295, directs the Federal Emergency Management Agency (FEMA) to conduct a Public Assistance (PA) Pilot Program. The legislation sets forth three goals for the PA Pilot Program: reducing the costs to the Federal Government of providing assistance to State and local governments, increasing flexibility in grant administration, and expediting the provision of assistance to States and local governments. The PA Pilot specifically addresses the provision of assistance under sections 403(a)(3)(A), 406 and 407 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, 42 U.S.C. 1570b(a)(3)(A), 5172, 5173 (Stafford Act). These sections relate to debris removal and the repair, restoration, and replacement of damaged facilities.

**Public Assistance Grant Program** The mission of the Federal Emergency Management Agency's (FEMA) Public Assistance (PA) Grant Program is to provide assistance to State, Tribal and local governments, and certain types of Private Nonprofit organizations so that communities can quickly respond to and recover from major disasters or emergencies declared by the President. Through the PA Program, FEMA provides supplemental Federal disaster grant assistance for debris removal, emergency protective measures, and the repair, replacement, or restoration of disaster-damaged, publicly owned facilities and the facilities of certain Private Non-Profit (PNP) organizations. The PA Program also encourages protection of these damaged facilities from future events by providing assistance for hazard mitigation measures during the recovery process. The Federal share of assistance is not less than 75% of the eligible cost for emergency measures and permanent restoration. The grantee (usually the State) determines how the non-Federal share (up to 25%) is split with the sub-grantees (eligible applicants).

- *Eligibility - Overview of eligibility criteria and definitions*
- *Roles and Responsibilities - Information on the duties of Federal, State, and local partners*
- *Public Assistance Grant Program Process - Step by step description of the PA grant life cycle*

- *Policy and Guidance - 9500 series policies and other publications*
- *Frequently Asked Questions (FAQ) - Top 10 questions pertaining to the Public Assistance Program*
- *Resource and Tools - Appeal database, equipment rates, cost estimating format, performance goals, funding trends, and other resources*

### *Applying for Public Assistance*

*Following a disaster declaration by the President, FEMA makes assistance for recovery from the disaster available to eligible applicants. This chapter describes the process through which this assistance becomes available.*

### *Process Overview*

*The PA Program is implemented through the steps listed below, each of which is described in detail in this chapter.*

- *An Applicants' Briefing is held.*
- *Potential applicants submit the Request for Public Assistance.*
- *A PAC is assigned to each applicant.*
- *The PAC holds a Kickoff Meeting with the applicant.*
- *The applicant's specific needs are identified and cost estimates developed through the project formulation process.*
- *Cost estimates for small projects that have been prepared by the applicant are checked through the validation process.*
- *FEMA approves and processes grants for the applicant's projects.*

*Projects. A project is a logical method of performing work required as a result of the declared event. A project may consist of one item of work, such as repairs to a single structure, or work that occurs at multiple sites, such as repairs to several washouts along a road. The applicant is responsible for identifying all work that is required as a result of the disaster. The PAC may assist the applicant in combining various recovery efforts into projects.- FEMA*

## **VI INDIVIDUAL ASSISTANCE**

The following is an excerpt from FEMA Individual Assistance (IA) guidance:

*FEMA and other federal, state, local and volunteer agencies offer disaster assistance in several forms:*

*Low-Interest Loans. Most, but not all, federal assistance is in the form of low interest loans to cover expenses not covered by state or local programs, or private insurance. People who do not qualify for loans may be able to apply for a cash grant. If you qualify, your check will be issued in about three weeks.*

*The Farm Service Agency (FMHA) and the Small Business Administration (SBA), offer low interest loans to eligible individuals, farmers and businesses to repair or replace damaged property and personal belongings not covered by insurance.*

*Cash Grants for up to \$13,400 adjusted (annually for inflation). Individuals who do not qualify for a loan from SBA may be eligible for these grants from FEMA and the state to help recover uninsured property losses. Home inspections are normally conducted before a check is issued. FEMA funds 75% of the grant program's eligible costs with the remaining 25% covered by the state. The state administers the program.*

*Housing Assistance. FEMA's Disaster Housing Assistance Program (DHA) makes funds and temporary housing available to individuals whose home is unlivable because of a disaster.*

*Veterans Benefits. The Department of Veterans' Affairs provides death benefits, pensions, insurance settlements and adjustments to home mortgages for veterans.*

*Tax Refunds. The Internal Revenue Service (IRS) allows certain casualty losses to be deducted on Federal income tax returns for the year of the loss or through an immediate amendment to the previous year's return.*

*Unemployment Benefits. Unemployment benefits may be available through the state unemployment office and supported by the U.S. Department of Labor.*

*Crisis Counseling. Local and state health agencies, the American Red Cross, as well as churches and synagogues may offer counseling to people who have experienced a disaster.*

*Free Legal Counseling. The Young Lawyers Division of the American Bar Association, through an agreement with FEMA, provides free legal advice for low-income individuals regarding cases that will not produce a fee (i.e., those cases where attorneys are paid part of the settlement which is awarded by the court). Cases that may generate a fee are turned over to the local lawyer referral service.*

*Independent Study Programs. FEMA offers an Independent Study Program through the Emergency Management institute.*

*Individuals, families and businesses may be eligible for federal assistance if they live, own a business, or work in a county declared a Major Disaster Area, incur sufficient property damage or loss, and, depending on the type of assistance, do not have the insurance or other resources to meet their needs. - FEMA*

## VII NATURAL HAZARDS

This Haddam section of the Natural Hazard Mitigation Plan contains a variety of localized details complementing the Natural Hazard Section in the Regional Section of this Plan. For overall information on potential natural hazards, see Regional Section III.B.

The profiling of hazards in Haddam is based on a variety of sources and personal observations of recent events and discussions with “the older generation”. During selectmen’s meetings and especially the Public Workshop (31 attendees) we also heard of other concerns...other than the ones we already were aware of. Some comments were expressed with a lot of energy.

Natural disasters can often be predicted. And damage can be anticipated. Crumbling infrastructure does require continuing R & R to minimize costly damage. Utilizing budget allocations and available State grants the current mitigation process is ongoing. Repetitive damage due to storms generally puts a vulnerable project as a top priority “fix” on Public Works “Wish List”.

Storm damage tends to occur repeatedly in the same geographical locations because they are related to weather patterns or physical characteristics of the area (flash and or spring river flooding). However; all areas of the community are vulnerable to one or another type of natural disaster (hurricanes, wind, ice storms, tornados, etc.).

A study of potential natural disasters in this area has shown they are the same as the State’s and Feds Top 4: floods, hurricanes, wind storms, and winter storms. Nationally flooding is the most common natural disaster (NOAA).

Haddam is vulnerable to many types of natural hazards. Flooding is by far the most significant natural hazard with the potential to do harm to people, places and things and to cause financial losses. The second greatest threat is from hurricanes. Therefore the focus of this Plan is on these two weather events.

The core team of Town officials contributed to the input for this Plan including: the Administrative Assistant, Public Works Director and Emergency Management Director. A lady (from the Historical Society) came forward at the Workshop and provided past storm photos. Jennifer Dorsett from NLJ Associates (the contract Town Planner...made major contributions to the Plan. She was replaced by Brian Curtis, who continued the effort.

Hurricane damage is not localized as is flooding. Generally the effects are town wide. Wet hurricanes also create flooding problems.

Wind and snow storms do regularly occur; but the results are not as catastrophic as flooding and hurricanes. The other potential threats are discussed extensively in the Regional Section of this Plan.

Spring flooding threatens the Connecticut River. The marina adjacent to the East Haddam Bridge and the structures just downstream are at risk to large spring floods.

**Likelihood prediction of natural hazards in Town**

Event	RISK*						Total
	Potential	Value	Loss Potential	Value	Financial Impact	Value	
Earthquakes	L	1	M	2	L	1	1
Extreme Heat	H	3	L	1	L	1	1
Fires	M	2	M	2	L	1	2
Flood	H	3	H	3	H	3	3
Hurricane	M	3	H	3	H	3	3
Landslide	L	1	L	1	L	1	1
Thunderstorm	H	3	L	1	L	1	2
Tornado	M	1	H	3	M	2	2
Winter Storm	H	3	M	2	L	1	2
* Risk: Risk of life, limb, property, and/or financial impact H=High, M=Medium, L=Low 3= High Priority, 2 = Medium Priority, 1 = Low Priority							

**Figure 5:** Hazards and Risk in Haddam

**A. Floods**

**1. Introduction**

For Haddam, flash floods are the most dangerous flooding condition as is evidenced by our history of flooding. They are the most significant natural hazard with the potential to do harm to people, places and things.

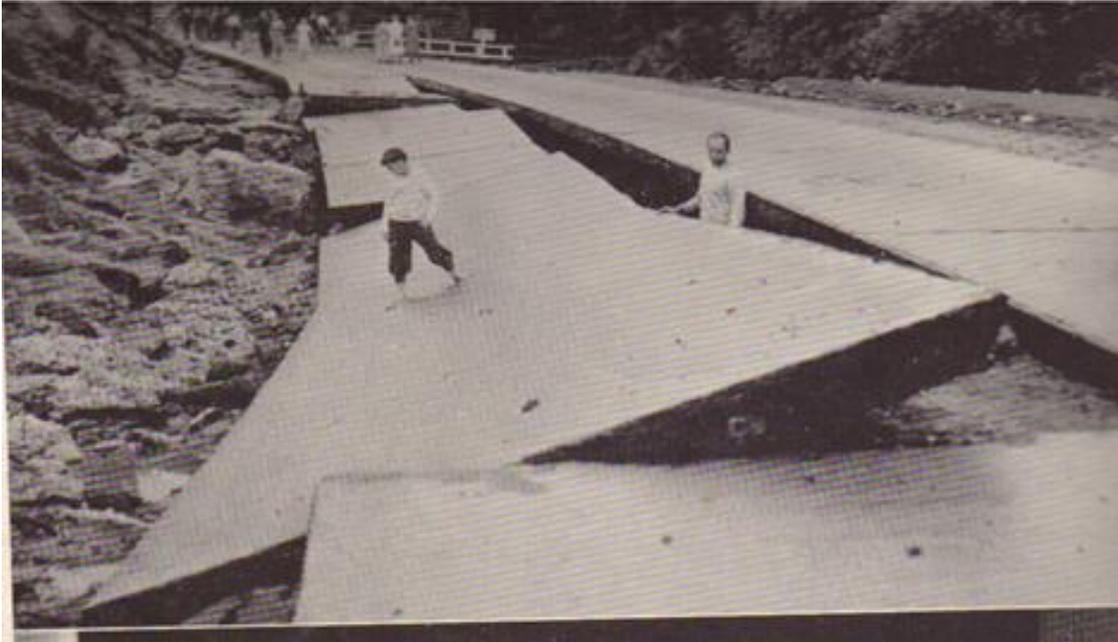
As mentioned they come with minimal, if any warning. There are 56 dams in Haddam; two are rated as high hazard dams and one as a Significant Hazard Dam. Many of the dams could be breached by a sudden surge of a large amount of runoff (flash flooding).

**2. Flash Floods:**

Flash Floods are caused by significant rain events ... a lot of rain during a short period of time or over an extended timeframe. These floods can be violent and come without any advance warning. Flash floods are characterized by high velocity flowing water often accompanied with debris.

The streams passing through Haddam and low lying roads are a cause of concern during significant rain events. See Haddam Mitigation Action Plan for a list of those areas in need of mitigation.

The following photographs show damage caused by flooding that has taken place at various times throughout the Town of Haddam.\



**Photo 2:** Route 9 (now 154) Collapse after flooding from 1938 Hurricane



**Photo 3:** Same as Photo 2, different view.



**Photo 4:** June 1982 Flood in Higganum Center, Brookside Plaza. The flood was exacerbated by dam breaks upstream.



**Photo 5:** Mud left behind after floodwaters receded in Higganum Center after the June 1982 flood.



**Photo 6:** City Savings Bank (Now Citizen's) in Higganum Center after 1982 Flood. Notice the watermark on the door.



**Photo 7:** 1937 Spring River Flooding along then Route 9 (now 154), near Haddam Meadows State Park.

Source for Photos 2-7: Haddam Historical Society

### **3. Spring Floods**

Annual Spring flooding occurs along the Connecticut River. These floods are predictable and slow moving. These floods are typically a result of large snow packs in northern New England melting when the weather warms. The flooding can be exacerbated if there is a large rain storm along the path of the River. Occasionally, such as in 1936 and 1984, these spring floods are especially large, causing the Connecticut River to spill beyond its typical flood plain.

### **4. Haddam Dams**

In the town of Haddam, the Connecticut Department of Energy and Environmental Protection (CT/DEEP) has 56 dams in their dam inventory. Of those 56 dams, two dams are rated as high hazard dams (Class C) and one dam is rated as a Significant Hazard Dam (Class B). The Hazard Classification for the individual dams are from the CT/DEEP website database "High Hazard and Significant Hazard Dams in CT" revised to 8/11/2007.

The State Department of Environmental Protection requires the registration of all dams over the height of six feet. The Dam Safety Section of the Inland Water Resources Division of the Connecticut Department of Environmental Protection (DEP) is responsible for administering and enforcing Connecticut's dam safety laws. The existing statutes require that permits be obtained to construct, repair or alter dams, dikes and similar structures and that existing dams, dikes and similar structures be registered and periodically inspected to assure that their continued operation and use does not constitute a hazard to life, health or property.

DEEP assigns dams to one of five classes according to their hazard potential:

Class AA: negligible hazard potential dam which, if it were to fail, would result in no measurable damage to roadways, land and structures, and negligible economic loss.

Class A: low hazard potential dam which, if it were to fail, would result in damage to agricultural land, damage to unimproved roadways, or minimal economic loss.

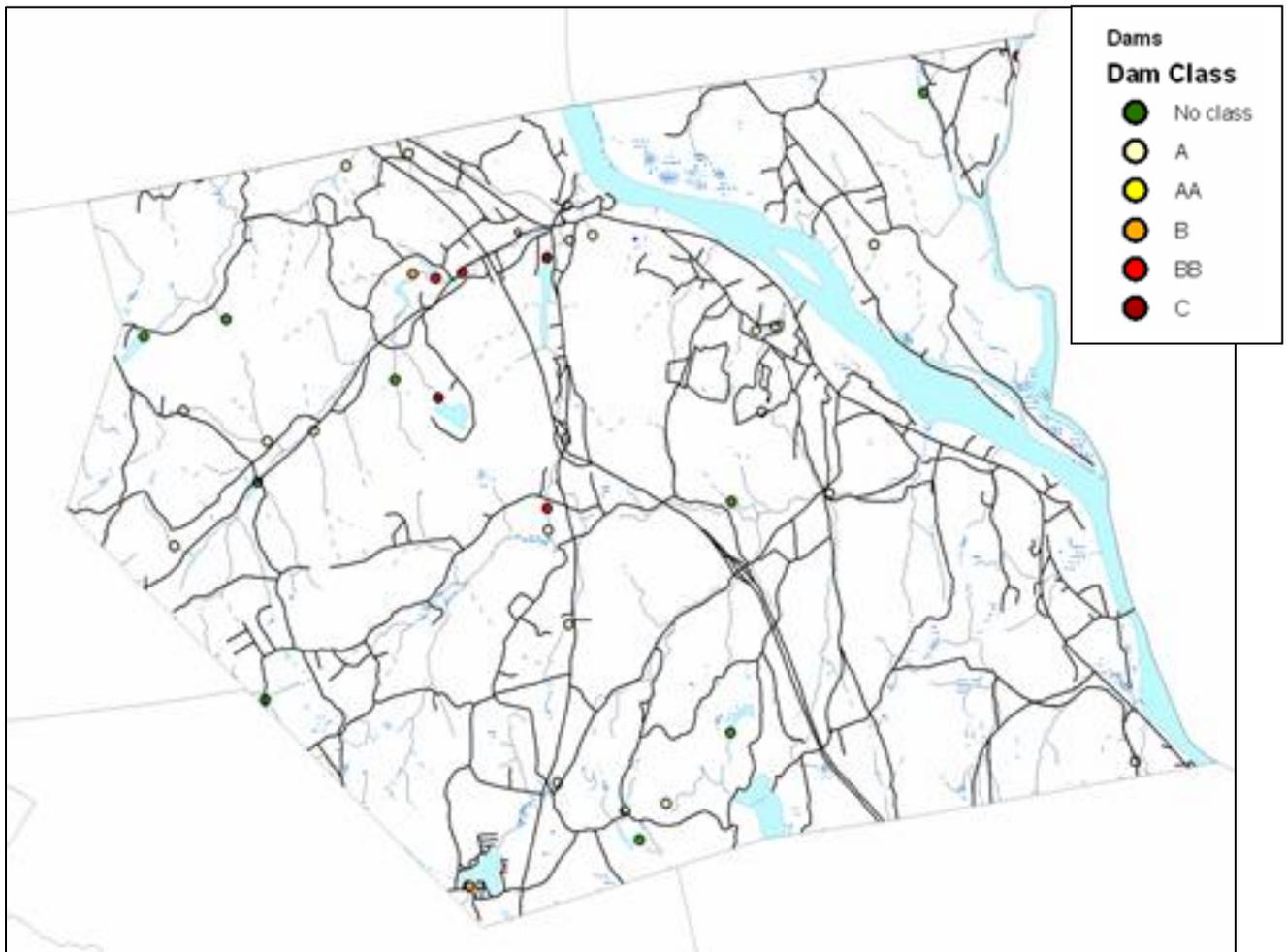
Class BB: moderate hazard potential dam which, if it were to fail, would result in damage to normally unoccupied storage structures, damage to low volume roadways, or moderate economic loss.

Class B: significant hazard potential dam which, if it were to fail, would result in possible loss of life; minor damage to habitable structures, residences, hospitals, convalescent homes, schools, etc.; damage to or interruption of the use or service of utilities; damage to primary roadways and railroads; or significant economic loss.

Class C: high hazard potential dam which, if it were to fail, would result in the probable loss of life; major damage to habitable structures, residences, hospitals, convalescent homes, schools, etc; damage to main highways; or great economic loss.

The classification of a dam can change due to changes in downstream development. 83% of dams in Connecticut fall within the negligible to moderate hazardous categories while only 17% fall within the significant and high hazard categories.

DEEP keeps track of which dams have emergency plans but not all of them would be up to date and not all dam owners will want those plans shared publically. Only the larger significant and high hazard dams would typically have an emergency plan with inundation areas but not all do as it is not yet mandated by state statute or regulation.



**Map 2:** Haddam Dams.  
Source: RiverCOG

The following are the high and significant hazard dams within Haddam:

DAM ID #	DAM NAME	HAZARD CLASS	OWNERSHIP
6101	Higganum Reservoir Dam	C	CT DEEP
6102	Scovill Reservoir Dam	C	Nason Group, LLC
6107	Hidden Lake Dam	B	Hidden Lake Association

**Figure 6:** High and Significant Hazard Dams in Haddam.

Higganum Reservoir Dam #6101

Hazard Classification – C – High Hazard Dam

Owner: State of Connecticut – DEEP

Higganum Reservoir Dam is owned and operated by the State of Connecticut DEEP. The dam is located on Ponset Brook and impounds Higganum Reservoir. The dam is adjacent to State Route 81 and is located approximately 500-feet above the center of Higganum. The Higganum Reservoir Dam is an earth embankment dam 44-foot tall and has a length of 900 feet. The spillway is a multi-staged concrete/masonry section 146-foot long.

Higganum Reservoir Dam underwent substantial repairs in 2003. The dam’s earth embankment was reconstructed and steel sheet piling was installed inside the earth embankment. The dam’s spillway was completely reconstructed and new toe drains were installed. A recent inspection by the CT/DEEP states the dam is in good condition.

As stated, Higganum Reservoir Dam is located adjacent to Route 81 about 500-feet upstream of the center of Higganum. Bridges over State Routes 81 and Routes 154 will be impacted in the event of a dam failure. There are several businesses and residences in the center of Higganum that will be damaged in the event of a dam failure. There is an emergency operation plan on file in the CT/DEEP Dam Safety files for Higganum Reservoir Dam.

Scovill Reservoir Dam #6102

Hazard Class- C – High Hazard Dam

Owner: Nason Group, LLC, c/o Robert Clark

Scovill Reservoir Dam is an earthen embankment dam with masonry walls on the upstream and downstream faces of the dam. The dam has a maximum height of approximately 21 feet and is approximately 245-feet long. The spillway is approximately 60 feet long by 25-feet wide with a concrete cap.

Scovill Reservoir Dam impounds Scovill Reservoir upstream of Nason Road. The failure of the dam would impact Nason Road and Candlewood Hill Road as well as potentially causing damage to numerous houses in this area.

Scovill Reservoir Dam was inspected on 11/23/2004. The dam was rated to be in good/fair condition. The following deficiencies were noted in the inspection report:

- Add fill and topsoil to dam crest. Establish a uniform crest elevation and a good grass cover. Mow at least twice a year.
- Cut woody vegetation, trees and lower/remove stumps where feasible on the dam crest and within 25 feet of the toe of dam. Fill voids with compacted gravel fill and establish a grass cover.
- Remove debris from the downstream channel and spillway. Monitor and keep spillway and channel clear.
- Monitor the seepage at the toe area in the vicinity of the old low level outlet.
- Retain the services of an engineer registered in the State of Connecticut to: a) evaluate the stability of the dam's downstream masonry wall, particularly the bulged area(s) of the masonry and provide repair recommendations/plans for the wall where masonry is missing, cracked or displaced; b) prepare plans to stabilize the undermined area at the toe of the downstream masonry wall.
- Operate and lubricate the midlevel outlet at least twice a year.
- Prohibit motorized vehicles from access to the dam.
- Provide an updated emergency operation plan per Department of Environmental protections EOP Guidelines.

#### Hidden Lake Dam #6107

Hazard Classification – B – Significant Hazard Dam

Owner: Hidden Lake Association

Hidden Lake Dam is an earth embankment dam approximately 10-feet high and approximately 95-feet long. There is a 16-foot wide concrete spillway centrally located on the dam. Hidden Lake Dam is located on Ponset Brook 125-feet upstream of Hidden Lake Road.

Hidden Lake Dam was inspected on 9/12/2008, by the CT/DEEP. The inspection report states that the dam is in good condition but reports the following deficiencies:

- Remove trees and other woody vegetation from left downstream embankment and within 25 feet of the downstream toe of the dam. Continue to maintain downstream embankments free of vegetative growth.

- Remove vegetative growth from spillway and vegetative growth overhanging the right spillway training wall. Maintain spillway free of debris and any vegetative growth.
- Repair the crack that is present on the right upstream concrete embankment wall adjacent to the spillway, and monitor for further settlement or movement. Repair minor spilling where evident on upstream concrete embankment wall.
- Re-grout joints/gaps in the concrete where the spillway training walls which abut the upstream concrete embankment.
- Lubricate and operate valve gate annually.
- Prepare and submit to CT DEEP an Emergency Operation Plan for this dam in accordance with the department's EOP guidelines.

Of the serious weather events in Town, heavy rains from hurricanes, nor'easters, or stalled major rainstorms pose the largest threat to our dams.

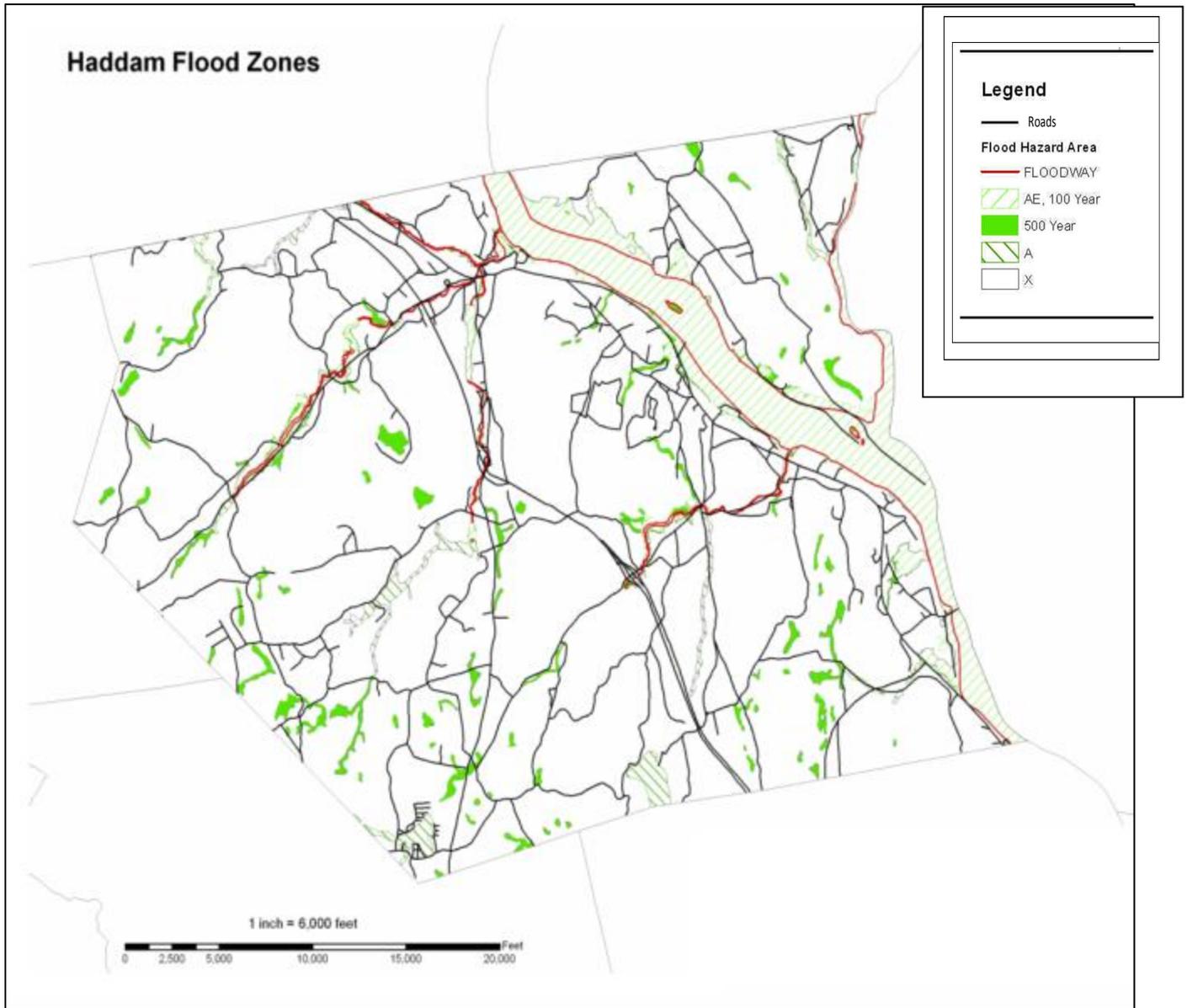
Dam failures are caused by these significant rain events (a lot of rain over a short period of time) and are a very real possibility here in Southern New England. The DEEP watches our dams closely and rates them. They notify the towns and or owners of those that are most susceptible to failure. During a weather event the DEEP Storm warning center activates. One of their duties is to monitor dam risks.

In Connecticut DEMHS sends out adverse weather bulletins to those that subscribe. These include flood (spring flooding and flash) snow, ice and forest fire, heat and extreme cold warnings.

The municipality has an obligation to report suspect dams to the DEEP. (CGS §22a-402(b)-(f))

## 5. Haddam Flood Zones

The following map shows all flood hazard zones and floodways within Haddam.



**Map 3:** Haddam Flood Zones

Source: RiverCOG

## 6. Haddam Flood plain Management

Section 11 of the Haddam Zoning Regulations defines the Special Flood Hazard Area within the town.

Flood plain management is the operation of a community program of corrective and preventative measures for reducing flood damage. These measures take a variety of forms and generally include requirements for zoning, subdivision or building, and special-purpose flood plain ordinances.

A community's agreement to adopt and enforce flood plain management ordinances, particularly with respect to new construction, is an important element in making flood insurance available to home and business owners. Currently over 20,100 communities voluntarily adopt and enforce local flood plain management ordinances that provide flood loss reduction building standards for new and existing development.

To help State and local officials in implementing the NFIP, see our

1. Adoption of Flood Insurance Rate Maps by Participating Communities
2. NFIP Flood plain Management Requirements
3. NFIP Policy Keyword Index

To encourage communities to establish sound flood plain management programs that recognize and encourage community flood plain management activities that exceed the minimum NFIP requirements, the Community Rating System (CRS) was created. This program provides communities with discounts to flood insurance rates.

Town	NFIP Participant?	Latest FIRM Adoption	Flood Zone Regulations	Enforcement
Haddam	Yes	August 28, 2008	August 28,2008	By Permit

- i. Zoning Regulations related to flood plain management

Flood plain regulations updated August 28, 2008

Section 11 Special Flood Hazard Zone Regulations 11.1 - 11.24

Section 11 of Zoning Regulations

### 11.3 Basis

The basis for establishing the Special Flood Hazard Area is the Federal Insurance Administration's scientific and engineering report entitled "The Flood

Insurance Study for the Town of Haddam, Connecticut, Middlesex County,” effective August 28, 2008, with accompanying Flood Insurance Rate Maps and Flood Boundary and Floodways Maps, as amended or revised. Such Study, maps and other supporting data, and any revisions thereto, are adopted by reference and declared to be a part of these regulations.3.2.18 Special flood hazards areas and base flood elevations.

ii. Plan of Conservation and Development

HADDAM

“FEMA 100-year flood plain areas account for approximately 2745 acres or 9 percent of Haddam’s land area”

Watersheds covered:

Higganum Creek,  
Connecticut River,  
Salmon River and  
Mill Creek.

The following is an excerpt from the Haddam plan of Conservation and Development, describing the character of the town.

*Infrastructure*

*No water or sewer service is available. Electric infrastructure is comprised of the transmissions lines, substations and a site previously occupied by CT Yankee Nuclear Plant in Haddam Neck. State officials and utilities have at time discussed the possibility of repowering the site as a natural gas fired electric generation plant. I-2Zone in Haddam Neck is located within an identified Conservation Area. This was the CT Yankee Plant site which is now undeveloped.*

*Open Space*

*Open space physically dominates the Haddam Landscape. Dedicated open space is present along Pine Brook in Haddam Neck and multiple other locations. State Forest dominates the central portion of town.*

*Commercial & Industrial Development*

*Two “growth areas/ Rural Community Centers” have been identified by the State POCD; Higganum Village District and Tylerville Center-Bridge Street. These areas are zoned for commercial and/or industrial uses. There are few vacant parcels in the Commercial Zones in town. Tylerville, presently is experiencing parcel re-use on Bridge Street.*

*The commercially zoned area along Route 81 near Killingworth is a conflict with the State Plan. It is located in Rural Lands and a Conservation Area. This*

*commercial zone also traverses several preservation areas. Dwellings are the predominate use.*

*Due to the lack of vacant land, re-use is the dominate means to commercial development. The preeminent location for re-use is the former Rossi Lumber parcel in the Higganum Village Center. Recently, there has been some interest in its potential re-use.*

**7. National Flood plain Management**

The Town of Haddam participates in the NFIP and is committed to participating in the future.

HADDAM	Initial Hazard Boundary Map FHBM	Initial Flood Insurance Rate map	Date Haddam entered the NFIP regular Program	Current FIRM Map(Date approved)	Date Planning &/or zoning Updated
	(i)FHBM	(i)FIRM	(r)FIRM	(c) FIRM	(l) Regulations updated
	31-May-74	16-Jan-80	16-Jan-80	28-Aug-08	28-Aug-08

**Figure 7:** Haddam Flood Regulation Adoption Dates

**8. Repetitive Loss Properties**

As of August 2013, Haddam has six repetitive loss properties which are all along the west bank of the Connecticut River. At the time of this writing, none of these properties have been mitigated, and only three are insured.

**9. HAZUS-MH Flood Summary Event Report**

Due to the fact that this individual town Annex is part of the larger Former Midstate Regional Natural Hazards Mitigation Plan, HAZUS-MH was generated on a regional scale. Please see Appendix A of this NHMP for the full HAZUS – MH Flood Event Summary Report for the Midstate Planning Region.

## 10. Flood Mitigation Strategies

For a detailed list of mitigation strategies, see Section VIII of this Annex. The following is a general list of actions that could be taken.

- Purchase flood prone properties and create open space
- Maintain culverts, bridges and other restricted flow streams of debris
- Maintain dams (municipally owned) and caution private dam owners to do the same
- When a storm is pending early warn residents of fast flowing waters,
- Remind residents of evacuation and sheltering procedures.
- Advise residents where to go for weather notifications.
- Advise the public of the dangers of driving through moving flood waters
- Monitor DEMHS, DEEP, local press and radio and TV for flood warnings.
- Through legislation change, pressure should be put on the DEEP to allow banking protection from erosion.
- Roadway elevation
- Structure (public/private) elevation
- Structure (public/private) relocation
- Structure (public/private) flood proofing
- Sewer/septic system (public/private) upgrades
- Levee/embankment improvement
- Stream modification (unlikely due to DEEP restrictions)
- Storm water runoff improvements
- Acquisition of storm debris managing equipment

## B. Hurricanes and Tropical Storms

### 1. Introduction

Hurricanes, though not a regular occurrence have the potential to create severe damage throughout the town of Haddam. Its location along the Connecticut River leave it susceptible to river flooding if water is pushed upstream from the Long Island Sound. Recent Hurricanes and Tropical Storms have also left the majority of residents in town without power for several days, including Tropical Storm Irene in 2011 and Hurricane Sandy in 2012. Other Hurricanes which have affected Haddam include the Great Hurricane of 1938, Hurricane Carol in 1954, Hurricane Gloria in 1985 and Hurricane Bob in 1991.



**Photos 8 & 9:** Storm Debris in Higganum after 1938 Hurricane.  
Source: Haddam Historical Society

### 2. Hazus-MH Hurricane Event Report

HAZUS is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences.

The primary purpose of HAZUS is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

Due to the fact that this individual town Annex is part of the larger Former Midstate Regional Natural Hazards Mitigation Plan, HAZUS-MH was generated on a regional scale. Please see Appendix B of this NHMP for the full HAZUS – MH Flood Hurricane Summary Report for the Midstate Planning Region.

### 3. Hurricane Mitigation Strategies

For a detailed list of mitigation strategies, see Section VIII of this Annex. The following is a general list of actions that could be taken.

- Tree Warden to work with Public Works and CL&P on an aggressive tree trimming program.
- Maintain culverts, bridges and other restricted flow streams of debris
- Maintain dams (municipally owned) and caution private dam owners
- When a storm is pending early warn residents of fast flowing waters,
- Advise homeowners at risk to flood proof the structure
- Advise residents to secure any loose objects in the yard.
- Advise homeowners to “stock up” on food, water and medications (including the animals)
- Remind residents AND RESPONDERS of dangers of handling anything in the vicinity of a downed wire.
- Remind residents of evacuation and sheltering procedures.
- Advise residents where to go for weather notifications.
- Purchase flood prone properties and create open space.

#### C. Winter Storms

NOTE: For an extensive discussion on winter storms in the Region and State see the Regional Section of this Plan: Section III.B.1.c.3)

The National Oceanic and Atmospheric Administration (NOAA) has recorded an estimated 2,092 severe weather events for the State of Connecticut during the time period of 1950-March 2007.2 Table 2.2 provides the total number of severe weather events recorded for each county. The events recorded by NOAA include such events as droughts, floods, hailstorms, severe lightning Precipitation, snow & ice storms, and extreme temperatures. Following is the winter storm record:

Middlesex County Winter Weather Events 1950-2013					
Blizzard	Ice Storm	Heavy Snow	High Wind	Snow	Total
5	16	11	12	24	68

**Figure 8:** Major Events affecting Middlesex County between 1950 and 2013.

Source: SHELDUS

#### 1. Snow Storms

The Town crew has and can handle snow storms. They have plenty of experience. However if a storm of the magnitude of 1888, that left 50 inches of snow and massive drifts was to happen, Public Works and contractors would have difficulty in not only clearing the roads; but where to put the snow. Haddam has 60miles of roadways. This was an issue during the January 2011 snow storm, when we had a major storm which also caused significant building structure failures throughout the county.

Building officials, the Fire Marshal and Fire Department should require truss roofed buildings be marked, on the roadside exterior, with a large “T”. This is a significant responder safety issue.

Though not technically the winter, an October Nor’easter snow storm hit the area in 2011. See following Windstorm section.

In a severe cold winter ice jams can be a problem. Public Works is prepared for breaking up ice above vulnerable culverts that have a history of ice cake clogging.

Major Snow storms have occurred in the area:

- 1978 (disaster Declaration 3060)
- 1992 (disaster Declaration 972)
- 1993 (disaster Declaration 3098)
- 1996 (disaster Declaration 1092)
- 2003 (disaster Declaration 3176)
- 2004 (disaster Declaration 3192)
- 2005 (disaster Declaration 3200)
- 2006 (disaster Declaration 3266)
- 2011 (disaster Declaration 1958)
- 2011 (disaster Declaration 3342/4046)

During the unusual October Nor’easter of 2011 power outages and blocked roads were major issues. Because the leaves were still on the trees when the snow came accompanied by strong winds, many trees and limbs came down taking power lines with them. Many Town roads were closed and there were extensive power outages.

## **2. Ice Storms**

A major ice storm can cause major road closures and power outages. See the Regional section of this Plan, Tables 21, 22 & 23 for a historic record including major ice storms.

Ice storms can cause dangerous driving conditions and build up on power lines, making them susceptible to breaking, telephone poles can also be snapped by heavy icing.

## **3. Winter Storm Mitigation Strategy**

For a detailed list of mitigation strategies, see Section VIII of this Annex. The following is a general list of actions that could be taken.

- Having in place a Vegetation Maintenance Plan.

- Hopefully, after the October Nor'easter of 2011, CL&P will put into place a more robust power restoration plan.
- Have in place an Evacuation and Sheltering Plan

## **D. Wind Storms**

For an extensive discussion on wind storms in the Region and State see the Regional Section III.B.1.c.4 (page 78).

### **1. Nor'easters**

During the unusual October Nor'easter of 2011 power outages and blocked roads were major issues. Because the leaves were still on the trees when the snow came accompanied by strong winds, many trees and limbs came down taking power lines with them. Many Town roads were closed and there were extensive power outages.

### **2. Tornadoes**

Tornados can happen anytime, anywhere in Town. As referenced in the Regional part of this Plan, Section III, they have happened in neighboring East Hampton and Wethersfield. In recent years there have been major, damaging tornados in Bridgeport and West Springfield.

When the conditions are right the National Weather Service and CT Division of Emergency Management and Homeland Security notify emergency management and the Administration of the potential. But; they can happen anytime and sometimes without warning; though the local weather forecasters are getting better.

### **3. Wind Shear**

See Regional Section B.1.c.4 for a discussion on the difference between the winds of a tornado and those in a wind shear.

### **4. Mitigation Strategies; Heavy snow, ice storm and wind storms**

For a detailed list of mitigation strategies, see Section VIII of this Annex. The following is a general list of actions that could be taken, keeping in mind that wind storms tend to generate significant amounts of debris

- Having in place a Vegetation Maintenance Plan.
- Hopefully, after the October Nor'easter of 2011, CL&P will put into place a more robust power restoration plan.
- Have in place an Evacuation and Sheltering Plan
- Inventory sufficient debris pick-up equipment for Town vehicles

- Have an approved Temporary Debris Storage and Reduction Site (TDSR) selected.
- Public Notifications: IMPORTANT Issue warnings to the public (and responders) to not go near downed power lines until the power company gives the OK.

**E. Other Natural Hazards**

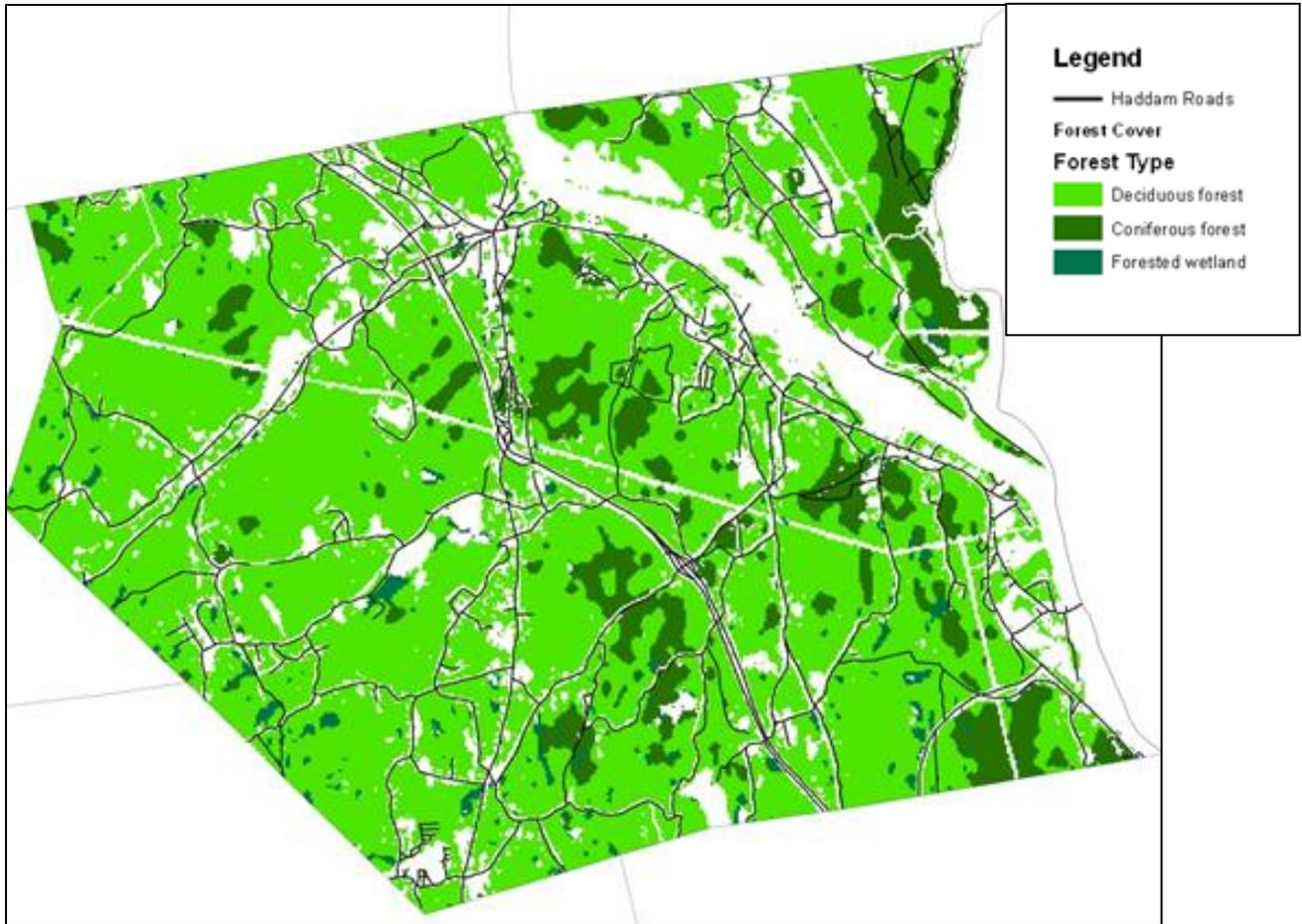
**1. Forest Fires**

Haddam is heavily forested which means there are several areas of the Town that are vulnerable to major forest fires. If the conditions are right; drought, hot windy weather a wildfire could happen. The risk is exacerbated by the encroachment of residents “deeper” into the woodlands. The following illustration shows the forest cover in Town.

Residential dwellings are encroaching closer and closer into forest tracks. Our wildfire vulnerabilities are increasing. This issue came out during the Public Workshop. Because of financial cutbacks and limited resources, historic fire roads have been allowed to become overgrown and are no longer passable by local fire or brush trucks. This is particularly true of State forests.

State Forests	Towns	Acres	Camping	Day Use	Recommended Use	Region
Cockaponset	Middletown, Haddam, and Chester	17,186		X	None	2

**Figure 9:** State Forest Located in Haddam



**Map 4:** Haddam Forest Cover  
Source: RiverCOG

## 2. Additional Natural Hazards

**NOTE:** For an extensive discussion on other natural disasters in the Region and State see Regional Section III.B.1.c.5.

**VIII HADDAM MITIGATION STRATEGIES**

**A. Authorities, Policies, Programs, and Resources**

The town has many available policies and resources at its disposal for mitigating effects of natural disasters. For example, its flood plain regulations allow the Town to control growth and expansion within flood zones. The town has the authority to order parking bans in the event of a snow storm and is well prepared for all but the very worst of snow storms. The Town of Cromwell uses the State Building Code for code compliance to ensure safe structures which withstand 110 mph wind speed and appropriate snow load. The town also has the authority to order backup water supplies to be installed in new subdivisions when water for firefighting is not sufficient. In additions, the town can set up and often does set up shelters, cooling centers, and heating centers when needed for residents.

Storms

- Land use planners and regulators have taken into serious consideration restrictions on the building of, and or winterizing of buildings in flood hazard zones.
- Continue monitoring DEMHS, DEEP, local press and radio and TV for storm warnings.
- When a serious flash flood warning is issued, advise the public of the dangers of driving through moving flood waters.

Crisis Communications Plan

Following Crisis Communications Plan guidelines, keep public and responders aware of events and certain storm specific warnings; e.g.; “don’t touch downed power lines”, “don’t drive through flowing water”, availability of shelters, etc.

Event	Potential	Loss Potential	Actions and Projects in Place?
Flood	H	H	Y
Hurricane	H	H	Y
Thunderstorms	H	L	P
Tornadoes	M	H	P
Nor’easter	H	M	Y
Extreme Cold	H	L	Y
Heavy Snow	H	M	Y
Ice Storm	M	H	Y
Forest Fires	M	H	Y
Extreme Heat	H	L	Y
Earthquakes	L	M	N
Y=Yes, N=No, P=Partial, N/A = Does Not Apply			

**Figure 10:** Hazard Events and Actions in Place

Currently there are many mitigation actions in place as regular maintenance, such as cleaning of catch basins, cutting of dying and decaying trees along town roads, along with others. Figure 10 above details which hazards have at least some mitigation actions associated with them currently in place in Town.

Regional perspectives can be found in the Regional Section of this Plan, Section VIII

Land Use Planning: Haddam officials, led by Town Planner Liz Glidden works with RiverCOG on Land Use. Haddam adopted the FIRM maps in August 2008.

### **B. NFIP and Community Rating System**

See Flood section of this (local) Plan and the Regional Section for information on the National Flood Insurance Program

Haddam does not participate in the CRS; but should consider it.

The Community Rating System (CRS) is a part of the NFIP. When communities go beyond the NFIP's minimum standards for flood plain management and participate in the CRS, discounts may be available on flood insurance premiums for policy holders in those communities.

### **C. Haddam Goals and Objectives**

Goals and Objectives can be found in the CROMWELL Mitigation Action Plan Section of this local Plan Section VIII.C and (overall) in the Regional part of this Plan, Section IV.3.

### **D. Mitigation Actions**

Prioritized mitigation actions with costs (where known) can be found in the Haddam Detailed Mitigation Action Plan Section J.

Administration: Current and future loss prevention is, and will continue to be sourced through local, regional, State and Federal efforts for updating maps, local regulatory actions, and insurance efforts (National Flood Insurance Program). Also capital improvement funding made available from State and Federal sources for infrastructure improvements.

#### Public Works:

- Continues to monitor culverts and bridges that clog by maintaining debris collections above and for prevention of ice damming.
- Continues to look for funding for culvert and bridge maintenance considering local budget restraints and State grants availability.
- The Town should have a Debris Management Plan in place.
- Continue monitoring Flood Warnings from DEEP and DEMHS.
- Currently requiring private compliance with CGS §22a-402(b)-(f); dam inspection requirements. Local dam owners including the municipality are responsible for periodic evaluations of their dams and making repairs as needed.
- Is continuing its historic responsibilities and new ones as a designated responder. And they are aware of the herculean responsibilities a major hurricane will bring.

- Assumes the primary responsibility for municipal building and critical infrastructure.
- The Public Works Crew will stabilize unstable stream and road bed bankings to the fullest extent allowable by DEEP, and local agencies.

Emergency Services: have mutual aid agreements in place with neighboring municipalities. There is also a statewide mutual aid agreement in place. These will be kept current.

Emergency Management will:

- Will continue to enhance EOC capabilities.
- Public health employees are now designated as responders<sup>41</sup>
- Public Works employees are now designated as responders<sup>42</sup>
- Haddam has always had a very strong Emergency management program in place.
- Annually practice/drill/exercise their capabilities regionally and statewide.
- They offer direct assistance in training/exercise sessions to the fire department, police department, public health and administration when needed.

Emergency Operations Center The EOC management continues to have access to WEBEOC for current information and assets available (mitigation actions) for the emergency response and recovery modes.

Funding:

- Through local direct assistance to fire fighter, law enforcement, call center improvement, emergency management grants, EMS assistance, etc. emergency responders are continuing to seek funding to enhance their response capability.
- The direct to the regional planning agency grants have gone away. Now the Department of Emergency Management and Homeland Security passes on FEMA grants to the five regions they have designated. Cromwell is in Region 3.
- The primary funding source for local infrastructure mitigation is through the local budgeting process. This is supplemented through regional, State and Federal grants. See Alternative Funding Sources, Regional Sections of this Plan, Section I.B.3&4.

Notifications:

- The emergency management team does and will continue to maintain multimedia communications to stay tuned to local media and DEMHS (e-mail) for bulletins.

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<sup>41</sup> Responders Vs First Responders

<sup>42</sup> Responders Vs First Responders

- NOAA broadcasts the potential when conditions are right to, say spawn a tornado. When the threat exists, EM will monitor the early warning system.
- Public Notifications: The Public will continue to be notified to stay tuned to local media for severe weather bulletins.
- Reminders will also be sent out about the dangers of driving through rushing waters and going near downed wires.
- Residents and vulnerable businesses will be reminded to continue in their efforts of flood proofing.

Social Services: Social services are in a position to continue in assisting in notifications of people with functional and other special needs.

Public Health and Social Services:

- Works closely with the State in preparing for the needs of people with functional needs
- Continue to enhance, and exercise shelter activities; both short and long term, for citizens during power outages, hurricanes, wind storms, ice storms, heat waves, and extreme cold.
- Sheltering activities includes participating in local and regional exercises.
- The Haddam Health Department is active in local regional (Middletown area) and Region 2 and 3 planning and exercises. There is a focus on enhancing exercise shelter activities; short and long term for citizens during power outages and evacuations. This is also particularly true of working with Special Needs and Fixed Populations:

NGOs: Emergency management works with Non-Governmental Organizations in preparing for storm emergencies. These include the American Red Cross, faith based agencies, Salvation Army, senior centers, Rotary, etc.

Land Use Planners:

- Regional and Haddam land use planners have worked with FEMA and its contractors on flood plain development planning. We began working on the revised FIRM maps at a workshop May 17, 2005. Haddam signed off on the maps August 2008.
- The planners are aware of flood hazards throughout the Town particularly in designated flood plains. They will continue to:
  - Monitor trends in number of permit requests in vulnerable areas
  - Monitor evolving vulnerable areas where development may occur
  - Encourage open space in vulnerable areas
  - Encourage municipal acquisition of buildings in flood plains and creation of open space.
- Monitor expected growth or development over the next 10, 20 years.
- 

Schools: The Schools, working with Emergency Management have severe weather plans in place, modeled after: Snow Days. They also have a NOAA provided weather alert radio for monitoring weather events.

### Special Situations

- People with Functional Needs (formerly; Special Needs) clusters: The Haddam Health Department/District and Emergency Management shall continue to participate regularly in sheltering exercises. This includes handling people with disabilities. DEMHS Regions are working on enhancing programs for working with people with disabilities.
- Fixed Populations: These initiatives are ongoing including activities: locally, regionally and Statewide. This population includes those individuals unable to evacuate due to a physical disability or clusters of elderly or those with functional medical needs that shelter-in-place. Emergency management is also aware of the local State facilities that they are responsible for. However it may fall on the responsibility of the municipality; such as a group home.
- Pet Evacuation and Sheltering: Municipal officials should continue to make a special effort to identify, at risk local animal population pets and livestock. They should be aware of owner notification requirements (e.g. sheltering available) and transportation needs.

The Town of Haddam Emergency Operations Plan, as updated in 2006, addresses in detail the evacuation and sheltering of animals.

Emergency management and animal control authorities have available (from Region 2 & 3) portable pet shelters to be set-up adjacent to human shelters.

Under the latest Americans with Disabilities Act (ADA) guidelines Service Animals are now specifically defined as Service Dogs. The only allowable exception is miniature horses. They have specific qualifiers.

### **E. Incorporation of Other Plans**

See Regional Section of this Plan for authorities, responsibilities and other<sup>43</sup> plans incorporated into the natural hazard planning; past and going forward. (Sections I, II and particularly IV)

Local land use plans apropos to natural hazard protection will be watched for ramifications to the natural hazard planning process. These plans include regional, State and Federal plans. See Section I, Part E.2

### **F. Proposed Mitigation Strategies**

The municipality of Haddam has a variety of mitigation actions currently in place. They are not limited to brick and mortar.

See this local Annex, Section III

### **G. Planning Team Recommendations**

### TDSR (Temporary Debris Storage and Reduction Site Plan

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<sup>43</sup> *Meaning other than natural hazard mitigation planning*

Haddam needs to have a current plan in place for managing the massive amount of debris as a result of a hurricane hitting the area. 100 MPH winds and up would cause major destruction to our trees and in many cases power, cable and telephone lines. Again 100MPH an up winds will blow down 80% of our mature growth trees ... many hanging over power lines ... on local and state roadways. Haddam should develop a Debris Management Plan, especially including a debris temporary storage site.

Erosion Protection:

Through legislation change, require the DEEP to allow banking protection from erosion.

COOP/COG

Develop a Continuity of Operations Plan/Continuity of Government Plan.

Community Rating System

Haddam should consider participating in the CRS.

Weather Awareness:

All municipal departments and local agencies will continue to listen for NOAA broadcasts and other emergency broadcasts, when conditions are right for a severe storm: significant rain event, heavy wind, tornado, hurricane, etc. They will then activate their emergency plans.

**H. Haddam Mitigation Action Plan**

**1. Prevention**

Haddam has rigorous land use regulations designed to protect natural resources and regulate development in flood zones and other hazard-prone areas. These regulations help prevent the loss of life and property by preventing inappropriate development in flood zones and reducing the amount of storm water discharge that may exacerbate flooding.

The Zoning Regulations require all new construction and substantial improvements located within the 100-year flood plain, as depicted on the Flood Insurance Rate Map (FIRM), to conform to minimum elevation requirements and construction standards so as to minimize flood damage. Substantial improvements mean any combination of repairs, reconstruction, alteration, or improvements to a structure, the cost of which equals or exceeds 50% of the market value either before the improvement or repair is started or, if the structure has been damaged, before the damage occurred. In these cases, all residential construction must be elevated to or above the base flood elevation. Likewise, all

non-residential construction must be elevated or flood proofed to or above the base flood elevation.

The Subdivision Regulations, Zoning Regulations and the recently adopted Regulations for Public Improvements all include required preventive measures to minimize damage from flooding. Specifically, the regulations require Storm water Runoff Control Plans that incorporate measures to minimize surface runoff and maximize infiltration before discharging storm water into wetlands, watercourses and existing drainage systems. If an engineering analysis shows that a proposed storm water discharge will overload or cause damage to existing downstream drainage facilities and/or result in flooding of downstream properties, the Storm water Runoff Control Plan must provide for adequate measures including retention and/or detention with the controlled release of increased flows or increasing the capacity of downstream drainage systems. Furthermore, the regulations require the protection of natural features including those that contribute to the natural functioning of the natural drainage system. In addition to flooding, the regulations address damaging winds by requiring buried utility lines for new subdivisions.

The Building Department, the Inland Wetland Agency, and Public Works Department also carry out additional activities that help prevent the loss of life and property as a result of natural disasters. In this regard, the Building Department ensures conformance with the Connecticut State Building Code including flood and wind resistant construction. The Inland Wetlands Agency, through its Inland Wetlands and Watercourses regulations, works toward the conservation of wetland resources to preserve their natural flood retention function of and to restore and enhance wetlands that have been degraded. The Public Works Department routinely inspect and clean public storm drains and catch basin grates of debris, conduct an annual catch basin cleaning program and arrange for the removal of dead and diseased trees along public roadways.

## **2. Emergency Services**

Haddam uses warning systems and emergency planning to help protect life and property before, during and after a natural disaster. In this regard, the Town is in the process of developing a database of resident's contact information to be used with the Everbridge notification system. Using this system, the Town will keep residents informed during emergencies with locations of shelters, hours of operation, availability of food, water and showers, locations of charging stations, road closures and special emergency instructions.

## **3. Natural Resource Protection**

The Subdivision Regulations, Zoning Regulations and the recently adopted Regulations for Public Improvements all include required preventive measures to minimize adverse impacts upon natural resources.

#### 4. Challenges

- a) The Everbridge system is not yet fully operational since the resident contact information database is not fully populated.
- b) Even though the owners of private and publicly owned dams may have an Emergency Operations Plan, the plans lack dependable protocols to ensure that town officials and property owners are contacted in the event of a dam emergency. A reverse 911 or similar system could provide rapid notification of property owners in the event of a dam emergency.
- c) Tree debris often results in street closures.
- d) Haddam has only one emergency shelter with limited capacity.
- e) Haddam needs an emergency generator at the Senior Center and needs to upgrade the generator at the High School, which serves as the emergency shelter.

#### 5. Proposed Mitigation Strategies

Haddam personnel will review and evaluate the strengths and weaknesses of its existing mitigation strategies and the municipality's challenges. This review will be used in the development of goals, objectives, proposed mitigation strategies and an implementation schedule. The following criteria were used to assign each supporting task a priority rating of "High," "Medium" or "Low".

- a) Does the supporting task benefit a large number of Haddam residents?
- b) Does the supporting task mitigate multiple natural hazards?
- c) Does the cost of the supporting task seem reasonable for the size of the problem and likely benefits?
- d) Is there enough political and public support to ensure the success of the supporting task?
- e) Does the supporting task improve upon existing programs or support other municipal priorities?
- f) Does the supporting task entail additional staff time that the municipality is unable to commit immediately?

Definitions of responsible parties, schedule, priority, funding source and estimated cost can all be found in on in Section IV.F on page 111.

#### 6. Goals & Objectives

**Goal 1:** Reduce the loss of life and property and economic consequences as a result of flooding, high winds, severe winter storms and dam failure

Haddam Natural Hazards Mitigation Annex

Supporting Task	Responsible Party	Schedule	Priority	Potential Funding Source	Estimated Cost
Improve the ability of Haddam residents to prepare and respond to approaching severe weather.	BOS	A	High	HMGP, CIP, OP	
Improve the number of residents and businesses registered on the Everbridge notification system that allows the town to alert various segments of the population depending on the nature of the emergency.	BOS	A	High	HMGP, CIP, OP	
Acquire emergency generators for the Senior Center, and upgrade the generator at the High School.	EMD, BOE	A	Medium	HMGP, CIP	
Provide cots, blanket, food supplies etc. for emergency shelter.	EMD, BOS	A	Medium	HMGP, CIP	
Develop a GIS application to assist personnel in the event of an emergency.	Town Planner	A	Medium	CIP, OP	

**Goal 2:** Reduce the amount of debris from severe storms through preventative tree maintenance.

Supporting Task	Responsible Party	When	Priority (see end of section)	Potential Funding Source	Estimated Cost
Prepare a Debris Management Plan	Public Works	2014-2015	Medium	CIP, OP	
Budget appropriate money necessary to maintain and remove dead, dying, dangerous, and diseased trees in rights-of-way and on other town land	Public Works	2014	Low	CIP, OP	

**7. Haddam Detailed Mitigation Action Items**

The following mitigation actions are those identified as priority projects for the Town of Haddam.

**A. Flooding Event**

Supporting Task	Responsible Party	Schedule	Priority	Funding Sources	Cost Estimate
Foot Hills Rd near Candlewood Rd. Drainage study and improvements to remedy roadway flooding and winter icing problems.	PW, BOS, BOF	B	High	HMGP, CIP, OP	\$\$\$
Wiese Albert Rd. Upgrade 2 undersized culverts.	PW, BOS, BOF	B	Medium	HMGP, CIP, OP	\$\$\$
Candlewood Hill Rd. Develop drainage study and install drainage improvements to remedy sever flooding area in low lying elevation adjacent to brook.	PW, BOS, BOF	B	Medium	HMGP, CIP, OP	\$\$\$
Wiese Albert Rd. Replace aging undersized bridge over Candlewood brook to remedy flooding problems.	PW, BOS, BOF	B	Medium	HMGP, CIP, OP	\$\$\$
Brainerd Hill Rd. Install single span bridge and drainage system over Bible Rock Brook to replace current undersized and deteriorating culvert.	PW, BOS, BOF	B	High	HMGP, CIP, OP	\$\$\$
Brainerd Hill Rd. Install precast concrete box culvert to replace undersized culvert near intersection with Joseph Cir .	PW, BOS, BOF	B	High	HMGP, CIP, OP	\$\$\$
Brainerd Hill Rd. Conduct drainage study and upgrade culvert over inlet to Black Shop Pond.	PW, BOS, BOF	B	Medium	HMGP, CIP, OP	\$\$\$
Jackson Rd. Conduct drainage study and replace undersized culvert over unnamed stream.	PW, BOS, BOF	B	Medium	HMGP, CIP, OP	\$\$\$
Jackson Rd. Conduct drainage study and replace undersized culvert over Ponset Brook.	PW, BOS, BOF	B	Medium	HMGP, CIP, OP	\$\$\$
Valley Ridge Drive. Conduct drainage study and replace upgrade culvert over Ponset Brook.	PW, BOS, BOF	B	Medium	HMGP, CIP, OP	\$\$\$

## Haddam Natural Hazards Mitigation Annex

McTich Rd. Conduct drainage study and upgrade culvert over Ponset Brook.	PW, BOS, BOF	B	High	HMGP, CIP, OP	\$\$\$
Little City Rd. Conduct drainage study and upgrade culvert over Ponset Brook.	PW, BOS, BOF	B	High	HMGP, CIP, OP	\$\$\$
Little City Rd. Conduct drainage study and upgrade culvert (currently stone culvert, route is main artery to Shelter) over unnamed stream.	PW, BOS, BOF	B	High	HMGP, CIP, OP	\$\$\$
Hidden Lake Rd. Elevate near outlet form Hidden lake Dam.	PW, BOS, BOF	B	High	HMGP, CIP, OP	\$\$\$
Beaver Meadow Rd. Install single span bridge and drainage system to replace currently undersized culvert (2 48" pipes with wood cribbing) over Beaver Meadow Brook.	PW, BOS, BOF	B	High	HMGP, CIP, OP	\$\$\$
Dish Mill Rd (North). Conduct drainage study for improvements, brook adjacent to roadway.	PW, BOS, BOF	B	Low	HMGP, CIP, OP	\$\$
Bible Rock Brook. Area between Thayer Rd and Thayer Rd Extension causes sever flooding on both roadways. Conduct drainage study for improvements.	PW, BOS, BOF	B	High	HMGP, CIP, OP	\$\$\$
Thayer Rd. Conduct drainage study for improvements over Bible Rock Brook.	PW, BOS, BOF	B	High	HMGP, CIP, OP	\$\$\$
Higganum Center. Engineering study. Center lies at a low elevation at the convergence of three stream, prone to flooding.	PW, BOS, BOF	B	Medium	HMGP, CIP, OP	\$\$\$
Town Garage. Study and relocate. Currently near stream, susceptible to flooding.	PW, BOS, BOF	B	Medium	HMGP, CIP, OP	\$\$\$
Walkley Hill Rd. Conduct drainage study and install precast box culvert over Krieger Brook.	PW, BOS, BOF	B	Medium	HMGP, CIP, OP	\$\$\$

## Haddam Natural Hazards Mitigation Annex

Intersection of Jail Hill, Beaver Meadow, Hayden Hill and Turkey Hill Roads. Conduct drainage study and construct detention system. Intersection lies adjacent to watershed convergence area and is susceptible to flooding.	PW, BOS, BOF	B	High	HMGP, CIP, OP	\$\$\$
Turkey Hill Rd. Conduct drainage study and install precast box culvert over Turkey Hill Brook to upgrade current undersized culvert.	PW, BOS, BOF	B	Medium	HMGP, CIP, OP	\$\$\$
Camp Bethel Rd. Conduct drainage study and upgrade undersized culvert over Ruddy Creek.	PW, BOS, BOF	B	Medium	HMGP, CIP, OP	\$\$\$
Andrews Marina/ Harpers Landing. Conduct engineering study. Facility currently floods, adjacent to CT River.	Private.	A	Medium	HMGP, CIP, OP	\$\$
Little Meadow Rd. Flood proof/elevate homes.	BOS, LUO, FM, BO	B	Medium	HMGP, FMA, RL, SRL, PDM, OP	\$\$\$
Sawmill Pond Dam (#6109). Conduct engineering study.	PW, BOS, BOF, EMD	A	Medium	HMGP, FMA, RL, SRL, PDM, OP	\$\$\$

### B. Other Events

Supporting Task	Responsible Party	Schedule	Priority	Funding Sources	Cost Estimate
Develop snow management plan for Higganum Center. Need arises for off-site snow disposal.	PW	A	High	CIP, OP	\$
Study Nuclear Waste Storage facility in Haddam neck to determine safety in event of lightning storm.	BO, FM, BOS	A	Medium	OP	\$
Increase firefighting access through state forest - build and maintain fire access roads.	DEEP, FM, Fire Dept.	A	Medium	OP	\$\$

**IX PLAN MAINTENANCE**

FEMA Regulations – 44 CFR §201.6(d)(3): The Town of Haddam, working with RiverCOG will conduct a complete review and do a revision if needed and submit it for approval in 5-years. Even if there are no changes, it must be reported, in order to continue being eligible for Natural Hazard Mitigation Grants.

In accordance with Section 201.6(c)(4) of 44 CFR Haddam will assure the Plan remains an active and relevant document. RiverCOG municipality officials will continue working with Haddam in the mitigation planning process.

Changes to the Plan can be made at any time to this Plan; however, any change will require a submission to FEMA for approval either as an amendment or as a Plan update requiring re-adoption of the plan by the affected jurisdiction. If there are regional implications, then the entire Plan would need to be re-adopted by all jurisdictions.

Please see the Regional Section V.E. for the maintenance schedule.

See Appendix Q for a sample mitigation planning tool.

**X. PLAN APPROVAL AND ADOPTION**

Upon FEMA Approval Pending Adoption of this Plan, it requires a sign-off by the municipal CEO. The adoption certificate follows. CEO signatures are required on the Regional Section of this Plan.

**THE LOWER CONNECTICUT RIVER VALLEY COUNCIL OF GOVERNMENTS  
MULTI-JURISDICTION NATURAL HAZARD MITIGATION PLAN  
CERTIFICATE OF ADOPTION  
Town of Haddam, Connecticut**

WHEREAS, the Town of Haddam has historically experienced severe damage from natural hazards and it continues to be vulnerable to the effects of - only those natural hazards profiled in the plan (i.e. flooding, thunderstorm, high wind, winter storms, earthquakes, and dam failure), resulting in loss of property and life, economic hardship, and threats to public health and safety; and

WHEREAS, the Town of Haddam, has developed and received conditional approval from the Federal Emergency Management Agency (FEMA) for its Hazard Mitigation Plan under the requirements of 44 CFR 201.6; and

WHEREAS, public and committee meetings were held between June 16, 2009 and December 1, 2011 regarding the development and review of the Multi-Jurisdiction Natural Hazard Mitigation Plan; and

WHEREAS, the Plan specifically addresses hazard mitigation strategies and Plan maintenance procedure for the Town of Haddam; and

WHEREAS, the Plan recommends several hazard mitigation actions/projects that will provide mitigation for specific natural hazards that impact the Town of Haddam, with the effect of protecting people and property from loss associated with those hazards; and

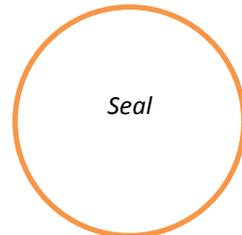
WHEREAS, adoption of this Plan will make the Town of Haddam eligible for funding to alleviate the impacts of future hazards; now therefore be it

RESOLVED by the Board of Selectmen:

1. The Plan is hereby adopted as an official plan of the Town of Haddam
2. The respective officials identified in the mitigation strategy of the Plan are hereby directed to pursue implementation of the recommended actions assigned to them;
3. Future revisions and Plan maintenance required by 44 CFR 201.6 and FEMA are hereby adopted as a part of this resolution for a period of five (5) years from the date of this resolution.
4. An annual report on the progress of the implementation elements of the Plan shall be presented to the Board of Selectmen by the Planning and Zoning Commission.

IN WITNESS WHEREOF, the undersigned has affixed his/her signature and the corporate seal of the Town of Haddam this \_\_\_ day of \_\_\_\_\_, (year).

\_\_\_\_\_  
(Name, Title)



**Annex F**

**Middlefield Natural Hazards Mitigation Annex  
NATURAL HAZARDS MITIGATION ANNEX**

**TOWN OF MIDDLEFIELD**



**June 2014**

Prepared by:

**Lower Connecticut River Valley Council of Governments**

*www.rivercog.org*

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## Middlefield Natural Hazards Mitigation Annex

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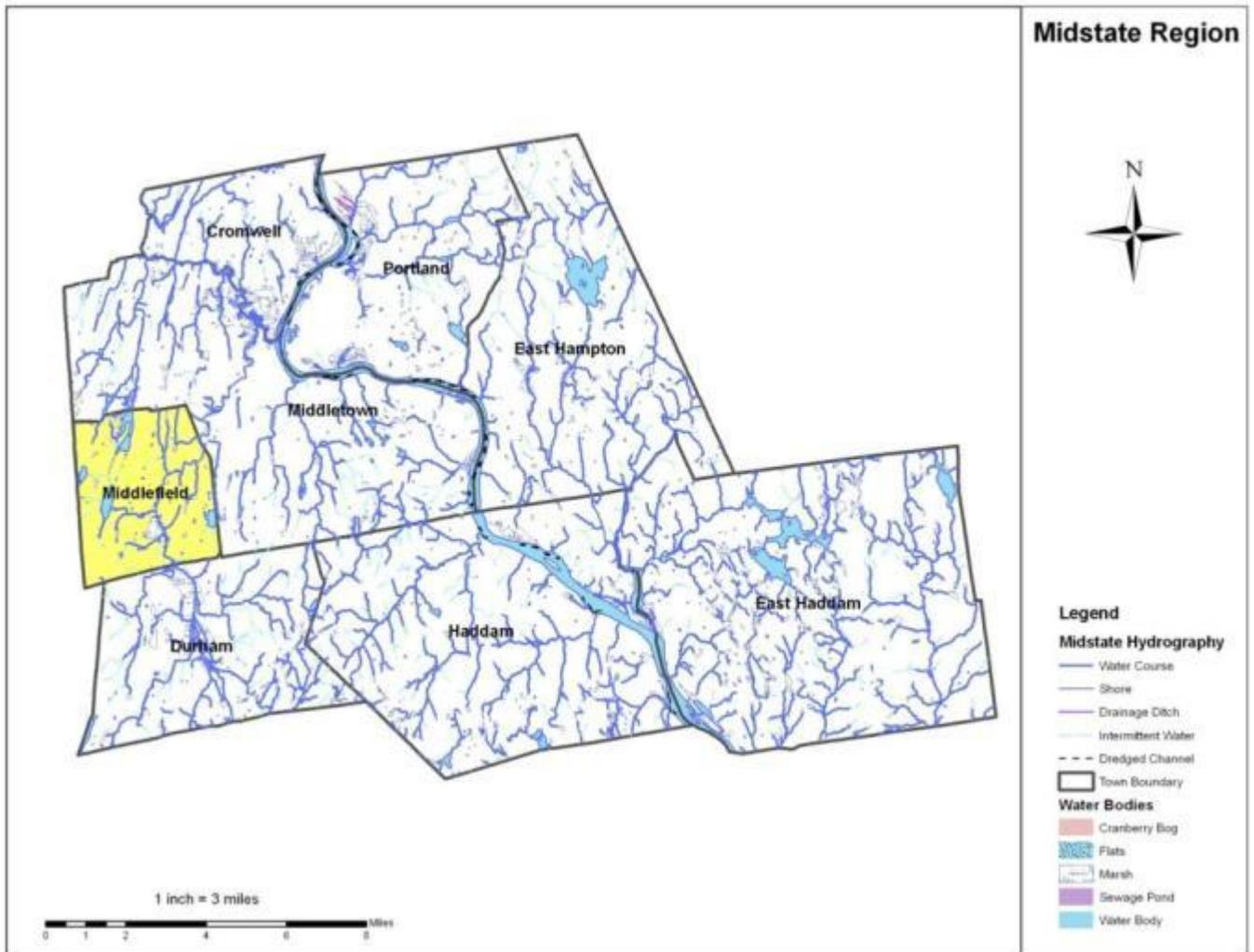
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**Map 1:** Middlefield within the former Midstate Region  
Source: RiverCOG

*On the Cover:*

**Photo 1:** Barn Collapse at Coleman Farm due to the Great Hurricane of 1938. 24 cows were killed.

**Source:** Middlesex County Historical Society

## **i PURPOSE**

The purpose of this Natural Hazard Mitigation Plan is to identify the natural hazards most likely to affect the area, to locate the vulnerabilities, assess the risks and estimate corrective actions to protect life, limb, property and financial loss. Also, to synchronize this Plan with other local, regional and State; land use, transportation, clean water, wetlands and debris management plans. This Plan will compliment traditional emergency response plans.

See Appendix A for a list of related plans.

This Plan could be considered a long term strategy to reduce the economic consequences of a natural disaster.

Funding these plans and projects reduces overall risks to the population and structures, while also reducing reliance on funding from actual disaster declarations. Pre Disaster Mitigation grants are to be awarded on a competitive basis and without reference to state allocations, quotas, or other formula-based allocation of funds.

Bottom line: The most likely event, considered to be hazardous to the population and properties in the region is a natural disaster. Since the tragic events of September 11<sup>th</sup>, 2001 municipal administrations, planners and emergency responders have overlaid terrorist attacks onto their chemical, biological, radiological, nuclear, and explosive (including fires) standard operating procedures and guidelines. Time has passed and now our focus is on natural hazards ... storms.

## **ii SCOPE OF PROJECT**

This pre-disaster risk and vulnerability assessment is designed and scoped to identify those areas that are vulnerable to specific or multiple severe weather related events. The Planning Team has evaluated history, current conditions and or state of repair and future potential conditions to develop a prioritized list of structures, utilities, roadways including bridges and culverts that are in need of repair, strengthening or replacement to prevent or minimize loss of life, limb or property. Dam failure (potential) and repetitive loss properties are a good example of areas the Planning Team looked closely at to predict the future. Historical data provides valuable references for future risk. Subject matter experts were contracted by the former MRPA to investigate and report on any repetitive loss properties and the hazardous dams in the region.

We looked at all possible natural hazards and categorized them according to the “likelihood” of an occurrence. Flooding was by far the highest on our priority list. Hurricanes could, and historically have happened and we are overdue for “a big one”. We are particularly vulnerable to the wind and flooding effects of a strong Category 1 and up hurricane. As you will see throughout this Natural Hazard Mitigation Plan we anticipate 80% of our mature growth trees will come down in a major hurricane. Earthquakes could happen; but are not likely.

Strategies for mitigation, within this Plan are best guess estimates by professionals.

To readers and stakeholders to this Plan, following is a summary of the local content with highlights for a quick review.

Middlefield Natural Hazards Mitigation Annex

**Benefit:** The Federal Emergency Management Agency (FEMA) in the Department of Homeland Security recognized the need for more robust “natural hazard” planning and mitigation at the local level. The purpose was to bring the need for proper preparation to the attention of local jurisdictions and regions<sup>44</sup>. A benefit of a natural hazard planning process is to identify those areas, buildings or infrastructure that can be “fixed” to minimize or prevent damage from a major storm. Another benefit of this planning process is if a project is identified in the plan, then the municipality or region can request a grant under the Natural Hazard Mitigation Grant Program to mitigate the risk. Another benefit is; if a project is identified in this Plan and it is damaged or destroyed in a storm, funding can be obtained under this program to replace the damage to what it should have been, as identified in the Plan. Otherwise disaster relief funding will only allow for rebuilding to: as it was.

Another benefit of this planning process is an awareness of a need to revisit other related plans.

Planning Process Benefit: Throughout the NHMP planning process all departments and vulnerable stakeholders were reminded of; or became aware of, local vulnerabilities that mitigation projects could protect them from loss of life, limb or property. This is particularly true of critical infrastructures. The interest/awareness level here is high; given the DEMHS and DEEP activities in the last ten years.

This Plan and mitigation strategies take into consideration the following potential major natural weather events: floods, drought, wildfire, extreme heat, extreme cold, wind storms, earthquakes, and winter storms.

<u>RISK*</u>							
EVENT	LIKELIHOOD	VALUE	LOSS POTENTIAL	VALUE	Financial Impact	VALUE	TOTAL
Earthquakes,	L	1	M	2	L	1	4
Extreme heat,	H	3	L	1	L	1	5
Fires,	M	2	M	2	L	1	5
Floods,	H	3	H	3	H	3	9
Hurricanes,	H	3	H	3	H	3	9
Landslides,	L	1	L	1	L	1	3
Thunderstorms,	H	3	L	1	L	1	5
Tornadoes,	L	1	H	3	M	2	6
Winter storms (extreme cold)	H	3	M	2	L	1	6

\* Risk: risk of life, limb, property and/or financial impact H=High (3); high priority , M=Medium (2) ; medium priority, L=Low priority (1); a priority; but not high or medium.

**Figure 1: Risks in Middlefield**

<sup>44</sup> In Connecticut we have regional planning agencies, organizations or councils of governments performing the planning functions traditionally done by county governments in other states.

The impact of these events was evaluated based on: presence of vulnerable populations; well-being of the residents and businesses; vulnerable structures; vulnerable infrastructure and financial exposure to the municipality.

Also followed are guidelines from the National Flood Insurance Program under the Federal Insurance Administration, which enables property owners to purchase insurance protection against losses from flooding. Generally if a property does not have a mortgage, where the lender requires flood insurance, they may not have a policy. Where known we have listed them.

#### Highlights of this Regional/Local Natural Hazard Mitigation Plan

That document includes historic photos documenting the local needs for mitigation, plus other locally valuable information and documentation not required under the FEMA NHMP Guidelines.

Project Input: Input for this Plan was gathered through the direct involvement of municipal staff, the public and the close relationship with the former MRPA. This input, including past and present projects, contributed to ongoing mitigation strategies which will result in future mitigation projects.

All these activities provided an opportunity for public input.

Meetings and participation: Meetings, throughout the planning period, were held with Town employees, the administration, the public, individual department heads and local historic society representatives. Additionally a great deal of historic information came from regional and state libraries.

Participants in the planning process can be found in the Planning Process part in the Regional Section of this Plan, and here in Section II.

Key Departments in planning: The two key departments contributing to the Plan were Public Works and Emergency Management. Jon Brayshaw, the First Selectman was also highly involved in the planning process. The First Selectman will carry the Plan through adoption.

#### Fixed Populations:

- There are no long term incarceration facilities in Middlefield, only holding cells.
- In neighboring Middletown there is a large State Mental Hospital
- Emergency Management, Public Health and Social Services work closely with local Convalescent hospitals, rest homes and senior citizen housing clusters in evacuation and shelter planning. Health Department personnel actively participate in local and regional public health emergency planning. This includes the statewide emergency management regions. At this time the Regions (2&3) are working on a Regional Support Plan addressing mitigation plans for protecting the public.

Regional Pet Sheltering: Grant monies have been and will continue to be sought for funding a regional pet holding area. Historically these were called “dog pounds”. These facilities can “back-up” the Pet Shelters adjacent to People Shelters.

Non-FIRM flooding vulnerable areas: Non flood plain areas vulnerable to flooding are within the scope of this planning exercise; though not in the FIRM plan.

Non-Disclosure; Repetitive Loss Properties: The Federal Privacy Act 1974 prohibits public release of the names of policy holders or recipients of financial assistance and the amount of the claim payment or assistance. Therefore only the highlights are listed in this plan

Hazard Monitoring: Because we have frequent floods in recent years our monitoring activities are real-time. Throughout this Plan appropriate flooding photographs are shown.

Funding Opportunities: The local budgeting process is the primary source of funding for mitigation projects. Through adoption of this Plan it is hoped additional funding and grants will be available. Funding sources are discussed in Section I of the Regional section of this Plan.

Planning Process: Town planners’ engaged in this project range from local planning departments, to this Agency and to outside engineering firms. In all cases they participated in this Project. See the Section II for participants and the planning process in the Region Part of this Plan and sections I, II & III of this Annex. Also Section VIII for ongoing NHMP Actions and Planning

Mitigation Actions: Prioritization of mitigation actions has been settled in each jurisdiction; simply put ... the CEO made the decision. BUT, we acknowledge a current failure can move a project to the head of the list

The carrying-out of the mitigation actions is a function of cost-benefit studies and availability of funding. . It is also understood that local budget spending is subject to conflicting interests in the available budget \$\$\$. E.g. school projects versus a particular road repair. Infrastructure mitigation projects can be a balancing act... by the Director of Public Works, subject to the administration’s wishes.

Updating current NHMP: There are no current NHMPs in place to update. After Plan adoption, if the need arises, elements can be updated annually.

For emergencies we have a FEMA/DEMHS Crisis Communications Plan in effect. It is outlined in our EMERGENCY OPERATIONS PLANS which MRPA assisted in the writing of. Notifications include postings on the local websites, the DEMHS 211 site and Press Releases.

For the development of this Plan the Mayor of Middletown issued a regional press release, advising the public of the Plan being in the works and requested they contact their local authorities and to watch for public workshops being held. For Public Outreach content, see Regional part of this Plan, Section IV and this local Annex Section IV

Natural Resource Protection: Advocates for protection of natural resources are ever present at meetings where projects are discussed that have the potential to affect natural resources. This also includes State Projects. Middlefield officials are very aware of protecting the environment. If areas are reclaimed during the hazard mitigation process, the space will be left as open space.

Goals and Objectives: Staff and planners, very early on in the process established goals and objectives to accomplish them. A brief synopsis of the Goals and Objectives can be found in the Regional and local sections of this Plan.

Loss Reductions: Mitigation goals are to reduce losses to life, limb and property ... and costly reductions in municipal services. Throughout the Plan there are references to actions to be taken to reduce losses. See Regional Section IV and this local Annex, Section, VIII for some of those actions.

Actions monitoring: Section III Part 6 Mitigation Action Plan. is the spreadsheet of prioritized projects in need of repair and/or replacement. This is the working playbook by which the municipality will work going forward. Section III, this Annex, indicates the department or agency responsibility for these actions.

Municipal Approval: In order for Middlefield to qualify for future funding opportunities under the Natural Hazard Grant Program, this Plan must be “adopted”. See Section XIII.

**I DEMOGRAPHICS**

**A. Town Profile**

The town of Middlefield was incorporated in 1866, and is a rural community centrally located and bordered by Middletown, Meriden and Durham. The form of government includes a Board of Selectmen consisting of a First Selectman, who is the chief executive official, and two other members. The Board of Selectmen and the Town Meeting are the legislative bodies of the town and may enact ordinances consistent with the General Statutes of the State of Connecticut and specific provisions of the Town Charter. Together with Durham, the towns form Regional School District 13, offering both a Contemporary and Integrated Day education programs for students in both communities.

The Town has a total area of 13.3 square miles or 8,448 acres. The topography of the western half of the Town is characterized by Beseck Mountain, with elevations approaching 800' above sea level. Included within the Town there are several lakes which comprise of 413 acres of the town's 8,448.

**B. Population Density**

Area	Population (2010)	Housing Units	Area (sq. miles)	Water Area (sq. miles)	Land Area (sq. miles)	Density per Square Mile of Land Area	
						Population	Housing Units
Middlesex County	165,626	74,837	439	70	369	449	203
Middlefield	4,425	1,863	13.3	0.6	12.7	348	147

**Figure 2: Middlefield Population and Density**  
Source: Census 2010

Year	2005	2010	2015	2020	2025	2030
Middlefield Population	4,206	4,280	4,261	4,236	4,195	4,179

**Figure 3: UConn Population Study Projection**  
Source: State Data Center at UCONN

**C. From HAZUS-MH Report**

Due to the fact that this individual town Annex is part of the larger Former Midstate Regional Natural Hazards Mitigation Plan, HAZUS-MH was generated on a regional scale. Please see Appendices A, B, and C of this NHMP for the full HAZUS – MH Flood, Hurricane, and Earthquake Event Summary Reports, respectively, for the former Midstate Planning Region.

## II. THE LOCAL PLANNING TEAM

Middlefield is a small rural community in Connecticut where town officials are able to keep a close watch on areas that need special planning and monitoring to maintain the character of the municipality and safety of its residents and visitors.

In keeping with the Goals and Objectives; and mitigation plans, the following agencies are actively engaged (as of 2009)

First Selectman; Jon Brayshaw

Overall management of the Project :

- Town Engineer; Brian Curtis, NLJ Associates
- Public Works: Director John Wyskiel
- Finance; Director Joe Geruch
- Town Planner; Geoff Colegrove

The Middlefield Natural Hazard Mitigation Planning Team leads were: First Selectman Jon Brayshaw, Brian Curtis and Geoff Colegrove. Additional contributors can be found under Responsibilities in this Section.

Sources utilized to identify the local vulnerabilities at risk:

Personal knowledge: RiverCOG staff; municipal elected and appointed officials, emergency management director, public works officials, municipal planners, P&Zs, FEMA HAZUS-MH, State CT Disaster History; FIRM Flood plain Maps (revised to August 2008), CCM Historic Connecticut Scenarios CEO Workshop (2004); a subject matter experts on National Flood Insurance and another on hazardous dams, the local historical society and public input. Also utilized was information from State DEEP and DEMHS interviews. A major contributing factor is the RiverCOG staff has an in-depth knowledge of local DOT plans, emergency operations plans, potential risk assessments and debris management planning efforts.

**III. MITIGATION ACTION RESPONSIBILITIES**

There are a variety of vulnerabilities with some of the same and some different risks. There is an equally large selection of people agencies and departments responsible for them.

Another area of concern is the State roads running through town. They flood frequently causing local traffic problems.

See the below spreadsheet for the list of Haddam vulnerabilities that need attention to a scale that is beyond the financial capability of the Town.

Middlefield RISK	Responsibility State/Federal	Responsibility Local		Mitigation
		Assessment	Mitigation	
Flash floods	DOT	PW	PW	Operations & Capital Budget/*/NHMP
Floods	DEEP	PW,EM	PW	Assessment (Owner) /reporting requirements Local Admin) see Hazardous Dam Report
Snow	NFPA	Fire/Fire Marshal	Owner	Admin Ordinance
Flood, Draught	DPH	PW Water/Sewer/HD	PW Water/Sewer/HD	HD ordinances and monitoring
Floods	EPA	Admin	Admin	Admin Manage
Thunder Storms, Floods	DEEP/EPA	Fire/Fire Marshal/EM	Fire/Fire Marshal/EM	Manage with DEEP
Wildfire	DEEP	Fire	Mire Marshall	P&Z - restricting building/ Fire Plan and practice (with DEEP, Forestry)
Floods, power outages	DEEP	local Emergency Manager/PW/PH	PW	PW Loss of Power Plan current
Hurricane/Ice Storm/Wind Storm	DEEP-DEMHS	PW	Management Plan	ADMIN/PW facilitate the writing of a DMP plan
All storms	DPH	Health Department	Health Department	PH Plan
All storms	DPH	Social Services/HD/EM	Social Services/HD/EM	EOP,& PH Plan maintenance and Shelter exercising

Middlefield Natural Hazards Mitigation Annex

Flood	NFIP	P&Z	Owners	Owners have NFIP coverage (Elevate/relocate/flood proofing)
Flood	NFIP	P&Z	Owners	Owners continue coverage (Elevate/relocate/flood proofing)
Flood	NFIP	P&Z	Owners	Owners continue coverage (Elevate/relocate/flood proofing)
Flood	NFIP	Admin/PW/EM	Admin	Elevate/relocate/flood proofing
Flood	DEEP/DEMHS	EM	PW	Develop a Plan of prevention
All storms	DEMHS	EM & Regional planners	All disciplines in EM	Participation in regional planning - REPT
All storms	NU/CL&P	EM & Responders	NU/CL&P	Public Notices (Crisis Communications Plan)

**Figure 4:** Middlefield Risks and Responsibilities

#### **IV. Public Outreach**

There are a variety of modes of communication with the public, see the Regional part of this Plan, Section IV.

Municipal responsibility to the public:

- People in vulnerable areas should monitor Flood Warnings:
- People with structures in vulnerable areas; specifically in flood plains should have a flood evacuation plan and participate in the National Flood Insurance Program. They should flood proof their buildings
- The municipalities will post storm info on their websites including proper preparations and warnings. DPH and DEMHS seasonally post info on their websites.

FEMA and the American Red Cross have extensive information and checklists for preparing for a major storm. See [READY.gov](http://READY.gov) for information on preparedness. Section IV of the Regional Section of this Plan, the PUBLIC OUTREACH part, highlights information sources available.

#### **V. PUBLIC ASSISTANCE**

A funding source option for mitigation projects is FEMA, Public Assistance. This is for repair, restoration or replacement of municipal facilities damaged by a storm...if a disaster has been declared.

There are two avenues of Public Assistance: Pre-Disaster Mitigation and Disaster Mitigation.

Property Acquisition and Relocation for Open Space is an example of pre-disaster mitigation. FEMA Pre Disaster Mitigation Program (PDM). Section 404

Damaged property reimbursement, after a disaster declaration is the other (Stafford Disaster Relief and Emergency Assistance Act, 42 U.S.C §5121, et seq. Section 406). Under this program Individual Assistance (includes residences and businesses). It should also be noted that low interest SBA loans for rebuilding are also available. There is also an Other Need Assistance (ONA) program available if all the above fail.

The later has a crossover PA element to the other; causing confusion CT March 2010 is an example. Disaster Mitigation will only allow a rebuild to “the way it was”. Pre-Disaster Mitigation allows for rebuilding to the “way it should be”.

FEMA - Hazard Mitigation Assistance (HMA)

- ✚ Guidance on Property Acquisition and Relocation for the Purpose of Open Space
- ✚ Recent amendments to Title 44 of the Code of Federal Regulations added a new Part 80,
- ✚ Property Acquisition and Relocation for Open Space. More detailed guidance to assist with implementation of the provisions found in Part 80 has also been

developed. This property acquisition and relocation guidance applies to all FEMA hazard mitigation grant programs. It is included in the FY09 Hazard Mitigation Assistance (HMA) Program Guidance at Section 2.3.13 and also governs this project type under the Hazard Mitigation Grant Program (HMGP) in place of previous desk reference sections. The property acquisition guidance section must be read in conjunction with the overall requirements for each grant program including the HMGP.

The Part 80 rule and implementing property acquisition guidance are effective for all disasters declared on or after December 3rd, 2007 (12/03/2007).

The following excerpt is from FEMA Public Assistance Guidance:

**Public Assistance** *The Department of Homeland Security (DHS) Appropriations Act, 2007, Public Law 109-295, directs the Federal Emergency Management Agency (FEMA) to conduct a Public Assistance (PA) Pilot Program. The legislation sets forth three goals for the PA Pilot Program: reducing the costs to the Federal Government of providing assistance to State and local governments, increasing flexibility in grant administration, and expediting the provision of assistance to States and local governments. The PA Pilot specifically addresses the provision of assistance under sections 403(a)(3)(A), 406 and 407 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, 42 U.S.C. 1570b(a)(3)(A), 5172, 5173 (Stafford Act). These sections relate to debris removal and the repair, restoration, and replacement of damaged facilities.*

**Public Assistance Grant Program** *The mission of the Federal Emergency Management Agency's (FEMA) Public Assistance (PA) Grant Program is to provide assistance to State, Tribal and local governments, and certain types of Private Nonprofit organizations so that communities can quickly respond to and recover from major disasters or emergencies declared by the President.*

*Through the PA Program, FEMA provides supplemental Federal disaster grant assistance for debris removal, emergency protective measures, and the repair, replacement, or restoration of disaster-damaged, publicly owned facilities and the facilities of certain Private Non-Profit (PNP) organizations. The PA Program also encourages protection of these damaged facilities from future events by providing assistance for hazard mitigation measures during the recovery process.*

*The Federal share of assistance is not less than 75% of the eligible cost for emergency measures and permanent restoration. The grantee (usually the State) determines how the non-Federal share (up to 25%) is split with the sub-grantees (eligible applicants).*

- *Eligibility - Overview of eligibility criteria and definitions*
- *Roles and Responsibilities - Information on the duties of Federal, State, and local partners*
- *Public Assistance Grant Program Process - Step by step description of the PA grant life cycle*
- *Policy and Guidance - 9500 series policies and other publications*
- *Frequently Asked Questions (FAQ) - Top 10 questions pertaining to the Public Assistance Program*

- *Resource and Tools - Appeal database, equipment rates, cost estimating format, performance goals, funding trends, and other resources*

## APPLYING FOR PUBLIC ASSISTANCE

Following a disaster declaration by the President, FEMA makes assistance for recovery from the disaster available to eligible applicants. This chapter describes the process through which this assistance becomes available.

### Process Overview

The PA Program is implemented through the steps listed below, each of which is described in detail in this chapter.

- *An Applicants' Briefing is held.*
- *Potential applicants submit the Request for Public Assistance.*
- *A PAC is assigned to each applicant.*
- *The PAC holds a Kickoff Meeting with the applicant.*
- *The applicant's specific needs are identified and cost estimates developed through the project formulation process.*
- *Cost estimates for small projects that have been prepared by the applicant are checked through the validation process.*
- *FEMA approves and processes grants for the applicant's projects.*

**Projects.** A project is a logical method of performing work required as a result of the declared event. A project may consist of one item of work, such as repairs to a single structure, or work that occurs at multiple sites, such as repairs to several washouts along a road. The applicant is responsible for identifying all work that is required as a result of the disaster. The PAC may assist the applicant in combining various recovery efforts into projects.

## **VI. INDIVIDUAL (residents and businesses) ASSISTANCE**

The following excerpt is from FEMA Individual Assistance (IA) Guidance:

FEMA and other federal, state, local and volunteer agencies offer disaster assistance in several forms:

**Low-Interest Loans.** Most, but not all, federal assistance is in the form of low interest loans to cover expenses not covered by state or local programs, or private insurance. People who do not qualify for loans may be able to apply for a cash grant. If you qualify, your check will be issued in about three weeks.

The Farm Service Agency and the Small Business Administration (SBA), offer low interest loans to eligible individuals, farmers and businesses to repair or replace damaged property and personal belongings not covered by insurance.

**Cash Grants** for up to \$13,400 adjusted (annually for inflation). Individuals who do not qualify for a loan from SBA may be eligible for these grants from FEMA and the state to help recover uninsured property losses. Home inspections are normally conducted before a check is issued. FEMA funds 75% of the grant program's eligible costs with the remaining 25% covered by the state. The state administers the program.

## Middlefield Natural Hazards Mitigation Annex

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**Housing Assistance.** FEMA's Disaster Housing Assistance Program (DHA) makes funds and temporary housing available to individuals whose home is unlivable because of a disaster.

**Veterans Benefits.** The Department of Veterans' Affairs provides death benefits, pensions, insurance settlements and adjustments to home mortgages for veterans.

**Tax Refunds.** The Internal Revenue Service (IRS) allows certain casualty losses to be deducted on Federal income tax returns for the year of the loss or through an immediate amendment to the previous year's return.

**Unemployment Benefits.** Unemployment benefits may be available through the state unemployment office and supported by the U.S. Department of Labor.

**Crisis Counseling.** Local and state health agencies, the American Red Cross, as well as churches and synagogues may offer counseling to people who have experienced a disaster.

**Free Legal Counseling.** The Young Lawyers Division of the American Bar Association, through an agreement with FEMA, provides free legal advice for low-income individuals regarding cases that will not produce a fee (i.e., those cases where attorneys are paid part of the settlement which is awarded by the court). Cases that may generate a fee are turned over to the local lawyer referral service.

**Independent Study Programs.** FEMA offers an Independent Study Program through the Emergency Management institute.

Individuals, families and businesses may be eligible for federal assistance if they live, own a business, or work in a county declared a Major Disaster Area, incur sufficient property damage or loss, and, depending on the type of assistance, do not have the insurance or other resources to meet their needs.

## VII. NATURAL HAZARDS

This Middlefield section of the Natural Hazard Mitigation Plan contains a variety of localized details complementing the Natural Hazard Section in the Regional Section of this Plan. For overall information on potential natural hazards, Go To the Regional Section of this Plan: Section III.B

The profiling of hazards in Middlefield is based on a variety of sources and personal observations of recent events and discussions with “the older generation”. During discussions with town employees, we also heard of other concerns...other than the ones we already were aware of.

Natural disasters can often be predicted. And damage can be anticipated. Crumbling infrastructure does require continuing rehabilitation and replacement to minimize costly damage. Utilizing budget allocations and available State grants the current mitigation process is ongoing. Repetitive damage due to storms generally puts a vulnerable project as a top priority “fix” on Public Works “Wish List”.

Storm damage tends to occur repeatedly in the same geographical locations because they are related to weather patterns or physical characteristics of the area (flash and or spring flooding). However; all areas of the community are vulnerable to one or another type of natural disaster (hurricanes, wind, ice storms, tornados, etc.).

A study of potential natural disasters in this area has shown they are the same as the State’s and Feds Top 4: floods, hurricanes, wind storms, and winter storms. Nationally flooding is the most common natural disaster (NOAA).

The Middlefield Public Outreach section contains a variety of references including, FEMA Directive on NFIP, USGS Floods, WATERWATCH [a Hydrologic Science and Data-Floods],USGS Flood Definitions, FLOWING Waters, Danger from Chevron – LEARN Cars website, DEMHS Hurricane Fact Sheet, NOAA Hurricane Definitions, Hurricane Grace – the PERFECT STORM story, The Great White Hurricane story, NWS Winter storm Advisories, FEMA Risk Prioritization Tool for Dams, NOAA, DEMHS Heat & Cold Advisor, USA Flood victims, WHEN THUNDER ROARS...GO INDOORS, EF Scale for Tornados, etc. Most of these info documents are suitable for posting for Public Outreach.

According to the State Natural Hazard Mitigation Plan,

“A review by Flood Management staff of available FEMA approved local natural hazards mitigation plans indicate that natural hazards concerns are very similar throughout many geographic areas of Connecticut. From highest level of threat to lowest, the following is a list of natural hazards that almost all local plans focused upon:

1. Flooding
2. High wind events (hurricanes, severe thunderstorms, tornadoes, etc.)
3. Winter storms/events (includes ices storms, ice jams, nor’easters, etc.)”

Middlefield is vulnerable to many types of natural hazards. Flooding is by far the most significant natural hazard with the potential to do harm to people, places and things and

Middlefield Natural Hazards Mitigation Annex

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to cause financial losses. The second greatest threat is from hurricanes. Therefore the focus of this Plan is on these two weather events.

The core team of Town officials contributed to the input for this Plan including: the First Selectman Jon Brayshaw and Town Planner Brian Curtis from NLJ Associates (the contract Town Planner).

Hurricane damage is not localized as is flooding. Generally the effects are town wide. Wet hurricanes also create flooding problems.

Wind and snow storms do regularly occur; but the results are not as catastrophic as flooding and hurricanes. The other potential threats are discussed extensively in the Regional Section of this Plan.

EVENT	RISK*						
	Potential	Value	Loss Potential	Value		Financial Impact	Total Value
Earthquakes	L	1	M	2	L	1	4
Extreme heat	H	3	L	1	L	1	5
Fires	M	2	M	2	L	1	5
Floods	H	3	H	3	H	3	9
Hurricanes	H	3	H	3	H	3	9
Landslides	L	1	L	1	L	1	3
Thunderstorms	H	3	L	1	L	1	5
Tornadoes	L	1	H	3	M	2	6
Winter storms (extreme cold)	H	3	M	2	L	1	6
* Risk: risk of life, limb, property and/or financial impact H=High (3); high priority, M=Medium (2) ; medium priority, L=Low priority (1); a priority; but not high or medium.							

**Figure 5:** Risk Potential for Hazards in Middlefield

**A. Floods**



**Photo 2:** Strickland Road flooding condition

Source: Hartford Courant

**1. Introduction**

For Middlefield, flash floods are the most dangerous flooding condition as is evidenced by our history of flooding. They are the most significant natural hazard with the potential to do harm to people, places and things.

As mentioned they come with minimal, if any warning. There are 28 dams in Middlefield. Many of which could be breached by a sudden surge of a large amount of runoff (flash flooding) Two are classified being a significant hazard and two as high hazard.

Roads flooded during the research for this Plan: Tax Day '07 Storm

Miller Road (between Rte. 147 and Pond Meadow Road)	Road flooded.
Route 147 between Miller Rd and Durham Town Line	Restricted to one lane
Lake Road	Only access into Lake Beseck area so roadway remained open, under control 8" of flowing water over it.

**Figure 6:** Flooding Events during the research period for this Plan.

**2. Flash Floods**

Flash Floods are caused by significant rain events; such as a lot of rain over a short period of time, or over a long timeframe. These floods can be violent and

come without any advance warning. Flash floods are characterized by high velocity flowing water often accompanied with debris.

The streams passing through Middlefield and low lying roads are a cause of concern during significant rain events. And excessive water coming off the Mountain, with high velocity adds to the flooding problem. See Middlefield Detailed Mitigation Action Plan for a list of those areas in need of mitigation.

### **3. Middlefield Dams**

Dams and levees are built for flood protection. They usually are engineered to withstand a flood with a computed risk of occurrence. For example, a dam or levee may be designed to contain a flood at a location on a stream that has a certain probability of occurring in any 1 year. If a larger flood occurs, then that structure will be overtopped. If during the overtopping the dam or levee fails or is washed out, the water behind it is released to become a flash flood. Failed dams or levees can create floods that are catastrophic to life and property because of the tremendous energy of the released water.

In Connecticut DEMHS sends out adverse weather bulletins to those that subscribe. These include flood (spring flooding and flash) snow, ice and forest fire, heat and extreme cold warnings.

The municipality has an obligation to report suspect dams to the DEEP. (CGS §22a-402(b)-(f))

The State Department of Environmental Protection requires the registration of all dams over the height of six feet. The Dam Safety Section of the Inland Water Resources Division of the Connecticut Department of Environmental Protection (DEP) is responsible for administering and enforcing Connecticut's dam safety laws. The existing statutes require that permits be obtained to construct, repair or alter dams, dikes and similar structures and that existing dams, dikes and similar structures be registered and periodically inspected to assure that their continued operation and use does not constitute a hazard to life, health or property.

DEEP assigns dams to one of five classes according to their hazard potential:

Class AA: negligible hazard potential dam which, if it were to fail, would result in no measurable damage to roadways, land and structures, and negligible economic loss.

Class A: low hazard potential dam which, if it were to fail, would result in damage to agricultural land, damage to unimproved roadways, or minimal economic loss.

Class BB: moderate hazard potential dam which, if it were to fail, would result in damage to normally unoccupied storage structures, damage to low volume roadways, or moderate economic loss.

Class B: significant hazard potential dam which, if it were to fail, would result in possible loss of life; minor damage to habitable structures, residences, hospitals, convalescent homes, schools, etc.; damage to or interruption of the use or service of utilities; damage to primary roadways and railroads; or significant economic loss.

Class C: high hazard potential dam which, if it were to fail, would result in the probable loss of life; major damage to habitable structures, residences, hospitals, convalescent homes, schools, etc; damage to main highways; or great economic loss.

The classification of a dam can change due to changes in downstream development. 83% of dams in Connecticut fall within the negligible to moderate hazardous categories while only 17% fall within the significant and high hazard categories.

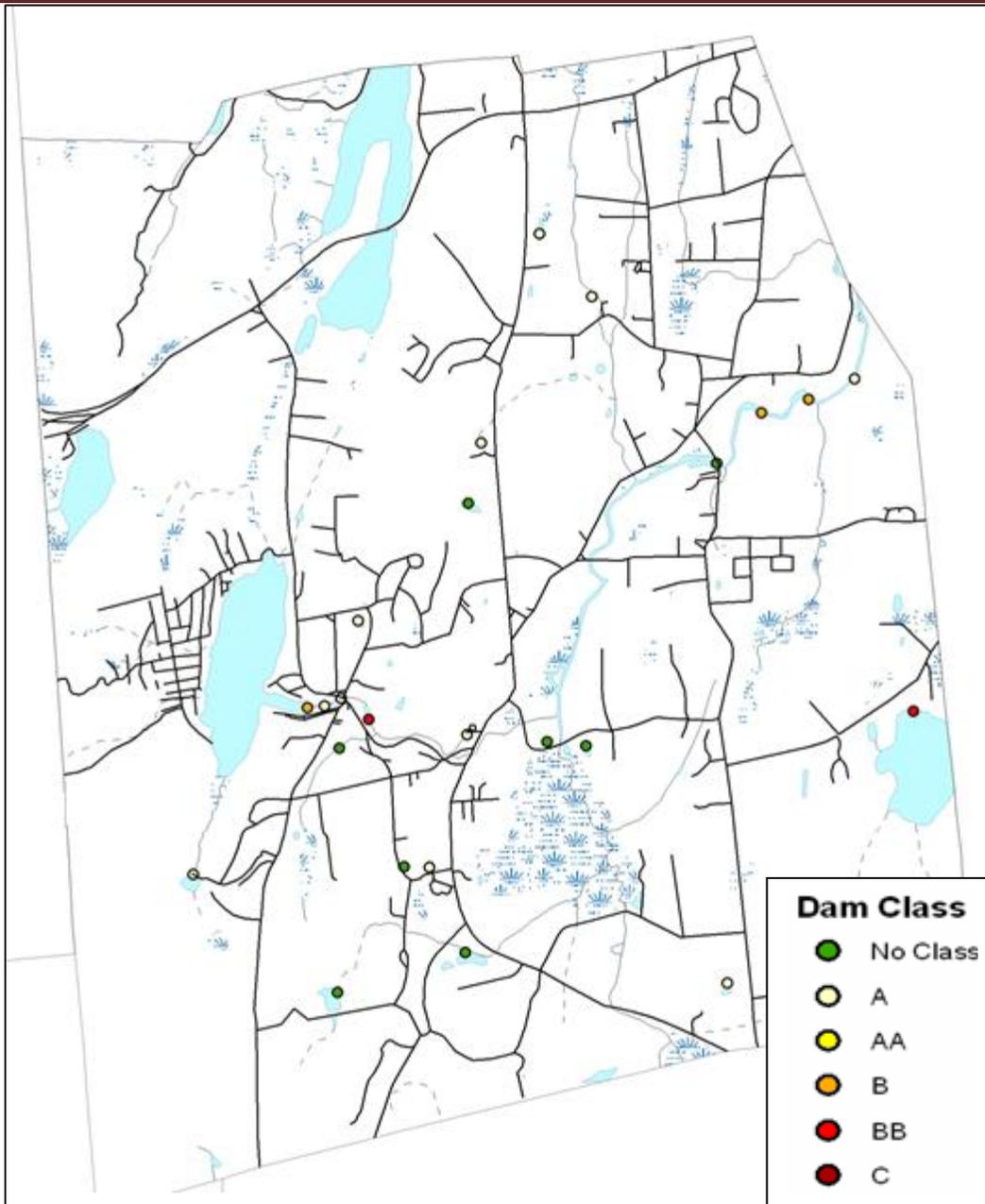
DEEP keeps track of which dams have emergency plans but not all of them would be up to date and not all dam owners will want those plans shared publically. Only the larger significant and high hazard dams would typically have an emergency plan with inundation areas but not all do as it is not yet mandated by state statute or regulation.

In the Town of Middlefield, the Connecticut Department of Environmental Protection (CT/DEEP) has 28 dams in their dam inventory. Of those 28 dams, 2 (two) dams are rated as Significant Hazard Dams (Class B). There are no High Hazard (Class C) dams in the Middlefield. The Hazard Classification for the individual dams are from the CT/DEEP website database “High Hazard and Significant Hazard Dams in CT” revised to 8/11/2007.

The following chart lists the significant hazard dams in the town of Middlefield:

DAM ID #	DAM NAME	HAZARD CLASS	OWNERSHIP
8201	Lake Beseck Dam	B – Significant Hazard	CT DEEP
8204	Coginchaug River Dam	B- Significant Hazard	Richard S. & Nancy H. Boyton

**Figure 7:** Middlefield Significant Risk Dams



**Map 2:** Middlefield Dams

Source: RiverCOG

The following Dams are listed as significant and high hazard dams:

*Lake Beseck Dam #8201*

Hazard Classification – B – Significant Hazard Dam

Owner: State of Connecticut – DEEP

Lake Beseck Dam is owned and operated by the State of Connecticut Department of Environmental Protection. Lake Beseck Dam is an arch masonry and earth embankment dam about 36-foot high and about 285-foot long. The

downstream face of the dam is masonry and the dam's centrally located spillway is 98 feet wide. Lake Beseck Dam impounds Lake Beseck and is located approximately 100-feet upstream of State Route 147 in the Baileyville section of Middlefield.

The Lake Beseck Dam has undergone several repairs over the past 10 years to correct the seepage through the dam and to address minor deficiencies in the dam. A recent inspection report by the CT/DEEP states that the dam is in good condition.

*Coginchaug River Dam #1, #8204*

Hazard Classification – B – Significant Hazard Dam

Owner: Richard S. & Nancy H. Boynton

Coginchaug River Dam #1 is a run of river masonry dam with masonry spillway abutments. The dam is approximately 12-feet tall and approximately 100-feet long. The dam is located on the Coginchaug River about 200-feet to the east of State Rt. 157 in the Rockfall section of Middlefield.

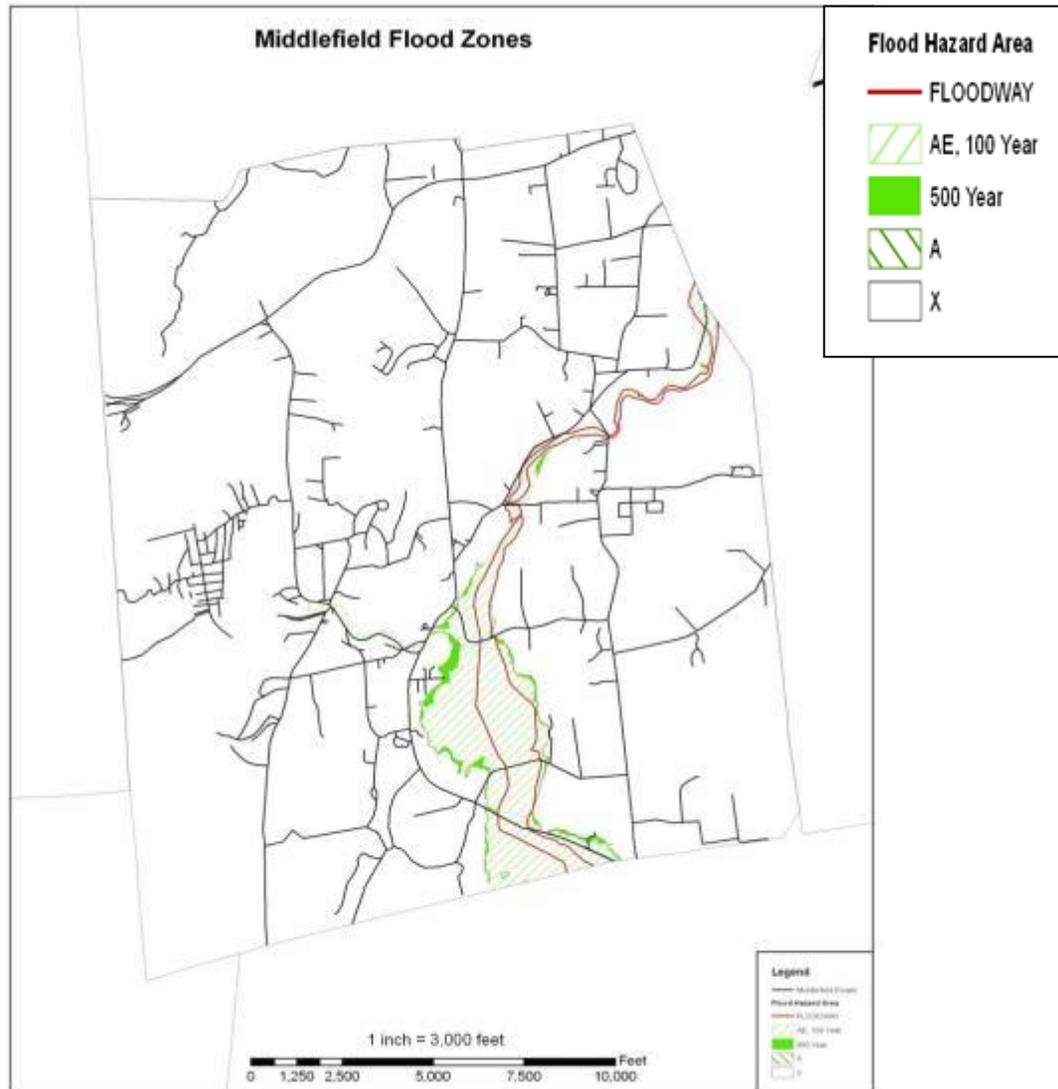
The Coginchaug River Dam #1 was inspected on 6/16/2005 and found to be in good condition. In July of 2005, the dam owner was sent a correspondence outlining the following deficiencies in the dam:

1. Remove the tree at the right dam abutment and remove the vegetative growth from the spillway section.
2. Repair the scour located at the right dam abutment.
3. Raise the right spillway training wall.
4. Keep the spillway and downstream channel clear of debris.
5. Monitor the seepage through the spillway.
6. Chink the voids in the downstream spillway face.
7. Provide DEEP with an emergency operation plan in accordance with DEEP's Emergency Operation Plan Guidelines and an operation and maintenance manual which identifies routine maintenance and operation activities required at the dam.

The chief executive official or designee shall have the right to enter private property, within constitutional limits, to undertake such inspection provided such official or designee shall in accordance with CGS §22a-402(b)2:

- a. Notify the Commissioner of the DEEP prior to conducting such inspection.
- b. Make reasonable attempt to notify the owner of the dam prior to such inspection.
- c. File a report with the Commissioner of DEEP in accordance with the provisions of subsection (f) of CGS §22a-402.

#### 4. Middlefield Flood Zones



**Map 3:** Middlefield Flood Zones

#### 5. Middlefield Flood Plain Management

Flood plain management is the operation of a community program of corrective and preventative measures for reducing flood damage. These measures take a variety of forms and generally include requirements for zoning, subdivision or building, and special-purpose flood plain ordinances.

A community's agreement to adopt and enforce flood plain management ordinances, particularly with respect to new construction, is an important element

in making flood insurance available to home and business owners. Currently over 20,100 communities voluntarily adopt and enforce local flood plain management ordinances that provide flood loss reduction building standards for new and existing development.

To help State and local officials in implementing the NFIP, see our

1. Adoption of Flood Insurance Rate Maps by Participating Communities
2. NFIP Flood plain Management Requirements
3. NFIP Policy Keyword Index

To encourage communities to establish sound flood plain management programs that recognize and encourage community flood plain management activities that exceed the minimum NFIP requirements, the Community Rating System (CRS) was created. This program provides communities with discounts to flood insurance rates.

Additional flood plain management resources are available to download or can be ordered from the FEMA Publication Distribution Center by calling 1-800-480-2520 and requesting the publication by its FEMA number.

i. Planning and Zoning Regulations related to Flood plain Management

The Middlefield Zoning Regulations (specific to Special Flood Hazards) were adopted August 28, 2008. Sections 9.4.1 through 9.4.25 define the regulations.

ii. Plan of Conservation and Development

The following excerpt is from the first page of the Middlefield Plan of Conservation and Development as it relates infrastructure and development in town to flooding risk:

*Open Space and Infrastructure*

The town of Middlefield has been the recipient of significant amount of varied infrastructure; including the Buckeye Pipeline, Electric Transmission Lines, and three sewer service territories. Open space acreage is also numerous and varied; Lake Beseck, Higby Reservoir, Wadsworth Falls State Park, Farms, and multiple locations of managed open space.

Areas with sewer service are supportive of State Designated Growth Areas (Route 66) or Neighborhood Conservation Zones (Lake Beseck Area) which is designated for infill development.

*Commercial and Industrial Development Potential*

The Design District along Route 66 is located within a designated Stated Growth Area. The area is zoned commercial and has recently been expanded. There is potential for an increase in development intensity. Several parcels are vacant

and/or would benefit from re-use. There is some development interest in the area of Route 66 and Higby Road.

An area in the central portion of town adjacent to the Railroad Tracks has been designated for growth. Middlefield has places multiple commercial/industrial zones in this area. The area around Lake Beseck is a Neighborhood Conservation Zone; identified for in-fill development. This is occurring. The area has sewers.

Commercial Zones are generally small and dispersed except for the Route 66 corridor. Few vacant parcels exist. Industrial Zones are dominant and there are some vacant parcels in the Laurel Brook Road area bordering Middletown.

Industrial Zoning near Cherry Hill is located in a Preservation and Conservation area and another Industrial Area which abuts Middletown is entirely located in a Preservation and Conservation Area. These areas would not receive the benefit of those development funds.

The Plan is divided up into the following NATURAL RESOURCE CATEGORIES:

Trap rock Ridges, Wetlands and Watercourses, The Coginchaug River Greenway, Ponds and Lakes, Stream belts and Flood zones and Aquifers and Groundwater Recharge Areas.

**6. National Flood plain Management**

Middlefield participates in the NFIP

	Initial Hazard Boundary Map FHBM	Initial Flood Insurance Rate map	Date Middlefield entered the NFIP regular Program	Current Effective Map	Date Planning &/or zoning Updated
	(i)FHBM	(i)FIRM	(r)FIRM	(c) FIRM	(l) Regulations updated
Middlefield	5/31/74	3/28/80	3/28/80	3/28/08	8/08

**Figure 8:** NFIP Adoption Dates

**7. Repetitive Loss Properties**

There are no repetitive loss properties in Middlefield

**8. HAZUS-MH FLOOD SUMMARY REPORT**

HAZUS is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences.

The primary purpose of HAZUS is to provide a methodology and software application to develop multi-hazard losses at a regional scale.

These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

Due to the fact that this individual town Annex is part of the larger Former Midstate Regional Natural Hazards Mitigation Plan, HAZUS-MH was generated on a regional scale. Please see Appendix A of this NHMP for the full HAZUS – MH Flood Event Summary Report for the former Midstate Planning Region.

## **9. Flood Mitigation Strategies**

For a detailed list of mitigation projects, see Section VIII of this annex. For a more general list of mitigation items could include:

- Purchase flood prone properties and create open space
- Maintain culverts, bridges and other restricted flow streams of debris
- Maintain dams (municipally owned) and caution private dam owners to do the same
- When a storm is pending early warn residents of fast flowing waters,
- Remind residents of evacuation and sheltering procedures.
- Advise residents where to go for weather notifications.
- Advise the public of the dangers of driving through moving flood waters
- Monitor DEMHS, DEEP, local press and radio and TV for flood warnings.
- Through legislation change, pressure should be put on the DEEP to allow banking protection from erosion.
- Roadway elevation
- Structure (public/private) elevation
- Structure (public/private) relocation
- Structure (public/private) flood proofing
- Sewer/septic system (public/private) upgrades
- Levee/embankment improvement
- Stream modification (unlikely due to DEEP restrictions)
- Storm water runoff improvements
- Acquisition of storm debris managing equipment

## **B. Hurricanes**

NOTE: For an extensive discussion on hurricanes in the Region and State, see the Regional Section of this Plan: Section III.B.1.c.2.

### **1. Introduction**

Hurricanes pose the most catastrophic damage potential of any natural disaster phenomenon. As indicated in the Regional part of this Plan, Section III they come in various shapes and sizes; some are wind events, some rain and some...the worst kind have... both e.g. 1938 Hurricane.

Here in Southern New England they do not occur often; but when they do, the consequences could be dire. A hurricane brings with it wide spread destruction.

Most people think only the shoreline is affected; but history has proven otherwise. Storm paths are unpredictable. If Long Island and the Connecticut shore take a direct hit, we can plan on the storm coming inland to Middlefield And depending on which side of the eye of the storm we are on, conditions can be bad for different reasons. The winds are strongest on the right front quadrant. The rains are heaviest on the left front quadrant.

Some hurricanes only bring wind; Gloria 1985 (a “dry” hurricane). Some mostly rain (1955 Hurricanes Connie and Diane). Just two months after Connie (Disaster Declaration #42) made landfall in Connecticut, and with the soil still saturated, the State was hit by torrential rains from Diane (October 15 to 17) resulting in severe flooding.

Double punch storms do happen. The Great Hurricane of 1938, which produced both wind and rain, came after several days of heavy rain.

### **2. Hazus-MH Hurricane Event Report**

HAZUS is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences.

The primary purpose of HAZUS is to provide a methodology and software application to develop multi -hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

Due to the fact that this individual town Annex is part of the larger Former Midstate Regional Natural Hazards Mitigation Plan, HAZUS-MH was generated on a regional scale. Please see Appendix B of this NHMP for the full HAZUS – MH Hurricane Event Summary Report for the Midstate Planning Region.

**3. Hurricane Mitigation Strategies**

For a detailed list of mitigation projects, see Section VIII of this annex. For a more general list of mitigation items could include:

- Tree Warden to work with Public Works and CL&P on an aggressive tree trimming program.
- Maintain culverts, bridges and other restricted flow streams of debris
- Maintain dams (municipally owned) and caution private dam owners
- When a storm is pending early warn residents of fast flowing waters,
- Advise homeowners at risk to flood proof the structure
- Advise residents to secure any loose objects in the yard.
- Advise homeowners to “stock up” on food, water and medications (including the animals)
- Remind residents AND RESPONDERS of dangers of handling anything in the vicinity of a downed wire.
- Remind residents of evacuation and sheltering procedures.
- Advise residents where to go for weather notifications.
- Purchase flood prone properties and create open space.

**C. Winter Storms**

NOTE: For an extensive discussion on winter storms in the Region and State see the Regional Section of this Plan: Section III.B.1.c.3)

This would be a minor section of the Plan if it were not for the recent January 2011 Blizzard Nor’easter and the very recent 2011 October Nor’easter Snow Storm.

The National Oceanic and Atmospheric Administration (NOAA) has recorded an estimated 2,092 severe weather events for the State of Connecticut during the time period of 1950-March 2007.2 Table 2.2 provides the total number of severe weather events recorded for each county. The events recorded by NOAA include such events as droughts, floods, hailstorms, severe lighting Precipitation, snow & ice storms, and extreme temperatures. Following is the winter storm record

<b>Middlesex County Winter Weather Events 1950-2013</b>					
<b>Blizzard</b>	<b>Ice Storm</b>	<b>Heavy Snow</b>	<b>High Wind</b>	<b>Snow</b>	<b>Total</b>
5	16	11	12	24	68

**Figure 9:** Major Events in Middlesex County between 1950 and 2013.

Source: SHELDUS

**1. Snow Storms**

The Town crew has and can handle snow storms. They have plenty of experience. However if a storm of the magnitude of 1888, that left 50 inches of snow and massive drifts was to happen, Public Works and contractors would have difficulty in not only clearing the roads; but where to put the snow. The issue is compounded by the fact a major thoroughfare running through the town is a State roadway. This was an issue during the January 2011 snow storm,

when we had a major storm which also caused significant building structure failures throughout the county.



**Photo 3:** Snow on the Town Line Sign from the Halloween Nor'easter in 2011.  
Source: Durham-Middlefield Patch.

Building officials, the Fire Marshal and Fire Department should require truss roofed buildings be marked, on the roadside exterior, with a large "T". This is a significant responder safety issue.

In a severe cold winter ice jams can be a problem. Public Works is prepared for breaking up ice above vulnerable culverts that have a history of ice cake clogging.

Major Snow storms have occurred in the area:

1978	(disaster Declaration 3060)
1992	(disaster Declaration 972)
1993	(disaster Declaration 3098)
1996	(disaster Declaration 1092)
2003	(disaster Declaration 3176)
2004	(disaster Declaration 3192)
2005	(disaster Declaration 3200)
2006	(disaster Declaration 3266)
2011	(disaster Declaration 1958)
2011	(disaster Declaration 3342/4046)

### Snow Storms and the October Nor'easter of 2011

Technically not winter we had a winter storm in October 2011. During this unusual October Nor'easter power outages and blocked roads were major issues. Because the leaves were still on the trees when the snow came accompanied by strong winds, many trees and limbs came down taking power

lines with them. Many Town roads were closed and there were extensive power outages.



**Photo 4:** Route 66, Middlefield during the October 2011 Storm.

Source: Joel Severance

## 2. Ice Storms

A major ice storm can cause major road closures and power outages. See the Regional section of this Plan, Tables 21, 22 & 23 for a historic record including major ice storms.

A major ice storm occurred December 17, 1973 (Ice Storm Felix):

*NEWS; Hartford Courant*

***Dark Days: Remembering The Ice Storm Of '73***

*By Peter Kushkowski*

*Widespread power outages this week in the hills of northwest Connecticut reminded me of when my hometown of Haddam was in the grips of a similarly devastating ice storm almost 30 years ago. The memory of "Felix" still strikes terror in my heart whenever an ice storm threatens. Winter came to Haddam four days early, on Dec. 17, 1973, when a freezing rain started coating everything with a thick, heavy crust of ice. It wasn't long before the electricity began to go out as ice-laden power lines and tree branches fell."*

## 3. Winter Storm Mitigation Strategy

For a detailed list of mitigation projects, see Section VIII of this annex. For a more general list of mitigation items could include:

- Having in place a Vegetation Maintenance Plan.
- Hopefully, after the October Nor'easter of 2011, CL&P will put into place a more robust power restoration plan.
- Have in place an Evacuation and Sheltering Plan

**D. Wind Storms**

NOTE: For an extensive discussion on wind storms in the Region and State see the Regional Section of this Plan: Section III.B.1.c.4)



**Photo 5:** Winds from Tropical Storm Irene in August 2011 toppled this tree on to the shed.

Source: Durham Middlefield Patch

**1. Nor'easters**

During the unusual October Nor'easter of 2011 power outages and blocked roads were major issues. Because the leaves were still on the trees when the snow came accompanied by strong winds, many trees and limbs came down taking power lines with them. Many Town roads were closed and there were extensive power outages.

**2. Tornadoes**

Tornados can happen anytime, anywhere in Town. As referenced in the Regional part of this Plan, Section III, they have happened in nearby East Hampton and Wethersfield. In recent years there have been major, damaging tornados in Bridgeport and West Springfield.

When the conditions are right the National Weather Service and CT Division of Emergency Management and Homeland Security notify emergency management and the Administration of the potential. But; they can happen anytime and sometimes without much warning; though the local weather forecasters are getting better.

**3. Wind Shear**

See Regional Section B.1.c.4 for a discussion on the difference between the winds of a tornado and those in a wind shear.

**4. Mitigation Strategies; Heavy snow, ice storm and wind storms**

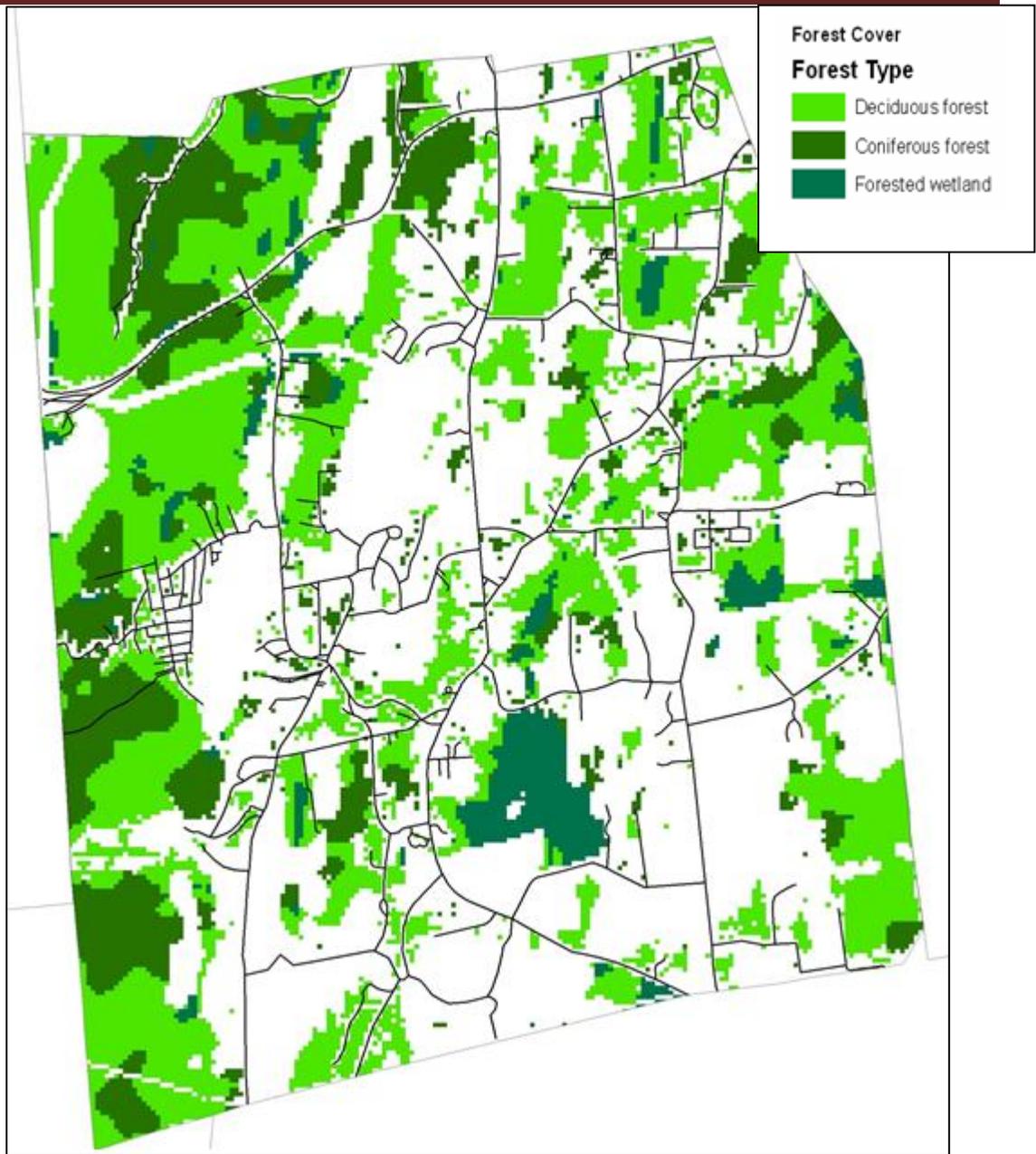
These weather events are considered debris generating storms. For a detailed list of mitigation projects, see Section VIII of this annex. For a more general list of mitigation items could include:

- Having in place a Vegetation Maintenance Plan.
- Hopefully, after the October Nor'easter of 2011, CL&P will put into place a more robust power restoration plan.
- Have in place an Evacuation and Sheltering Plan
- Inventory sufficient debris pick-up equipment for Town vehicles
- Have an approved Temporary Debris Storage and Reduction Site (TDSR) selected.
- Public Notifications: IMPORTANT Issue warnings to the public (and responders) to not go near downed power lines until the power company gives the OK.

**E. Other Natural Hazards**

**1. Forest Fire Risk**

Middlefield is heavily forested which means there are several areas of the Town that are vulnerable to major forest fires. If the conditions are right; drought, hot windy weather a wildfire could happen. The risk is exacerbated by the encroachment of residents "deeper" into the woodlands. The following illustration shows the forest cover in Town.



**Map 4:** Middlefield Forest Cover

**2. Additional Natural Hazards**

NOTE: For an extensive discussion on other natural disasters in the Region and State see the Regional Section of this Plan: Section III.B.1.c.5)

- Earthquakes
- Ice Dams
- Heat and Cold Extremes
- Droughts

## VIII. MIDDLEFIELD MITIGATION STRATEGIES

### A. Authorities, Policies, Programs, and Resources

Also see the Table in Regional Section III Mitigation Actions Responsibilities

Highlights:

#### Storms

Land use planners and regulators have taken into serious consideration restrictions on the building of, and or winterizing of buildings in designated or known flood risk areas.

Continue monitoring DEMHS, DEEP, local press and radio and TV for storm warnings.

When a serious flash flood warning is issued, advise the public of the dangers of driving through moving flood waters.

#### Crisis Communications Plan

Following Crisis Communications Plan guidelines, keep public and responders aware of “what is going on” and certain storm specific warnings; e.g.; “don’t touch downed power lines”, “don’t drive through flowing water”, availability of shelters, etc.

### B. NFIP and Community Rating System

See the Flood section of this (local) Plan and the Regional Section for information on the National Flood Insurance Program.

Middlefield does not participate in the CRS; but should considerate.

The Community Rating System (CRS) is a part of the NFIP. When communities go beyond the NFIP’s minimum standards for flood plain management and participate in the CRS, discounts may be available on flood insurance premiums for policy holders in those communities.

Middlefield is the only municipality in the former MRPA region that has no repetitive loss properties.

### C. Middlefield Goals and Objectives

Goals and Objectives can be found in Part I of the Middlefield Mitigation Action Plan Section of this local Plan. Regional (overall) Goals and Objectives can be found in the Regional Section of this Plan. Section IV.3

### D. Mitigation Actions

Prioritized mitigation actions with costs (where known) can be found in the Middlefield Detailed Mitigation Action Plan Section J.

Administration: Current and future loss prevention is, and will continue to be sourced through local, regional, State and Federal efforts for updating maps, local regulatory actions, and insurance efforts (National Flood Insurance Program). Also capital improvement funding made available from State and Federal sources for infrastructure improvements.

Public Works:

- Continues to monitor culverts and bridges that clog by maintaining debris collections above and for prevention of ice damming.
- Continues to look for funding for culvert and bridge maintenance considering local budget restraints and State grants availability.
- The Town should have a Debris Management Plan in place.
- Continue monitoring Flood Warnings from DEEP and DEMHS.
- Currently requiring private compliance with CGS §22a-402(b)-(f); dam inspection requirements. Local dam owners including the municipality are responsible for periodic evaluations of their dams and making repairs as needed.
- Is continuing its historic responsibilities and new ones as a designated responder. And they are aware of the herculean responsibilities a major hurricane will bring.
- Assumes the primary responsibility for municipal building and critical infrastructure.
- The Public Works Crew will stabilize unstable stream and road bed bankings to the fullest extent allowable by DEEP, and local agencies.

Emergency Services: have mutual aid agreements in place with neighboring municipalities. There is also a statewide mutual aid agreement in place. These will be kept current.

Emergency Management will:

- Will continue to enhance EOC capabilities.
- Public health employees are now designated as responders<sup>45</sup>
- Public Works employees are now designated as responders<sup>46</sup>
- Middlefield has always had a very strong Emergency management program in place.
- Annually practice/drill/exercise their capabilities regionally and statewide.
- They offer direct assistance in training/exercise sessions to the fire department, police department, public health and administration when needed.

Emergency Operations Center The EOC management continues to have access to WEBEOC for current information and assets available (mitigation actions) for the emergency response and recovery modes.

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<sup>45</sup> Responders Vs First Responders

<sup>46</sup> Responders Vs First Responders

Funding:

- Through local direct assistance to fire fighter, law enforcement, call center improvement, emergency management grants, EMS assistance, etc. emergency responders are continuing to seek funding to enhance their response capability.
- The direct to the regional planning agency grants have gone away. Now the Department of Emergency Management and Homeland Security passes on FEMA grants to the five regions they have designated. Middlefield is a part of Region 2 and 3.
- The primary funding source for local infrastructure mitigation is through the local budgeting process. This is supplemented through regional, State and Federal grants. See Alternative Funding Sources, Regional Sections of this Plan, Section I.B.3&4.

Notifications:

- The emergency management team does and will continue to maintain multimedia communications to stay tuned to local media and DEMHS (e-mail) for bulletins.
- NOAA broadcasts the potential when conditions are right to, say spawn a tornado. When the threat exists, EM will monitor the early warning system.
- Public Notifications: The Public will continue to be notified to stay tuned to local media for severe weather bulletins.
- Reminders will also be sent out about the dangers of driving through rushing waters and going near downed wires.
- Residents and vulnerable businesses will be reminded to continue in their efforts of flood proofing.

Social Services: Social services are in a position to continue in assisting in notifications of people with functional and other special needs.

Public Health and Social Services:

- Works closely with the State in preparing for the needs of people with functional needs
- Continue to enhance, and exercise shelter activities; both short and long term, for citizens during power outages, hurricanes, wind storms, ice storms, heat waves, and extreme cold.
- Sheltering activities includes participating in local and regional exercises.
- The Middlefield Health Department is active in local regional (Middletown area) and Region 2 and 3 planning and exercises. There is a focus on enhancing exercise shelter activities; short and long term for citizens during power outages and evacuations. This is also particularly true of working with Special Needs and Fixed Populations

NGOs: Emergency management works with Non-Governmental Organizations in preparing for storm emergencies. These include the American Red Cross, faith based agencies, Salvation Army, senior centers, Rotary, etc.

Land Use Planners:

- Regional and Middlefield land use planners have worked with FEMA and its contractors on flood plain development planning. We began working on the revised FIRM maps at a workshop May 17, 2005. Middlefield signed off on the maps August 2008.
- The planners are aware of flood hazards throughout the Town particularly in designated flood plains. They will continue to:
  - Monitor trends in number of permit requests in vulnerable areas
  - Monitor evolving vulnerable areas where development may occur
  - Encourage open space in vulnerable areas
  - Encourage municipal acquisition of buildings in flood plains and creation of open space.
- Monitor expected growth or development over the next 10, 20 years.

Schools: The Schools, working with Emergency Management have severe weather plans in place, modeled after: Snow Days. They also have a NOAA provided weather alert radio for monitoring weather events.

### Special Situations

People with Functional Needs (formerly; Special Needs) clusters: The Middlefield Health Department/District and Emergency Management shall continue to participate regularly in sheltering exercises. This includes handling people with disabilities. DEMHS Regions are working on enhancing programs for working with people with disabilities.

Fixed Populations: These initiatives are ongoing including activities: locally, regionally and Statewide. This population includes those individuals unable to evacuate due to a physical disability or clusters of elderly or those with functional medical needs that shelter-in-place. Emergency management is also aware of the local State facilities that they are responsible for. However it may fall on the responsibility of the municipality; such as a group home.

Pet Evacuation and Sheltering: Municipal officials should continue to make a special effort to identify, at risk local animal population pets and livestock. They should be aware of owner notification requirements (e.g. sheltering available) and transportation needs.

- The Town of Middlefield Emergency Operations Plan, as updated in 2006, addresses in detail the evacuation and sheltering of animals.
- Emergency management and animal control authorities have available (from Region 2 & 3) portable pet shelters to be set-up adjacent to human shelters.
- Under the latest Americans with Disabilities Act (ADA) guidelines Service

Animals are now specifically defined as Service Dogs. The only allowable exception is miniature horses. They have specific qualifiers. Neighboring Durham has a Durham Animal Response Team (DART) in place for assistance if needed.

Land Use Planning: Middlefield officials, led by First Selectman Brayshaw works with RiverCOG on Land Use. Middlefield signed off on the FIRM maps August 2008.

The municipality of Middlefield has a variety of mitigation actions currently in place.

Event	Potential	Loss Potential	Actions and Projects in Place?
Flood	H	H	Y
Hurricane	H	H	Y
Thunderstorms	H	L	P
Tornadoes	M	H	P
Nor'easter	H	M	Y
Extreme Cold	H	L	Y
Heavy Snow	H	M	Y
Ice Storm	M	H	Y
Forest Fires	M	H	Y
Extreme Heat	H	L	Y
Earthquakes	L	M	N
Landslides	L	L	N/A
Y=Yes, N=No, P=Partial, N/A = Does Not Apply			

**Figure 9:** Major events and actions in place in Middlefield.

**E. Incorporation of Other Plans**

See the Regional Section of this Plan for authorities, responsibilities and other<sup>47</sup> plans incorporated into the natural hazard planning; past and going forward. (Sections I, II and particularly IV)

Local land use plans apropos to natural hazard protection will be watched for ramifications to the natural hazard planning process. These plans include regional, State and Federal plans. See Section I, Part E.2

**F. Proposed Mitigation Strategies**

The municipality of Middlefield has a variety of mitigation actions currently in place. They are not limited to brick and mortar.

See Section III of this local Annex.

**G. Planning Team Recommendations**

TDSR (Temporary Debris Storage and Reduction Site Plan)

Middlefield needs to have a current plan in place for managing the massive amount of debris as a result of a hurricane hitting the area. 100 MPH winds and up would cause major destruction to our trees and in many cases power, cable and telephone lines. Again 100MPH an up winds will blow down 80% of our mature growth trees ... many hanging over power lines ... on local and state roadways. Middlefield should develop a Debris Management Plan, especially including a debris temporary storage site.

<sup>47</sup> Meaning other than natural hazard mitigation planning

Erosion Protection:

Through legislation change, require the DEEP to allow banking protection from erosion.

COOP/COG

Develop a Continuity of Operations Plan/Continuity of Government Plan.

Community Rating System

Middlefield should consider participating in the CRS.

Weather Awareness:

All municipal departments and local agencies will continue to listen for NOAA broadcasts and other emergency broadcasts, when conditions are right for a severe storm: significant rain event, heavy wind, tornado, hurricane, etc. They will then activate their emergency plans.

**H. Middlefield Mitigation Action Plan**

**1. Prevention**

Middlefield has rigorous land use regulations designed to protect natural resources and restrict development in flood zones and other hazard-prone areas. These regulations help prevent the loss of life and property by preventing inappropriate development in flood zones and reducing the amount of storm water discharge that may exacerbate flooding.

The Zoning Regulations restrict all new construction and substantial improvements in the 100-year flood plain as depicted on the most recent revision of the FEMA Flood Insurance Rate Map (FIRM). Substantial improvements mean any combination of repairs, reconstruction, alteration, or improvements to a structure taking place during a ten-year period, the cost of which equals or exceeds 50% of the market value either before the improvement or repair is started or, if the structure has been damaged, before the damage occurred. In these cases, all residential construction must be elevated to or above the base flood elevation. Likewise, all non-residential construction must be elevated or flood proofed to or above the base flood elevation. In regards to elevated buildings, the areas below the base flood elevation must allow floodwater to flow in all directions, and the building must have at least one access route above the base flood elevation. In addition, the regulations prohibit all encroachments in regulated floodways. The Zoning Regulations were updated in 2010 to conform to current FEMA requirements.

The Subdivision Regulations build upon the Zoning Regulations to offer additional preventive measures during the subdivision submittal process. Specifically, the regulations require a storm water management plan that minimizes runoff and maximizes infiltration before discharging storm water into

wetlands and watercourses. If storm water discharge will overload existing downstream drainage facilities, the storm drainage plan must provide adequate detention of the runoff to match pre-development conditions. Furthermore, the regulations require the protection of natural features including those that contribute to the natural functioning of the natural drainage system. The regulations require that utility lines be placed underground for new subdivisions. These land use regulations are described in detail in the Zoning Regulations and Subdivision Regulations available at the Middlefield Town Hall.

The Building Department, the Inland Wetland Agency, and Public Works Department carries out additional activities that help prevent the loss of life and property as a result of natural disasters. The Building Department ensures conformance with the Connecticut State Building Code including flood resistant construction and with elevation certification. The Inland Wetlands Agency, through its Inland Wetlands and Watercourses regulations, works toward the conservation of wetland resources through avoiding impacts from development on functional wetlands and watercourses. The Commission also seeks to restore and enhance wetlands that have been degraded. Middlefield implements an as-needed program for tree maintenance. Whenever possible, Public Works examines and clears public storm drains and grates of debris before and during periods of rainfall, snowfall, and storms.

## **2. Emergency Services**

Middlefield uses warning systems and emergency planning to help protect life and property before, during and after a natural disaster. During emergencies the Town notifies residents regarding locations of shelters, hours of operation, availability of food, water and showers, locations of charging stations, road closures and special emergency instructions. An illuminated sign board is posted on Main Street to notify residents of the availability of the emergency shelter located at the regional high school.

## **3. Natural Resource Protection**

Zoning and Inland Wetland regulations regulate activities that could have an adverse impact on natural resources. Since the 1960's the Town has had an active open space acquisition program and has secured numerous open space parcels.

## **4. Challenges**

- a) Tree debris often results in street closures.
- b) A number of road culverts in Middlefield are undersized causing periodic road flooding and damage during heavy rainfall events. In some cases residential neighborhoods are completely isolated from normal passenger or ambulance travel during these events.
- c) Middlefield needs additional backup electrical generators to supply electricity to all municipal buildings in the event of an extended power outage, particularly Town Hall and the Public Works Department.

## 5. Proposed Mitigation Strategies

Middlefield personnel will review the “Hazard Evaluation and Risk Assessment,” the strengths and weaknesses of its existing mitigation strategies, and the municipality’s challenges. This review will be used in the development of the goals, objectives, proposed mitigation strategies and implementation schedule. The following criteria were used to assign each supporting task a priority rating of “High,” “Medium” or “Low”.

- a) Does the supporting task benefit a large number of residents?
- b) Does the supporting task mitigate multiple natural hazards?
- c) Does the cost of the supporting task seem reasonable for the size of the problem and likely benefits?
- d) Is there enough political and public support to ensure the success of the supporting task?
- e) Does the supporting task improve upon existing programs or support other municipal priorities?
- f) Does the supporting task entail additional staff time that the municipality is unable to commit immediately?

The public review and plan adoption process may result in additional modifications.

Definitions for Responsible Party, Schedule, Priority, Funding Sources and Cost Estimate can be found in Section IV.F on page 111.

## 6. Goals and Objectives

Goal 1 : Reduce the loss of life and property and economic consequences as a result of flooding, high winds, severe winter storms and dam failure.

Objective - Improve the ability of Middlefield residents to prepare and respond to approaching severe weather by:

Supporting Task	Responsible Party	Schedule	Priority	Funding Sources	Cost Estimate
Consider implementation of a reverse-911 system and continue update of the Town website to notify residents of approaching severe weather and update residents during storm events.	EMD	A	Medium	CIP, OP	\$\$
Acquire emergency generators for the Senior Center, and upgrade the generator at the High School.	PW	A	High	HMGP, CIP, OP	\$\$
Continue to provide cots, blanket, food supplies etc. for emergency shelter.	EMD	A	Low	CIP, OP	\$

Middlefield Natural Hazards Mitigation Annex

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Goal 2 - Reduce the amount of debris from severe storms through preventive tree maintenance by:

Supporting Task	Responsible Party	Schedule	Priority	Funding Sources	Cost Estimate
Update the Debris Management Plan	PW/EM	A	High	CIP, OP	\$
Budget appropriate money necessary to remove dead, dying, dangerous, and diseased trees in rights-of-way and on other town land	Public Works	A	High	CIP	\$\$

**7. Middlefield Mitigation Action Items**

Supporting Task	Responsible Party	Schedule	Priority	Funding Sources	Cost
Undersized culvert, low road/Roadway floods, only access road to hundreds of homes on west side of Lake Beseck, tributary to Lake Beseck. Conduct a drainage study, replace with larger culverts, raise road.	PW, EMD, BOS, BOF	B	High	HMGP, RTP, STIP, CIP, OP	\$\$\$
Undersized culvert, low road/Roadway floods, Ellen Doyle Brook. Drainage study, replace with larger culverts.	PW, BOS, BOF	B	Medium	HMGP, RTP, CIP, OP	\$\$\$
Low road floods due to Coginchaug River flood plain and Miller Road Bridge over Coginchaug River. Drainage study, evaluate bridge capacity and roadway elevation	PW, BOS, BOF	B	Medium	HMGP, RTP, CIP, OP	\$\$\$
Route 66 improvements flooding impact on Hans Brook due to increase in Rte. 66 culvert size. Drainage study, evaluate culvert sizing Rte. 66	CT DOT, PW, BOS	B	High	HMGP, RTP, STIP, OP	\$\$
Undersized culvert, Roadway floods, tributary to Coginchaug River. Drainage study, replace with larger culverts	PW, BOS, BOF	B	High	HMGP, RTP, STIP	\$\$\$
Provide backup generator at Town Hall and Public Works Garage. Extended power outages/major ice storm/snowstorm.	PW, BOS, BOF	B	High	HMGP, CIP	\$\$
Develop a debris management plan.	PW, EMD, FM, BO, BOS	A	High	CIP	\$4k

**IX. PLAN MAINTENANCE**

FEMA Regulations – 44 CFR §201.6(d)(3): The Town of Middlefield, working with RiverCOG will conduct a complete review and do a revision if needed and submit it for approval in 5-years. Even if there are no changes, it must be reported, in order to continue being eligible for Natural Hazard Mitigation Grants.

In accordance with Section 201.6(c)(4) of 44 CFR Middlefield will assure the Plan remains an active and relevant document. RiverCOG municipality officials will continue working with Middlefield in the mitigation planning process.

Changes to the Plan can be made at any time to this Plan; however, any change will require a submission to FEMA for approval either as an amendment or as a Plan update requiring re-adoption of the plan by the affected jurisdiction. If there are regional implications, then the entire Plan would need to be re-adopted by all jurisdictions.

Please see the Regional Section V.E. for the maintenance schedule.

See Appendix Q for a sample mitigation planning tool.

**X. PLAN APPROVAL AND ADOPTION**

Upon FEMA Approval Pending Adoption of this Plan, it requires a sign-off by the municipal CEO. The adoption certificate follows. CEO signatures are required on the Regional Section of this Plan.

Middlefield Natural Hazards Mitigation Annex

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**THE LOWER CONNECTICUT RIVER VALLEY COUNCIL OF GOVERNMENTS  
MULTI-JURISDICTION NATURAL HAZARD MITIGATION PLAN  
CERTIFICATE OF ADOPTION**

Town of Middlefield, Connecticut

WHEREAS, the Town of Middlefield has historically experienced severe damage from natural hazards and it continues to be vulnerable to the effects of - only those natural hazards profiled in the plan (i.e. flooding, thunderstorm, high wind, winter storms, earthquakes, and dam failure), resulting in loss of property and life, economic hardship, and threats to public health and safety; and

WHEREAS, the Town of Middlefield, has developed and received conditional approval from the Federal Emergency Management Agency (FEMA) for its Hazard Mitigation Plan under the requirements of 44 CFR 201.6; and

WHEREAS, public and committee meetings were held between June 16, 2009 and December 1, 2011 regarding the development and review of the Multi-Jurisdiction Natural Hazard Mitigation Plan; and

WHEREAS, the Plan specifically addresses hazard mitigation strategies and Plan maintenance procedure for the Town of Middlefield; and

WHEREAS, the Plan recommends several hazard mitigation actions/projects that will provide mitigation for specific natural hazards that impact the Town of Middlefield, with the effect of protecting people and property from loss associated with those hazards; and

WHEREAS, adoption of this Plan will make the Town of Middlefield eligible for funding to alleviate the impacts of future hazards; now therefore be it

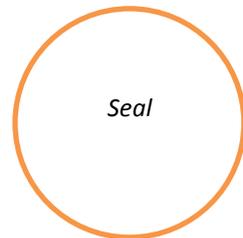
RESOLVED by the Board of Selectmen:

1. The Plan is hereby adopted as an official plan of the Town of Middlefield
2. The respective officials identified in the mitigation strategy of the Plan are hereby directed to pursue implementation of the recommended actions assigned to them;
3. Future revisions and Plan maintenance required by 44 CFR 201.6 and FEMA are hereby adopted as a part of this resolution for a period of five (5) years from the date of this resolution.
4. An annual report on the progress of the implementation elements of the Plan shall be presented to the Board of Selectmen by the Planning and Zoning Commission.

IN WITNESS WHEREOF, the undersigned has affixed his/her signature and the corporate seal of the Town of Middlefield this \_\_\_ day of \_\_\_\_\_, (year).

\_\_\_\_\_

(Name, Title)



**Annex G**  
**Middletown Natural Hazards Mitigation Annex**

**NATURAL HAZARDS MITIGATION ANNEX**  
**CITY OF MIDDLETOWN, CONNECTICUT**



**June 2014**

Prepared by:

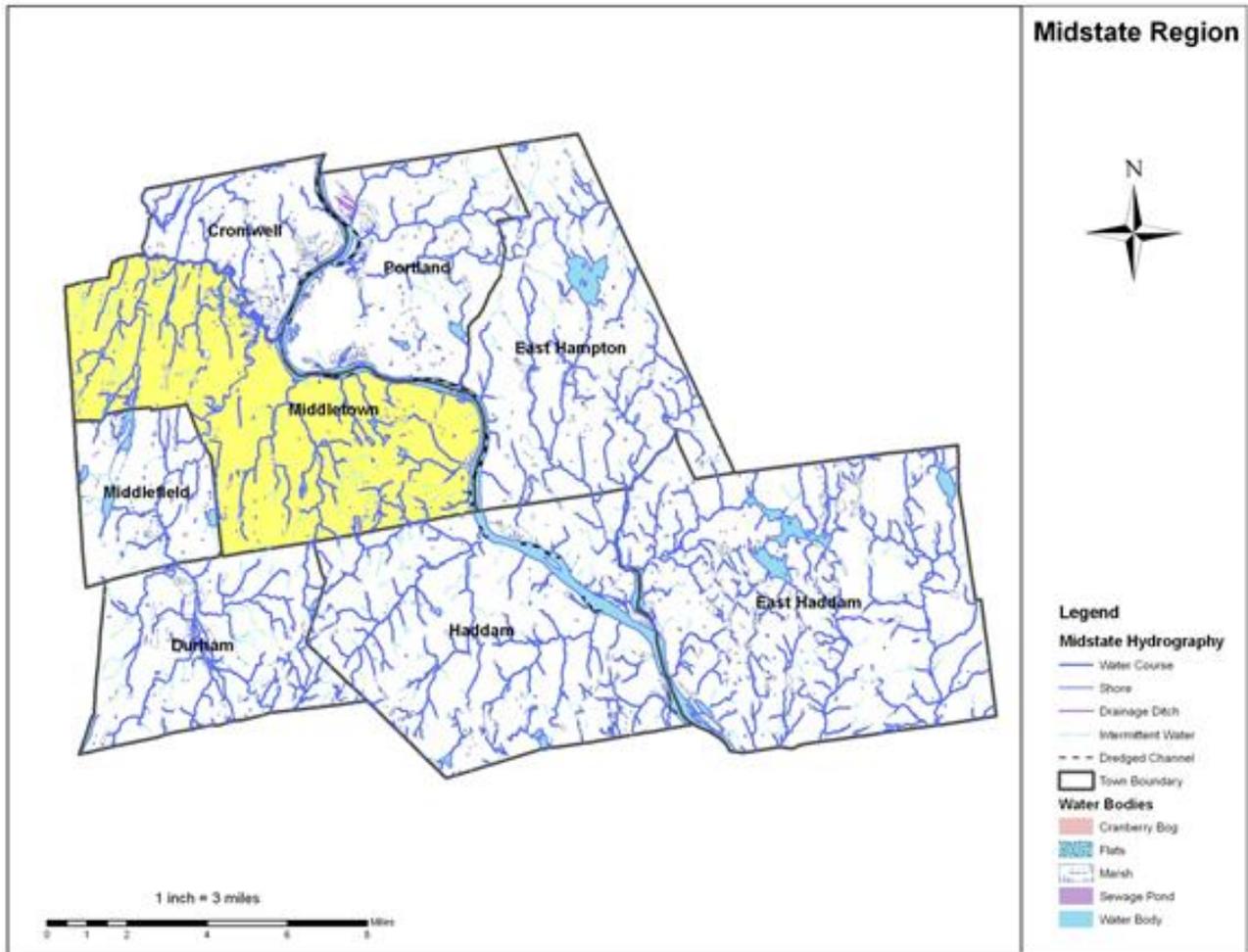
**Lower Connecticut River Valley Council of Governments**

*[www.rivercog.org](http://www.rivercog.org)*

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**Map 1:** Middletown within the former Midstate Planning Region  
Source: RiverCOG

*On the Cover:*

**Photo 1:** Harbor Park during 1982 Flood.  
Source: Middlesex County Historical Society

**i PURPOSE**

The purpose of this Natural Hazard Mitigation Plan is to identify the natural hazards most likely to affect the area, to locate the vulnerabilities, assess the risks and estimate corrective actions to protect life, limb, property and financial loss. Also, to synchronize this Plan with other local, regional and State; land use, transportation, clean water, wetlands and debris management plans. This Plan will compliment traditional emergency response plans.

See Appendix A for a list of related plans.

This Plan could be considered a long term strategy to reduce the economic consequences of a natural disaster.

Funding these plans and projects reduces overall risks to the population and structures, while also reducing reliance on funding from actual disaster declarations. Pre Disaster Mitigation grants are to be awarded on a competitive basis and without reference to state allocations, quotas, or other formula-based allocation of funds.

**Bottom line:** The most likely event, considered to be hazardous to the population and properties in the region is a natural disaster. Since the tragic events of September 11<sup>th</sup>, 2001 municipal administrations, planners and emergency responders have overlaid terrorist attacks onto their chemical, biological, radiological, nuclear, and explosive (including fires) standard operating procedures and guidelines. Time has passed and now our focus is on natural hazards ... storms.

**ii SCOPE OF PROJECT**

This pre-disaster risk and vulnerability assessment is designed and scoped to identify those areas that are vulnerable to specific or multiple severe weather related events. The Planning Team has evaluated history, current conditions and or state of repair and future potential conditions to develop a prioritized list of structures, utilities, roadways including bridges and culverts that are in need of repair, strengthening or replacement to prevent or minimize loss of life, limb or property. Dam failure (potential) and repetitive loss properties are a good example of areas the Planning Team looked closely at to predict the future. Historical data provides valuable references for future risk. Subject matter experts were contracted by the former MRPA to investigate and report on the repetitive loss properties and hazardous dams in the region.

We looked at all possible natural hazards and categorized them according to the “likelihood” of an occurrence. Flooding was by far the highest on our priority list. Hurricanes could, and historically have happened and we are overdue for “a big one”. We are particularly vulnerable to the wind and flooding effects of a strong Category 1 and up hurricane. As you will see throughout this Natural Hazard Mitigation Plan **we anticipate 80% of our mature growth trees will come down in a major hurricane.** Earthquakes could happen; but are not likely.

Strategies for mitigation, within this Plan are best guess estimates by professionals.

**To readers and stakeholders to this Plan, following is a summary of the local content with highlights for a quick review.**

**Benefit:** The Federal Emergency Management Agency (FEMA) in the Department of Homeland Security recognized the need for more robust “natural hazard” planning and mitigation at the local level. The purpose was to bring the need for proper preparation to the attention of local jurisdictions and regions<sup>48</sup>. A benefit of a natural hazard planning process is to identify those areas, buildings or infrastructure that can be “fixed” to minimize or prevent damage from a major storm. Another benefit of this planning process is if a project is identified in the plan, then the municipality or region can request a grant under the Natural Hazard Mitigation Grant Program to mitigate the risk. Another benefit is; if a project is identified in this Plan and it is damaged or destroyed in a storm, funding can be obtained under this program to replace the damage to what it should have been, as identified in the Plan. Otherwise disaster relief funding will only allow for rebuilding to: as it was.

Another benefit of this planning process is an awareness of a need to revisit other related plans.

Planning Process Benefit: Throughout the NHMP planning process all departments and vulnerable stakeholders were reminded of; or became aware of, local vulnerabilities that mitigation projects could protect them from loss of life, limb or property. This is

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<sup>48</sup> *In Connecticut we have regional planning agencies, organizations or councils of governments performing the planning functions traditionally done by county governments in other states.*

particularly true of critical infrastructures. The interest/awareness level here is high; given the DEMHS and DEEP activities in the last ten years.

This Plan and mitigation strategies take into consideration the following potential major natural hazard events:

- Floods
- Hurricanes
- Winter Storms
- Drought
- Wildfire
- Wind Storms
- Heat Wave
- Earthquakes
- Extreme Cold

Each natural hazard and subsequent risk has been evaluated to set-up the vulnerabilities of the municipality and region.

Event	RISK*						Total
	Potential	Value	Loss Potential	Value	Financial Impact	Value	
Earthquakes	L	1	M	2	L	1	1
Extreme Heat	H	3	L	1	L	1	1
Fires	M	2	M	2	L	1	2
Flood	H	3	H	3	H	3	3
Hurricane	M	3	H	3	H	3	3
Landslide	L	1	L	1	L	1	1
Thunderstorm	H	3	L	1	L	1	2
Tornado	M	1	H	3	M	2	2
Winter Storm	H	3	M	2	L	1	2
* Risk: Risk of life, limb, property, and/or financial impact H=High, M=Medium, L=Low 3= High Priority, 2 = Medium Priority, 1 = Low Priority							

**Figure 1:** Risk Potential of hazards in Middletown.

The impact of these events was evaluated based on: presence of vulnerable populations; well-being of the residents and businesses; vulnerable structures; vulnerable infrastructure and financial exposure to the municipality.

Also followed are guidelines from the National Flood Insurance Program under the Federal Insurance Administration, which enables property owners to purchase insurance protection against losses from flooding. Generally if a property does not have a mortgage, where the lender requires flood insurance, they may not have a policy. Where known we have listed them.

**Highlights of this Regional/Local Natural Hazard Mitigation Plan**

That document includes historic photos documenting the local needs for mitigation, plus other locally valuable information and documentation not required under the FEMA NHMP Guidelines.

**Project Input:** Input for this Plan was gathered through the direct involvement of municipal staff, the public and the close relationship with the former MRPA. This input, including past and present projects, contributed to ongoing mitigation strategies which will result in future mitigation projects.

All these activities provided an opportunity for public input.

**Meetings and participation:** Meetings, throughout the planning period, were held with City employees, the administration, the public, individual department heads and local historic society representatives. Additionally a great deal of historic information came from regional and state libraries.

Participants in the planning process can be found in the Planning Process part in the Regional Section of this Plan, and here in Section II.

**Key Departments in planning:** Mayor Sebastian Giuliano was very supportive of this planning process and had an interest in the regional aspects. His Administrative Assistant Gene Thazhamallath did most of the coordination of interviews and meetings. The Mayor's office published a press release advising the public of the plan in progress and solicited their input. Public Works Deputy Director; Bob Dobmeier did the extensive local detail work for the plan. George Dunn, Emergency Management Director also provided local information and a historic prospective. The current Mayor, Dan Drew, will carry the Plan through adoption.

**Fixed Populations:**

- ✚ There are no long term incarceration facilities in Middletown... only holding cells.
- ✚ There is a large State Mental Hospital in the City.
- ✚ Emergency Management, Public Health and Social Services work closely with local Convalescent hospitals, rest homes and senior citizen housing clusters in evacuation and shelter planning. Health Department personnel actively participate in local and regional public health emergency planning. This includes the statewide emergency management regions. At this time the Regions (2&3) are working on a Regional Support Plan addressing mitigation plans for protecting the public.

**Regional Pet Sheltering:** Grant monies have been and will continue to be sought for funding a regional pet holding area. Historically these were called "dog pounds". During this planning process we worked with the City on a grant request for a regional facility...to no avail (this time) These facilities can "back-up" the Pet Shelters adjacent to People Shelters.

**Non-FIRM flooding vulnerable areas:** Non flood plain areas vulnerable to flooding are within the scope of this planning exercise; though not in the FIRM plan.

**Non-Disclosure; Repetitive Loss Properties:** The Federal Privacy Act 1974 prohibits public release of the names of policy holders or recipients of financial assistance and the amount of the claim payment or assistance. Therefore only the highlights are listed in this plan

**Hazard Monitoring:** Because we have frequent floods in recent years our monitoring activities are real-time. Throughout this Plan appropriate flooding photographs are shown.

**Funding Opportunities:** The local budgeting process is the primary source of funding for mitigation projects. Through adoption of this Plan it is hoped additional funding and grants will be available. Funding sources are discussed in Section I of the Regional section of this Plan.

**Planning process:** City Planners, led by Bill Warner, Conservation and Development Commission and Jim Sipperly, Environmental Specialist provided valuable input and were involved in the regional planning aspect of the Plan.

From the City Website: William Warner, Director of Planning, Conservation, and Development, indicates that Middletown's success is based on sound land use planning. Whether it is developing industrial parks, buying open space, or building bike paths to improve the quality of life in the City, Middletown has been on the forefront since establishing one of the first planning commission's in the Country in 1931.

See the Section II for participants and the planning process in the Region Part of this Plan and sections I, II & III of this Annex. Also Section VIII for ongoing NHMP Actions and Planning

**Mitigation Actions:** Prioritization of mitigation actions has been settled in each jurisdiction; simply put ... the CEO marks the final decision. BUT, we acknowledge a current failure can move a project to the head of the list

The carrying-out of the mitigation actions is a function of cost-benefit studies and availability of funding. . It is also understood that local budget spending is subject to conflicting interests in the available budget \$\$\$. E.g. school projects versus a particular road repair. Infrastructure mitigation projects can be a balancing act... by the Director of Public Works, subject to the administration's wishes.

**Updating current NHMP:** There are no current NHMPs in place to update. After Plan adoption, if the need arises, elements can be updated annually.

**Public Outreach:**

For emergencies we have a FEMA/DEMHS Crisis Communications Plan in effect. It is outlined in our EMERGENCY OPERATIONS PLANS which MRPA assisted in the writing of. Notifications include postings on the City websites, the 211 site, CNTV and press releases.

For the development of this Plan the Mayor issued a regional press release, advising the public of the Plan being in the works and requested they contact local authorities and to watch for public workshops being held. For Public Outreach content, see Regional part of this Plan, Section IV and this local Annex Section IV.

**Natural Resource Protection:** Advocates for protection of natural resources are ever present at meetings where projects are discussed that have the potential to affect natural resources. This also includes State Projects. Middletown officials are very aware of protecting the environment. If areas are reclaimed during the hazard mitigation process, the space will be left as open space.

**Goals and Objectives:** Staff and planners, very early on in the process established goals and objectives to accomplish them. A brief synopsis of the Goals and Objectives can be found in the Regional and local sections of this Plan.

**Loss Reductions:** Mitigation goals are to reduce losses to life, limb and property ... and costly reductions in municipal services. Throughout the Plan there are references to actions to be taken to reduce losses. The City has a Loss Reduction Manager, Janet Leonardi. Janet is also very active in public health preparedness. Also see the Regional part of this Plan, Section IV and this local Annex, Section, VIII.

**Actions monitoring:** Section III Part 6 Mitigation Action Plan is a spreadsheet of prioritized projects in need of repair and/or replacement. This is the working playbook by which the municipality will work going forward. Section III, this Annex, indicates the department or agency responsibility for these actions.

**Municipal Approval:** In order for Middletown to qualify for future funding opportunities under the Natural Hazard Grant Program, this Plan must be “adopted”. See Section XIII.

**I. DEMOGRAPHICS**

**1. City Profile**

The City of Middletown is centrally located in Connecticut and is in the Connecticut River Valley. The working population number during this planning process was 52,000. Middletown hosts the area hospital. Middlesex Memorial Hospital is a 275 bed facility serving 230,000 people in 23 towns in and around Middlesex County. Connecticut Valley Hospital, a State mental institution, is also located here. There is also a large power generating plant and another one under construction.

Middletown, the hub of Middlesex County, is located on the Connecticut River, with easy access to major highways, airports, railroads and other modes of transportation. Our City's forty-two square miles include rural, suburban and urban settings, an historic downtown and large City-owned parks and open spaces.

Middletown is made up of 42.9 square miles and contains an urban area, flood plains, farm land and rugged, steep sloped, wooded areas. Causing the risk of flash flooding is the water flow from Mt. Higby (907 feet) to the Connecticut River at 15 feet.

**2. Population Density**

CITY	Population Group	Census 2010	CT State Data Center <sup>49</sup> Projected Population					
			2005	2010	2015	2020	2025	2030
Middletown	Total Population	45,728	46,862	47,954	49,086	50,241	51,320	52,141

**Figure 2:** Middletown Population Projection based on UConn Population study.  
Source: State Data Center at UCONN

Area	Population (2010)	Housing Units	Area (sq. miles)	Water Area (sq. miles)	Land Area (sq. miles)	Density per Square Mile of Land Area	
						Population	Housing Units
Middlesex County	165,626	74,837	439	70	369	449	203
Middletown	47,648	21,223	13.3	1.4	40.9	1,165	519

**Figure 3:** Middletown Population and density.  
Source: Census 2010

<sup>49</sup> Office of Policy and Management, State Data Center

## **II. THE LOCAL PLANNING TEAM**

Because Middletown is a small City, City officials are able to keep a close watch on areas that need special planning and monitoring to maintain the character of the municipality and safety of its residents and visitors. The initial meetings were informational sessions to define the scope of work. Subsequent meetings and many e-mails resulted in the information, goals and objectives reflected in this Plan. Though sparkly attended the Public Workshop added to the content of this Plan.

Local contributions came from City officials, contract engineers, volunteers, historical societies, (local and County) and the public. Several local Chambers of Commerce sub-group meetings were attended to solicit input.

A major source of historic documentation was the Russell Library and the Middlesex County Historical Society Library.

In keeping with the Goals and Objectives; and mitigation plans, the following agencies are actively engaged (as of 2009)

Mayor of the City: Sebastian Giuliano (was not reelected). Very supportive of the Project including meeting with the Planning Team and issued "regional" press release.

Aid to the Mayor: Gene Thazhamallath. Overall management of the Project, coordinating meetings, press releases etc.

Public Works Deputy Director; Bob Dobmeier. Direct responsibility for assessments and managing the mix of funding sources for mitigation actions. His goal is to minimize the financial impact locally by utilization of regional, State and Federal grants. Bob had the lead in providing the Team with the info on vulnerabilities in this Plan.

Emergency Management Director; George Dunn. Key player in the coordinating of meetings and providing valuable input.

Plan Conservation & Development: Bill Warner, Director. Actively assisted in assessments and meetings.

Water and Sewer; Guy Russo, Director

Provided input to the assessment of City vulnerabilities

Environmental Specialist, Jim Sipperly. Attended meetings and contributed.

Also see Section III, Part 7, Responsibilities

**III. MITIGATION ACTION RESPONSIBILITIES**

**Middletown Risk Assessment Responsibilities**

There are a variety of vulnerabilities with some of the same and some different risks. There is an equally large selection of people agencies and departments responsible for them.

Another area of concern is the State roads running through town. They flood frequently causing local traffic problems. Therefore the State has some local mitigation responsibilities

See the below spreadsheet for the list of Haddam vulnerabilities that need attention to a scale that is beyond the financial capability of the City.

Middletown RISK	Responsibility State/Federal	Responsibility Local		Mitigation
		Assessment	Mitigation	
Flash floods	DOT	PW	PW	Operations & Capital Budget/*/NHMP
Floods	DEEP	PW,EM	PW	Assessment (Owner) /reporting requirements Local Admin) see Hazardous Dam Report
Snow	NFPA	Fire/Fire Marshal	Owner	Admin Ordinance
Flood, Draught	DPH	PW Water/Sewer/HD	PW Water/Sewer/HD	HD ordinances and monitoring
Floods	EPA	Admin	Admin	Admin Manage
Thunder Storms, Floods	DEEP/EPA	Fire/Fire Marshal/EM	Fire/Fire Marshal/EM	Manage with DEEP
Wildfire	DEEP	Fire	Fire Marshall	P&Z - restricting building/ Fire Plan and practice (with DEEP, Forestry)
Floods, power outages	DEEP	local Emergency Manager/PW/PH	PW	PW Loss of Power Plan current
Hurricane/Ice Storm/Wind Storm	DEEP/DEMHS	PW	Management Plan	ADMIN/PW facilitate the writing of a DMP plan
All storms	DPH	Health Department	Health Department	PH Plan
All storms	DPH	Social Services/HD/EM	Social Services/HD/EM	EOP,& PH Plan maintenance and Shelter exercising

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Flood	NFIP	P&Z	Owners	Owners have NFIP coverage (Elevate/relocate/flood proofing)
Flood	NFIP	P&Z	Owners	Owners continue coverage (Elevate/relocate/flood proofing)
Flood	NFIP	P&Z	Owners	Owners continue coverage (Elevate/relocate/flood proofing)
Flood	NFIP	Admin/PW/EM	Admin	Elevate/relocate/flood proofing
Flood	DEEP/DEMHS	EM	PW	Develop a Plan of prevention
All storms	DEMHS	EM & LUO	All disciplines in EM	Participation in regional planning - REPT
All storms	NU/CL&P	EM & Responders	NU/CL&P	Public Notices (Crisis Communications Plan)

**Figure 4: Mitigation Responsibilities**

#### IV. PUBLIC OUTREACH

The Mayor issued a Press Release in the Middletown Press (with regional distribution) re the Regional Plan being developed and soliciting comments. This is a good vehicle to get and keep the public, and businesses attention re we are watching out for them and want to hear from them re their concerns. Releases were also sent out advising of workshops. They were also posted on the City website.

People in vulnerable areas have been advised they should monitor Flood Warnings:

People with structures in vulnerable areas; specifically in flood plains also have been advised they should have a flood evacuation plan and participate in the National Flood Insurance Program. They should flood proof their buildings

The City will post storm info on the website including proper preparations and warnings. DPH and DEMHS seasonally post info on their websites.

FEMA and the American Red Cross have extensive information and checklists for preparing for a major storm. Look for **READY.XXX**.

#### V. PUBLIC ASSISTANCE

A funding source option for mitigation projects is FEMA, Public Assistance. This is for repair, restoration or replacement of municipal facilities damaged by a storm...if a disaster has been declared.

There are two avenues of Public Assistance: Pre-Disaster Mitigation and Disaster Mitigation.

Property Acquisition and Relocation for Open Space is an example of pre-disaster mitigation. FEMA Pre Disaster Mitigation Program (PDM). Section 404

Damaged property reimbursement, after a disaster declaration is the other (Stafford Disaster Relief and Emergency Assistance Act, 42 U.S.C §5121, et seq. Section 406). Under this program Individual Assistance (includes residences and businesses). It should also be noted that low interest SBA loans for rebuilding are also available. There is also an ONA assistance program available if all the above fail....(Other Needs Assistance)

The later has a crossover PA element to the other; causing confusion CT March 2010 is an example. Disaster Mitigation will only allow a rebuild to “the way it was”. Pre-Disaster Mitigation allows for rebuilding to the “way it should be”.

FEMA - Hazard Mitigation Assistance (HMA)

- Guidance on Property Acquisition and Relocation for the Purpose of Open Space
- Recent amendments to Title 44 of the Code of Federal Regulations added a new Part 80,

- Property Acquisition and Relocation for Open Space. More detailed guidance to assist with implementation of the provisions found in Part 80 has also been developed. This property acquisition and relocation guidance applies to all FEMA hazard mitigation grant programs. It is included in the FY09 Hazard Mitigation Assistance (HMA) Program Guidance at Section 2.3.13 and also governs this project type under the Hazard Mitigation Grant Program (HMGP) in place of previous desk reference sections. The property acquisition guidance section must be read in conjunction with the overall requirements for each grant program including the HMGP.

The Part 80 rule and implementing property acquisition guidance are effective for all disasters declared on or after December 3rd, 2007 (12/03/2007).

The following is an excerpt from FEMA Public Assistance (PA) guidance:

*FEMA Public Assistance (PA)*

*Public Assistance The Department of Homeland Security (DHS) Appropriations Act, 2007, Public Law 109-295, directs the Federal Emergency Management Agency (FEMA) to conduct a Public Assistance (PA) Pilot Program. The legislation sets forth three goals for the PA Pilot Program: reducing the costs to the Federal Government of*

- *providing assistance to State and local governments, increasing flexibility in grant administration, and expediting the provision of assistance to States and local*
- *governments. The PA Pilot specifically addresses the provision of assistance under sections 403(a)(3)(A), 406 and 407 of the Robert T. Stafford Disaster Relief*
- *and Emergency Assistance Act, 42 U.S.C. 1570b(a)(3)(A), 5172, 5173 (Stafford Act). These sections relate to debris removal and the repair, restoration, and*
- *replacement of damaged facilities.*

*Public Assistance Grant Program The mission of the Federal Emergency Management Agency's (FEMA) Public Assistance (PA) Grant Program is to provide assistance to State, Tribal and local governments, and certain types of Private Nonprofit organizations so that communities can quickly respond to and recover from major disasters or emergencies declared by the President.*

*Through the PA Program, FEMA provides supplemental Federal disaster grant assistance for debris removal, emergency protective measures, and the repair, replacement, or restoration of disaster-damaged, publicly owned facilities and the facilities of certain Private Non-Profit (PNP) organizations. The PA Program also encourages protection of these damaged facilities from future events by providing assistance for hazard mitigation measures during the recovery process.*

*The Federal share of assistance is not less than 75% of the eligible cost for emergency measures and permanent restoration. The grantee (usually the State) determines how the non-Federal share (up to 25%) is split with the sub-grantees (eligible applicants).*

- *Eligibility - Overview of eligibility criteria and definitions*
- *Roles and Responsibilities - Information on the duties of Federal, State, and local partners*
- *Public Assistance Grant Program Process - Step by step description of the PA grant life cycle*
- *Policy and Guidance - 9500 series policies and other publications*
- *Frequently Asked Questions (FAQ) - Top 10 questions pertaining to the Public Assistance Program*
- *Resource and Tools - Appeal database, equipment rates, cost estimating format, performance goals, funding trends, and other resources*
- *Office of Equal Rights - Information about the Office of Equal Rights and how to file a discrimination complaint*

### APPLYING FOR PUBLIC ASSISTANCE

*Following a disaster declaration by the President, FEMA makes assistance for recovery from the disaster available to eligible applicants. This chapter describes the process through which this assistance becomes available.*

#### *Process Overview*

*The PA Program is implemented through the steps listed below, each of which is described in detail in this chapter.*

- *An Applicants' Briefing is held.*
  - *Potential applicants submit the Request for Public Assistance.*
  - *A PAC is assigned to each applicant.*
  - *The PAC holds a Kickoff Meeting with the applicant.*
  - *The applicant's specific needs are identified and cost estimates developed through the project formulation process.*
  - *Cost estimates for small projects that have been prepared by the applicant are checked through the validation process.*
  - *FEMA approves and processes grants for the applicant's projects.*
- Projects. A project is a logical method of performing work required as a result of the declared event. A project may consist of one item of work, such as repairs to a single structure, or work that occurs at multiple sites, such as repairs to several washouts along a road. The applicant is responsible for identifying all work that is required as a result of the disaster. The PAC may assist the applicant in combining various recovery efforts into projects*

## **VI. INDIVIDUAL (residents and businesses) ASSISTANCE**

The following is an excerpt from FEMA Individual Assistance (IA) guidance:

*FEMA and other federal, state, local and volunteer agencies offer disaster assistance in several forms:*

*Low-Interest Loans. Most, but not all, federal assistance is in the form of low interest loans to cover expenses not covered by state or local programs, or*

*private insurance. People who do not qualify for loans may be able to apply for a cash grant. If you qualify, your check will be issued in about three weeks.*

*The Farm Service Agency (FMHA) and the Small Business Administration (SBA), offer low interest loans to eligible individuals, farmers and businesses to repair or replace damaged property and personal belongings not covered by insurance.*

*Cash Grants for up to \$13,400 adjusted (annually for inflation). Individuals who do not qualify for a loan from SBA may be eligible for these grants from FEMA and the state to help recover uninsured property losses. Home inspections are normally conducted before a check is issued. FEMA funds 75% of the grant program's eligible costs with the remaining 25% covered by the state. The state administers the program.*

*Housing Assistance. FEMA's Disaster Housing Assistance Program (DHA) makes funds and temporary housing available to individuals whose home is unlivable because of a disaster.*

*Veterans Benefits. The Department of Veterans' Affairs provides death benefits, pensions, insurance settlements and adjustments to home mortgages for veterans.*

*Tax Refunds. The Internal Revenue Service (IRS) allows certain casualty losses to be deducted on Federal income tax returns for the year of the loss or through an immediate amendment to the previous year's return.*

*Unemployment Benefits. Unemployment benefits may be available through the state unemployment office and supported by the U.S. Department of Labor.*

*Crisis Counseling. Local and state health agencies, the American Red Cross, as well as churches and synagogues may offer counseling to people who have experienced a disaster.*

*Free Legal Counseling. The Young Lawyers Division of the American Bar Association, through an agreement with FEMA, provides free legal advice for low-income individuals regarding cases that will not produce a fee (i.e., those cases where attorneys are paid part of the settlement which is awarded by the court). Cases that may generate a fee are turned over to the local lawyer referral service.*

*Independent Study Programs. FEMA offers an Independent Study Program through the Emergency Management institute.*

*Individuals, families and businesses may be eligible for federal assistance if they live, own a business, or work in a county declared a Major Disaster Area, incur sufficient property damage or loss, and, depending on the type of assistance, do not have the insurance or other resources to meet their needs.*

## VII. NATURAL HAZARDS

Note: This Middletown section of the Natural Hazard Mitigation Plan contains a variety of localized details complementing the Natural Hazard Section in the Regional Section of this Plan. For overall information on potential natural hazards, see the Regional Section of this Plan: Section III.B.

Middletown is vulnerable to many types of natural hazards. Flooding is by far the most significant natural hazard with the potential to do harm to people, places and things and to cause financial losses. The second greatest threat is from hurricanes. Therefore the focus of this Plan is on these two weather events. Due to recent events we include Tropical Storms with Hurricane and Wind Event discussions. Tropical Winds are up to 74MPH.

The core team of City officials contributed to the hazard input for this Plan included: the Mayor, Administrative Assistant, Public Works Director, Director of Water and Sewer, Land Use Planners, Emergency Management Director and Health Department..

Their contributions included hurricane damage is not localized as is flooding. Generally the effects are town wide. Wet hurricanes also create flooding problems.

Wind and snow storms do regularly occur; but the results are not as catastrophic as flooding and hurricanes. The other potential threats are discussed extensively in the Regional Section of this Plan.

The profiling of hazards in Middletown is based on a variety of sources and personal observations of recent events and discussions with “the older generation”. During Council meetings and especially the Public Workshop we also heard of other concerns...other than the ones we already were aware of.

Throughout the planning process many people contributed to the gathering of information and provided leads of other sources. It was a consensus of Middletown officials that “it’s only a matter of time until we get hit with another ‘big one’”.

As another example of the benefit of the planning process; when the Mayor was told of the 50” snowfall in 1888 he approached the PW Director and asked him if “we were prepared today”.

Natural disasters can often be predicted. And damage can be anticipated. Crumbling infrastructure does require continuing R & R to minimize costly damage. Utilizing budget allocations and available State grants the current mitigation process is ongoing. Repetitive damage due to storms generally puts a vulnerable project as a top priority “fix” on Public Works “Wish List”.

Storm damage tends to occur repeatedly in the same geographical locations because they are related to weather patterns or physical characteristics of the area (flash and or spring flooding). However; all areas of the community are vulnerable to one or another type of natural disaster (hurricanes, wind, ice storms, tornados, etc.).

A study of potential natural disasters in this area has shown they are the same as the State’s and Feds Top 4: floods, hurricanes, wind storms, and winter storms. Nationally flooding is the most common natural disaster (NOAA).

**For public information:** Note; The Middletown Public Outreach section contains a variety of references including, FEMA Directive on NFIP, USGS Floods, WATERWATCH [a Hydrologic Science and Data-Floods], USGS Flood Definitions, FLOWING Waters, Danger from Chevron –LEARN Cars website, DEMHS Hurricane Fact Sheet, NOAA Hurricane Definitions, Hurricane Grace – the PERFECT STORM story, The Great White Hurricane story, NWS Winter storm Advisories, FEMA Risk Prioritization Tool for Dams, NOAA, DEMHS Heat & Cold Advisor, USA Flood victims, WHEN THUNDER ROARS...GO INDOORS, EF Scale for Tornadoes, etc. Most of these info documents are suitable for posting for Public Outreach.

## **A. Floods**

### **1. Introduction**

For Middletown, flash floods are the most dangerous flooding condition as is evidenced by our history of flooding. They are the most significant natural hazard with the potential to do harm to people, places, things, and cause economic and financial loss.

As mentioned they come with; minimal, if any warning. There are 31 dams in Middletown. Many of which could be breached by a sudden surge of a large amount of runoff (flash flooding) Two are classified being a significant hazard.

### **2. Spring Flooding**

There are two main types of floods that may affect Middletown; flash floods and annual spring floods.

Spring flooding is the second flooding condition with the potential for causing damage in Middletown. Yet they are the most likely, given its proximity to the low points from Route 9 to the River.

Spring flooding is the result of a large rain storm ranging from the Middletown Area all the way up to, or near the Canadian border. This accompanied by a warm spell and if there is a deep snow pack in Vermont, New Hampshire and the fields of Western Massachusetts puts more water in the River than it can normally handle.

Since 1936 Route 9 has been overtopped 18 times. This occurs when the River rises 19' over flood stage.

Below is a list of floods at Harbor Park form the Middletown Yacht Club, formerly located in the Harbor Park area. Note, not all entries are legible as the chart was submersed in the Hurricane of '38 flood. Special thanks to Denise Russo at the Russell Library for interpreting the entries.

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Feet above Flood Stage		
1	31.0	Saturday, March 21, 1936
2	25.8	Saturday, September 24, 1938
3	24.5	Wednesday, May 02, 1934
4	22.7	Monday, November 07, 1927
5	22.6	April 2, 1801
6	22.6	Saturday, February 04, 1905
7	21.3	Saturday, June 02, 1984
8	22.4	Saturday, August 20, 1955
9	21.8	Spring 1843
10	20.8	April 1859
11	20.7	April 18, 1869
12	20.4	April 1, 19?
13	20.4	Monday, October 17, 1955
14	19.7	10/08/1869
15	19.5	Wednesday, April 10, 1901
16	18.7	Thursday, April 07, 1960

Spring floods do come with advance warnings. DEEP and DEMHS as well as the radio and TV stations broadcast warnings with time lines for when a crest will reach a certain point.

The two largest spring flooding events in memory are 1936 and 1984. The 1936 flood stage reached 31', by far the greatest flood in our recorded history. The (old) Arrigoni Bridge was closed as there was a fear the River would cover the roadway, plus there was a buildup of debris above it, exacerbating the danger. The Bridge clearance, above the River, was only 28ft. The bridge we see and use today was completed in 1938. It opened August 6<sup>th</sup>, a month before the Great Hurricane of 1938. The Bridge clearance is now 90'.

The 1984 crest was measured at the Bodkin Rock tide gage at 22 feet.

The following collage of historic photographs, uncovered in the Russell Library and Middlesex County Historical Society Library show the consequences of floods throughout the City.



**Photo 2: 1936 Spring Flood.**



**Photo 3:** 1936 Spring Flood.



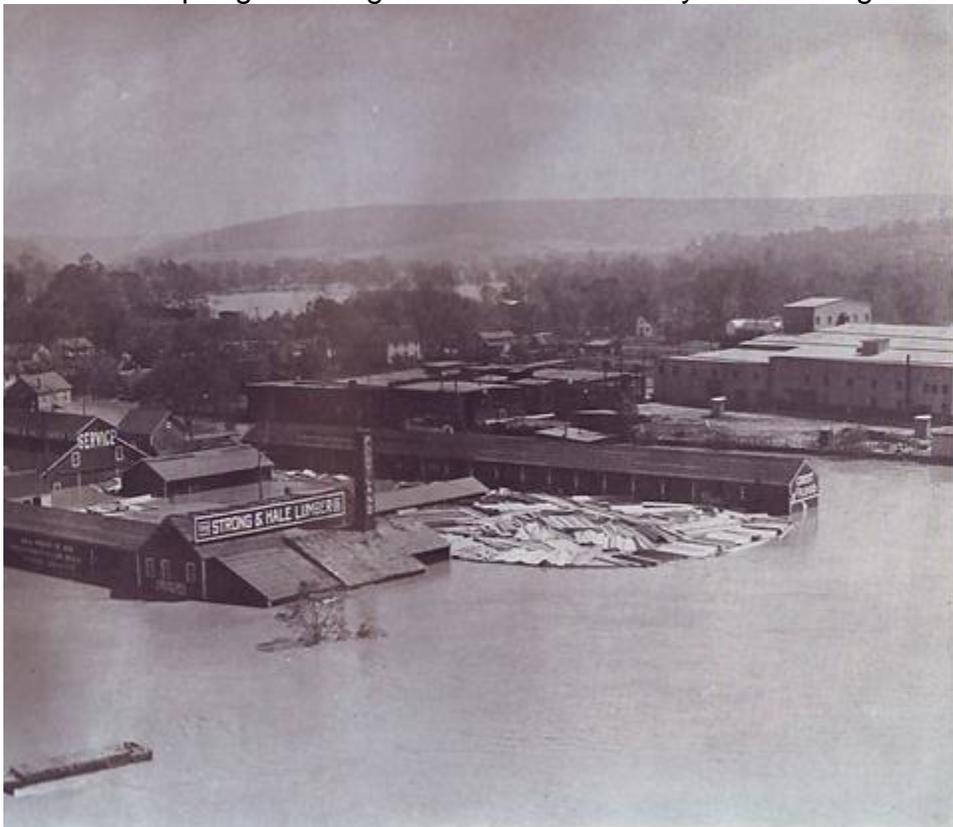
**Photo 4:** 1936 Spring Flood at Railroad Bridge



**Photo 5:** 1936 Spring Flood. Notice the water over current DeKoven Drive area as well as the water level at the two bridges.



**Photo 6:** 1936 Spring Flooding at the Palmer Factory on Washington Street.



**Photo 7:** Flooding from 1938 Hurricane



**Photo 8 (Left):** Flooding on Main Street. **Photo 9 (Right):** Flooding closes Hartford Ave, 1963



**Photo 10:** Spring Flooding over Route 9, 1984  
Source for Photos 2-8: Russell Library

### **3. Flash Flooding**

The first flood condition, caused by significant rain events, is when we receive a lot of precipitation from a major rain storm ... or a lot of rain over number of days. These floods can be violent and come without advance warning. Flash floods are characterized by high velocity flowing water often accompanied by debris. Flash floods cause significantly greater damage than riverine flooding. The

streams passing through Middletown and low lying roads are a cause of concern during significant rain events.

Flash floods are a particular threat for damaging dams. See Dam Section.



**Photo 11:** 1971, Wilcox Road at Sumner Brook



**Photo 12:** 1971, Randolph Road at Sumner Brook  
Source for Photos 11&12: Middlesex County Historical Society

## 10. Middletown Dams

In the City of Middletown, the State of Connecticut Department of Environmental Protection (CT/DEEP) has 48 dams in their dam inventory. Of those 48 dams,

two dams are rated as high hazard dams (Class C) and six dams are rated as Significant Hazard Dams (Class B). Three of the latter are owned by the City. The Hazard Classification for the individual dams are from the CT/DEEP website database “High Hazard and Significant Hazard Dams in CT” revised to 8/11/2007.

The State Department of Environmental Protection requires the registration of all dams over the height of six feet. The Dam Safety Section of the Inland Water Resources Division of the Connecticut Department of Environmental Protection (DEP) is responsible for administering and enforcing Connecticut’s dam safety laws. The existing statutes require that permits be obtained to construct, repair or alter dams, dikes and similar structures and that existing dams, dikes and similar structures be registered and periodically inspected to assure that their continued operation and use does not constitute a hazard to life, health or property.

DEEP assigns dams to one of five classes according to their hazard potential:

Class AA: negligible hazard potential dam which, if it were to fail, would result in no measurable damage to roadways, land and structures, and negligible economic loss.

Class A: low hazard potential dam which, if it were to fail, would result in damage to agricultural land, damage to unimproved roadways, or minimal economic loss.

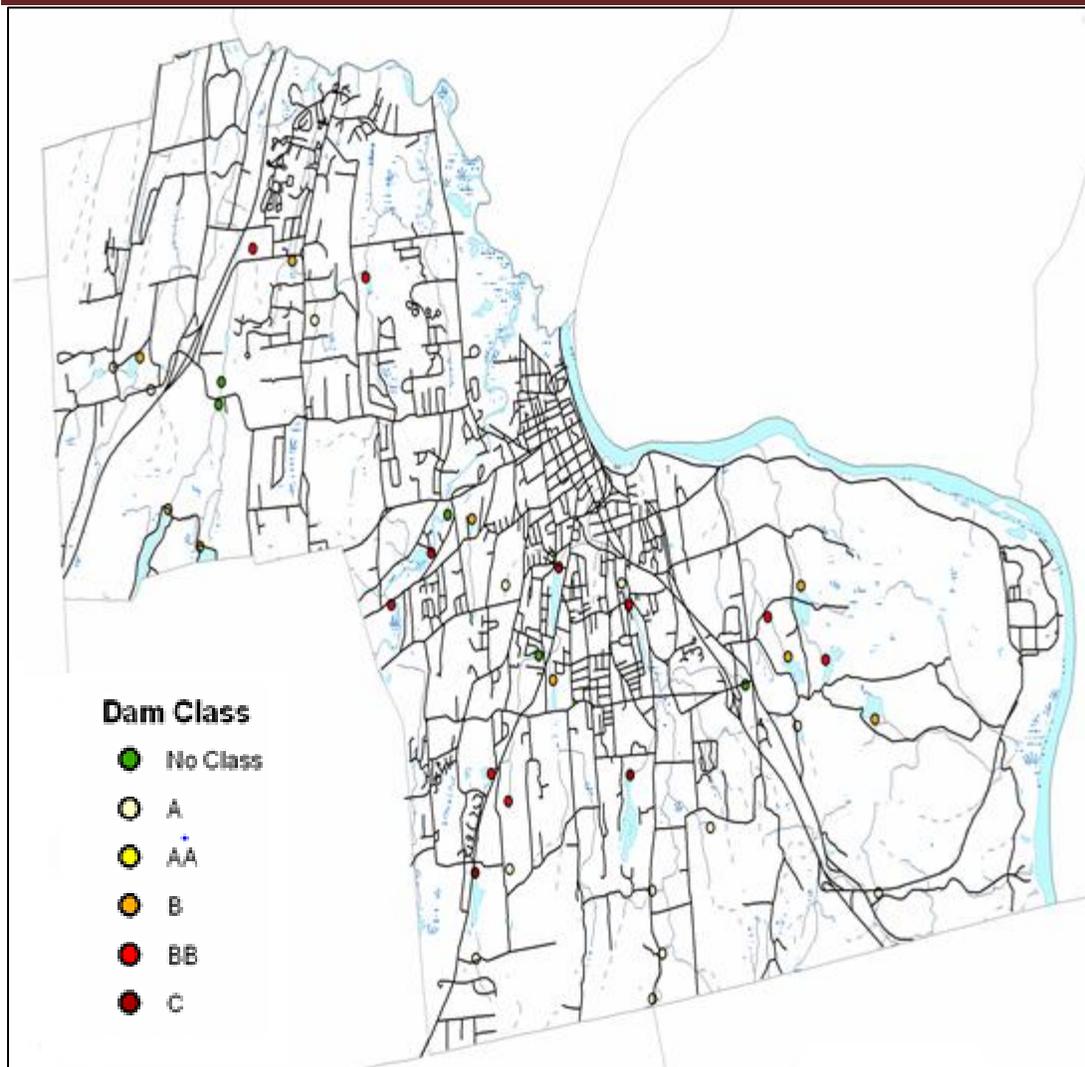
Class BB: moderate hazard potential dam which, if it were to fail, would result in damage to normally unoccupied storage structures, damage to low volume roadways, or moderate economic loss.

Class B: significant hazard potential dam which, if it were to fail, would result in possible loss of life; minor damage to habitable structures, residences, hospitals, convalescent homes, schools, etc.; damage to or interruption of the use or service of utilities; damage to primary roadways and railroads; or significant economic loss.

Class C: high hazard potential dam which, if it were to fail, would result in the probable loss of life; major damage to habitable structures, residences, hospitals, convalescent homes, schools, etc; damage to main highways; or great economic loss.

The classification of a dam can change due to changes in downstream development. 83% of dams in Connecticut fall within the negligible to moderate hazardous categories while only 17% fall within the significant and high hazard categories.

DEEP keeps track of which dams have emergency plans but not all of them would be up to date and not all dam owners will want those plans shared publically. Only the larger significant and high hazard dams would typically have an emergency plan with inundation areas but not all do as it is not yet mandated by state statute or regulation.



**Map 2: Middletown Dams**  
Source: RiverCOG

Figure 5 below lists the high and significant hazard potential dams located in Middletown:

DAM ID #	DAM NAME	HAZARD CLASS	OWNERSHIP
8301	Crystal Lake Dam	C – High Hazard	CT DEEP
8307	Dooley Pond	C – High Hazard	CT DEEP
8302	Adder Reservoir Dam	B – Significant Hazard	City of Middletown
8303	Mt. Higby Reservoir	B – Significant Hazard	City of Middletown Water Department

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8305	Butternut Hollow Dam	B – Significant Hazard	City of Middletown
8310	Hubbard Pond	B – Significant Hazard	CT Valley Hospital
8315	Highland Pond Dam	B – Significant Hazard	Middlesex Land Trust
8322	Asylum Reservoir #1	B – Significant Hazard	CT Valley Hospital

**Figure 5:** High and Significant Hazard Dams in Middletown.

*Crystal Lake Dam #8301*

Hazard Class C – High Hazard Dam  
 Owner: State of Connecticut DEEP

Crystal Lake Dam is a 50-foot tall, 130-foot long earth embankment dam with a concrete drop inlet principal spillway. The dam is located on Prout Brook and impounds Crystal Lake. The dam is approximately 400 feet south of Prout Hill Road in Middletown. A recent inspection of Crystal Lake Dam by the CT/DEEP indicates the dam is in good condition. The inspection indicated that the woody vegetation must be removed from the dam.

Prout Hill Road, Millbrook Road and Randolph Road below the dam potentially will be damaged by a dam breach. Numerous residential properties on Prout Hill Road, Millbrook Road and Randolph Road potentially will be damaged by the dam's failure.

*Dooley Pond Dam #8307*

Hazard Class C – High Hazard Dam  
 Owner: State of Connecticut DEEP

Dooley Pond Dam is a 24-foot high, 320 feet long earth embankment dam with a 20-foot long broad crested weir spillway located at the right abutment of the dam. Dooley Pond Dam impounds Dooley Pond and is located on Long Hill Brook adjacent to Route 17 and 300-feet south of Brush Hill Road. A recent inspection by the CT/DEEP indicates the dam is in good condition but requires some maintenance work. The required work includes repairing the spillway outlet channel and cutting the trees and brush on the dam.

Brush Hill Road, South Main St. (State Rt. 17) and Wesleyan Hills Road potentially will be damaged by the dam's failure. There are numerous residential and commercial properties below the dam that potentially may be damaged in the event of a dam failure.

*Adder Reservoir Dam #8302*

Hazard Class B – Significant Hazard Dam

Owner: City of Middletown

Adder Reservoir Dam is a +/- 28 feet tall, 700 feet long earth embankment dam with a 17-foot wide spillway near the right abutment of the dam. Adder Reservoir Dam, otherwise known as Roaring Brook Reservoir Dam, is located on Roaring Brook adjacent to Middle Street. A December 9, 2004, inspection of the dam by the CT/DEEP indicated some deficiencies in the dam. The report indicates a significant amount of seepage was observed at the toe of the dam. A March 2, 2005, CT/DEEP letter was sent to the City of Middletown stating:

10. Monitor/continue to investigate the seepage in the downstream face and downstream toe of the dam and outlet end wall. Provide the Department of Environmental Protection's Dam Safety Section with reports/findings/repair options and implement repairs as recommended by your engineering consultant.
11. Monitor/stabilize the spillway training walls and the downstream embankment slope that is saturated.
12. Provide/update emergency operation plan in accordance with the Department of Environmental Protection's emergency operation plan guidelines.

*Hubbard Pond Dam #8310*

Hazard Class B – Significant Hazard Dam

Owner: State of Connecticut – Connecticut Valley Hospital

Hubbard Pond Dam is owned and operated by the State of Connecticut, Connecticut Valley Hospital. Hubbard Pond Dam is an earth embankment dam. Hubbard Pond Dam is located approximately 200-feet upstream of Bear Hill Road. The dam was inspected on September 5, 2002, and the following deficiencies were noted:

1. The spillway apron is cracking and undermined at the end of the structure.
2. There is scouring in the downstream channel.
3. The tree stumps on the embankment need to be removed and back filled or monitored.
4. Brush needs to be cleared off the upstream slope and the spillway training walls.

*Asylum Reservoir #1 Dam #8322*

Hazard Class B – Significant Hazard Dam

Owner: State of Connecticut – Connecticut Valley Hospital

Asylum Reservoir Dam is owned and operated by the State of Connecticut, Connecticut Valley Hospital. It is located approximately 300-feet to the east of Cedar Lane. Asylum Reservoir Dam is an earth embankment dam with a masonry broad crested spillway. The dam was last inspected on September 5,

2002, and was in good condition. The following conditions were noted during the inspection:

The upstream and downstream dam embankments must have the trees and brush removed.

*Mount Higby Reservoir Dam #8303*

Hazard Class B – Significant Hazard Dam  
Owner: City of Middletown Water Department

Mount Higby Reservoir Dam is located approximately 2000-feet to the west of Higby Road and is owned and operated by the City of Middletown Water Department. Mount Higby Reservoir Dam is an earth embankment dam about 30 feet high and is about 865 feet long. Mount Higby Reservoir is located on Fall Brook, which is a tributary of Sawmill Brook. The spillway is located at the left abutment and is excavated into bedrock.

Mount Higby Reservoir was last inspected on April 7, 1995, by CT/DEEP dam inspectors. The dam was in good condition at the time of the inspection but the following recommendations were made:

1. Continue the excellent maintenance program shown by this inspection.
2. Eradicate burrowing animals on the dam embankments, and refill the burrows with compacted material.
3. Continue to cut the brush growing in the spillway approach channel upstream of the bridge.
4. Redistribute the riprap in the outlet channel.

*Butternut Hollow Dam #8305*

Hazard Class B – Significant Hazard Dam  
Owner: City of Middletown

Butternut Hollow Dam is a 21-foot high earth embankment dam 535 feet long. The spillway is a broad crested weir 20 feet wide. Butternut Hollow Dam impounds Rowans Pond. The dam is located 500-feet to the north of Butternut Street.

Butternut Hollow Dam was repaired by the City of Middletown in 1993. The dam's spillway, approach slab and discharge channel and the dam embankments were reconstructed. The dam repairs were completed by the City of Middletown. There were no recent inspection reports on the dam.

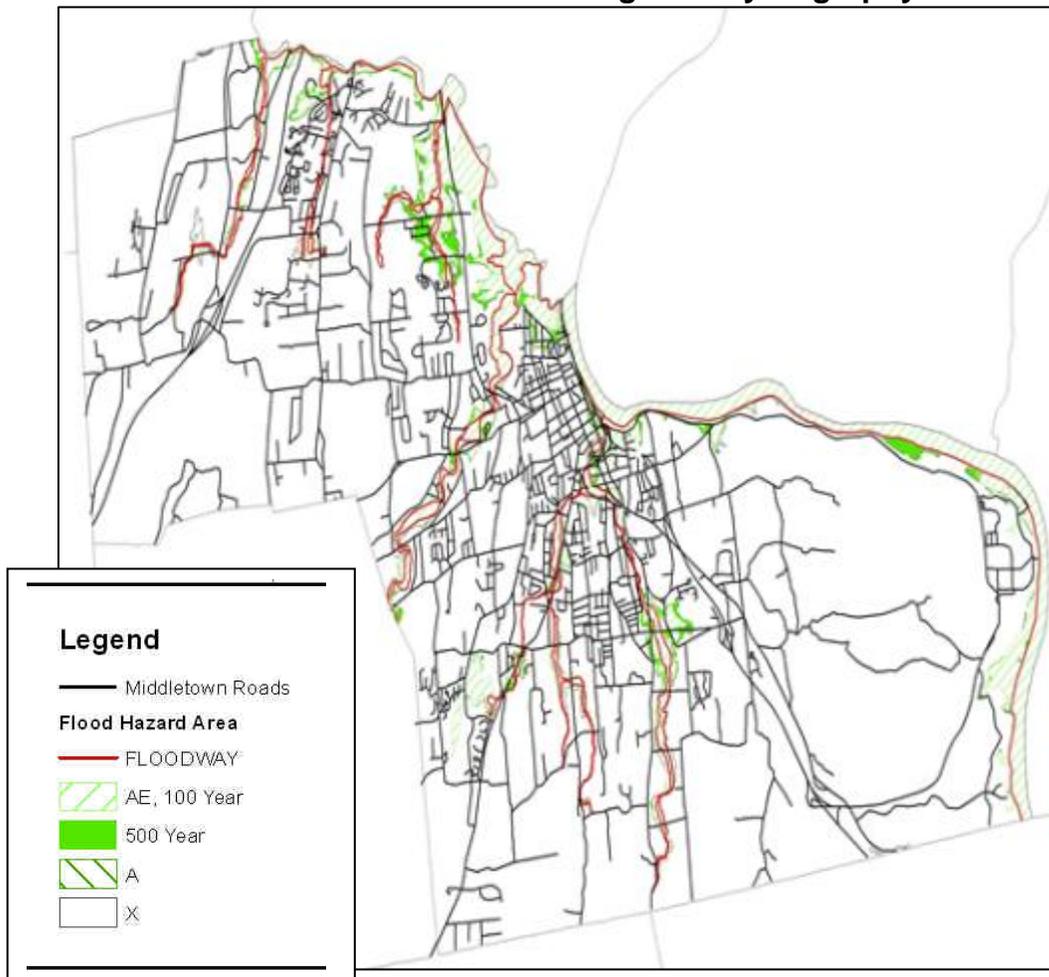
*Highland Pond Dam #8315*

Hazard Class B – Significant Hazard Dam  
Owner: Middlesex Land Trust c/o DeKoven House

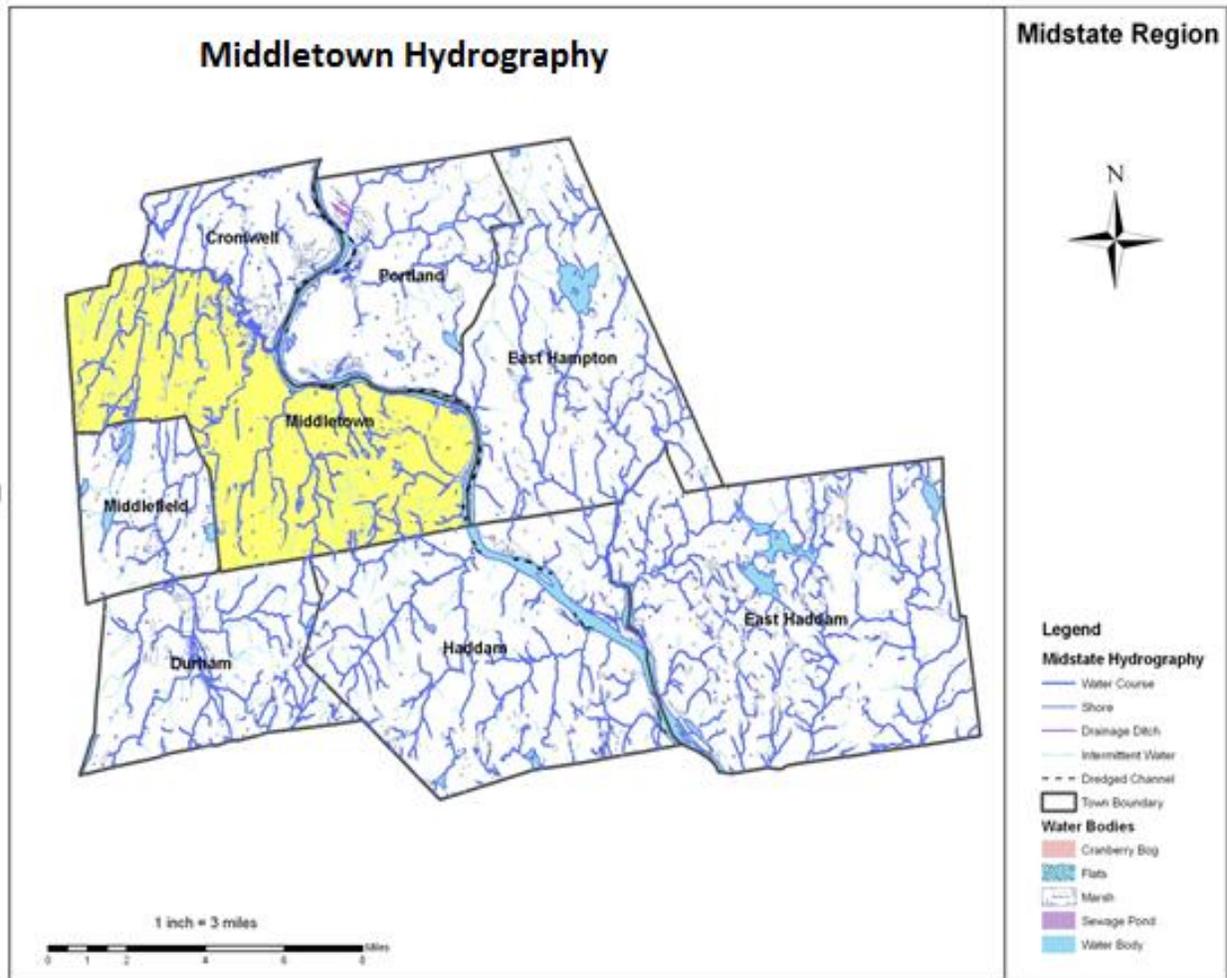
Highland Pond Dam is a dry stone rubble masonry dam with earth fill and a concrete cap. The dam is 18 feet high and 120 feet long with a 22-foot wide concrete spillway centrally located on the dam. Highland Pond Dam is located approximately 200-feet upstream of Saw Mill Road. CT/DEEP personnel inspected the dam on June 16, 2005. The dam was in good condition at the time of the inspection. The following deficiencies were noted during the inspection:

1. Remove all beaver debris from below the spillway.
2. Cut the brush in the riprap and keep the area cleared of brush.
3. Removed the fence sections located in the emergency spillway.
4. Monitor the bulge in the vertical downstream face of the left emergency spillway section.
5. Exercise the gate/draw down structure biannually to maintain proper function.
6. Chink the minor voids in the vertical masonry walls.
7. Provide DEEP with an updated emergency operation plan.

#### 4. Middletown Flood Zones and Regional Hydrography



**Map 3: Middletown Flood Zones**  
Source: RiverCOG



**Map 4:** Middletown Hydrography.

Source: RiverCOG

## 5. Middletown Flood Plain Management

Flood plain management is the operation of a community program of corrective and preventative measures for reducing flood damage. These measures take a variety of forms and generally include requirements for zoning, subdivision or building, and special-purpose flood plain ordinances.

A community's agreement to adopt and enforce flood plain management ordinances, particularly with respect to new construction, is an important element in making flood insurance available to home and business owners. Currently over 20,100 communities voluntarily adopt and enforce local flood plain management ordinances that provide flood loss reduction building standards for new and existing development.

To help State and local officials in implementing the NFIP, see our

### 7. Adoption of Flood Insurance Rate Maps by Participating Communities

8. NFIP Flood plain Management Requirements
9. NFIP Policy Keyword Index

To encourage communities to establish sound flood plain management programs that recognize and encourage community flood plain management activities that exceed the minimum NFIP requirements, the Community Rating System (CRS) was created. This program provides communities with discounts to flood insurance rates.

Middletown Zoning Regulations Section 46 is the Flood Area Management Regulations. The latest regulations were adopted March 2, 2009.

Flood Area regulations are covered in Sections 46.01 through 46.09.03

**Middletown Plan of Conservation and Development**

Department of Planning, Conservation and Development

Chapter 10 THE NATURAL ENVIRONMENT

Flood hazard specific areas in the Plan are: Inland Wetland areas, Ground Water Aquifers and Public Water Supply Watersheds, the Connecticut River and its Flood Plain and Other Rivers and Streams.

Following is an excerpt of page one of the POCD overview.

Infrastructure:

Middletown is the sole regional center in the [RiverCOG] territory and exhibits a broad array of infrastructure elements; highways, freight rail service, power plants, sewer and water service and treatments, water storage, electric transmission lines and sub-stations, cell phone towers, and petroleum pipelines.

Providence & Worcester Railroad presently operates freight service that originates in Middletown and runs southwest through Middlefield, Durham, and North Haven. Service is provided to Pratt & Whitney in the Maromas section of Middletown.

The Middletown POCD reports that the sewer department has 10,000 customers comprised of residential, commercial, and industrial users and maintains approximately 130 miles of pipe, 15 pumping stations, and one sewer treatment plant. (Work is currently underway to expand the Mattabasset District in Cromwell in order to accept Middletown sewage, which will eliminate the Middletown treatment plant.)

**6. National Flood plain Management**

Middletown currently and will continue to participate in the NFIP. The table below depicts adoption dates of various flood regulations.

Middletown Natural Hazards Mitigation Annex

	Initial Hazard Boundary Map FHBM	Initial Flood Insurance Rate map	Date Middletown entered the NFIP regular Program	Current Effective FIRM Map Adopted	Date Planning &/or zoning Updated
	(i)FHBM	(i)FIRM	(r)FIRM	(c) FIRM	(l) Regulations updated
Middletown	16-Aug-74	16-Dec-80	16-Dec-80	28-Aug-08	8/08

**Figure 6:** Middletown FIRM and regulatory adoption dates.

**7. Repetitive Loss Properties**

There are three repetitive loss properties in Middletown with very different exposures and loss histories. Two of these properties lie along inland streams, while the third lies along the Connecticut River.

Town	NFIP Participant?	Latest FIRM Adoption	Flood Zone Regulations	Enforcement
Middletown	Yes	August 28, 2008	2-Mar-09	Permit, Staff Observations

**Figure 7:** Synopsis of NFIP Compliance.

**8. HAZUS-MH FLOOD SUMMARY EVENT REPORT**

HAZUS is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences.

The primary purpose of HAZUS is to provide a methodology and software application to develop multi -hazard losses at a regional scale.

These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The RiverCOG PDM Team utilized HAZUS-MH<sup>50</sup>, enabling estimates of vulnerabilities and potential losses from natural hazards.

On file in the RiverCOG Office is the HAZUS-MH Report which includes:

- ✚ Census block demographics including: businesses, households, and essential facilities.

<sup>50</sup> HAZUS-MH = HAZardsUnitedStates - Multi-Hazards

- ✚ Projected debris generation from storms reports.
- ✚ Projected shelter requirements should evacuations be necessary

For the full report, see the Appendix A of this plan.

## 9. Flood Mitigation Strategies

Middletown regulations have been amended and are in full compliance with the most recent flood maps (August 2008). The CT DEEP signed off on the amendments. City planners and regulators will continue to update local flood management plans.

Middletown regulations do not allow residential development in the flood plains and there is very little developable commercial land in the flood plain. If there is a request for commercial development in a flood plain it has to be above the 100 year and on site compensation is required

Other:

- Purchase flood prone properties and create open space( there is one major possibility in discussion)
- Maintain culverts, bridges and other restricted flow streams of debris
- Maintain dams (municipally owned) and caution private dam owners to do the same
- When a storm is pending early warn residents of fast flowing waters,
- Remind residents of evacuation and sheltering procedures.
- Advise residents where to go for weather notifications.
- Advise the public of the dangers of driving through moving flood waters
- Monitor DEMHS, DEEP, local press and radio and TV for flood warnings.
- Through legislation change, pressure should be put on the DEEP to allow banking protection from erosion.
- Roadway elevation
- Structure (public/private) elevation
- Structure (public/private) relocation
- Structure (public/private) flood proofing
- Sewer/septic system (public/private) upgrades
- Levee/embankment improvement
- Stream modification (unlikely due to DEEP restrictions)

- Storm water runoff improvements
- Acquisition of storm debris managing equipment

## **B. Hurricanes**

### **1. Introduction**

Middletown officials are aware that although winter storms cause more frequent coastal flooding and more annual damage, a single major hurricane (Category I - III) can cause 3 - 10 times that amount of damage<sup>51</sup>. Consider the damage of “only” Tropical Storm Irene in October of 2011. Irene hit the area with sustained 40 - 50 MPH winds with gusts to 67.

In a large Category II or Category III we can expect 80% of our mature growth trees to be felled. Irene only caused 2% (statewide).

Here in Southern New England they do not occur often; but when they do, the consequences could be dire. A hurricane brings with it wide spread destruction, not just vegetation.

Hurricanes are rated by NOAA by several factors. Commonly we classify them by sustained wind velocity. The guideline is called The SAFFIR-SIMPSON HURRICANE SCALE. See Section II, Part C.1. .e.g. the Hurricane of '38 is listed as with winds of Cat III strength (111 – 130). But a wind gust of 161 MPH was recorded, on the shoreline, in Clinton. That's a Cat IV. For the record; it came ashore as a Category III, went inland Connecticut as a Cat II and was still a Cat I when it went into Canada

As indicated in the Regional part of this Plan, Section III they come in various shapes and sizes; some are wind events, some rain and some...the worst kind... have both e.g. the Hurricane of '38

Most people think only the shoreline is affected; but history has proven otherwise. Storm paths are unpredictable. If Long Island and the Connecticut shore take a direct hit, we can plan on the storm coming inland to the RiverCOG area. And depending on which side of the eye of the storm we are on, conditions can be bad for different reasons. The winds are strongest on the right front quadrant. The rains are heaviest on the left front quadrant.

Gloria 1985 was a “dry” hurricane, she only brought Cat I winds. Some mostly rain (1955 Hurricanes Connie and Diane). Just two months after Connie made landfall, when the soil was saturated, the State was hit by torrential rains from Diane. The result was severe flooding.

The Great Hurricane of 1938, which arrived after several days of rain brought us both wind and rain.

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<sup>51</sup> CT Hazard Mitigation Plan



**Photo 13:** Damage from the Hurricane of 1938



**Photo 14:** Trees have been cut away from High Street after the Hurricane of 1938

Source for Photos 13&14: Russell Library

## **2. HAZUS-MH Hurricane Event Report**

HAZUS is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences.

The primary purpose of HAZUS is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss

estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

Due to the fact that this individual town Annex is part of the larger Former Midstate Regional Natural Hazards Mitigation Plan, HAZUS-MH was generated on a regional scale. Please see Appendix B of this NHMP for the full HAZUS – MH Hurricane Event Summary Report for the Midstate Planning Region.

**3. Hurricane Mitigation Strategies**

For a more detailed list of mitigation actions, see Section VIII of this annex. Below is a list of more general items that the City could choose to employ.

- Tree Warden to work with Public Works and CL&P on an aggressive tree trimming program.
- Maintain culverts, bridges and other restricted flow streams of debris
- Maintain dams (municipally owned) and caution private dam owners
- When a storm is pending early warn residents of fast flowing waters,
- Advise homeowners at risk to flood proof the structure
- Advise residents to secure any loose objects in the yard.
- Advise homeowners to “stock up” on food, water and medications (including the animals)
- Remind residents AND RESPONDERS of dangers of handling anything in the vicinity of a downed wire.
- Remind residents of evacuation and sheltering procedures.
- Advise residents where to go for weather notifications.
- Purchase flood prone properties and create open space.

**C. Winter Storms**

NOTE: For an extensive discussion on winter storms in the Region and State see the Regional Section of this Plan: Section III.B.1.c.3)

This would be a minor section of the Plan if it were not for the recent January 2011 Blizzard Nor’easter and the very recent 2011 October Nor’easter Snow Storm.

**1. Introduction**

The National Oceanic and Atmospheric Administration (NOAA) has recorded an estimated 2,092 severe weather events for the State of Connecticut during the time period of 1950-March 2007.2 Table 2.2 provides the total number of severe weather events recorded for each county. The events recorded by NOAA include such events as droughts, floods, hailstorms, severe lighting Precipitation, snow & ice storms, and extreme temperatures. Following is the winter storm record:

<b>Middlesex County Winter Weather Events 1950-2013</b>					
<b>Blizzard</b>	<b>Ice Storm</b>	<b>Heavy Snow</b>	<b>High Wind</b>	<b>Snow</b>	<b>Total</b>
5	16	11	12	24	68

**Figure 8:** Winter Weather events in Middlesex County between 1950 and 2013.

Source: SHEL DUS

Middletown officials, led by the Health Department aggressively prepares for possible power outages, the most serious consequence of a major wind and or ice storm is the evacuation and sheltering of people in need. It is their responsibility (technically, under state statutes it is the Mayor's (CEO) responsibility) to protect the residents. This protection includes a robust people with disabilities and pet sheltering plan. There is a "redirection of those with special needs" that cannot be met in the shelter and a "forward movement" of patients at Middlesex Hospital when they reach their surge capacity.

## **2. Snow Storms**

Major Snow storms have occurred in the area:

1978	(disaster Declaration 3060)
1992	(disaster Declaration 972)
1993	(disaster Declaration 3098)
1996	(disaster Declaration 1092)
2003	(disaster Declaration 3176)
2004	(disaster Declaration 3192)
2005	(disaster Declaration 3200)
2006	(disaster Declaration 3266)
2011	(disaster Declaration 1958)
2011	(disaster Declaration 3342/4046)

### **2011 October Nor'easter**

Middletown Press Article regarding the historic October 2011 snow storm that affected the region.

By WALT GOGOL

YA, Press Staff, Middletown Press

MIDDLETOWN — The recent winter storm will end up costing the city close to \$30,000 but officials say Middletown was prepared and the costs are necessary.

The blizzard, which dumped nearly a foot of snow throughout Middlesex County, was handled by 30 city plow trucks as well as seven private contractors to help with snow removal.

Public Work Director William Russo said 22 hours of overtime was put in per man and estimates the cost to the city at \$28,000.

The city was 100 percent prepared Russo said, and the man hours were necessary to keep up with the blizzard and to ensure that the roads remain open for safety personnel.

**Snow Storms and the October Nor'easter of 2011**

Technically not winter we had a winter storm in October 2011. During this unusual October Nor'easter power outages and blocked roads were major issues. Because the leaves were still on the trees when the snow came accompanied by strong winds, many trees and limbs came down taking power lines with them. Many City roads were closed and there were extensive power outages.

The winter of 2010/2011 was particularly snowy. Heavy snow loads caused many roof collapses in and around Middletown.

Reported Roof Collapse or Structure Damage, January/February 2011 combination Snow Storms		
Municipality	Address	Structure
Middletown	1310 South Main Street	Passport Inn Building & Suites
Middletown	505 Main Street	Accounting firm, converted, mixed use (3 story)
Middletown	70 Robin Court	Madison at Northwoods Apartment
Middletown	80 North Main Street	Abandoned warehouse

**Figure 9:** Building collapses in Middletown due to snow.  
Source: DEMHS



**Photo 15:** A building on Main Street collapsed as a result of heavy snow in early 2011.  
Source: Middletown Press

## 2. Ice Storm

A major ice storm can cause major road closures and power outages. See Tables 16, 17 and 19 for a historic record including major ice storms.

A major ice storm occurred December 17, 1973 (Ice Storm Felix):

NEWS; Hartford Courant

### *Dark Days: Remembering The Ice Storm Of '73*

By Peter Kushkowski Peter Kushkowski is a retired mechanical engineer, November 20, 2002

Widespread power outages this week in the hills of northwest Connecticut reminded me of when my hometown of Haddam was in the grips of a similarly devastating ice storm almost 30 years ago. The memory of "Felix" still strikes terror in my heart whenever an ice storm threatens. Winter came to Haddam four days early, on Dec. 17, 1973, when a freezing rain started coating everything with a thick, heavy crust of ice. It wasn't long before the electricity began to go out as ice-laden power lines and tree branches fell.



**Photo 16:** Undated ice storm photo of Main Street, Middletown.

Source: Russell Library

## 3. Winter Storm Mitigation Strategy

For a more detailed list of mitigation actions, see Section VIII of this annex. Below is a list of more general items that the City could choose to employ.

- Having in place a Vegetation Maintenance Plan.
- Hopefully, after the October Nor'easter of 2011, CL&P will put into place a more robust power restoration plan.
- Have in place an updated Evacuation and Sheltering Plan
- Building officials, the Fire Marshal and Fire Department should require truss roofed buildings be marked, on the roadside exterior, with a large "T". This is a significant responder safety issue.

- In a severe cold winter ice jams can be a problem. Public Works is prepared for breaking up ice above vulnerable culverts that have a history of ice cake clogging.

#### **D. Wind Storms**

Windstorms, though not as widespread as a hurricane a tornado can be a significant debris generator. Bill Warner along with the Plan of Conservation and Development is leading an initiative to develop a Debris Management Plan.

**NOTE: For an extensive discussion on wind storms in the Region and State see the Regional Section of this Plan: Section III.B.1.c.4)**

##### **1. Nor'easters**

During the unusual October Nor'easter of 2011 power outages and blocked roads were major issues. Because the leaves were still on the trees when the snow came accompanied by strong winds, many trees and limbs came down taking power lines with them. Many City roads were closed and there were extensive power outages.

##### **2. Tornadoes**

Tornadoes can happen anytime, anywhere in the City. As referenced in the Regional part of this Plan, Section III, they have happened in nearby East Hampton and Wethersfield. In recent years there have been major, damaging tornados in Bridgeport and West Springfield.

The good news is when the conditions are right the National Weather Service and CT Division of Emergency Management and Homeland Security notify emergency management and the Administration of the potential. But; they can happen anytime and sometimes without warning; though the local weather forecasters are getting better.

##### **3. Wind Shear**

See Regional Section B.1.c.4 for a discussion on the difference between the winds of a tornado and those in a wind shear.

##### **4. Mitigation Strategies; Heavy snow, ice storm and wind storms**

These weather events are considered debris generating storms. For a more detailed list of mitigation actions, see Section VIII of this annex. Below is a list of more general items that the City could choose to employ.

- Having in place a Vegetation Maintenance Plan. Hopefully, after the October Nor'easter of 2011, CL&P will put into place a more robust power restoration plan.
- Have in place an updated Evacuation and Sheltering Plan
- Inventory sufficient debris pick-up equipment for City vehicles
- Have an approved Temporary Debris Storage and Reduction Site (TDSR) selected.

- Public Notifications: IMPORTANT Issue warnings to the public (and responders) to not go near downed power lines until the power company gives the OK.

**E. Other Natural Hazards**

**1. Forest Fire Risk**

**a. Introduction**

Middletown has several areas in the city that are heavily forested meaning they are vulnerable to major forest fires. If the conditions are right; drought, hot windy weather, a wildfire could happen. The risk is exacerbated by the encroachment of residents “deeper” into the woodlands.

State Forests	Towns	Acres	Cam ping	Day Use	Recommended Use	Region
Cockaponset	Middletown, Haddam, and Chester	17,186	N	X	None	2

**Figure 10: State Forest in Middletown**



**Map 4: Middletown Forest Cover**

Source: RiverCOG

**b. Wildfire Mitigation Strategies**

- Minimize development “deep” into forest lands
- Maintain forest fire fighting access to woodland tracks.
- Maintain forest firefighting equipment
- Continue pressure on DEEP, Forestry Division to maintain firefighting access in Cockaponset State Forest

**2. Earthquakes**

See Regional, Natural Hazards Section of this Plan for additional details.

According to Commissioner Skip Thomas: January 2007

**“Earthquakes:**

Believe it or not Connecticut has the oldest record of earthquakes in the United States. The earliest settlers learned of seismic activity in this area, dating back to 1568 in Moodus. This area is still very active today. We are located near the middle of the North American Tectonic Plate which is subject to intra-plate earthquakes, as opposed to inter-plate earthquakes which afflict California.

While we are not near a plate boundary, there are numerous fault lines formed hundreds of millions of years ago.

The magnitude of an earthquake is a measure of the amount of energy released. Each earthquake has a unique magnitude assigned to it. This is based on the amplitude of seismic waves measured at a number of seismograph sites, after being corrected for distance from the earthquake.

The USGS has determined that Connecticut has a 1 in 10 chance that at some point during a 50-year period an earthquake would cause ground shaking of 4 to 8 percent of the force of gravity. This amount of shaking may cause minor damage resulting from items falling from shelves and very minor damage to buildings (broken windows, doors jamming shut).”

**VIII. MIDDLETOWN MITIGATION STRATEGIES**

**A. Authorities, Policies, Programs, and Resources**

The town has many available policies and resources at its disposal for mitigating effects of natural disasters. For example, its flood plain regulations allow the Town to control growth and expansion within flood zones. The town has the authority to order parking bans in the event of a snow storm and is well prepared for all but the very worst of snow storms. The Town of Cromwell uses the State Building Code for code compliance to ensure safe structures which withstand 110 mph wind speed and appropriate snow load. The town also has the authority to order backup water supplies to be installed in new subdivisions when water for firefighting is not sufficient. In additions, the town can set up and often does set up shelters, cooling centers, and heating centers when needed for residents.

**Storms**

Land use planners and regulators have taken into serious consideration restrictions on the building of, and or winterizing of buildings in designated or known flood risk areas.

Continue monitoring DEMHS, DEEP, local press and radio and TV for storm warnings.

When a serious flash flood warning is issued, advise the public of the dangers of driving through moving flood waters.

**Crisis Communications Plan**

Following Crisis Communications Plan guidelines, keep public and responders aware of events and certain storm specific warnings; e.g.; “don’t touch downed power lines”, “don’t drive through flowing water”, availability of shelters, etc.

The City of Middletown has a variety of mitigation actions currently in place. They are not limited to brick and mortar.

	LIKELIHOOD	LOSS POTENTIAL	COMPREHENSIVE Range of Actions and Projects in Place
Floods,	H	H	Y
Hurricanes,	H	H	Y
Thunderstorms	H	L	P
Tornadoes	M	H	P
Nor’easter	H	M	Y
Extreme Cold	H	L	Y
Heavy Snow	H	M	Y
Ice Storm	M	H	Y
Fires,	M	H	Y
Extreme heat,	H	L	Y
Earthquakes,	L	H	N

**Figure 13:** Hazards and Actions in place in Middletown

**B. NFIP and Community Rating System**

See the Flood section of this (local) Plan and the Regional Section for information on the National Flood Insurance Program

Middletown does not participate in the CRS; but should consider it.

The Community Rating System (CRS) is a part of the NFIP. When communities go beyond the NFIP's minimum standards for flood plain management and participate in the CRS, discounts may be available on flood insurance premiums for policy holders in those communities.

**C. Middletown Goals and Objectives**

Goals and Objectives can be found in the Middletown Mitigation Action Plan Section of this local Plan Section VIII.C and (overall) in the Regional part of this Plan, Section IV.3.

**D. Mitigation Action Items**

Prioritized mitigation actions with costs (where known) can be found in the Middletown Detailed Mitigation Action Plan Section J.

**Administration:** Current and future loss prevention is, and will continue to be sourced through local, regional, State and Federal efforts for updating maps, local regulatory actions, and insurance efforts (National Flood Insurance Program). Also capital improvement funding made available from State and Federal sources for infrastructure improvements.

**Public Works:**

- Continues to monitor culverts and bridges that clog by maintaining debris collections above and for prevention of ice damming.
- Continues to look for funding for culvert and bridge maintenance considering local budget restraints and State grants availability.
- Work with the Director of Planning, Conservation, and Development on the City Debris Management Plan.
- Continue monitoring Flood Warnings from DEEP and DEMHS.
- Currently requiring private compliance with CGS §22a-402(b)-(f); dam inspection requirements. Local dam owners including the municipality are responsible for periodic evaluations of their dams and making repairs as needed.
- Is continuing its historic responsibilities and new ones as a designated responder. And they are aware of the herculean responsibilities a major hurricane will bring.
- Assumes the primary responsibility for municipal building and critical infrastructure.
- The Public Works Crew will stabilize unstable stream and road bed bankings to the fullest extent allowable by DEEP, and local agencies.

**Water and Sewer**

- Primary responsibilities are classified as critical infrastructure. Where life safety is concerned their mitigation requests should be given a priority.

- Continue on protection against flood waters over powering low lying pumping stations.
- Continue on plans to relocate the local treatment plant to the Mattabassett Wastewater Treatment Plant.

**Emergency Services:** have mutual aid agreements in place with neighboring municipalities. There is also a statewide mutual aid agreement in place. These will be kept current.

**Emergency Management** will:

- Will continue to enhance EOC capabilities.
- Public health employees are now designated as responders<sup>52</sup>
- Public Works employees are now designated as responders<sup>53</sup>
- Middletown has always had a very strong emergency management program in place.
- Annually practice/drill/exercise their capabilities regionally and statewide.
- They offer direct assistance in training/exercise sessions to the fire department, police department, public health and administration when needed.
- Middletown has a very active CERT. (Community Emergency Response Team). A team of volunteers that assists in mitigation activities such as planning, training and exercising of sheltering, Points of Distribution (emergency medication distribution) and other responder activities. Wesleyan also has a CERT Team in place and the two teams regularly train together.

**Emergency Operations Center** The EOC management continues to have access to WEBEOC for current information and assets available (mitigation actions) for the emergency response and recovery modes.

**Funding:**

- Through local direct assistance to fire fighter, law enforcement, call center improvement, emergency management grants, EMS assistance, etc. emergency responders are continuing to seek funding to enhance their response capability.
- The direct to the regional planning agency grants have gone away. Now the Department of Emergency Management and Homeland Security passes on FEMA grants to the five regions they have designated. Cromwell is in Region 3.
- The primary funding source for local infrastructure mitigation is through the local budgeting process. This is supplemented through regional, State and Federal grants. See Alternative Funding Sources, Regional Sections of this Plan, Section I.B.3 & 4.

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<sup>52</sup> Responders Vs First Responders

<sup>53</sup> Responders Vs First Responders

**Notifications:**

- The emergency management team does and will continue to maintain multimedia communications to stay tuned to local media and DEMHS (e-mail) for bulletins.
- NOAA broadcasts the potential when conditions are right to, say spawn a tornado. When the threat exists, EM will monitor the early warning system.
- Public Notifications: The Public will continue to be notified to stay tuned to local media for severe weather bulletins.
- Reminders will also be sent out about the dangers of driving through rushing waters and going near downed wires.
- **Residents and vulnerable businesses** will be reminded to continue in their efforts of flood proofing.
- The City will post notices on the website pre, during and post major weather events.

**Social Services:** Social services are in a position to continue in assisting in notifications of people with functional and other special needs.

**Public Health and Social Services:**

- The staff in the Health Department, particularly Janet Leonardi, works regularly on updating the local and regional public health emergency response and sheltering Plans. She also closely with the State in preparing for the needs of people with functional needs
- Continue to enhance, and exercise shelter activities; both short and long term, for citizens during power outages, hurricanes, wind storms, ice storms, heat waves, and extreme cold.
- Sheltering activities includes participating in local and regional exercises.
- The Middletown Health Department is active in local regional (Middletown area) and Region 2, 3 and 4 planning and exercises. There is a focus on enhancing exercise shelter activities; short and long term for citizens during power outages and evacuations. This is also particularly true of working with Special Needs and Fixed Populations:
- The City hosts the regional shelter.

**NGOs:** Emergency management works with **Non-Governmental Organizations** in preparing for storm emergencies. These include the American Red Cross, faith based agencies, Salvation Army, senior centers, Rotary, etc.

**Land Use Planners:**

- Regional and Middletown land use planners have worked with FEMA and its contractors on flood plain development planning. We began working on the revised FIRM maps at a workshop May 17, 2005 at a meeting in the City Hall. Middletown signed off on the maps August 2008.
- The Department of Planning, Conservation, and Development is very active in this flood plain planning.
- The planners are aware of flood hazards throughout the City particularly in designated flood plains. They will continue to:

- Monitor trends in number of permit requests in vulnerable areas
- Monitor evolving vulnerable areas where development may occur
- Encourage open space in vulnerable areas
- Encourage municipal acquisition of buildings in flood plains and creation of open space.
- Monitor expected growth or development over the next 10, 20 years.

**Schools:** The Schools, working with Emergency Management have severe weather plans in place, modeled after: Snow Days. They also have a NOAA provided weather alert radio for monitoring weather events.

### **Special Situations**

**People with Functional Needs (formerly; Special Needs) clusters:** The Middletown Health Department/District and Emergency Management shall continue to participate regularly in sheltering exercises. This includes handling people with disabilities. DEMHS Regions are working on enhancing programs for working with people with disabilities.

**Fixed Populations:** These initiatives are ongoing including activities: locally, regionally and Statewide. This population includes those individuals unable to evacuate due to a physical disability or clusters of elderly or those with functional medical needs that shelter-in-place. Emergency management is also aware of the local State facilities that they are responsible for. However it may fall on the responsibility of the municipality; such as a group home.

**Pet Evacuation and Sheltering:** Municipal officials should continue to make a special effort to identify, at risk local animal population pets and livestock. They should be aware of owner notification requirements (e.g. sheltering available) and transportation needs.

- The City of Middletown Emergency Operations Plan, as updated in 2006, addresses in detail the evacuation and sheltering of animals.
- Emergency management and animal control authorities have available (from Region 2 & 3) portable pet shelters to be set-up adjacent to human shelters.
- Under the latest Americans with Disabilities Act (ADA) guidelines Service Animals are now specifically defined as Service Dogs. The only allowable exception is miniature horses.. They have specific qualifiers.

## **E. Incorporation of Other Plans**

See the Regional Section of this Plan for authorities, responsibilities and other<sup>54</sup> plans incorporated into the natural hazard planning; past and going forward. (Sections I, II and particularly IV)

Local land use plans apropos to natural hazard protection will be watched for ramifications to the natural hazard planning process. These plans include regional, State and Federal plans. See Section I, Part E.2

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<sup>54</sup> *Meaning other than natural hazard mitigation planning*

Typical regional efforts: Middletown is within; so is vulnerable to Mattabasset River watershed flooding. There is a MANAGEMENT PLAN FOR THE MATTABESSET RIVER WATERSHED Flood Plan in place.

#### **F. Proposed Mitigation Strategies**

The municipality of Middletown has a variety of mitigation actions currently in place.

See Section III of this local Annex for details.

#### **G. Planning Team Recommendations** **TDSR (Temporary Debris Storage and Reduction Site Plan)**

Middletown needs to have a current plan in place for managing the massive amount of debris as a result of a hurricane hitting the area. 100 MPH winds and up would cause major destruction to our trees and in many cases power, cable and telephone lines. Again 100MPH an up winds will blow down 80% of our mature growth trees ... many hanging over power lines ... on local and state roadways. Middletown should identify approved sites for temporary debris storage.

#### **Erosion Protection:**

Through legislation change, require the DEEP to allow banking protection from erosion.

#### **COOP/COG**

Develop a Continuity of Operations Plan/Continuity of Government Plan.

#### **Community Rating System**

Middletown should consider participating in the CRS.

#### **Weather Awareness:**

All **municipal departments and local agencies** will continue to listen for NOAA broadcasts and other emergency broadcasts, when conditions are right for a severe storm: significant rain event, heavy wind, tornado, hurricane, etc. They will then activate their emergency plans.

#### **H. Middletown Mitigation Action Plan**

##### **1. Prevention**

Middletown, town planners, P&Z, the building department and emergency management, working with RiverCOG continuously monitors growth trends and vulnerable sites and has enhanced its land use regulations designed to protect natural resources and restrict development in flood zones and other hazard-prone areas.

These regulations help prevent the loss of life, limb and property by preventing inappropriate development in flood zones and other high risk areas reducing the amount of damage caused by spring flooding and flash flooding.

The Zoning Regulations update in 1988 restrict select new construction in the 100-year flood plain as depicted on the most recent revision of the Flood Insurance Rate Map (FIRM)

In some cases all residential construction in areas that periodically flood (other than those in the FIRM areas, must be elevated to or above the flood risk elevation. Likewise, all non-residential construction must be elevated or flood proofed to or above the base flood elevation. The buildings vulnerable to wildfires must have at least two access routes.

The Zoning Regulations, offer additional preventive measures during the site plan submittal process. The regulations require the protection of natural features including those that contribute to the natural functioning of the natural drainage system.

Wherever possible utility lines are required to be buried for new subdivisions and are encouraged for certain projects such as major road projects. These land use regulations are described in detail in the Zoning Regulations and Subdivision Regulations available through Middletown City Hall.

The Building Department ensures conformance with the Connecticut State Building Code including flood resistant construction.

The Inland Wetlands Commission, through its Inland Wetlands and Watercourses regulations, works toward the conservation of wetland resources through avoiding impacts from development on functional wetlands and watercourses.

Whenever possible, Public Works examines and clears public storm drains and grates of debris and as-needed tree maintenance.

## **2. Emergency Services**

Middletown utilizes its own local warning systems for the notification of residents of emergencies affecting their area.

The Office of Emergency management is very active in emergency planning to help protect life, limb and property. The Emergency Management Director monitors the River forecasts very closely when there is a threat of a large spring flood.

The School Board has its own “snow notification” list.

### **3. Natural Resource Protection**

Middletown has an aggressive open space acquisition policy that helps protect areas prone to flooding and other natural hazards from future development.

Mattabassett River Watershed Initiative: Middletown supports the goals of the Mattabassett River Watershed Plan . MRWP organized workshops and prepared outreach materials on storm water and flood plain management. In addition, LRWI actively promoted open space preservation and protection adjacent to the Local River and other critical areas to ensure the proper functioning of the watershed.

Local repetitive loss property owners were interview as a part of this NHMP process.

Local dams have been evaluated as a part of this Plan process. At risk dams were looked at by a dam expert. The dam report can be found in Section III of this Plan

### **4. Challenges**

- a) Middletown regularly receives proposals for commercial and multi-family housing projects in or near the flood plains. Middletown regulations, the cumulative effect of relatively intense land use may increase the likelihood of flooding in commercial and densely populated areas in the Local River flood plain.
- b) The City emergency notification system is underutilized meaning the public needs to be educated re the value of subscribing to it.
- c) The Middletown Sewer Commission needs to stay on top of activities at the Mattabassett Wastewater Treatment plant and protect the City's interests
- d) Tree debris often results in street closures. In addition, tree debris creates blockages in the local streams and in culverts.
- e) Middletown has only one emergency shelter with limited capacity.
- f) Relocation of the Wastewater Treatment Plan to the Mattabassett facility

### **5. Proposed Mitigation Strategies**

Middletown personnel met with former MRPA staff on several occasions to review the potential natural hazards that may cause loss of life, limb or property. The list of vulnerabilities can be found in Part 5. These are the Middletown priority projects that need addressing.

Definitions for Priority, Schedule, and Responsible Party, and Cost can be found in Section IV.F on page 111.

**6. Goals and Objectives**

Goal of this Plan: Reduce the loss of life, limb and property as a result of natural disasters.

Objective 1 Improve the ability of Middletown residents to prepare and respond to approaching severe weather.

<b>Supporting Task</b>	<b>Responsible Party</b>	<b>Schedule</b>	<b>Priority</b>	<b>Funding Sources</b>	<b>Cost Estimate</b>
Improve the number of residents and business registered on the State and local emergency notification system.	Dispatch	2014-15	High	CIP, OP	\$
Provide cots, blanket, food supplies etc. for emergency shelter.	HD/EM	2014	Medium	HMGP, CIP, OP	\$

Objective 2. Reduce the amount of debris from severe storms through preventive tree maintenance.

<b>Supporting Task</b>	<b>Responsible Party</b>	<b>Schedule</b>	<b>Priority</b>	<b>Funding Sources</b>	<b>Cost Estimate</b>
Update the Debris Management Plan	PW/EM	2014-2015	Medium	CIP, OP	\$
Budget appropriate money necessary to maintain and remove dead, dying, dangerous, and diseased trees in rights-of-way and on other town land	Public Works	2014	Low	CIP, OP	\$\$

**7. Middletown Detailed Mitigation Action Plan**

**1. Flooding**

The parties responsible for the following projects include the Public Works Department and the Board of Finance for funding.

Priority	What Affected (See Notes 1&2)	Needed to respond (assumes notification in place)	Mitigation	Responsible Party	Funding Source	Cost Estimate
High	All facilities from Main Street to the River	sandbagging	increase inventory of sand bags	PW	CIP	\$
Medium			increase inventory of barricades	PW	CIP	\$
High	South District Fire Station of Randolph Road	Relocate out of flood plain	Develop a Plan	Fire Dept., EMD, LUO	HMGP, CIP, OP	\$
High	MAT Bus Station if Flood Gauge exceeds 40'	transportation	Relocate Bus garage.	Transit District	CIP, OP	\$\$\$
Medium	RLP on Millbrook Road	evacuation	elevation/sandbagging	LUO, BO, FM	HMGP, RLP, FMA	\$
High	RLP on Harbor Drive	evacuation	elevation/Health Department monitoring	LUO,	HMGP, FMA, RLP	\$
High	RLP on Nejako Drive	Relocate and create Open space	Purchase 5 houses @\$200,000	LUO	HMGP, RLP, FMA	\$\$\$
High	All flood plain residents	routing	GIS mapping	LUO	HMGP, FMA, RLP, CIP	\$
Medium			Acquisition and relocation	LUO		\$\$
High			Additional cots	EMD		\$
Medium	Business in the 100 DeKoven Drive area if Flood Stage exceeds 19'	evacuation and "business relocation"	Develop a Plan	EMD, LUO	HMGP, FMA, RLP, CIP	\$
High	City Hall	Business Continuity	Develop a COOP	BOS	HMGP, CIP	\$
			Need generator	PW		\$\$

**2. Other Natural Hazards**

The parties responsible for the following projects include the Public Works Department, Emergency Management, and the Board of Finance for funding.

Priority	What Affected	Mitigation	Funding Sources	Costs
High	Town Wide	Debris Management Plan	HMGP, CIP	\$
High	Critical Facilities	Generators for high priority facilities and designated shelters	HMGP, CIP	\$\$

The following is a list of projects pertaining to Water and Sewer Infrastructure Projects for facilities that are subject to flooding.

Supporting Task	Responsible Party	Schedule	Priority	Funding Sources	Cost Estimate
J.S. Roth Well field including Wells. Need to upgrade facility.	Water and Sewer Department.	B	Medium	HMGP, CIP, OP	\$\$\$
Water Pollution Control Facility. Relocate facility services to Mattabassett.		B	High	HMGP, CIP, OP	\$\$\$
Harbor Park Pumping Station. Abandon some facilities and install watertight grinder pump.		B	Medium	HMGP, CIP, OP	\$\$\$
Johnson Street Pumping Station. Relocate station upland		B	Medium	HMGP, CIP, OP	\$\$\$
Adder Brook Diversion Chamber. Repair		B	Medium	HMGP, CIP, OP	\$\$\$
South Main Street. Replace station to upland site		B	Medium	HMGP, CIP, OP	\$\$\$
Adder Brook Dam (see Dam Hazard Report). Repair outlet at gatehouse, spillway needs improvement, toe drain needs improvement.		B	Medium	HMGP, CIP, OP	\$\$\$
Mt. Higby Dam (see Dam Hazard Report). Spillway needs improvement		B	Medium	HMGP, CIP, OP	\$\$\$
Laurel Ledge Dam. Spillway needs improvement		B	Medium	HMGP, CIP, OP	\$\$\$
#3 Dam (Rte. 66 Widening Project). Spillway needs improvement.		B	Medium	HMGP, CIP, OP	\$\$\$
Coginchaug River Sewer. Raise all structure tops above flood elevation		B	Medium	HMGP, CIP, OP	\$\$\$
Saw Mill interceptor. Waterproof and repair tops		B	Medium	HMGP, CIP, OP	\$\$\$
West Swamp Brook interceptor. Waterproof and repair tops		B	Medium	HMGP, CIP, OP	\$\$\$
Newfield Street interceptor. Waterproof and repair tops		B	Medium	HMGP, CIP, OP	\$\$\$

## **IX PLAN MAINTENANCE**

FEMA Regulations – 44 CFR §201.6(d)(3): The City of Middletown, working with RiverCOG will conduct a complete review and do a revision if needed and submit it for approval in 5-years. Even if there are no changes, it must be reported, in order to continue being eligible for Natural Hazard Mitigation Grants.

In accordance with Section 201.6(c)(4) of 44 CFR Middletown will assure the Plan remains an active and relevant document. RiverCOG municipality officials will continue working with Middletown in the mitigation planning process.

Changes to the Plan can be made at any time to this Plan; however, any change will require a submission to FEMA for approval either as an amendment or as a Plan update requiring re-adoption of the plan by the affected jurisdiction. If there are regional implications, then the entire Plan would need to be re-adopted by all jurisdictions.

Please see the Regional Section V.E. for the maintenance schedule.

See Appendix Q sample mitigation planning tool.

## **X. PLAN APPROVAL AND ADOPTION**

Upon FEMA Approval Pending Adoption of this Plan, it requires a sign-off by the municipal CEO. The adoption certificate follows. CEO signatures are required on the Regional Section of this Plan.

Middletown Natural Hazards Mitigation Annex

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**THE LOWER CONNECTICUT RIVER VALLEY COUNCIL OF GOVERNMENTS  
MULTI-JURISDICTION NATURAL HAZARD MITIGATION PLAN  
CERTIFICATE OF ADOPTION  
City of Middletown, Connecticut**

WHEREAS, the City of Middletown has historically experienced severe damage from natural hazards and it continues to be vulnerable to the effects of - only those natural hazards profiled in the plan (i.e. flooding, thunderstorm, high wind, winter storms, earthquakes, and dam failure), resulting in loss of property and life, economic hardship, and threats to public health and safety; and

WHEREAS, the City of Middletown, has developed and received conditional approval from the Federal Emergency Management Agency (FEMA) for its Hazard Mitigation Plan under the requirements of 44 CFR 201.6; and

WHEREAS, public and committee meetings were held between June 16, 2009 and December 1, 2011 regarding the development and review of the Multi-Jurisdiction Natural Hazard Mitigation Plan; and

WHEREAS, the Plan specifically addresses hazard mitigation strategies and Plan maintenance procedure for the City of Middletown; and

WHEREAS, the Plan recommends several hazard mitigation actions/projects that will provide mitigation for specific natural hazards that impact the Town of Middlefield, with the effect of protecting people and property from loss associated with those hazards; and

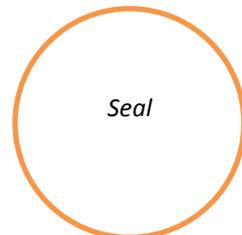
WHEREAS, adoption of this Plan will make the City of Middletown eligible for funding to alleviate the impacts of future hazards; now therefore be it

RESOLVED by the Board of Selectmen:

1. The Plan is hereby adopted as an official plan of the City of Middletown
2. The respective officials identified in the mitigation strategy of the Plan are hereby directed to pursue implementation of the recommended actions assigned to them;
3. Future revisions and Plan maintenance required by 44 CFR 201.6 and FEMA are hereby adopted as a part of this resolution for a period of five (5) years from the date of this resolution.
4. An annual report on the progress of the implementation elements of the Plan shall be presented to the Board of Selectmen by the Planning and Zoning Commission.

IN WITNESS WHEREOF, the undersigned has affixed his/her signature and the corporate seal of the City of Middletown this \_\_\_ day of \_\_\_\_\_, (year).

\_\_\_\_\_  
(Name, Title)



**Annex H**  
**Portland Natural Hazard Mitigation Annex**

**NATURAL HAZARDS MITIGATION ANNEX**  
**TOWN OF PORTLAND CONNECTICUT**



**June 2014**

Prepared by:

**Lower Connecticut River Valley Council of Governments**

[www.rivercog.org](http://www.rivercog.org)

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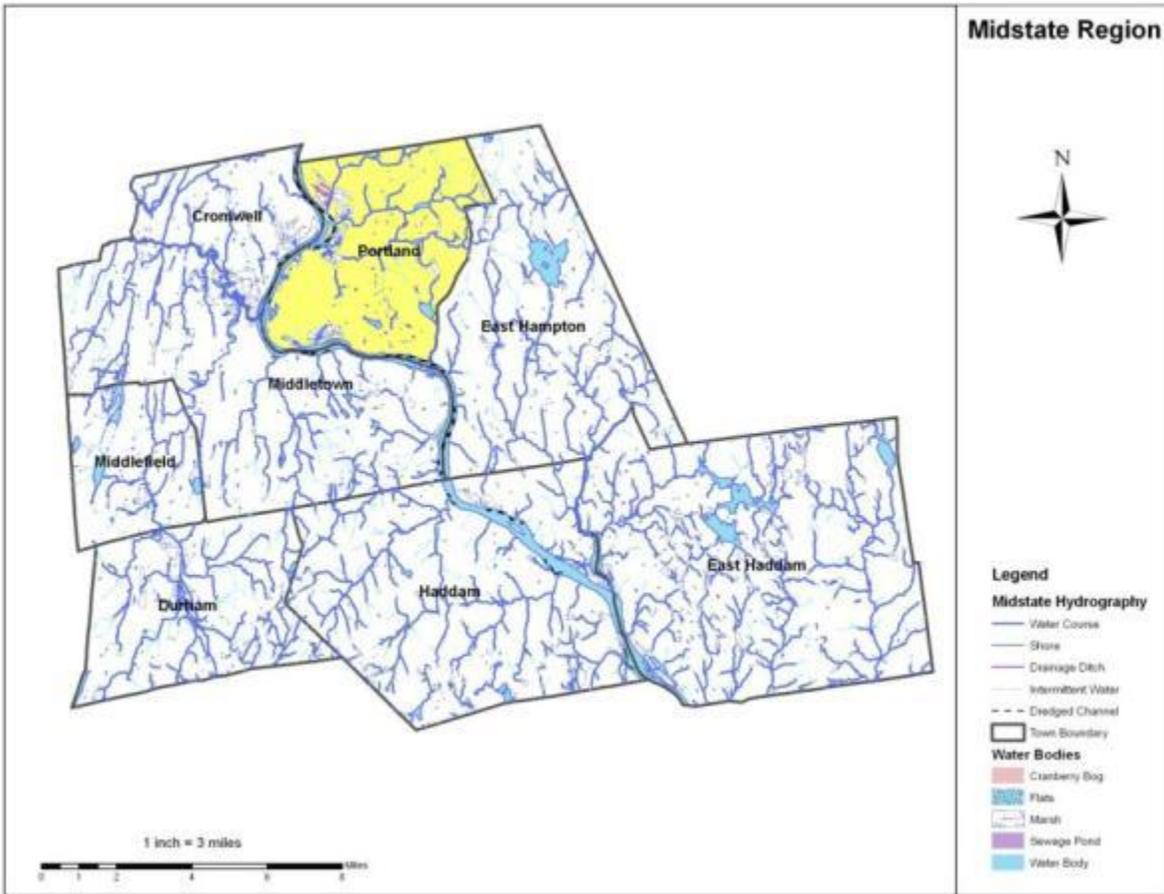
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**Map 1:** Portland within the former Midstate Region  
Source: RiverCOG

*On the Cover:*

**Photo 1:** Looking east at the Connecticut River and the Town of Portland, flood of 1936. Note the water level at the two bridges.  
Source: Middlesex County Historical Society Library

**i PURPOSE**

The purpose of this Natural Hazard Mitigation Annex is to identify the natural hazards most likely to affect the area, to locate the vulnerabilities, assess the risks and estimate corrective actions to protect life, limb, property and financial loss. Also, to synchronize this Plan with other local, regional and State; land use, transportation, clean water, wetlands and debris management plans. This Plan will compliment traditional emergency response plans.

See Appendix A for a list of related plans.

This Plan could be considered a long term strategy to reduce the economic consequences of a natural disaster.

Funding these plans and projects reduces overall risks to the population and structures, while also reducing reliance on funding from actual disaster declarations. Pre Disaster Mitigation grants are to be awarded on a competitive basis and without reference to state allocations, quotas, or other formula-based allocation of funds.

Bottom line: The most likely event, considered to be hazardous to the population and properties in the region is a natural disaster. Since the tragic events of September 11<sup>th</sup>, 2001 municipal administrations, planners and emergency responders have overlaid terrorist attacks onto their chemical, biological, radiological, nuclear, and explosive (including fires) standard operating procedures and guidelines. Time has passed and now our focus is on natural hazards ... storms.



**Photo 2:** Oil storage tanks on the banks of the Connecticut River, 1936 flood.  
Source: Middlesex County Historical Society Library

## ii SCOPE OF PROJECT

This pre-disaster risk and vulnerability assessment is designed and scoped to identify those areas that are vulnerable to specific or multiple severe weather related events. The Planning Team has evaluated history, current conditions and or state of repair and future potential conditions to develop a prioritized list of structures, utilities, roadways including bridges and culverts that are in need of repair, strengthening or replacement to prevent or minimize loss of life, limb or property. Dam failure (potential) and repetitive loss properties are a good example of areas the Planning Team looked closely at to predict the future. Historical data provides valuable references for future risk. Subject matter experts were contracted by the former MRPA to investigate and report on the repetitive loss properties and hazardous dams in the region.

We looked at all possible natural hazards and categorized them according to the “likelihood” of an occurrence. Flooding was by far the highest on our priority list. Hurricanes could, and historically have happened and we are overdue for “a big one”. We are particularly vulnerable to the wind and flooding effects of a strong Category 1 and up hurricane. As you will see throughout this Natural Hazard Mitigation Plan we anticipate 80% of our mature growth trees will come down in a major hurricane. Earthquakes could happen; but are not likely.

Strategies for mitigation within this Plan are best guess estimates by professionals.

The following is a summary of the local content with highlights for a quick review.

**Benefit:** The Federal Emergency Management Agency (FEMA) in the Department of Homeland Security recognized the need for more robust “natural hazard” planning and mitigation at the local level. The purpose was to bring the need for proper preparation to the attention of local jurisdictions and regions<sup>55</sup>. A benefit of a natural hazard planning process is to identify those areas, buildings or infrastructure that can be “fixed” to minimize or prevent damage from a major storm. Another benefit of this planning process is if a project is identified in the plan, then the municipality or region can request a grant under the Natural Hazard Mitigation Grant Program to mitigate the risk. Another benefit is; if a project is identified in this Plan and it is damaged or destroyed in a storm, funding can be obtained under this program to replace the damage to what it should have been as identified in the Plan. Otherwise disaster relief funding will only allow for rebuilding to: as it was.

Planning Process Benefit: Throughout the NHMP planning process all departments and vulnerable stakeholders were reminded of; or became aware of local vulnerabilities that mitigation projects could protect them from loss of life, limb or property. This is particularly true of critical infrastructures. The interest/awareness level here is high; given the DEMHS and DEEP activities in the last ten years.

This Plan and mitigation strategies take into consideration the following potential major natural hazard events: floods, drought, hurricanes, wildfire, extreme heat, extreme cold, wind storms, and winter storms.

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<sup>55</sup> *In Connecticut we have regional planning agencies, organizations or councils of governments performing the planning functions traditionally done by county governments in other states.*

RISK*							
EVENT	LIKELIHOOD	VALUE	LOSS POTENTIAL	VALUE	Financial Impact	VALUE	TOTAL
Earthquakes,	L	1	M	2	L	1	4
Extreme heat,	H	3	L	1	L	1	5
Fires,	M	2	M	2	L	1	5
Floods,	H	3	H	3	H	3	9
Hurricanes,	H	3	H	3	H	3	9
Landslides,	L	1	L	1	L	1	3
Thunderstorms,	H	3	L	1	L	1	5
Tornadoes,	L	1	H	3	M	2	6
Winter storms (extreme cold)	H	3	M	2	L	1	6

\* Risk: risk of life, limb, property and/or financial impact H=High (3); high priority , M=Medium (2) ; medium priority, L=Low priority (1); a priority; but not high or medium.  
Table II-3

**Figure 1:** Natural Hazards and Risk in Portland

The impact of these events was evaluated based on: presence of vulnerable populations; well-being of the residents and businesses; vulnerable structures; vulnerable infrastructure and financial exposure to the municipality.

Also followed are guidelines from the National Flood Insurance Program under the Federal Insurance Administration, which enables property owners to purchase insurance protection against losses from flooding. Generally if a property does not have a mortgage, where the lender requires flood insurance, they may not have a policy. Where known we have listed them.

**Highlights of this Regional/Local Natural Hazard Mitigation Plan**

That document includes historic photos documenting the local needs for mitigation, plus other locally valuable information and documentation not required under the FEMA NHMP Guidelines.

**Project Input:** Input for this Plan was gathered through the direct involvement of municipal staff, the public and the close relationship with the former MRPA. This input, including past and present projects, contributed to ongoing mitigation strategies which will result in future mitigation projects.

All of these activities provided an opportunity for public input.

**Meetings and participation:** Meetings, throughout the planning period, were held with Town employees, the administration, the public, individual department heads and local historic society representatives. Additionally a great deal of historic information came from regional and state libraries.

Participants in the planning process can be found in the Planning Process part in the Regional Section of this Plan, and here in Section II.

Attendees can be found in Section I Part D and local in Section III, Part A.I.

**Key Departments in planning:** The two key departments contributing to the Plan were Public Works and Emergency Management. The First Selectwoman was highly involved in the planning process. The First Selectwoman will carry the Plan through adoption.

**Fixed Populations:**

- There are no long term incarceration facilities in Portland... only holding cells.
- In neighboring Middletown (across the River) there is a large State Mental hospital
- Emergency Management, Public Health and Social Services work closely with local Convalescent hospitals, rest homes and senior citizen housing clusters in evacuation and shelter planning. Health Department personnel actively participate in local and regional public health emergency planning. This includes the statewide emergency management regions. At this time the Regions (2&3) are working on a Regional Support Plan addressing mitigation plans for protecting the public.

**Regional Pet Sheltering:** Grant monies have been and will continue to be sought for funding a regional pet holding area. Historically these were called “dog pounds”. These facilities can “back-up” the Pet Shelters adjacent to People Shelters.

**Non-FIRM flooding vulnerable areas:** Non flood plain areas vulnerable to flooding are within the scope of this planning exercise; though not in the FIRM plan.

**Non-Disclosure; Repetitive Loss Properties:** The Federal Privacy Act 1974 prohibits public release of the names of policy holders or recipients of financial assistance and the amount of the claim payment or assistance. Therefore only the highlights are listed in this plan

**Hazard Monitoring:** Because we have frequent floods in recent years our monitoring activities are real-time. Throughout this Plan appropriate flooding photographs are shown.

**Funding Opportunities:** The local budgeting process is the primary source of funding for mitigation projects. Through adoption of this Plan it is hoped additional funding and grants will be available. Funding sources are discussed in Section I of the Regional section of this Plan.

**Planning Process:** Town planners’ engaged in this project range from local planning departments, to this Agency and to outside engineering firms. In all cases they participated in this Project. See the Section II for participants and the planning process

in the Region Part of this Plan and sections I, II & III of this Annex. Also Section VIII for ongoing NHMP Actions and Planning

**Mitigation Actions:** Prioritization of mitigation actions has been settled in each jurisdiction; simply put ... the CEO made the decision. BUT, we acknowledge a current failure can move a project to the head of the list

The carrying-out of the mitigation actions is a function of cost-benefit studies and availability of funding. . It is also understood that local budget spending is subject to conflicting interests in the available budget \$\$\$. E.g. school projects versus a particular road repair. Infrastructure mitigation projects can be a balancing act... by the Director of Public Works, subject to the administration's wishes.

**Updating current NHMP:** There are no current NHMPs in place to update. After Plan adoption, if the need arises, elements can be updated annually.

**Public Outreach:**

For emergencies we have a FEMA/DEMHS Crisis Communications Plan in effect. It is outlined in our EMERGENCY OPERATIONS PLANS which MRPA assisted in the writing of. Notifications include postings on the local websites, the DEMHS 211 site and Press Releases.

For the development of this Plan the Mayor of Middletown issued a regional press release, advising the public of the Plan being in the works and requested they contact their local authorities and to watch for public workshops being held. For Public Outreach content, see Regional part of this Plan, Section IV and this local Annex Section IV

**Natural Resource Protection:** Advocates for protection of natural resources are ever present at meetings where projects are discussed that have the potential to affect natural resources. This also includes State Projects. Portland officials are very aware of protecting the environment. If areas are reclaimed during the hazard mitigation process, the space will be left as open space.

**Goals and Objectives:** Staff and planners, very early on in the process established goals and objectives to accomplish them. A brief synopsis of the Goals and Objectives can be found in the Regional and local sections of this Plan.

**Loss Reductions:** Mitigation goals are to reduce losses to life, limb and property ... and costly reductions in municipal services. Throughout the Plan there are references to actions to be taken to reduce losses. Also see the Regional part of this Plan, Section IV and this local Annex, Section, VIII.

**Actions monitoring:** Section III Part 6 Mitigation Action Plan. is the spreadsheet of prioritized projects in need of repair and/or replacement. This is the working playbook by which the municipality will work going forward. Section III, this Annex, indicates the department or agency responsibility for these actions.

**Municipal Approval:** Upon FEMA's issuance of an "Approval Pending Adoption" letter, the Town of Portland will adopt the Plan.

**I DEMOGRAPHICS**

**A. Town Profile**

From the Town website:

“Portland is a community in the truest sense of the word, a village centered on families, friendships and old time traditions. Neighbors chat at local shops. Town meetings invite participation. Your opinion and vote really count. We have schools that are nationally acclaimed. Active churches. Responsive public works. Full-time police services. A modern library where you still get to know staff on a personal basis.”

Activities: We have a modern Senior Center, an ever-expanding Parks & Recreation department, and special programs for kids sponsored by Youth Services. Quality golf courses, riverfront marinas, YMCA Camp Ingersoll, an incredible 4th of July Fireworks display (best in Connecticut!). Old time parades. Festivals, fairs and concerts. Portland's beautiful Main Street provides a safe and wonderful environment for walking, jogging or bicycle rides. Meshomasic State Forest is the oldest of its kind in Connecticut.

Portland offers more than the nostalgic charm of a New England village. It offers the convenience of Central Connecticut, midway between Boston and New York. A short ride gives you access to shopping malls, cultural programs sponsored by top-grade universities, airports, a variety of restaurant cuisine, beaches, ski-slopes, sports arenas, the capital city of Hartford. If theater is what you enjoy, we are not far from Hartford Stage, Bushnell, Hartford Civic Center, Shubert, Goodspeed and Oakdale.

**B. Population Density**

Area	Population (2010)	Housing Units	Area (sq. miles)	Water Area (sq. miles)	Land Area (sq. miles)	Density per Square Mile of Land Area	
						Population	Housing Units
Middlesex County	165,626	74,837	439	70	369	449	203
Portland	9,508	4,077	25	2	23	413	177

**Figure 2:** Population and density in Portland

Source: Census 2010

Year	2005	2010	2015	2020	2025	2030
Portland Population	8,971	9,222	9,500	9,799	10,121	10,421

**Figure 3:** Population projection from UConn population study.

Source: State Data Center at UCONN

## **II THE LOCAL PLANNING TEAM**

The Portland Natural Hazard Mitigation Planning Team leads were First Selectwoman Susan Bransfield and Public Works Director Richard Kelsey. Additional key information and photographic evidence of risks/vulnerabilities came from visits to the Middlesex County and Russell libraries. And the public workshop provided valuable input to this Plan.

Sources utilized to identify the local vulnerabilities at risk:

Personal knowledge: RiverCOG staff; municipal elected and appointed officials, emergency management director, public works officials, municipal planners, P&Zs, FEMA HAZUS-MH, State CT Disaster History; FIRM Flood plain Maps (revised to August 2008), CCM Historic Connecticut Scenarios CEO Workshop (2004); a subject matter experts on National Flood Insurance and another on hazardous dams. Also utilized was information from State DEEP and DEMHS interviews. A major contributing factor is the RiverCOG staff has an in-depth knowledge of local DOT plans, emergency operations plans, potential risk assessments and debris management planning efforts

**III MITIGATION ACTION RESPONSIBILITIES**

Each risk below has an associated entity charged with responsibility. In the event of an incident or mitigation project, the entity listed would be responsible.

Middletown RISK	Responsibility	Responsibility Local		Mitigation
	State/Federal	Assessment	Mitigation	
Flash floods	DOT	PW	PW	Operations & Capital Budget/* /NHMP
Floods	DEEP	PW,EM	PW	Assessment (Owner) /reporting requirements Local Admin) see Hazardous Dam Report
Snow	NFPA	Fire/Fire Marshal	Owner	Admin Ordinance
Flood, Draught	DPH	PW Water/Sewer/HD	PW Water/Sewer/HD	HD ordinances and monitoring
Floods	EPA	Admin	Admin	Admin Manage
Thunder Storms, Floods	DEEP	Fire/Fire Marshal/EM	Fire/Fire Marshal/EM	Manage with DEEP
Wildfire	DEEP	Fire	Fire Marshall	P&Z - restricting building/ Fire Plan and practice (with DEEP, Forestry)
Floods, power outages	DEEP	local Emergency Manager/PW/PH	PW	PW Loss of Power Plan current
Hurricane/Ice Storm/Wind Storm	DEEP/DEMHS	PW	Management Plan	ADMIN/PW facilitate the writing of a DMP plan
All storms	DPH	Health Department	Health Department	PH Plan
All storms	DPH	Social Services/HD/EM	Social Services/HD/EM	EOP,& PH Plan maintenance and Shelter exercising
Flood	NFIP	P&Z	Owners	Owners have NFIP coverage (Elevate/relocate/flood proofing)
Flood	NFIP	P&Z	Owners	Owners continue coverage (Elevate/relocate/flood proofing)

Flood	NFIP	P&Z	Owners	Owners continue coverage (Elevate/relocate/flood proofing)
Flood	NFIP	Admin/PW/EM	Admin	Elevate/relocate/flood proofing
Flood	DEEP/DEMHS	EM	PW	Develop a Plan of prevention
All storms	DEMHS	EM & LUO	All disciplines in EM	Participation in regional planning - REPT
All storms	NU/CL&P	EM & Responders	NU/CL&P	Public Notices (Crisis Communications Plan)

**Figure 4:** Mitigation Action Strategies and Responsibilities.

**IV PUBLIC OUTREACH**

There are a variety of modes of communication with the public, see the Regional part of this Plan, Section IV.

Municipal responsibility to the public:

- People in vulnerable areas should monitor Flood Warnings:
- People with structures in vulnerable areas; specifically in flood plains should have a flood evacuation plan and participate in the National Flood Insurance Program. They should flood proof their buildings
- The municipalities will post storm info on their websites including proper preparations and warnings. DPH and DEMHS seasonally post info on their websites.

FEMA and the American Red Cross have extensive information and checklists for preparing for a major storm. See [READY.gov](http://READY.gov) for important preparedness information. Section IV of the Regional Section of this Plan, the PUBLIC OUTREACH part, highlights information sources available.

## V PUBLIC ASSISTANCE

A funding source option for mitigation projects is FEMA, Public Assistance. This is for repair, restoration or replacement of municipal facilities damaged by a storm...if a disaster has been declared.

There are two avenues of Public Assistance: Pre-Disaster Mitigation and Disaster Mitigation.

Property Acquisition and Relocation for Open Space is an example of pre-disaster mitigation. FEMA Pre Disaster Mitigation Program (PDM). Section 404

Damaged property reimbursement, after a disaster declaration is the other (Stafford Disaster Relief and Emergency Assistance Act, 42 U.S.C §5121, et seq. Section 406). Under this program Individual Assistance (includes residences and businesses). It should also be noted that low interest SBA loans for rebuilding are also available. There is also an ONA assistance program available if all the above fail....(Other Needs Assistance)

The later has a crossover PA element to the other; causing confusion CT March 2010 is an example. Disaster Mitigation will only allow a rebuild to “the way it was”. Pre-Disaster Mitigation allows for rebuilding to the “way it should be”.

FEMA - Hazard Mitigation Assistance (HMA)

- ✚ Guidance on Property Acquisition and Relocation for the Purpose of Open Space
- ✚ Recent amendments to Title 44 of the Code of Federal Regulations added a new Part 80,
- ✚ Property Acquisition and Relocation for Open Space. More detailed guidance to assist with implementation of the provisions found in Part 80 has also been developed. This property acquisition and relocation guidance applies to all FEMA hazard mitigation grant programs. It is included in the FY09 Hazard Mitigation Assistance (HMA) Program Guidance at Section 2.3.13 and also governs this project type under the Hazard Mitigation Grant Program (HMGP) in place of previous desk reference sections. The property acquisition guidance section must be read in conjunction with the overall requirements for each grant program including the HMGP.

The Part 80 rule and implementing property acquisition guidance are effective for all disasters declared on or after December 3rd, 2007 (12/03/2007).

The following excerpt is from FEMA Public Assistance (PA) guidance:

**Public Assistance** The Department of Homeland Security (DHS) Appropriations Act, 2007, Public Law 109-295, directs the Federal Emergency Management Agency (FEMA) to conduct a Public Assistance (PA) Pilot Program. The legislation sets forth

three goals for the PA Pilot Program: reducing the costs to the Federal Government of providing assistance to State and local governments, increasing flexibility in grant administration, and expediting the provision of assistance to States and local governments. The PA Pilot specifically addresses the provision of assistance under sections 403(a)(3)(A), 406 and 407 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, 42 U.S.C. 1570b(a)(3)(A), 5172, 5173 (Stafford Act). These sections relate to debris removal and the repair, restoration, and replacement of damaged facilities.

**Public Assistance Grant Program** The mission of the Federal Emergency Management Agency's (FEMA) Public Assistance (PA) Grant Program is to provide assistance to State, Tribal and local governments, and certain types of Private Nonprofit organizations so that communities can quickly respond to and recover from major disasters or emergencies declared by the President.

Through the PA Program, FEMA provides supplemental Federal disaster grant assistance for debris removal, emergency protective measures, and the repair, replacement, or restoration of disaster-damaged, publicly owned facilities and the facilities of certain Private Non-Profit (PNP) organizations. The PA Program also encourages protection of these damaged facilities from future events by providing assistance for hazard mitigation measures during the recovery process.

The Federal share of assistance is not less than 75% of the eligible cost for emergency measures and permanent restoration. The grantee (usually the State) determines how the non-Federal share (up to 25%) is split with the sub-grantees (eligible applicants).

- Eligibility - Overview of eligibility criteria and definitions
- Roles and Responsibilities - Information on the duties of Federal, State, and local partners
- Public Assistance Grant Program Process - Step by step description of the PA grant life cycle
- Policy and Guidance - 9500 series policies and other publications
- Frequently Asked Questions (FAQ) - Top 10 questions pertaining to the Public Assistance Program
- Resource and Tools - Appeal database, equipment rates, cost estimating format, performance goals, funding trends, and other resources
- Office of Equal Rights - Information about the Office of Equal Rights and how to file a discrimination complaint

### CHAPTER 3

#### APPLYING FOR PUBLIC ASSISTANCE

Following a disaster declaration by the President, FEMA makes assistance for recovery from the disaster available to eligible applicants. This chapter describes the process through which this assistance becomes available.

##### Process Overview

The PA Program is implemented through the steps listed below, each of which is described in detail in this chapter.

- An Applicants' Briefing is held.
- Potential applicants submit the Request for Public Assistance.
- A PAC is assigned to each applicant.
- The PAC holds a Kickoff Meeting with the applicant.
- The applicant's specific needs are identified and cost estimates developed through the project formulation process.

- Cost estimates for small projects that have been prepared by the applicant are checked through the validation process.
- FEMA approves and processes grants for the applicant's projects.

Projects. A project is a logical method of performing work required as a result of the declared event. A project may consist of one item of work, such as repairs to a single structure, or work that occurs at multiple sites, such as repairs to several washouts along a road. The applicant is responsible for identifying all work that is required as a result of the disaster. The PAC may assist the applicant in combining various recovery efforts into projects.

## **VI INDIVIDUAL (residents and businesses) ASSISTANCE (IA)**

The following excerpt is from FEMA Individual Assistance (IA) guidance:

FEMA and other federal, state, local and volunteer agencies offer disaster assistance in several forms:

**Low-Interest Loans.** Most, but not all, federal assistance is in the form of low interest loans to cover expenses not covered by state or local programs, or private insurance. People who do not qualify for loans may be able to apply for a cash grant. If you qualify, your check will be issued in about three weeks.

The Farm Service Agency (FMHA) and the Small Business Administration (SBA), offer low interest loans to eligible individuals, farmers and businesses to repair or replace damaged property and personal belongings not covered by insurance.

**Cash Grants** for up to \$13,400 adjusted (annually for inflation). Individuals who do not qualify for a loan from SBA may be eligible for these grants from FEMA and the state to help recover uninsured property losses. Home inspections are normally conducted before a check is issued. FEMA funds 75% of the grant program's eligible costs with the remaining 25% covered by the state. The state administers the program.

**Housing Assistance.** FEMA's Disaster Housing Assistance Program (DHA) makes funds and temporary housing available to individuals whose home is unlivable because of a disaster.

**Veterans Benefits.** The Department of Veterans' Affairs provides death benefits, pensions, insurance settlements and adjustments to home mortgages for veterans.

**Tax Refunds.** The Internal Revenue Service (IRS) allows certain casualty losses to be deducted on Federal income tax returns for the year of the loss or through an immediate amendment to the previous year's return.

**Unemployment Benefits.** Unemployment benefits may be available through the state unemployment office and supported by the U.S. Department of Labor.

**Crisis Counseling.** Local and state health agencies, the American Red Cross, as well as churches and synagogues may offer counseling to people who have experienced a disaster.

Free Legal Counseling. The Young Lawyers Division of the American Bar Association, through an agreement with FEMA, provides free legal advice for low-income individuals regarding cases that will not produce a fee (i.e., those cases where attorneys are paid part of the settlement which is awarded by the court). Cases that may generate a fee are turned over to the local lawyer referral service.

Independent Study Programs. FEMA offers an Independent Study Program through the Emergency Management institute.

Individuals, families and businesses may be eligible for federal assistance if they live, own a business, or work in a county declared a Major Disaster Area, incur sufficient property damage or loss, and, depending on the type of assistance, do not have the insurance or other resources to meet their needs

## **VII NATURAL HAZARDS**

This Portland section of the Natural Hazard Mitigation Plan contains a variety of; localized details complementing the Natural Hazard Section in the Regional Section of this Plan. For overall information on potential natural hazards, see the Regional Section of this Plan: Section III.B

The profiling of hazards in Portland is based on a variety of sources and personal observations of recent events and discussions with “the older generation”. At the Public Workshop we also heard of other concerns...other than the ones we already were aware of.

Natural disasters can often be predicted. And damage can be anticipated. Crumbling infrastructure does require continuing R & R to minimize costly damage. Utilizing budget allocations and available State grants the current mitigation process is ongoing. Repetitive damage due to storms generally puts a vulnerable project as a top priority “fix” on Public Works “Wish List”.

Storm damage tends to occur repeatedly in the same geographical locations because they are related to weather patterns or physical characteristics of the area (flooding). However; all areas of the community are vulnerable to one or another type of natural disaster (hurricanes, wind and ice storms, tornados).

Portland is vulnerable to many types of natural hazards. Flooding is by far the most significant natural hazard with the potential to do harm to people, places and things and to cause financial losses. The second greatest threat is from hurricanes. Therefore the focus of this Plan is on these two weather events.

Hurricane damage is not localized as is flooding. Generally the effects are town wide. Wet hurricanes also create flooding problems.

Wind and snow storms do regularly occur; but the results are not as catastrophic as flooding and hurricanes. The other potential threats are discussed extensively in the Regional Section of this Plan.

Annual spring flooding events threaten Connecticut River. During significant spring floods the petroleum storage tanks and hazardous waste transfer facility are at risk of over flooding. (see photographs at beginning of this Annex.) In flash floods, Main Street structures are vulnerable. Hurricane damage is not localized and generally the effects are town wide. Wet hurricanes also create flooding problems.

## **A. Floods**

### **1. Introduction**

The town of Portland is susceptible to several types of floods. Its position on the east bank of the Connecticut River makes it especially vulnerable to yearly spring flooding as a result of melting snow in northern New England matched with the typically higher amounts of rain during the spring season. Almost yearly, Route 17A in the northwestern portion of town is closed due to river flooding over the roadway. In addition, with many smaller streams and waterways, inland flooding is also likely whenever there are particularly heavy rain storms. This section details some of the ways in which Portland may experience flooding, what regulations are currently in place to protect residents, and what the town can do in the future to mitigate severe flooding events.

### **2. Flash Floods**

For Portland flash floods are the most dangerous flooding condition as is evidenced by our history of flooding. Flash floods are caused by significant rain event during a short period of time, or a lot of rain over number of days. These floods can be violent and come without advance warning. Flash floods are characterized by high velocity flowing water often accompanied by debris. Flash floods cause significantly greater damage than riverine flooding. The streams passing through Portland and low lying roads are a cause of concern during significant rain events.

See the Portland Detailed Mitigation Action Plan for a list of those areas in need of mitigation.

They are the most significant natural hazard with the potential to do harm to people, places, and things, and cause economic harm.

As mentioned they come with minimal, if any warning. Many of the dams in Town could be breached by a sudden surge of a large amount of runoff (flash flooding). In Portland there are 14 dams classified as posing a high or significant hazard potential.

### **3. Annual Spring Floods**

Annual spring floods pose a threat to property along the Connecticut River. These floods are predictable and slow moving and typically do not cause as much damage. However, especially snowy winters mixed with a rainy spring can

cause the spring flood to be larger than usual, causing damage to adjacent properties.

A spring flood is a condition where the Connecticut River overflows its banks onto flood plains and sometimes beyond, two of the largest spring floods being in 1936 and 1984.

Spring Flooding is the result of a heavy snow pack in northern New England melting as the weather warms and the water drains into the Connecticut River basin. These floods can be exacerbated by especially large snowpack mixed with a particularly rainy spring season.

The marinas above and below the bridge and the industrial area under it are at risk to major spring flooding.

Two major spring floods in memory are 1936 and 1984. The 1936 flood stage reached 31', by far the greatest flood in our recorded history. Debris was piled on the upstream side of the former bridge, along with the water level being at the bridge deck, causing it to be closed to traffic. The Bridge clearance, above the River, was only 28ft. As a result of this flood, the new bridge was constructed in 1938. It opened August 6<sup>th</sup>, a month before the Great Hurricane of 1938. The Bridge clearance is now 90'.



**Photo 3:** Flooding along the Connecticut River near the oil storage tanks.



**Photo 4 – 7: 1936 Spring Flooding in Portland**  
Source for Photos 3-7: Middlesex County Historical Society

#### **4. Portland Dams**

Although not a natural hazard in and of themselves, dams can become compromised with significant flooding, and if one breaks, can exacerbate already severe flooding downstream of a break. This section outlines the significant dams within Portland.

##### **i. Portland Hazardous Dam Report**

In the town of Portland, the Connecticut Department of Environmental Protection (CT/DEEP) has 14 dams in their dam inventory. Of those 14 dams, 1(one) dam is rated as a High Hazard Dam (Class C) and 2 (two) dams are rated as Significant Hazard Dams (Class B). There are no municipally owned dams in the

town of Portland. The Hazard Classification for the individual dams are from the CT/DEEP website database “High Hazard and Significant Hazard Dams in CT” revised to 8/11/2007.

The State Department of Environmental Protection requires the registration of all dams over the height of six feet. The Dam Safety Section of the Inland Water Resources Division of the Connecticut Department of Environmental Protection (DEP) is responsible for administering and enforcing Connecticut’s dam safety laws. The existing statutes require that permits be obtained to construct, repair or alter dams, dikes and similar structures and that existing dams, dikes and similar structures be registered and periodically inspected to assure that their continued operation and use does not constitute a hazard to life, health or property.

DEEP assigns dams to one of five classes according to their hazard potential:

Class AA: negligible hazard potential dam which, if it were to fail, would result in no measurable damage to roadways, land and structures, and negligible economic loss.

Class A: low hazard potential dam which, if it were to fail, would result in damage to agricultural land, damage to unimproved roadways, or minimal economic loss.

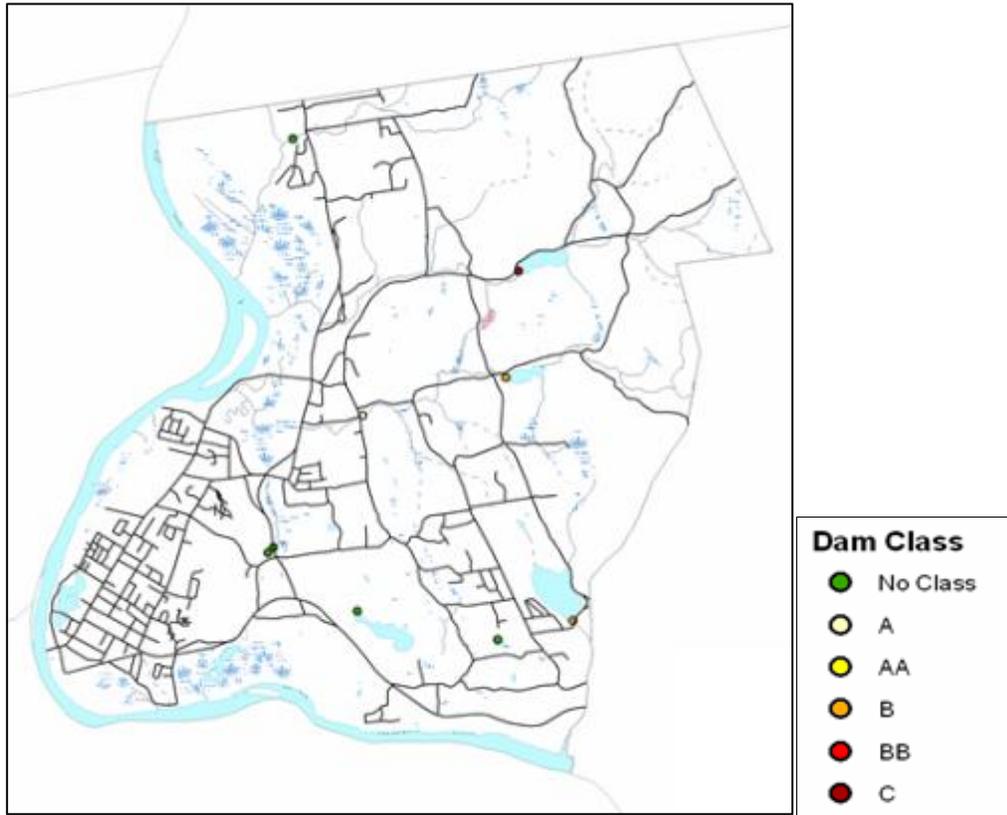
Class BB: moderate hazard potential dam which, if it were to fail, would result in damage to normally unoccupied storage structures, damage to low volume roadways, or moderate economic loss.

Class B: significant hazard potential dam which, if it were to fail, would result in possible loss of life; minor damage to habitable structures, residences, hospitals, convalescent homes, schools, etc.; damage to or interruption of the use or service of utilities; damage to primary roadways and railroads; or significant economic loss.

Class C: high hazard potential dam which, if it were to fail, would result in the probable loss of life; major damage to habitable structures, residences, hospitals, convalescent homes, schools, etc; damage to main highways; or great economic loss.

The classification of a dam can change due to changes in downstream development. 83% of dams in Connecticut fall within the negligible to moderate hazardous categories while only 17% fall within the significant and high hazard categories.

DEEP keeps track of which dams have emergency plans but not all of them would be up to date and not all dam owners will want those plans shared publically. Only the larger significant and high hazard dams would typically have an emergency plan with inundation areas but not all do as it is not yet mandated by state statute or regulation.



**Map 2: Portland Dams**

Source: RiverCOG

DAM ID #	DAM NAME	HAZARD CLASS	OWNERSHIP
11301	Portland Reservoir Dam	C – High Hazard	Town of Portland
11302	Great Hill Pond Dam	B – Significant Hazard	CT DEEP
11304	Kelsey Pond Dam	B – Significant Hazard	William & Constance McBrien

**Figure 5: High and Significant Hazard Dams in Portland**

*Portland Reservoir Dam #11301*

Hazard Classification – C – High Hazard Dam  
Owner: Town of Portland

The Portland Reservoir Dam is a 28-foot tall, 475-foot long earth embankment dam with a 94-foot wide concrete ogee spillway. The Portland Reservoir dam impounds the Portland Reservoir and is located on Reservoir Brook at the end of Old Marlborough Turnpike. There are several residences along Old Marlborough Turnpike that potentially will be damaged in the event of a dam failure. Portions of Old Marlborough Turnpike and Thompson Hill Road may be damaged in the event of a dam failure.

Portland Reservoir Dam was inspected on 7/25/05 and was found to be in good condition. The inspection revealed the following deficiencies in the dam that were sent to the owner on 1/25/2006:

- Remove the woody vegetation from the upstream and downstream slopes and from within 25 feet of the toe.
- Establish a good grass cover on the dam embankments and dam crest and mow on a regular basis.
- Repair/fill eroded areas of the dam caused by pedestrian traffic.
- Clean weep holes in the spillway training walls.
- Monitor the seepage occurring at the right spillway training wall.

*Great Hill Pond #11302*

Hazard Classification – B – Significant Hazard Dam  
Owner: State of Connecticut – DEEP

Great Hill Pond Dam is owned and operated by the State of Connecticut – DEEP. The dam is an earth fill dam with masonry walls and a centrally located masonry spillway with a concrete cap.

Great Hill Pond Dam impounds Great Hill Pond and is 100-feet upstream of Great Hill Pond Road.

The dam was recently inspected by the CT/DEEP and was found to be in good condition. The following historic deficiencies in the dam were noted:

1. Trees and brush on the dam and 20 feet from the downstream toe should be removed.
2. On the upstream side of both spillway wing walls, there is erosion that should be repaired.

3. It is suspected that there is a low-level outlet. This should be investigated and determine its condition and location.
4. There is minor seepage coming from the toe near the right spillway wing wall. This should be monitored for any change in volume and clarity of water.
5. Displaced riprap at the toe of the spillway should be repaired.

*Kelsey Pond Dam #11304*

Hazard Classification: B

Owner: William & Constance McBrien

Kelsey Pond Dam is an earth fill dam with downstream masonry walls and upstream concrete wall and a concrete tiered spillway. Kelsey Pond Dam impounds Kelsey Pond and is located upstream of Cox Road.

The Kelsey Pond Dam was most recently inspected on April 7, 1995, and found to be in good condition. The inspection report detailed some deficiencies that were sent to the dam owner on 1/10/1996:

1. Eradicate the small burrowing animals from the right abutment and fill the holes.
2. Monitor the seepage at the left downstream toe to insure that it remains slight and clear running.
3. Monitor the cracks in the spillway section and repair as necessary.
4. Clear the brush from the downstream channel on a routine basis

Inspection/Reporting Requirements

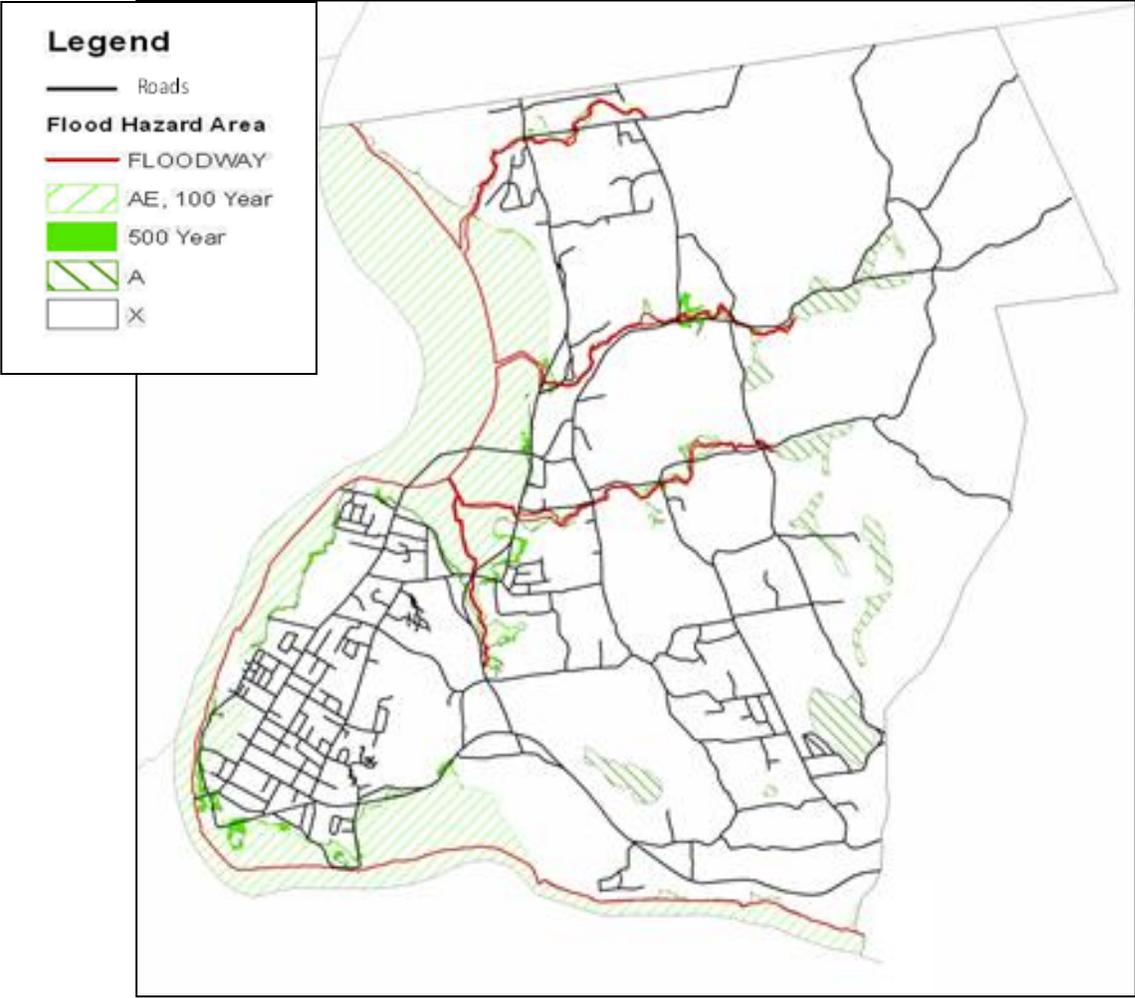
The State of Connecticut General Statutes (CGS §22a-402(b)-(f)) were recently revised, giving the chief executive official or his designee the ability to inspect dams if they reasonably believe that a public safety concern exists. Inspection of any such dam owned or operated by a water company or of a dam that is a hydroelectric generating facility shall be controlled by the provisions of subsection (c) of CGS §22a-402.

The chief executive official or designee shall have the right to enter private property, within constitutional limits, to undertake such inspection provided such official or designee shall in accordance with CGS §22a-402(b)2:

- a. Notify the Commissioner of the DEEP prior to conducting such inspection.
- b. Make reasonable attempt to notify the owner of the dam prior to such inspection.
- c. File a report with the Commissioner of DEEP in accordance with the provisions of subsection (f) of CGS §22a-402.

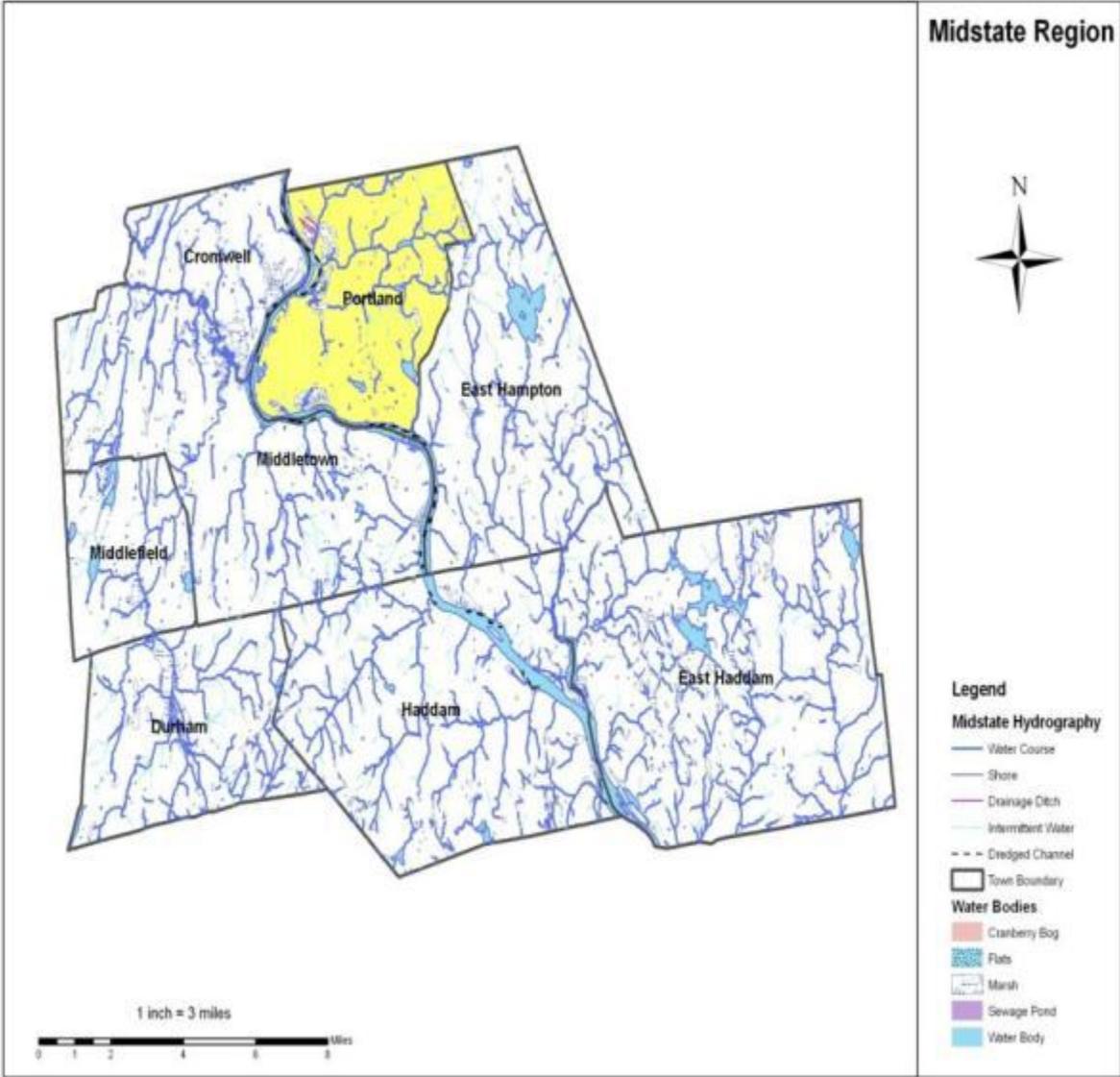
- d. Maintain dams (municipally owned) and caution private dam owners to do the same

**4. Portland Flood Zones and Regional Hydrography**



**Map 3:** Portland Flood Zones

Source: RiverCOG



**Map 4:** Portland Hydrography

Source: RiverCOG

## 5. Portland Flood Plain Management

Flood plain management is the operation of a community program of corrective and preventative measures for reducing flood damage. These measures take a variety of forms and generally include requirements for zoning, subdivision or building, and special-purpose flood plain ordinances.

A community's agreement to adopt and enforce flood plain management ordinances, particularly with respect to new construction, is an important element in making flood insurance available to home and business owners. Currently over 20,100 communities voluntarily adopt and enforce local flood plain management ordinances that provide flood loss reduction building standards for new and existing development.

To help State and local officials in implementing the NFIP, see our

4. Adoption of Flood Insurance Rate Maps by Participating Communities
5. NFIP Flood plain Management Requirements
6. NFIP Policy Keyword Index

To encourage communities to establish sound flood plain management programs that recognize and encourage community flood plain management activities that exceed the minimum NFIP requirements, the Community Rating System (CRS) was created. This program provides communities with discounts to flood insurance rates.

Town	NFIP Participant?	Latest FIRM Adoption	Flood Zone Regulations	Enforcement
Portland	Yes	August 28, 2008	2008	by Permit

**Figure 6:** Flood Regulations adoption dates.

Portland Planning and Zoning Regulations define a Flood Plain Zone and a Special Flood Hazard Area. A total of 11 percent of the Town is zoned Flood Plain.

Section 7.6 of the Portland Zoning Regulations defines the Flood Plain Zone. Special Flood Hazard Area Regulations are in Sections 7.6.1 through 7.6.10.

## 6. Portland Plan of Conservation and Development

The following is an excerpt from a summary of the Portland POCD relevant to flood mitigation in town.

### **Infrastructure**

*The areas served by sewer and water service are generally coterminous with the Neighborhood Conservation Area. The presence of sewer and water service should assist in the promotion of infill development. The areas which are served by “water service only” are primarily located along a distribution main from the MDC South Glastonbury connection, and a loop to the water tanks at the reservoir, and an area in central Portland in the vicinity of Bartlett Street.*

*Portland water requirement is primarily provided, under contract for 2.2mgd, by the MDC through a distribution main to South Glastonbury. Water tanks near the reservoir provide operating storage, fire storage, and peak instantaneous flows. The Glastonbury turnpike well remains active. The Portland Reservoir supply has become inactive.*

*Sewer service is provided through the town operated Water Pollution Control Plant which is located near the Connecticut River and the Middletown Bridge. The present plant capacity is .4mgd; however, it has a design capacity of 1.2mgd.*

*In a referendum held in November 2008 voters approved two questions to fund repairs to the town’s aging water system. The first, was to replace approximately 5,000 linear feet of main along High Street. The town plans to replace the nearly 50 year old pipeline from the entrance to the high school down High Street to Marlborough Street (Route 66). The second question was to approve spending to repair and replace two water storage tanks. The tanks are located on top of a hill next to the High/Middle School complex.*

### **Open Space**

*The Northeastern portion of Town and the area along the river north of the Village Center is dominated by existing open space. There are many other areas in town which are either designated open space or managed open space and many of these are identified by the state POCD as conservation and/or preservation areas.*

Several sections of the Portland Plan of Conservation and Development focus on the Flood Plain including:

- |            |     |  |
|------------|-----|--|
| Section 3; | Pg. | 3-4 Protecting the Connecticut River                       |
|            |     | 3-6 Action: Protect the Groundwater and aquifer Supplies   |
|            |     | 3-7 Protect the town’s Other Water Resources               |
|            |     | 3-8 Action: expand the Meshomasic State Forest             |
|            |     | 3-10 Action: Relate Development Intensity to Land Capacity |
|            |     | 3-12 Action: Preserve and Protect Areas of Special Concern |
|            |     | 3-14 Preserve the Town’s Unique Geology                    |
|            |     | 3-14 Action: Develop the Riverfront with a Mix of Uses     |

**7. National Flood Plain Management**

The Town of Portland has voluntarily participated in the National Flood Insurance Program (NFIP) since 1974. Balance of Regulation can be found in the Town Hall.

Initial Hazard Boundary Map	Initial Flood Insurance Rate Map	Date Portland Entered NFIP	Current FIRM Date Adoption	Latest Zoning Regulation Update
(i) FHBM	(i) FIRM	(r) FIRM	© FIRM	(i) Regulations Updated
March 15, 1974	July 3, 1978	3-Jul-78	August 28, 2008	August 2008

**Figure 7:** Portland regulation adoption dates.

**8. Repetitive Loss Properties**

A Repetitive Loss property (RLP) is any insurable building for which two or more claims of more than \$1,000 were paid by the National Flood Insurance Program (NFIP) within any rolling ten-year period, since 1978. Within the town of Portland, there are a total of six Repetitive Loss Properties. One of those properties is deemed as a Severe Repetitive Loss Property (residential). Of these six properties, four are along the Connecticut River and two are along inland streams. All six RLPs are residential properties. See Section III.C.1.g on page 65 for more information.

i. Evaluations through 2009

Connecticut River Floodway

In the case of one residence that has been in the same family for many years, the owners have made one main floor elevation change. This home is in an AE zone. There have been two claims that were 67% “building”.

Mitigation measures could include: Contents pre-event plan; Further elevation and flood proofing in any reconstruction plus being attentive to alerts/warnings for large storm events.

ii. Connecticut River Floodway

Two businesses located within an AE zone and the Connecticut River Floodway. Two losses, 55% of which were “building”

Mitigation strategies could include: flood proofing, event preparation and response plans plus being attentive to weather forecasts, river levels, alerts/warnings.

Owners do have a Flood Plan in place.

Residence in an AE Zone and the floodway of the Connecticut River. Three claims, largest total losses in town, 70% “contents”.

Mitigation strategies should include: flood proofing, contents pre-plan and being attentive to alerts/warnings and river level.

iii. Inland Stream

Upland location – not in any designated flood zone but apparently subject to local conditions. This residence has had two losses, 85% of which were for “building”.

Mitigation measures could include flood proofing, attention to predicted storm events and pre-planning a response.

Discussed with the town planner and engineer. No area-wide mitigation measures planned.

## **9. HAZUS-MH Flood Summary Event Report**

Due to the fact that this individual town Annex is part of the larger Former Midstate Regional Natural Hazards Mitigation Plan, HAZUS-MH was generated on a regional scale. Please see Appendix A of this NHMP for the full HAZUS – MH Flood Event Summary Report for the Midstate Planning Region.

## **10. Flood Mitigation Strategies**

For a detailed listing of all mitigation projects, see section VIII of this annex. Below is a general list of actions the Town may choose to employ.

- Purchase flood prone properties and create open space
- Maintain culverts, bridges and other restricted flow streams of debris
- When a storm is pending early warn residents of fast flowing waters,
- Remind residents of evacuation and sheltering procedures.
- Advise residents where to go for weather notifications.
- Advise the public of the dangers of driving through moving flood waters
- Work with the State DOT to improve drainage under Main Street.
- Emergency management personnel to monitor DEMHS, DEEP, local press and radio and TV for flood warnings.
- Through legislation change, pressure should be put on the DEEP to allow banking protection from erosion.
- Roadway elevation
- Structure (public/private) elevation
- Structure (public/private) relocation
- Structure (public/private) flood proofing
- Sewer/septic system (public/private) upgrades
- Levee/embankment improvement
- Stream modification (unlikely due to DEEP restrictions)

- Storm water runoff improvements
- Acquisition of storm debris managing equipment

## **B. Hurricanes**

NOTE: For an extensive discussion on hurricanes in the Region and State see the Regional Section of this Plan: Section III.B.1.c.2)

### **1. Introduction**

Portland departments and administration will continue to monitor National Weather Service, NOAA, local media, and DEMHS extreme weather announcements.

Because hurricanes are the event we here in the Northeast are most apt to encounter in catastrophic proportions, the section in the Emergency Operations Plan...HSA Annex A ... contains excerpts from the HAZARDOUS WEATHER RESPONSE GUIDE.

Also available to the Emergency Management Director is the CD NEW ENGLAND HURRICANE ARE YOU READY? ([www.fema.gov](http://www.fema.gov)). Most EMDs received one in 2003.

Typically hurricanes cross Long Island Sound before arriving in Connecticut; but traditionally this does not “slow” them down.

The State has an agreement with CNTV for use as a source of current information during an emergency.

The State also has an arrangement for utilization 211 for a dial in info line.

The good news is local responders frequently train and exercise for major hurricane events



**Photo 8:** A Portland road was blocked by downed trees after the 1938 Hurricane.  
Source: Russell Library

## **2. HAZUS-MH Hurricane Summary Event Report**

Due to the fact that this individual town Annex is part of the larger Former Midstate Regional Natural Hazards Mitigation Plan, HAZUS-MH was generated on a regional scale. Please see Appendix B of this NHMP for the full HAZUS – MH Hurricane Event Summary Report for the Midstate Planning Region.

## **3. Hurricane Mitigation Strategies**

For a detailed listing of all mitigation projects, see section VIII of this annex. Below is a general list of actions the Town may choose to employ.

- Tree Warden to work with Public Works and CL&P on an aggressive tree trimming program.
- Maintain culverts, bridges and other restricted flow streams of debris
- Maintain dams (municipally owned) and caution private dam owners
- When a storm is pending early warn residents of fast flowing waters,
- Advise homeowners at risk to flood proof the structure
- Advise residents to secure any loose objects in the yard.
- Advise homeowners to “stock up” on food, water and medications (including the animals)
- Remind residents AND RESPONDERS of dangers of handling anything in the vicinity of a downed wire.
- Remind residents of evacuation and sheltering procedures.
- Advise residents where to go for weather notifications.

- Purchase flood prone properties and create open space.

**C. Winter Storms**

Winter storms are a typical winter season occurrence in Portland. The town annually budgets funding to provide for snow removal efforts, sand, salt, personnel and is ready when storms enter the area. However, atypical storms, like the October Snowstorm of 2011, are difficult to predict and protect against. The October 2011 storm hit the region when leaves were still on trees, adding weight, breaking many trees, knocking out power throughout the region. It is these atypical storms that the town must better prepare itself for.

The National Oceanic and Atmospheric Administration (NOAA) has recorded an estimated 2,092 severe weather events for the State of Connecticut during the time period of 1950-March 2007.2 Table 2.2 provides the total number of severe weather events recorded for each county. The events recorded by NOAA include such events as droughts, floods, hailstorms, severe lighting Precipitation, snow & ice storms, and extreme temperatures. Following is the winter storm record:

Middlesex County Winter Weather Events 1950-2013					
Blizzard	Ice Storm	Heavy Snow	High Wind	Snow	Total
5	16	11	12	24	68

**Figure 8:** Major winter weather event in Middlesex County between 1950 and 2013.  
Source: SHELDUS



**Photo 9:** Tree Down at Town Hall after October 2011 snowstorm  
Source: Portland - East Hampton Patch



**Photo 10:** Typical Snowstorm in Portland

Source: Portland - East Hampton Patch

## 1. Snow Storm

The Town crew has and can handle snow storms. They have plenty of experience. However if a storm of the magnitude of 1888, that left 50 inches of snow and massive drifts was to happen, Public Works and contractors would have difficulty in not only clearing the roads; but where to put the snow. Portland has 63 miles of roadways. This was an issue during the January/February 2011 snow storm/s.

### Snow Storm Disasters in the area:

- 1978 disaster Declaration 3060
- 1992 disaster Declaration 972
- 1993 disaster Declaration 3098
- 1996 disaster Declaration 1092
- 2003 disaster Declaration 3176
- 2004 disaster Declaration 3192
- 2005 disaster Declaration 3200
- 2006 disaster Declaration 3266
- 2011 disaster Declaration 1958
- 2011 disaster Declaration 3342/4046

Due to the tremendous weight of the “wet” snow in the January/February 2011 storms there was considerable damage to structures throughout the Town,

Reported Roof Collapse or Structure Damage, January/February 2011 combination Snow Storms
--

Municipality	Address	Structure
Portland	286 Airline Avenue	Midstate Recovery Systems, LLC waste transfer station
Portland	680 Portland-Cobalt Road Route 66	Vacant commercial property
Portland	Tryon Street	Residential home sunroof
Portland	Main Street	Marina

**Figure 9:** Roof collapses in Portland during 2011 Winter Season.

Building officials, the Fire Marshal and Fire Department should require truss roofed buildings be marked, on the roadside exterior, with a large “T”. This is a significant responder safety issue.

Though not technically the winter, an October Nor’easter snow storm hit the area in 2011. See following Wind Storm section.

In a severe cold winter ice jams can also be a problem. Public Works is prepared for breaking up ice above vulnerable culverts that have a history of ice cake clogging.

**2. Ice Storms**

A major ice storm can cause major road closures and power outages. See Figure 10 for a historic record including major ice storms.

A major ice storm occurred December 17, 1973, Ice Storm Felix.

**3. Winter Storm Mitigation Strategy**

For a detailed listing of all mitigation projects, see section VIII of this annex.

Below is a general list of actions the Town may choose to employ:

- Having in place a Vegetation Maintenance Plan.
- Hopefully, after the October Nor’easter of 2011, CL&P will put into place a more robust power restoration plan.
- Have in place an Evacuation and Sheltering Plan

**D. Wind Storms**

NOTE: For an extensive discussion on wind storms in the Region and State see the Regional Section of this Plan: Section III.B.1.c.4

**1. Nor’easters**

During the unusual October Nor’easter of 2011 power outages and blocked roads were major issues. Because the leaves were still on the trees when the snow came accompanied by strong winds, many trees and limbs came down

taking power lines with them. Many Town roads were closed and there were extensive power outages.

**2. Thunder Storms**

Thunder storms are the most likely wind event to occur and the strongest ones can create considerable damage when strong imbedded winds accompany them. For our planning purposes we have further broken thunder storms into tornado activity and microbursts/wind shear. See Section II Part E

In 2005 within ten days Portland was hit by two violent thunder storms registering winds of 58 and 60 miles per hour.

178 Portland	7/19/2005	4:06 PM	T' storm Wind	58 MPH
180 Portland	7/27/2005	5:29 PM	T' storm Wind	66 MPH.

**Figure 10:** Thunderstorm statistics, summer 2005

From: NOAA Satellite Information Service - National Climatic Data Center

**3. Tornadoes**

Tornados. Tornados can happen anytime, anywhere in Town. (As referenced in the Regional Plan Section III.B.1.c.4.) Tornadoes have happened in neighboring East Hampton and Wethersfield. In recent years there have also been major, damaging tornados in Bridgeport and West Springfield.

The good news is when the conditions are right the National Weather Service and CT Division of Emergency Management and Homeland Security notify emergency management and the administration of the potential. But; they can happen anytime and sometimes without much warning; though the local weather forecasters are getting better.

**4. Wind Shear**

See Regional Section B.1.c.4 for a discussion on the difference between the winds of a tornado and those in a wind shear.

**5. Wind Storm Mitigation Strategies**

For a detailed listing of all mitigation projects, see section VIII of this annex. Below is a general list of actions the Town may choose to employ:

- Public Notifications: IMPORTANT Issue warnings to the public and responders to not go near downed power lines until the power company gives the OK.
- An aggressive vegetation management program in place along Town roadways.

**E. Other Natural Hazards**

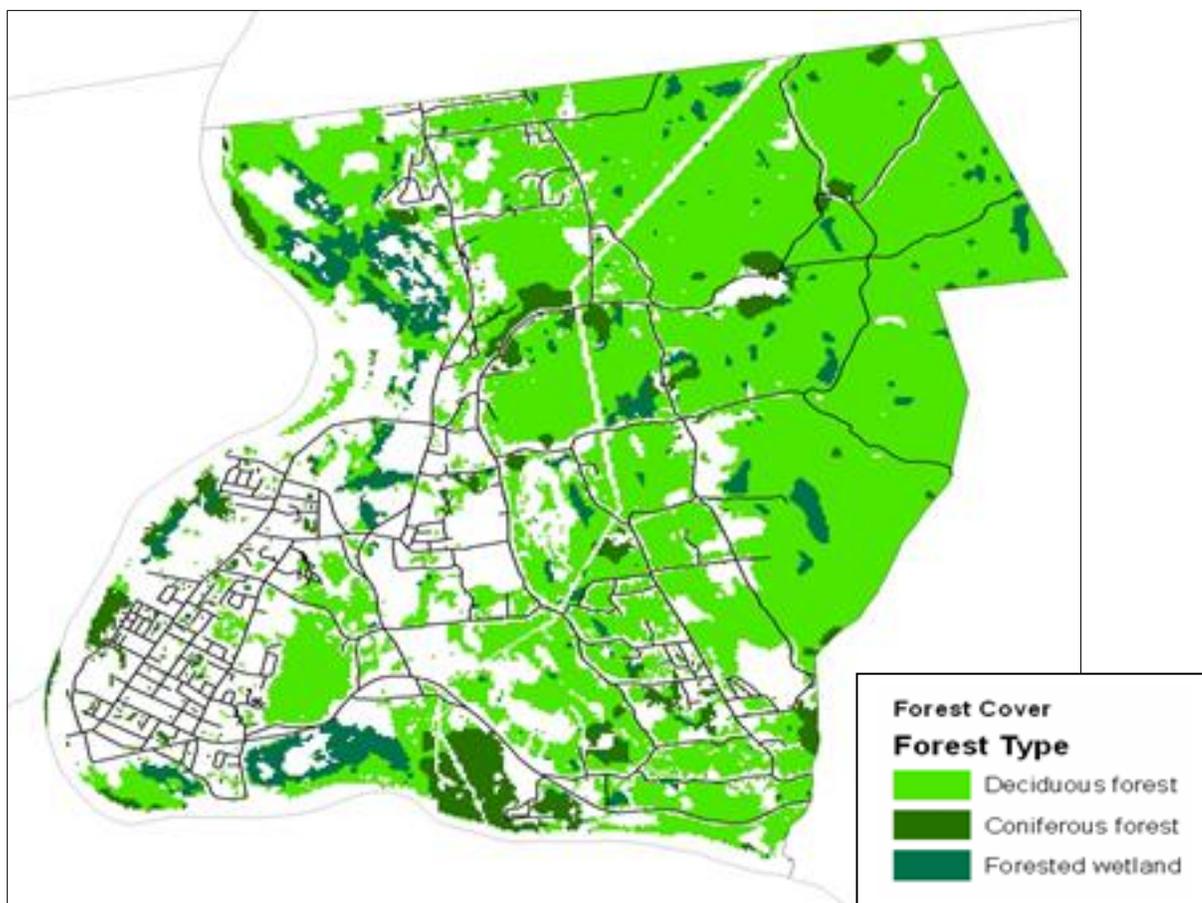
*NOTE: For an extensive discussion on other natural disasters not discussed here see the Regional Section of this Plan: Section III.B.1.c.5*

**1. Forest Fires**

Portland is heavily forested which means there are several areas of the Town that are vulnerable to major forest fires. If the conditions are right; drought, hot windy weather a wildfire could happen. The risk is exacerbated by the encroachment of residents “deeper” into the woodlands. The following illustration shows the forest cover in Town

State Forests	Towns	Acres	Day Use
Meshomasic	Portland	9,118	X

**Figure 11:** State Forests in Portland  
Source: DEEP



**Map 5: Portland Forest Cover**

Source: RiverCOG

## 2. Additional Natural Hazards

See the Regional Section of this Plan for an extensive discussion on the following. Natural Hazards: Heat and Cold Extremes, Droughts, Power Outages, Ice Dams, Earthquakes, and Erosion.

## VIII. PORTLAND MITIGATION STRATEGIES

### A. Authorities, Policies, Programs, and Resources

See also the Table in the Regional Section III Mitigation Actions Responsibilities

Highlights:

Storms

Land use planners and regulators have taken into serious consideration restrictions on the building of, and or winterizing of buildings in designated or known flood risk areas.

Continue monitoring DEMHS, DEEP, local press and radio and TV for storm warnings.

When a serious flash flood warning is issued, advise the public of the dangers of driving through moving flood waters.

### Crisis Communications Plan

Following Crisis Communications Plan guidelines, keep public and responders aware of “what is going on” and certain storm specific warnings; e.g.; “don’t touch downed power lines”, “don’t drive through flowing water”, availability of shelters, etc.

### **B. NFIP and Community Rating System**

See the Flood section of this local Plan and the Regional Section for information on the National Flood Insurance Program

Portland does not participate in the CRS; but should consider.

The Community Rating System CRS is a part of the NFIP. When communities go beyond the NFIP’s minimum standards for flood plain management and participate in the CRS, discounts may be available on flood insurance premiums for policy holders in those communities.

### **C. Portland Goals and Objectives**

Goals and Objectives can be found in Part I of the Portland Mitigation Action Plan Section of this local Plan. Regional overall Goals and Objectives can be found in the Regional Section of this Plan.

### **D. Mitigation Action Items**

Prioritized mitigation actions with costs where known can be found in the Portland Detailed Mitigation Action Plan Section J.

The municipalities in the RiverCOG region have a variety of mitigation actions currently in place. They are not limited to brick and mortar.

**Administration:** Current and future loss prevention is, and will continue to be sourced through local, regional, State and Federal efforts for updating maps, local regulatory actions, and insurance efforts National Flood Insurance Program. Also capital improvement funding made available from State and Federal sources for infrastructure improvements.

**Public Works:**

- Continues to monitor culverts and bridges that clog by maintaining debris collections above and for prevention of ice damming.
- Continues to look for funding for culvert and bridge maintenance considering local budget restraints and State grants availability.
- The Town should have a Debris Management Plan in place.
- Continue monitoring Flood Warnings from DEEP and DEMHS.
- Currently requiring private compliance with CGS §22a-402b-f; dam inspection requirements. Local dam owners including the municipality are responsible for periodic evaluations of their dams and making repairs as needed.
- Is continuing its historic responsibilities and new ones as a designated responder. And they are aware of the herculean responsibilities a major hurricane will bring.
- Assumes the primary responsibility for municipal building and critical infrastructure.
- The Public Works Crew will stabilize unstable stream and road bed bankings to the fullest extent allowable by DEEP, and local agencies.

**Emergency Services:** have mutual aid agreements in place with neighboring municipalities. There is also a statewide mutual aid agreement in place. These will be kept current.

**Emergency Management will:**

- Will continue to enhance EOC capabilities.
- Public health employees are now designated as responders<sup>56</sup>
- Public Works employees are now designated as responders<sup>57</sup>
- Portland has always had a very strong Emergency Management program in place. Annually they practice/drill/exercise their capabilities regionally and statewide.
- They offer direct assistance in training/exercise sessions to the fire department, police department, public health and administration when needed.
- Portland has a very active CERT. Community Emergency Response Team

**Emergency Operations Center** The EOC management continues to have access to WEBEOC for current information and assets available mitigation actions for the emergency response and recovery modes.

**Funding:**

- Through local direct assistance to fire fighter, law enforcement, call center improvement, emergency management grants, EMS assistance, etc. emergency responders are continuing to seek funding to enhance their response capability.

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<sup>56</sup> Responders Vs First Responders

<sup>57</sup> Responders Vs First Responders

- The direct to the regional planning agency grants have gone away. Now the Department of Emergency Management and Homeland Security passes on FEMA grants to the five regions they have designated. Cromwell is in Region 3.
- The primary funding source for local infrastructure mitigation is through the local budgeting process. This is supplemented through regional, State and Federal grants. See Alternative Funding Sources, Regional Sections of this Plan, Section I.B.3&4.

**Notifications:**

- The emergency management team does and will continue to maintain multimedia communications to stay tuned to local media and DEMHS e-mail for bulletins.
- NOAA broadcasts the potential when conditions are right to, say spawn a tornado. When the threat exists, EM will monitor the early warning system.
- Public Notifications: The Public will continue to be notified to stay tuned to local media for severe weather bulletins.
- Reminders will also be sent out about the dangers of driving through rushing waters and going near downed wires.
- Residents and vulnerable businesses will be reminded to continue in their efforts of flood proofing.

**Social Services:** Social services are in a position to continue in assisting in notifications of people with functional and other special needs.

**Public Health and Social Services:**

- Works closely with the State in preparing for the needs of people with functional needs
- Continue to enhance, and exercise shelter activities; both short and long term, for citizens during power outages, hurricanes, wind storms, ice storms, heat waves, and extreme cold.
- Sheltering activities includes participating in local and regional exercises.
- The Portland Health Department is part of the Chatham Health District and is active in local regional Middletown area and Region 3 planning and exercises. There is a focus on enhancing exercise shelter activities; short and long term for citizens during power outages and evacuations. This is also particularly true of working with Special Needs and Fixed Populations:

**NGOs:** Emergency management works with Non-Governmental Organizations in preparing for storm emergencies. These include the American Red Cross, faith based agencies, Salvation Army, senior centers, Rotary, etc.

**Land Use Planners:**

- Regional and Portland land use planners have worked with FEMA and its contractors on flood plain development planning. We began working on the revised FIRM maps at a workshop May 17, 2005. Portland signed off on the maps August 2008.

- The planners are aware of flood hazards throughout the Town particularly in designated flood plains. They will continue to:
- Monitor trends in number of permit requests in vulnerable areas
- Monitor evolving vulnerable areas where development may occur
- Encourage open space in vulnerable areas
- Encourage municipal acquisition of buildings in flood plains and creation of open space.
- Monitor expected growth or development over the next 10, 20 years.

**Schools:** The Schools, working with Emergency Management have severe weather plans in place, modeled after: Snow Days. They also have a NOAA provided weather alert radio for monitoring weather events.

### **Special Situations**

People with Functional Needs formerly; Special Needs clusters: The Portland Health Department/District and Emergency Management shall continue to participate regularly in sheltering including handling people with disabilities. DEMHS Regions are working on enhancing programs for working with people with disabilities.

Fixed Populations: These initiatives are ongoing including activities: locally, regionally and Statewide. This population includes those individuals unable to evacuate due to a physical disability or clusters of elderly or those with functional medical needs that shelter-in-place. Emergency management is also aware of the local State facilities that they are responsible for. However it may fall on the responsibility of the municipality; such as a group home.

Pet Evacuation and Sheltering: Municipal officials should continue to make a special effort to identify, at risk local animal population pets and livestock. They should be aware of owner notification requirements e.g. sheltering available and transportation needs.

The Town of Portland Emergency Operations Plan, as updated in 2006, addresses in detail the evacuation and sheltering of animals.

Emergency management and animal control authorities have available from Region 2 & 3 portable pet shelters to be set-up adjacent to human shelters.

Under the latest Americans with Disabilities Act ADA guidelines Service Animals are now specifically defined as Service Dogs. The only allowable exception is miniature horses.. They have specific qualifiers. UPDATE: as of this writing there is an issue with the horses not being able to be house trained.

**E. Incorporation into Other Plans**

See the Regional Section of this Plan for authorities, responsibilities and other<sup>58</sup> plans incorporated into the natural hazard planning; past and going forward. (Sections I, II and particularly IV)

Local land use plans apropos to natural hazard protection will be watched for ramifications to the natural hazard planning process. These plans include regional, State and Federal plans. See Section I, Part E.2

**F. Proposed Mitigation Strategies**

The municipality of Portland has a variety of mitigation actions currently in place. They are not limited to brick and mortar.

See Section III of this local Annex for more information.

**Events and Actions in Place**

**Land Use Planning:** Portland officials, led by First Selectwoman Susan Bransfield works with RiverCOG on Land Use planning. Portland signed off on the FIRM maps August 2008.

Event	Potential	Loss Potential	Actions and Projects in Place?
Flood	H	H	Y
Hurricane	H	H	Y
Thunderstorms	H	L	P
Tornadoes	M	H	P
Nor'easter	H	M	Y
Extreme Cold	H	L	Y
Heavy Snow	H	M	Y
Ice Storm	M	H	Y
Forest Fires	M	H	Y
Extreme Heat	H	L	Y
Earthquakes	L	M	N
Landslides	L	L	N/A
Y=Yes, N=No, P=Partial, N/A = Does Not Apply			

**Figure 12:** Events, Potential and Action in Place in Portland

**G. Planning Team Recommendations**

TDSR Temporary Debris Storage and Reduction Site Plan

<sup>58</sup> Meaning other than natural hazard mitigation planning

Portland needs to have a current plan in place for managing the massive amount of debris as a result of a hurricane hitting the area. 100 MPH winds and up would cause major destruction to our trees and in many cases power, cable and telephone lines. Again 100MPH an up winds will blow down 80% of our mature growth trees ... many hanging over power lines ... on local and state roadways. Portland should develop a Debris Management Plan, especially including a temporary debris storage site.

Erosion Protection:

Through legislation change, require the DEEP to allow banking protection from erosion.

COOP/COG

Develop a Continuity of Operations Plan/Continuity of Government Plan.

Community Rating System

Portland should consider participating in the CRS.

Weather Awareness:

All municipal departments and local agencies will continue to listen for NOAA broadcasts and other emergency broadcasts, when conditions are right for a severe storm: significant rain event, heavy wind, tornado, hurricane, etc. They will then activate their emergency plans.

**H. Portland Mitigation Action Plan**

**1. Prevention**

Portland has rigorous land use regulations designed to protect natural resources and restrict development in flood zones and other hazard-prone areas. These regulations help prevent the loss of life and property by preventing inappropriate development in flood zones and reducing the amount of storm water discharge that may exacerbate flooding.

The Zoning Regulations restrict all new construction and substantial improvements in the 100-year flood plain as depicted on the most recent revision of the Flood Insurance Rate Map FIRM. Substantial improvements mean any combination of repairs, reconstruction, alteration, or improvements to a structure taking place during a ten-year period, the cost of which equals or exceeds 50% of the market value either before the improvement or repair is started or, if the structure has been damaged, before the damage occurred. In these cases, all residential construction must be elevated to or above the base flood elevation. Likewise, all non-residential construction must be elevated or flood proofed to or above the base flood elevation. In regards to elevated buildings, the areas below the base flood elevation must allow floodwater to flow in all directions, and the building must have at least one access route above the base flood elevation. In addition, the regulations prohibit all encroachments in regulated floodways.

The Subdivision Regulations build upon the Zoning Regulations to offer additional preventive measures during the site plan submittal process. Specifically, the regulations require a storm drainage plan that minimizes runoff and maximizes infiltration before discharging storm water into wetlands and watercourses. If storm water discharge will overload existing downstream drainage facilities, the storm drainage plan must provide adequate retention/detention of the runoff. Furthermore, the regulations require the protection of natural features including those that contribute to the natural functioning of the natural drainage system. In addition to flooding, the regulations address damaging winds as a result of severe storms. For instance, utility lines are required to be buried for new subdivisions and are encouraged for certain projects such as major road projects. These land use regulations are described in detail in the Zoning Regulations and Subdivision Regulations available through the Portland Planning & Development Department.

The Building Department, Inland Wetland Commission, and Public Works Department carries out additional activities that help prevent the loss of life and property as a result of natural disasters.

The Building Department ensures conformance with the Connecticut State Building Code including flood resistant construction and with elevation certification Section 3107.

The Inland Wetlands Commission, through its Inland Wetlands and Watercourses regulations, works toward the conservation of wetland resources through avoiding impacts from development on functional wetlands and watercourses. The Commission also seeks to restore and enhance wetlands that have been degraded.

Portland implements an as-needed program for tree maintenance.

Whenever possible, Public Works examines and clears public storm drains and grates of debris during periods of rainfall, snowfall, and storms.

## **1. Emergency Services**

Portland uses warning systems and emergency planning to help protect life and property before, during and after a natural disaster. Portland has an Emergency Operations Plan that outlines emergency procedures. The plan has procedures in place for flooding, tornado, hurricane, and earthquake. In addition, the Automated Local Evaluation in Real Time ALERT system monitors the water level of the Local River, rainfall, and weather conditions and prepares forecasts of potential flooding in Portland.

## **2. Natural Resource Protection**

Portland has an open space acquisition policy that helps protect areas prone to flooding and other natural hazards from future development. For example, the Municipal Plan of Conservation and Development lists desired public open space acquisitions including properties with demonstrable mitigation benefits.

The Town of Portland places great emphasis on natural resource preservation as demonstrated in Chapter 3, entitled “Preserve Community Resources”, of the municipal Plan of Conservation and Development, adopted in March 2006. The dedication and/or the granting of protective easements for open space are a requirement in most all subdivision approvals, especially ones having any area of special concern. The Portland Planning and Zoning Commission, with the support of the Conservation Commission and Inland Wetlands Agency, made the unique and progressive distinction of zoning properties identified within A Zones 100 year flood on the FEMA Flood Insurance Rate Map as being located within the Portland Flood Plain Zone. This local land use regulatory zone is very restrictive relative to the development of flood prone properties and specifically prohibits the new construction of residential dwellings.

The Town of Portland is a designated member of the Connecticut River Assembly see CT General Statutes Chapter 477c, Section 25-102aa for its location within the Upper Connecticut River Conservation Zone. A membership benefit includes the review of land use applications for development of sensitive lands located along the Connecticut River. Technical assistance and education relative to soil and water conservation, erosion and sedimentation control, storm water management, and watershed protection is provided regularly by the Connecticut River Coastal Conservation District, a 501c3 nonprofit organization whose mission is to promote the sound use and management of natural resources.

## **3. Challenges**

Erosion of waterways due to severe rain events. Flooding of roadways and buildings due to inadequate storm drainage systems.

## **4. Proposed Mitigation Strategies**

Portland personnel will review the “Hazard Evaluation and Risk Assessment,” the strengths and weaknesses of its existing mitigation strategies, and the municipality’s challenges.

This review will be used in the development of the goals, objectives, proposed mitigation strategies and implementation schedule. The following criteria were used to assign each supporting task a priority rating of “High,” “Medium” or “Low”.

- a) Does the supporting task benefit a large number of Municipal residents?

- b) Does the supporting task mitigate multiple natural hazards?
- c) Does the cost of the supporting task seem reasonable for the size of the problem and likely benefits?
- d) Is there enough political and public support to ensure the success of the supporting task?
- e) Does the supporting task improve upon existing programs or support other municipal priorities?
- f) Does the supporting task entail additional staff time that the municipality is unable to commit immediately an answer of “No” satisfies this criterion?

Definitions for Priority, Schedule, and Responsible Party, and Cost can be found in Section IV.F on page 111.

**5. GOAL AND OBJECTIVES**

**Goal:** Reduce the loss of life and property and economic consequences as a result of flooding, high winds, severe storms and dam failure.

Supporting Task	Responsible Party	Schedule	Priority	Funding Sources	Cost Estimate
Improve the ability of Portland residents to prepare and respond to approaching severe weather.	EM	2014	High	HMGP, PDM, FMA, CIP	\$\$
Reduce the amount of debris from severe storms through preventive tree maintenance.	PW	2014	High	CIP, OP	\$\$
Implement a reverse 911 system that allows the town to alert various segments of the population depending on the nature of the emergency.	Dispatch	2014-15	High	CIP, OP	\$\$
Implement a community alert system to fill the gap between the National Emergency Alert system and community-based emergencies	PD, FD	2014-15	Medium	CIP, OP	\$
Acquire emergency generators for various Town facilities.	PW,EM	2014-15	Medium	HMGP, CIP	\$\$
Provide cots, blankets, food supplies, etc. for the Emergency Shelter	EM, HD	2014-15	Medium	HMGP, CIP	\$
Develop a GIS application to assist personnel in the event of an	PD, FD	2014-15	Medium	CIP, OP	\$\$
Upgrade and provide ongoing training for the ALERT system	PD, FD	2014-15	Low	CIP, OP	\$
Budget appropriate money necessary to maintain and remove dead, dying, dangerous or diseased trees in rights-of-way and on other town land.	PW	2014	Low	CIP	\$\$

**Portland Detailed Mitigation Action Plan**

The following mitigation action items have been proposed by the planning team in order to mitigate damages in Portland.

Supporting Task	Responsible Party	Schedule	Priority	Funding Sources	Cost Estimate
Road Culvert - East of Thompson Hill Road. Water overtops road in high intensity/short duration storms. Engineering study needed to determine mitigation options and costs to accomplish.	PW, BOS, BOF	B	Low	HMGP, FMA, PDM, CIP	\$\$
Portland Police Department. Water backs up into basement in severe storms. Engineering study needed to determine mitigation options and costs to accomplish.	PW, BOS, BOF	B	High	HMGP, FMA, PDM, CIP	\$\$
Portland Senior Center. Water backs up into basement in severe storms. Engineering study needed to determine mitigation options and costs to accomplish.	PW, BOS, BOF	B	High	HMGP, FMA, PDM, CIP	\$\$
Old Marlborough Turnpike Culverts @ 2 Locations. Water overtops road/scours outlet pipe and downstream slope. Engineering study needed to determine mitigation options and costs to accomplish	PW, BOS, BOF	B	Low	HMGP, FMA, PDM, CIP	\$\$
Rose Hill Road - Various Locations. Runoff from Golf Course crosses road / enters private property. Engineering study needed to determine mitigation options and costs to accomplish.	PW, BOS, BOF	B	Low	HMGP, FMA, PDM, CIP	\$\$
Collins Hill Road - Various Locations. Runoff from Golf Course crosses road / enters private property. Engineering study needed to determine mitigation options and costs to accomplish.	PW, BOS, BOF	B	Low	HMGP, FMA, PDM, CIP	\$\$
Sage Hollow Road. Water overtops road in high intensity/short duration storms. Engineering study needed to determine mitigation options and costs to accomplish.	PW, BOS, BOF	B	Low	HMGP, FMA, PDM, CIP	\$\$
Cox Road - East Section. Water overtops road in high intensity/short duration storms. Engineering study needed to determine mitigation options and costs to accomplish.	PW, BOS, BOF	B	Low	HMGP, FMA, PDM, CIP	\$\$
Main Street near intersection with Williams Street. Water overtops road in high intensity/short duration storms. Engineering study needed to determine mitigation options and costs to accomplish.	PW, BOS, BOF	B	High	HMGP, FMA, PDM, CIP	\$\$
Drainage System at YMCA Camp Ingersoll. Drainage system failure sends water & fill down to Jobs Pond. Engineering study needed to determine mitigation options and costs to accomplish	PW, BOS, BOF	B	Low	HMGP, FMA, PDM, CIP	\$\$

Portland Natural Hazards Mitigation Annex

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4 Freestone Avenue. Water backs up in storm drain then into basement. Engineering study needed to determine mitigation options and costs to accomplish	PW, BOS, BOF	B	High	HMGP, FMA, PDM, CIP	\$\$
5 Edwards Road. Water overtops off-road drain inlet and floods road & property. Engineering study needed to determine mitigation options and costs to accomplish.	PW, BOS, BOF	B	Medium	HMGP, FMA, PDM, CIP	\$\$
St. Mary's Cemetery. Water overtops swale in severe storms. Engineering study needed to determine mitigation options and costs to accomplish.	PW, BOS, BOF	B	Medium	HMGP, FMA, PDM, CIP	\$\$
Watercourse between William Street & Main Street. Water overtops off-road drain inlet and floods road & property. Engineering study needed to determine mitigation options and costs to accomplish.	PW, BOS, BOF	B	High	HMGP, FMA, PDM, CIP	\$\$
Watercourse between High School detention basin & Redberry Lane. Erosion of soil and plugging of drains. Engineering study needed to determine mitigation options and costs to accomplish	PW, BOS, BOF	B	Low	HMGP, FMA, PDM, CIP	\$\$
314 Main Street - Brownstone Intermediate School. Water backs up into basement during severe storms. Engineering study needed to determine mitigation options and costs to accomplish.	PW, BOS, BOF	B	High	HMGP, FMA, PDM, CIP	\$\$
Watercourse between Scenic Drive & Main Street. Stream banks erode and plug Route 17A - drains and road. Engineering study needed to determine mitigation options and costs to accomplish.	PW, BOS, BOF	B	High	HMGP, FMA, PDM, CIP	\$\$
Main Street from Middlesex Avenue to bridge approach. Water overtops road in severe storms. Engineering study needed to determine mitigation options and costs to accomplish.	PW, BOS, BOF	B	High	HMGP, FMA, PDM, CIP	\$\$
Strongs Avenue. Water overtops Route 17A in severe storms and floods road. Engineering study needed to determine mitigation options and costs to accomplish.	PW, BOS, BOF	B	High	HMGP, FMA, PDM, CIP	\$\$

## Spring River Floods

Project (Notes 1&2)	Responsible Party	Schedule	Priority	Funding Source	Estimated Cost
Isinglass Hill Road Bridge on Hales Brook. Water overtops bridge in high intensity/short duration storms. Engineering study needed to determine mitigation options and costs to accomplish.	PW, BOS, BOF	B	Medium	HMGP, STIP, CIP	\$\$
Old Marlborough Tpke./East Cotton Hill Rd on Reservoir Brook. Water overtops road in high intensity/short duration storms. Engineering study needed to determine mitigation options and costs to accomplish.	PW, BOS, BOF	B	Medium	HMGP, STIP, CIP	\$\$
Cox Road Bridge by Kelsey Pond on Carr Brook. Water overtops bridge in high intensity/short duration storms. Engineering study needed to determine mitigation options and costs to accomplish.	PW, BOS, BOF	B	Medium	HMGP, STIP, CIP	\$\$
Cox Road culvert by power lines on Carr Brook. Water overtops bridge in high intensity/short duration storms. Engineering study needed to determine mitigation options and costs to accomplish.	PW, BOS, BOF	B	Medium	HMGP, STIP, CIP	\$\$
Penfield Hill Road culvert by Cox Rd on Carr Brook. Water overtops bridge in high intensity/short duration storms. Engineering study needed to determine mitigation options and costs to accomplish.	PW, BOS, BOF	B	High	HMGP, STIP, CIP	\$\$
Rose Hill Bridge on Carr Brook. Failure of Stockings Dam likely to block bridge. Engineering study needed to determine mitigation options and costs to accomplish.	PW, BOS, BOF	B	High	HMGP, STIP, CIP	\$\$
Riverview Street near Yankee Boat Yard on Ct. River. Street floods when CT. River rises above el. 13.0 msl. Engineering study needed to determine mitigation options and costs to accomplish.	PW, BOS, BOF	B	Medium	HMGP, STIP, CIP	\$\$
Riverview Street at Grove St. on Ct. River. Street floods when CT River rises above el. 16.0 msl. Engineering study needed to determine mitigation options and costs to accomplish.	PW, BOS, BOF	B	Medium	HMGP, STIP, CIP	\$\$
Bartlett Street at Rte. 17 influenced by CT River. Street floods when CT River rises above el. 21.0 msl. Engineering study needed to determine mitigation options and costs to accomplish.	PW, BOS, BOF	B	Low	HMGP, STIP, CIP	\$\$

Portland Natural Hazards Mitigation Annex

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Strickland Street at Rte. 17 influenced by CT River. Street floods when CT River rises above el. 23.0 msl. Engineering study needed to determine mitigation options and costs to accomplish.	PW, BOS, BOF	B	Medium	HMGP, STIP, CIP	\$\$
Indian Hill Avenue at FC#2 Picnic Grounds on CT River. Street floods when CT River rises above el. 20.0 msl. Engineering study needed to determine mitigation options and costs to accomplish.	PW, BOS, BOF	B	Low	HMGP, STIP, CIP	\$\$
Tryon Street on CT River. Street floods when CT River rises above el. 20.0 msl. Engineering study needed to determine mitigation options and costs to accomplish.	PW, BOS, BOF	B	Medium	HMGP, STIP, CIP	\$\$
Access Road to Coe Ave. Sewer Pump Station on CT River. Road floods when CT River rises above el. 12.0 msl. Engineering study needed to determine mitigation options and costs to accomplish.	PW, BOS, BOF	B	High	HMGP, STIP, CIP	\$\$
Route 17A between Indian Hill Avenue & Route 17. Road floods when CT River rises above el. 12.0 msl. Engineering study needed to determine mitigation options and costs to accomplish.	CT DOT, PW, BOS, BOF	B	Medium	HMGP, STIP, CIP	\$\$
Riverview Street Extension. Street floods when CT River rises above el. 16.0 msl. Engineering study needed to determine mitigation options and costs to accomplish.	PW, BOS, BOF	B	Medium	HMGP, STIP, CIP	\$\$

If an extended power outage ensues after any natural hazard event, the following will need power:

Town-wide	Trees & wires down/roads blocked/pwr. out/ bldg. dmg./ flooding
Town-wide	Roads may be impassable for short duration
Glastonbury Turnpike Water Supply Well	If power out/no emergency generator to provide backup power
Bartlett Street Water Pumping Station	If power out/no emergency generator to provide backup power
Portland Library	If power out/no emergency generator to provide backup power
Portland Senior Center	If power out/no emergency generator to provide backup power
Portland Transfer Station	If power out/no emergency generator to provide backup power
Brownstone Intermediate School	If power out/no emergency generator to provide backup power
Valley View School	If power out/no emergency generator to provide backup power
Gildersleeve School	If power out/no emergency generator to provide backup power

**Other Natural Hazards**

<b>Specific Hazard</b>	<b>Supporting Task</b>	<b>Responsible Party</b>	<b>Schedule</b>	<b>Priority</b>	<b>Funding Sources</b>	<b>Cost Estimate</b>
Ice Dams	Develop a Plan to prevent road flooding throughout town due to Ice Dams	PW, BOS, EMD, BOF	A	Medium	HMGP, CIP, OP	\$\$
Earthquake	Develop an Earthquake Recovery Plan in order to repair broken water and sewer lines, and building or road damage in the event of a large earthquake.	PW, BOS, EMD, BOF	A	Medium	HMGP, CIP, OP	\$\$
Forest Fire	Develop wildfire protection plan	FM, Fire Dept., BOS	A	Medium	HMGP, CIP, OP	\$\$
Forest Fire	Install water storage tanks adjacent to state forest to ensure ample water supply during a large fire.	FM, Fire Dept., BOS	B	Medium	HMGP, CIP, OP	\$\$

Hurricane, Ice Storm, Snow Storm, Wind Storm and extended power outages See Notes

<b>Supporting Task</b>	<b>Responsible Party</b>	<b>Schedule</b>	<b>Priority</b>	<b>Funding Sources</b>	<b>Cost Estimate</b>
Install generators at all critical facilities.	PW, BOS, BOF, EMD, FM	B	High	HMGP, CIP	\$\$

**IX PLAN MAINTENANCE**

FEMA Regulations – 44 CFR §201.6d3: The Town of Portland, working with RiverCOG will conduct a complete review and do a revision if needed and submit it for approval in 5-years. Even if there are no changes, it must be reported, in order to continue being eligible for Natural Hazard Mitigation Grants.

In accordance with Section 201.6c4 of 44 CFR Portland will assure the Plan remains an active and relevant document. RiverCOG municipality officials will continue working with Portland in the mitigation planning process.

Changes to the Plan can be made at any time to this Plan; however, any change will require a submission to FEMA for approval either as an amendment or as a Plan update requiring re-adoption of the plan by the affected jurisdiction. If there are regional implications, then the entire Plan would need to be re-adopted by all jurisdictions.

Please see the Regional Section V.E. for the maintenance schedule.

See Appendix Q for is a sample mitigation planning tool.

**X PLAN APPROVAL AND ADOPTION**

Upon FEMA Approval Pending Adoption of this Plan, it requires a sign-off by the municipal CEO. The adoption certificate follows. CEO signatures are required on the Regional Section of this Plan.

**THE LOWER CONNECTICUT RIVER VALLEY COUNCIL OF GOVERNMENTS  
MULTI-JURISDICTION NATURAL HAZARD MITIGATION PLAN  
CERTIFICATE OF ADOPTION  
Town of Portland, Connecticut**

WHEREAS, the Town of Portland has historically experienced severe damage from natural hazards and it continues to be vulnerable to the effects of - only those natural hazards profiled in the plan (i.e. flooding, thunderstorm, high wind, winter storms, earthquakes, and dam failure), resulting in loss of property and life, economic hardship, and threats to public health and safety; and

WHEREAS, the Town of Portland, has developed and received conditional approval from the Federal Emergency Management Agency (FEMA) for its Hazard Mitigation Plan under the requirements of 44 CFR 201.6; and

WHEREAS, public and committee meetings were held between June 16, 2009 and December 1, 2011 regarding the development and review of the Multi-Jurisdiction Natural Hazard Mitigation Plan; and

WHEREAS, the Plan specifically addresses hazard mitigation strategies and Plan maintenance procedure for the Town of Portland; and

WHEREAS, the Plan recommends several hazard mitigation actions/projects that will provide mitigation for specific natural hazards that impact the Town of Portland, with the effect of protecting people and property from loss associated with those hazards; and

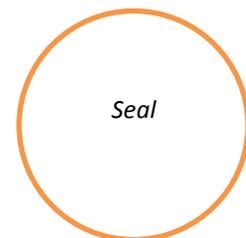
WHEREAS, adoption of this Plan will make the Town of Portland eligible for funding to alleviate the impacts of future hazards; now therefore be it

RESOLVED by the Board of Selectmen:

1. The Plan is hereby adopted as an official plan of the Town of Portland
2. The respective officials identified in the mitigation strategy of the Plan are hereby directed to pursue implementation of the recommended actions assigned to them;
3. Future revisions and Plan maintenance required by 44 CFR 201.6 and FEMA are hereby adopted as a part of this resolution for a period of five (5) years from the date of this resolution.
4. An annual report on the progress of the implementation elements of the Plan shall be presented to the Board of Selectmen by the Planning and Zoning Commission.

IN WITNESS WHEREOF, the undersigned has affixed his/her signature and the corporate seal of the Town of Portland this \_\_\_ day of \_\_\_\_\_, (year).

\_\_\_\_\_  
(Name, Title)



**VI APPENDICES**

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# Hazus-MH: Flood Event Report

**Region Name:** Midstate

**Flood Scenario:** Midstate Flood

**Print Date:** Tuesday, May 07, 2013

***Disclaimer:***

*Totals only reflect data for those census tracts/blocks included in the user's study region.*

*The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social*

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## General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Connecticut

**Note:**

Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 247 square miles and contains 1,853 census blocks. The region contains over 41 thousand households and has a total population of 104,442 people (2000 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 39,876 buildings in the region with a total building replacement value (excluding contents) of 10,375 million dollars (2006 dollars). Approximately 90.63% of the buildings (and 72.36% of the building value) are associated with residential housing.

## Building Inventory

### General Building Stock

Hazus estimates that there are 39,876 buildings in the region which have an aggregate total replacement value of 10,375 million (2006 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

**Table 1**  
**Building Exposure by Occupancy Type for the Study Region**

<b>Occupancy</b>	<b>Exposure (\$1000)</b>	<b>Percent of Total</b>
Residential	7,507,643	72.4%
Commercial	1,750,257	16.9%
Industrial	673,105	6.5%
Agricultural	32,448	0.3%
Religion	156,953	1.5%
Government	50,299	0.5%
Education	204,248	2.0%
<b>Total</b>	<b>10,374,953</b>	<b>100.00%</b>

**Table 2**  
**Building Exposure by Occupancy Type for the Scenario**

<b>Occupancy</b>	<b>Exposure (\$1000)</b>	<b>Percent of Total</b>
Residential	5,762,026	69.5%
Commercial	1,568,036	18.9%
Industrial	641,300	7.7%
Agricultural	27,342	0.3%
Religion	118,140	1.4%
Government	38,534	0.5%
Education	138,860	1.7%
<b>Total</b>	<b>8,294,238</b>	<b>100.00%</b>

### Essential Facility Inventory

For essential facilities, there are 4 hospitals in the region with a total bed capacity of 747 beds. There are 52 schools, 9 fire stations, 6 police stations and 4 emergency operation centers.

## Flood Scenario Parameters

Hazus used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

<b>Study Region Name:</b>	Midstate
<b>Scenario Name:</b>	Midstate Flood
<b>Return Period Analyzed:</b>	100
<b>Analysis Options Analyzed:</b>	No What-Ifs

## Building Damage

### General Building Stock Damage

Hazus estimates that about 915 buildings will be at least moderately damaged. This is over 36% of the total number of buildings in the scenario. There are an estimated 602 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5.3 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

**Table 3: Expected Building Damage by Occupancy**

Occupancy	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	0	0.00	20	66.67	3	10.00	0	0.00	1	3.33	6	20.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	100.00
Government	3	100.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	1	50.00	0	0.00	1	50.00
Religion	0	0.00	1	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	9	1.01	21	2.36	26	2.92	90	10.11	150	16.85	594	66.74
<b>Total</b>	<b>12</b>		<b>42</b>		<b>29</b>		<b>91</b>		<b>151</b>		<b>602</b>	

**Table 4: Expected Building Damage by Building Type**

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete Manuf.	4	50.00	3	37.50	0	0.00	0	0.00	0	0.00	1	12.50
Housing	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Masonry	4	6.25	6	9.38	2	3.13	7	10.94	9	14.06	36	56.25
Steel	4	20.00	10	50.00	1	5.00	1	5.00	1	5.00	3	15.00
Wood	1	0.12	18	2.20	24	2.93	83	10.13	140	17.09	553	67.52

## Essential Facility Damage

Before the flood analyzed in this scenario, the region had 747 hospital beds available for use. On the day of the scenario flood event, the model estimates that 554 hospital beds are available in the region.

Before the flood analyzed in this scenario, the region had 747 hospital beds available for use. On the day of the scenario flood event, the model estimates that 747 hospital beds are available in the region.

**Table 5: Expected Damage to Essential Facilities**

Classification	Total	# Facilities		
		At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	9	2	0	2
Hospitals	4	1	1	2
Police Stations	6	0	0	0
Schools	52	9	2	8

If this report displays all zeros or is blank, two possibilities can explain this.

- (1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.
- (2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

## Induced Flood Damage

### Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

**Analysis has not been performed for this Scenario.**

## Social Impact

### Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 4,842 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 11,076 people (out of a total population of 104,442) will seek temporary shelter in public shelters.

## Economic Loss

The total economic loss estimated for the flood is 925.58 million dollars, which represents 11.16 % of the total replacement value of the scenario buildings.

### Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 920.87 million dollars. 1% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 37.02% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

## Appendix A

**Table 6: Building-Related Economic Loss Estimates**  
(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
<u>Building Loss</u>						
	Building	207.78	117.74	35.79	15.61	376.92
	Content	134.44	267.98	75.74	48.48	526.64
	Inventory	0.00	4.43	12.49	0.40	17.31
	Subtotal	342.21	390.15	124.02	64.49	920.87
<u>Business Interruption</u>						
	Income	0.04	1.14	0.01	0.12	1.30
	Relocation	0.15	0.33	0.00	0.06	0.55
	Rental Income	0.15	0.15	0.00	0.00	0.30
	Wage	0.10	1.41	0.00	1.05	2.56
	Subtotal	0.44	3.04	0.02	1.22	4.71
	Total	342.65	393.19	124.03	65.71	925.58

### Appendix A: County Listing for the Region

Connecticut  
- Middlesex

### Appendix B: Regional Population and Building Value Data

Building Value (thousands of dollars)				
	Population	Residential	Non-Residential	Total
<b>Connecticut</b>				
Middlesex	104,442	7,507,643	2,867,310	10,374,953
<b>Total</b>	<b>104,442</b>	<b>7,507,643</b>	<b>2,867,310</b>	<b>10,374,953</b>
<b>Total Study Region</b>	<b>104,442</b>	<b>7,507,643</b>	<b>2,867,310</b>	<b>10,374,953</b>

# Hazus-MH: Hurricane Event Report

**Region Name:** Midstate

**Hurricane Scenario:** Probabilistic 100-year Return Period

**Print Date:** Wednesday, May 08, 2013

**Disclaimer:**

*Totals only reflect data for those census tracts/blocks included in the user's study region.*

*The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Hurricane. These results can be improved by using enhanced inventory data*

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## General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences. The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The hurricane loss estimates provided in this report are based on a region that includes 1 county(ies) from the following state(s):

- Connecticut

**Note:**

Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 256.60 square miles and contains 23 census tracts. There are over 41 thousand households in the region and has a total population of 104,442 people (2000 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 39 thousand buildings in the region with a total building replacement value (excluding contents) of 10,375 million dollars (2006 dollars). Approximately 91% of the buildings (and 72% of the building value) are associated with residential housing.

## Building Inventory

### General Building Stock

Hazus estimates that there are 39,876 buildings in the region which have an aggregate total replacement value of 10,375 million (2006 dollars). Table 1 presents the relative distribution of the value with respect to the general occupancies. Appendix B provides a general distribution of the building value by State and County.

**Table 1: Building Exposure by Occupancy Type**

<b>Occupancy</b>	<b>Exposure (\$1000)</b>	<b>Percent of Tot</b>
Residential	7,507,643	72.4%
Commercial	1,750,257	16.9%
Industrial	673,105	6.5%
Agricultural	32,448	0.3%
Religious	156,953	1.5%
Government	50,299	0.5%
Education	204,248	2.0%
<b>Total</b>	<b>10,374,953</b>	<b>100.0%</b>

## **Essential Facility Inventory**

For essential facilities, there are 4 hospitals in the region with a total bed capacity of 747 beds. There are 52 schools, 9 fire stations, 6 police stations and 4 emergency operation facilities.

## **Hurricane Scenario**

Hazus used the following set of information to define the hurricane parameters for the hurricane loss estimate provided in this report.

<b>Scenario Name:</b>	Probabilistic
<b>Type:</b>	Probabilistic

## **Building Damage**

### **General Building Stock Damage**

Hazus estimates that about 475 buildings will be at least moderately damaged. This is over 1% of the total number of buildings in the region. There are an estimated 6 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 6 of the Hazus Hurricane technical manual. Table 2 below summarizes the expected damage by general occupancy for the buildings in the region. Table 3 summarizes the expected damage by general building type.

**Table 2: Expected Building Damage by Occupancy : 100 - year Event**

<b>Occupancy</b>	<b>None</b>		<b>Minor</b>		<b>Moderate</b>		<b>Severe</b>		<b>Destruction</b>	
	<b>Count</b>	<b>(%)</b>	<b>Count</b>	<b>(%)</b>	<b>Count</b>	<b>(%)</b>	<b>Count</b>	<b>(%)</b>	<b>Count</b>	<b>(%)</b>
Agriculture	180	90.68	14	7.20	3	1.44	1	0.63	0	0.04
Commercial	2132	92.69	142	6.17	24	1.03	2	0.11	0	0.00
Education	105	93.32	7	6.03	1	0.63	0	0.02	0	0.00
Government	54	93.78	3	5.58	0	0.62	0	0.02	0	0.00
Industrial	826	93.17	52	5.81	7	0.83	2	0.18	0	0.01
Religion	169	93.13	11	6.31	1	0.54	0	0.03	0	0.00
Residential	32414	89.69	3293	9.11	416	1.15	11	0.03	6	0.02
<b>Total</b>	<b>35,879</b>		<b>3,522</b>		<b>452</b>		<b>17</b>		<b>6</b>	

**Table 3: Expected Building Damage by Building Type : 100 - year Event**

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	272	91.75	22	7.24	3	1.00	0	0.01	0	0.00
Masonry	2462	87.40	250	8.86	101	3.57	4	0.16	0	0.01
MH	107	99.57	0	0.34	0	0.08	0	0.00	0	0.01
Steel	1515	93.21	92	5.69	16	0.98	2	0.12	0	0.00
Wood	29779	90.39	2918	8.86	232	0.70	10	0.03	5	0.02

**Essential Facility Damage**

Before the hurricane, the region had 747 hospital beds available for use. On the day of the hurricane, the model estimates that 418 hospital beds (only 56.00%) are available for use. After one week, 100.00% of the beds will be in service. By 30 days, 100.00% will be operational.

**Table 4: Expected Damage to Essential Facilities**

Classification	Total	# Facilities		Expected Loss of Use < 1 day
		Probability of at Least Moderate Damage > 50%	Probability of Complete Damage > 50%	
EOCs	4	0	0	4
Fire Stations	9	0	0	9
Hospitals	4	1	0	1
Police Stations	6	0	0	6
Schools	52	0	0	46

**Induced Hurricane Damage**

**Debris Generation**

Hazus estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into four general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, c) Eligible Tree Debris, and d) Other Tree Debris. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 115,337 tons of debris will be generated. Of the total amount, 85,876 tons (74%) is Other Tree Debris. Of the remaining 29,461 tons, Brick/Wood comprises 37% of the total, Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Eligible Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 441 truckloads (@25 tons/truck) to remove the building debris generated by the hurricane. The number of Eligible Tree Debris truckloads will depend on how the 18,426 tons of Eligible Tree Debris are collected and processed. The volume of tree debris generally ranges from about 4 cubic yards per ton for chipped or compacted tree debris to about 10 cubic yards per ton for bulkier, uncompacted debris.

## **Social Impact**

### **Shelter Requirement**

Hazus estimates the number of households that are expected to be displaced from their homes due to the hurricane and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 7 households to be displaced due to the hurricane. Of these, 0 people (out of a total population of 104,442) will seek temporary shelter in public shelters.

## Economic Loss

The total economic loss estimated for the hurricane is 93.0 million dollars, which represents 0.90 % of the total replacement value of the region's buildings.

### Building-Related Losses

The building related losses are broken into two categories: direct property damage losses and business interruption losses. The direct property damage losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the hurricane. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the hurricane.

The total property damage losses were 93 million dollars. 2% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 88% of the total loss. Table 4 below provides a summary of the losses associated with the building damage.

**Table 5: Building-Related Economic Loss Estimates**  
(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
<u>Property Damage</u>						
	Building	65528.41	3950.71	1604.09	845.30	71928.52
	Content	11223.09	811.64	765.03	139.56	12939.33
	Inventory	0.00	15.63	153.92	5.51	175.06
	<b>Subtotal</b>	<b>76751.50</b>	<b>4777.98</b>	<b>2523.04</b>	<b>990.38</b>	<b>85042.91</b>
<u>Business Interruption Loss</u>						
	Income	0.00	557.80	19.69	138.12	715.61
	Relocation	2671.37	678.38	72.19	131.60	3553.55
	Rental	2214.95	303.22	17.74	12.13	2548.04
	Wage	0.00	669.74	32.64	446.50	1148.89
	<b>Subtotal</b>	<b>4886.32</b>	<b>2209.14</b>	<b>142.26</b>	<b>728.36</b>	<b>7966.08</b>
<u>Total</u>						
	<b>Total</b>	<b>81637.82</b>	<b>6987.13</b>	<b>2665.30</b>	<b>1718.73</b>	<b>93008.99</b>

**Appendix A: County Listing for the Region**

Connecticut  
- Middlesex

**Appendix B: Regional Population and Building Value Data**

	Building Value (thousands of dollars)			
	Population	Residential	Non-Residential	Total
<b>Connecticut</b>				
<u>Middlesex</u>	104,442	7,507,643	2,867,310	10,374,953
<b>Total</b>	<b>104,442</b>	<b>7,507,643</b>	<b>2,867,310</b>	<b>10,374,953</b>
<b>Study Region</b>				
<b>Total</b>	<b>104,442</b>	<b>7,507,643</b>	<b>2,867,310</b>	<b>10,374,953</b>

# Hazus-MH: Earthquake Event Report

**Region Name:** Midstate

**Earthquake Scenario:** Midstate Probabilistic Earthquake

**Print Date:** May 08, 2013

*Totals only reflect data for those census tracts/blocks included in the user's study region.*

***Disclaimer:***

*The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific earthquake. These results can be improved by using enhanced inventory, geotechnical, and observed ground motion data.*

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### General Description of the Region

Hazus is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences. The primary purpose of Hazus is to provide a methodology and software application to develop earthquake losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from earthquakes and to prepare for emergency response and recovery.

The earthquake loss estimates provided in this report was based on a region that includes 1 county(ies) from the following state(s):

Connecticut

**Note:**

Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 256.53 square miles and contains 23 census tracts. There are over 41 thousand households in the region which has a total population of 104,442 people (2002 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 39 thousand buildings in the region with a total building replacement value (excluding contents) of 10,374 (millions of dollars). Approximately 91.00 % of the buildings (and 72.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 2,911 and 561 (millions of dollars) , respectively.

## Building and Lifeline Inventory

### Building Inventory

Hazus estimates that there are 39 thousand buildings in the region which have an aggregate total replacement value of 10,374 (millions of dollars) . Appendix B provides a general distribution of the building value by State and County.

In terms of building construction types found in the region, wood frame construction makes up 83% of the building inventory. The remaining percentage is distributed between the other general building types.

### Critical Facility Inventory

Hazus breaks critical facilities into two (2) groups: essential facilities and high potential loss facilities (HPL). Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites .For essential facilities, there are 4 hospitals in the region with a total bed capacity of 747 beds. There are 52 schools, 9 fire stations, 6 police stations and 4 emergency operation facilities. With respect to high potential loss facilities (HPL), there are 34 dams identified within the region. Of these, 8 of the dams are classified as 'high hazard'. The inventory also includes 20 hazardous material sites, 0 military installations and 1 nuclear power plants.

**Transportation and Utility Lifeline Inventory**

Within Hazus, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data are provided in Tables 1 and 2.

The total value of the lifeline inventory is over 3,472.00 (millions of dollars). This inventory includes over 219 kilometers of highways, 154 bridges, and 3,690 kilometers of pipes.

**Table 1: Transportation System Lifeline Inventory**

<b>System</b>	<b>Component</b>	<b># Locations/ # Segments</b>	<b>Replacement value (millions of dollars)</b>
<b>Highway</b>	Bridges	154	1,593.10
	Segments	102	1,272.80
	Tunnels	0	0.00
	<b>Subtotal</b>		<b>2,865.90</b>
<b>Railways</b>	Bridges	4	1.50
	Facilities	0	0.00
	Segments	8	21.80
	Tunnels	0	0.00
	<b>Subtotal</b>		<b>23.30</b>
<b>Light Rail</b>	Bridges	0	0.00
	Facilities	0	0.00
	Segments	0	0.00
	Tunnels	0	0.00
	<b>Subtotal</b>		<b>0.00</b>
<b>Bus</b>	Facilities	2	2.50
	<b>Subtotal</b>		<b>2.50</b>
<b>Ferry</b>	Facilities	0	0.00
	<b>Subtotal</b>		<b>0.00</b>
<b>Port</b>	Facilities	10	20.00
	<b>Subtotal</b>		<b>20.00</b>
<b>Airport</b>	Facilities	0	0.00
	Runways	0	0.00
	<b>Subtotal</b>		<b>0.00</b>
	<b>Total</b>		<b>2,911.60</b>

## Appendix C

**Table 2: Utility System Lifeline Inventory**

System	Component	# Locations / Segments	Replacement value (millions of dollars)
<b>Potable Water</b>	Distribution		
	Lines	NA	36.90
	Facilities	0	
	Pipelines	0.00	0
		Subtotal	<b>36.9</b>
<b>Waste Water</b>	Distribution		
	Lines	NA	22.10
	Facilities	4	306.4
	Pipelines	0	0
		Subtotal	<b>328.5</b>
<b>Natural Gas</b>	Distribution		
	Lines	NA	14.8
	Facilities	1	1.3
	Pipelines	0	0
		Subtotal	<b>16</b>
<b>Oil Systems</b>	Facilities	1	0.1
	Pipelines	0	0
			Subtotal
<b>Electrical Power</b>	Facilities	2	253
			Subtotal
<b>Communication</b>	Facilities	3	0.3
			Subtotal
		Total	<b>634.9</b>

## Earthquake Scenario

Hazus uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.

<b>Scenario Name</b>	Midstate Probabilistic Earthquake
<b>Type of Earthquake</b>	Probabilistic
<b>Fault Name</b>	NA
<b>Historical Epicenter ID #</b>	NA
<b>Probabilistic Return Period</b>	100.00
<b>Longitude of Epicenter</b>	NA
<b>Latitude of Epicenter</b>	NA
<b>Earthquake Magnitude</b>	5.00
<b>Depth (Km)</b>	NA
<b>Rupture Length (Km)</b>	NA
<b>Rupture Orientation (degrees)</b>	NA
<b>Attenuation Function</b>	NA

## Building Damage

### Building Damage

Hazus estimates that about 0 buildings will be at least moderately damaged. This is over 0.00 % of the buildings in the region. There are an estimated 0 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 below summarizes the expected damage by general building type.

**Table 3: Expected Building Damage by Occupancy**

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
<b>Agriculture</b>	198	0.50	0	0.00	0	0.00	0	0.00	0	0.00
<b>Commercial</b>	2,300	5.77	0	0.00	0	0.00	0	0.00	0	0.00
<b>Education</b>	112	0.28	0	0.00	0	0.00	0	0.00	0	0.00
<b>Government</b>	58	0.15	0	0.00	0	0.00	0	0.00	0	0.00
<b>Industrial</b>	887	2.22	0	0.00	0	0.00	0	0.00	0	0.00
<b>Other</b>										
<b>Residential</b>	6,059	15.19	0	0.00	0	0.00	0	0.00	0	0.00
<b>Religion</b>	181	0.45	0	0.00	0	0.00	0	0.00	0	0.00
<b>Single Family</b>	30,081	75.44	0	0.00	0	0.00	0	0.00	0	0.00
<b>Total</b>	<b>39,876</b>		<b>0</b>		<b>0</b>		<b>0</b>		<b>0</b>	

## Appendix C

**Table 4: Expected Building Damage by Building Type (All Design Levels)**

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
<b>Wood</b>	33,166	83.17	0	0.00	0	0.00	0	0.00	0	0.00
<b>Steel</b>	1,882	4.72	0	0.00	0	0.00	0	0.00	0	0.00
<b>Concrete</b>	495	1.24	0	0.00	0	0.00	0	0.00	0	0.00
<b>Precast</b>	133	0.33	0	0.00	0	0.00	0	0.00	0	0.00
<b>RM</b>	828	<b>2.08</b>	0	<b>0.00</b>	0	<b>0.00</b>	0	<b>0.00</b>	0	0.00
<b>URM</b>	<b>3,221</b>	8.08	0	0.00	0	0.00	0	0.00	0	0.00
<b>MH</b>	151	0.38	0	0.00	0	0.00	0	0.00	0	0.00
<b>Total</b>	39,876		0		0		0		0	

\*Note:

RM Reinforced Masonry  
 URM Unreinforced Masonry  
 MH Manufactured Housing

### **Essential Facility Damage**

Before the earthquake, the region had 747 hospital beds available for use. On the day of the earthquake, the model estimates that only 738 hospital beds (99.00%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 100.00% of the beds will be back in service. By 30 days, 100.00% will be operational.

**Table 5: Expected Damage to Essential Facilities**

Classification	# Facilities			
	Total	At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
<b>Hospitals</b>	4	0	0	4
<b>Schools</b>	52	0	0	52
<b>EOCs</b>	4	0	0	4
<b>Police Stations</b>	6	0	0	6
<b>Fire Stations</b>	9	0	0	9

**Transportation and Utility Lifeline Damage**

Table 6 provides damage estimates for the transportation system.

**Table 6: Expected Damage to the Transportation Systems**

System	Component	Locations/ Segments	With at least Mod. Damage	Number of Locations		
				With Complete Damage	With Functionality > 50% After Day 1	After Day 7
<b>Highway</b>	Segments	102	0	0	102	102
	Bridges	154	0	0	154	154
	Tunnels	0	0	0	0	0
<b>Railways</b>	Segments	8	0	0	8	8
	Bridges	4	0	0	4	4
	Tunnels	0	0	0	0	0
<b>Light Rail</b>	Facilities	0	0	0	0	0
	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
<b>Bus</b>	Facilities	2	0	0	2	2
<b>Ferry</b>	Facilities	0	0	0	0	0
<b>Port</b>	Facilities	10	0	0	10	10
<b>Airport</b>	Facilities	0	0	0	0	0
	Runways	0	0	0	0	0

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 7-9 provide information on the damage to the utility lifeline systems. Table 7 provides damage to the utility system facilities. Table 8 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, Hazus performs a simplified system performance analysis. Table 9 provides a summary of the system performance information.

## Appendix C

**Table 7: Expected Utility System Facility Damage**

System	Total #	Number of Locations			
		With at least Mod. Damage	With Complete Damage	With Functionality > 50% After Day 1	After Day 7
Potable Water	0	0	0	0	0
Waste Water	4	0	0	4	4
Natural Gas	1	0	0	1	1
Oil Systems	1	0	0	1	1
Electrical					
Power	2	0	0	2	2
Communication	3	0	0	3	3

**Table 8 : Expected Utility System Pipeline Damage (Site Specific)**

System	Total Pipelines Length (km)	Number of Leaks	Number of Breaks
Potable Water	1,845	0	0
Waste Water	1,107	0	0
Natural Gas	738	0	0
Oil	0	0	0

**Table 9: Expected Potable Water and Electric Power System Performance**

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	41,077	0	0	0	0	0
Electric Power		0	0	0	0	0

## Induced Earthquake Damage

### Fire Following Earthquake

Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. Hazus uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be 0 ignitions that will burn about 0.00 sq. mi 0.00 % of the region's total area.) The model also estimates that the fires will displace about 0 people and burn about 0 (millions of dollars) of building value.

### Debris Generation

Hazus estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 0.00 million tons of debris will be generated. Of the total amount, Brick/Wood comprises 0.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 0 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

## Social Impact

### Shelter Requirement

Hazus estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 0 households to be displaced due to the earthquake. Of these, 0 people (out of a total population of 104,442) will seek temporary shelter in public shelters.

### Casualties

Hazus estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

- Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
- Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
- Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
- Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 10 provides a summary of the casualties estimated for this earthquake

## Appendix C

**Table 10: Casualty Estimates**

		Level 1	Level 2	Level 3	Level 4
<b>2 AM</b>	Commercial	0	0	0	0
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	0	0	0	0
	Industrial	0	0	0	0
	Other-Residential	0	0	0	0
	Single Family	0	0	0	0
	<b>Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>2 PM</b>	Commercial	0	0	0	0
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	0	0	0	0
	Industrial	0	0	0	0
	Other-Residential	0	0	0	0
	Single Family	0	0	0	0
	<b>Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>5 PM</b>	Commercial	0	0	0	0
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	0	0	0	0
	Industrial	0	0	0	0
	Other-Residential	0	0	0	0
	Single Family	0	0	0	0
	<b>Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

## Economic Loss

The total economic loss estimated for the earthquake is 0.00 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

### Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses were 0.00 (millions of dollars); 0 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 0 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.

**Table 11: Building-Related Economic Loss Estimates**  
(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
<b><u>Income Losses</u></b>							
	Wage	0.00	0.00	0.00	0.00	0.00	0.00
	Capital-Related	0.00	0.00	0.00	0.00	0.00	0.00
	Rental	0.00	0.00	0.00	0.00	0.00	0.00
	Relocation	0.00	0.00	0.00	0.00	0.00	0.00
	<b>Subtotal</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>
<b><u>Capital Stock Losses</u></b>							
	Structural	0.00	0.00	0.00	0.00	0.00	0.00
	Non-Structural	0.00	0.00	0.00	0.00	0.00	0.00
	Content	0.00	0.00	0.00	0.00	0.00	0.00
	Inventory	0.00	0.00	0.00	0.00	0.00	0.00
	Subtotal	0.00	0.00	0.00	0.00	0.00	0.00
	<b>Total</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>

### Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, Hazus computes the direct repair cost for each component only. There are no losses computed by Hazus for business interruption due to lifeline outages. Tables 12 & 13 provide a detailed breakdown in the expected lifeline losses.

Hazus estimates the long-term economic impacts to the region for 15 years after the earthquake. The model quantifies this information in terms of income and employment changes within the region. Table 14 presents the results of the region for the given earthquake.

## Appendix C

**Table 12: Transportation System Economic Losses**  
(Millions of dollars)

<b>System</b>	<b>Component</b>	<b>Inventory Value</b>	<b>Economic Loss</b>	<b>Loss Ratio (%)</b>
<b>Highway</b>	<b>Segments</b>	1,272.76	\$0.00	0.00
	Bridges	1,593.13	\$0.00	0.00
	Tunnels	0.00	\$0.00	0.00
	Subtotal	<b>2,865.90</b>	<b>\$0.00</b>	
<b>Railways</b>	<b>Segments</b>	21.83	\$0.00	0.00
	Bridges	1.45	\$0.00	0.00
	Tunnels	0.00	\$0.00	0.00
	Facilities	0.00	\$0.00	0.00
	Subtotal	<b>23.30</b>	<b>\$0.00</b>	
<b>Light Rail</b>	Segments	0.00	\$0.00	0.00
	Bridges	0.00	\$0.00	0.00
	Tunnels	0.00	\$0.00	0.00
	Facilities	0.00	\$0.00	0.00
	Subtotal	<b>0.00</b>	<b>\$0.00</b>	
<b>Bus</b>	Facilities	2.51	\$0.00	0.02
	Subtotal	<b>2.50</b>	<b>\$0.00</b>	
<b>Ferry</b>	Facilities	0.00	\$0.00	0.00
	Subtotal	<b>0.00</b>	<b>\$0.00</b>	
<b>Port</b>	Facilities	19.97	\$0.00	0.02
	Subtotal	<b>20.00</b>	<b>\$0.00</b>	
<b>Airport</b>	Facilities	0.00	\$0.00	0.00
	Runways	0.00	\$0.00	0.00
	Subtotal	<b>0.00</b>	<b>\$0.00</b>	
<b>Total</b>		<b>2,911.60</b>	<b>\$0.00</b>	

## Appendix C

**Table 13: Utility System Economic Losses**  
(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
<b>Potable Water</b>	Pipelines	0.00	\$0.00	0.00
	Facilities	0.00	\$0.00	0.00
	Distribution			
	Lines	36.90	\$0.00	0.00
	Subtotal	<b>36.91</b>	<b>\$0.00</b>	
<b>Waste Water</b>	Pipelines	0.00	\$0.00	0.00
	Facilities	306.40	\$0.00	0.00
	Distribution			
	Lines	22.10	\$0.00	0.00
	Subtotal	<b>328.50</b>	<b>\$0.00</b>	
<b>Natural Gas</b>	Pipelines	0.00	\$0.00	0.00
	Facilities	1.30	\$0.00	0.00
	Distribution			
	Lines	14.80	\$0.00	0.00
	Subtotal	<b>16.02</b>	<b>\$0.00</b>	
<b>Oil Systems</b>	Pipelines	0.00	\$0.00	0.00
	Facilities	0.10	\$0.00	0.00
	Subtotal	<b>0.12</b>	<b>\$0.00</b>	
<b>Electrical Power</b>	Facilities	253.00	\$0.00	0.00
	Subtotal	<b>253.00</b>	<b>\$0.00</b>	
<b>Communication</b>	Facilities	0.30	\$0.00	0.00
	Subtotal	<b>0.35</b>	<b>\$0.00</b>	
	<b>Total</b>	<b>634.88</b>	<b>\$0.00</b>	

**Table 14. Indirect Economic Impact with outside aid**  
(Employment as # of people and Income in millions of \$)

<b>LOSS</b>	<b>Total</b>	<b>%</b>
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**Appendix A: County Listing for the Region**

Middlesex, CT

**Appendix B: Regional Population and Building Value Data**

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
<b>Connecticut</b>	Middlesex	104,442	7,507	2,867	10,374
<b>Total State</b>		<b>104,442</b>	<b>7,507</b>	<b>2,867</b>	<b>10,374</b>
<b>Total Region</b>		<b>104,442</b>	<b>7,507</b>	<b>2,867</b>	<b>10,374</b>

## Appendix D: Hartford Courant Article: Public Workshops

[www.courant.com/community/news/mr/hc-middisaster1230.artdec30,0,572841.story](http://www.courant.com/community/news/mr/hc-middisaster1230.artdec30,0,572841.story)

**Courant.com**  
**Middletown Area**  
**Grant Supports Disaster Preparation In Middletown Area**  
By PETER MARTEKA The Hartford Courant  
December 30, 2008

MIDDLETOWN —

The center of the state hasn't seen a major ice storm since 1973. The last time a hurricane set its sights on the state was Gloria in 1985. Although both events were decades ago, officials at the

Midstate Planning Agency knows that luck is bound to run out. The agency recently received a grant of more than \$100,000 from the Federal Emergency Management Agency that would help Middletown and the surrounding communities served by Midstate develop a disaster mitigation plan.

The plan would evaluate "natural hazard vulnerabilities," including dams, bridges, buildings and storm culverts in the municipalities served by Midstate — Middletown, Portland, East Hampton, East Haddam, Cromwell, Durham, Middlefield and Haddam.

"It's what can we do today to prevent damage to infrastructure, buildings and roadways in the event of a disaster," said Joel Severance, Midstate emergency management planner. "We aren't here to alarm folks, but we want to be sure we are prepared regardless of the storm or its timing. This is all about preparation."

Starting in January, each town will hold a workshop to collect information from town officials and residents about vulnerable infrastructure, including sewer, water and power lines, cell towers or areas of town that are in a flood plain or have suffered repeated losses. The plan will also look at local and regional capabilities to address the vulnerabilities and list the municipalities' needs.

The plan should be completed by August. Severance said the advantage of having a plan in place is that when FEMA representatives come in after a disaster, the information will be documented. "If it is in your plan as a 'should have been fixed,' you are fast-tracked to the top of FEMA's list; if not, you are sent to the bottom," Severance said.

The plan will also look to detail the community and list populations that are vulnerable, including senior citizens or people with disabilities.

"It's good to know Middletown has anticipated many of these factors into our own plan already," Mayor Sebastian N. Giuliano said. "But it never hurts to double-check it and make sure our plan integrates with the regional and other local plans. This grant allows for that integration."

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## **Appendix E: THE SAFFIR-SIMPSON HURRICANE SCALE**

The Saffir-Simpson Hurricane Scale is a 1-5 rating system based on the hurricane's intensity at a given time. This scale is used to give an estimate of the potential property damage and flooding expected along the coast from a hurricane landfall.

Wind speed is the determining factor in the scale, as storm surge values are highly dependent on the slope of the continental shelf in the landfall region. Note that all winds are using the U.S. 1-minute average.

### **Category One Hurricane:**

Winds 74-95 mph (64-82 kt or 119-153 kph). Storm surge generally 4-5 ft. above normal. No real damage to building structures. Damage primarily to unanchored mobile homes, shrubbery, and trees. Some damage to poorly constructed signs. Also, some coastal road flooding and minor pier damage. Hurricanes Allison of 1995 and Danny of 1997 were Category One hurricanes at peak intensity.

### **Category Two Hurricane:**

Winds 96-110 mph (83-95 kt or 154-177 kph). Storm surge generally 6-8 feet above normal. Some roofing material, door, and window damage of buildings. Considerable damage to shrubbery and trees with some trees blown down.

Considerable damage to mobile homes, poorly constructed signs, and piers. Coastal and low-lying escape routes flood 2-4 hours before arrival of the hurricane's center. Small craft in unprotected anchorages break moorings.

Hurricane Bonnie of 1998 was a Category Two hurricane when it hit the North Carolina coast, and Hurricane George of 1998 was a Category Two Hurricane when it hit the Florida Keys and the Mississippi Gulf Coast.

### **Category Three Hurricane:**

Winds 111-130 mph (96-113 kt or 178-209 kph). Storm surge generally 9-12 ft above normal. Some structural damage to small residences and utility buildings with a minor amount of curtain wall failures. Damage to shrubbery and trees with foliage blown off trees and large trees blown down. Mobile homes and poorly constructed signs are destroyed. Low-lying escape routes are cut by rising water 3-5 hours before arrival of the hurricane's center.

Flooding near the coast destroys smaller structures with larger structures damaged by battering of floating debris.

Terrain continuously lower than 5 ft above mean sea level may be flooded inland 8 miles (13 km) or more.

Evacuation of low-lying residences within several blocks of the shoreline may be required. Hurricanes Roxanne of 1995 and Fran of 1996 were Category Three

hurricanes at landfall on the Yucatan Peninsula of Mexico and in North Carolina, respectively.

### **Category Four Hurricane:**

Winds 131-155 mph (114-135 kt or 210-249 kph). Storm surge generally 13-18 ft above normal. More extensive curtain wall failures with some complete roof structure failures on small residences. Shrubs, trees, and all signs are blown down. Complete destruction of mobile homes. Extensive damage to doors and windows. Low-lying escape routes may be cut by rising water 3-5 hours before arrival of the hurricane's center. Major damage to lower floors of structures near the shore. Terrain lower than 10 ft above sea level may be flooded requiring massive evacuation of residential areas as far inland as 6 miles (10 km). Hurricane Luis of 1995 was a Category Four hurricane while moving over the Leeward Islands. Hurricanes Felix and Opal of 1995 also reached Category Four status at peak intensity.

### **Category Five Hurricane:**

Winds greater than 155 mph (135 kt or 249 kph). Storm surge generally greater than 18 ft above normal. Complete roof failure on many residences and industrial buildings. Some complete building failures with small utility buildings blown over or away. All shrubs, trees, and signs blown down. Complete destruction of mobile homes. Severe and extensive window and door damage. Low-lying escape routes are cut by rising water 3-5 hours before arrival of the hurricane center. Major damage to lower floors of all structures located less than 15 ft above sea level and within 500 yards of the shoreline. Massive evacuation of residential areas on low ground within 5-10 miles (8-16 km) of the shoreline may be required. Hurricane Mitch of 1998 was a Category Five hurricane at peak intensity over the western Caribbean. Hurricane Gilbert of 1988 was a Category Five hurricane at peak intensity and is the strongest Atlantic tropical cyclone of record. Hurricane Katrina in 2005 was a Category Five hurricane before it came on shore in the Gulf Coast states.

Source: National Weather Service

Appendix E

Anticipated Damage from Category 1 and 2 Hurricanes							
Category	Winds (mph)	Summary	People, Livestock and Pets	Frame Homes	Apartments, shopping Centers, and Industrial Buildings	Trees	Power and Water
1	74-95	Very dangerous winds will produce some damage	People, livestock, and pets struck by flying or falling debris could be injured or killed.	Some poorly constructed frame homes can experience major damage, involving loss of the roof covering and damage to gable ends as well as the removal of porch coverings and awnings. Unprotected windows may break if struck by flying debris. Masonry chimneys can be toppled. Well-	Some apartment building and shopping center roof coverings could be partially removed. Industrial buildings can lose roofing and siding especially from windward corners, rakes, and eaves. Failures to overhead doors and unprotected windows will be common.	Large branches of trees will snap and shallow rooted trees can be toppled.	Extensive damage to power lines and poles will likely result in power outages that could last a few to several days.
2	96-110	Extremely dangerous winds will cause extensive damage	There is a substantial risk of injury or death to people, livestock, and pets due to flying and falling debris.	Poorly constructed frame homes have a high chance of having their roof structures removed especially if they are not anchored properly. Unprotected windows will have a high probability of being broken by flying debris. Well-constructed frame homes could sustain major roof and siding damage. Failure of aluminum, screened-in, swimming pool enclosures will be common	There will be a substantial percentage of roof and siding damage to apartment buildings and industrial buildings. Unreinforced masonry walls can collapse.	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. Potable water could become scarce as filtration systems begin to fail.

## Appendix F: The Perfect Storm

# GRACE AND THE PERFECT STORM

<http://www.hurricaneville.com/grace.html>

Grace had a very short life-span as a tropical system. Lasting only four days, it just missed being one of the [shortest lasting storms](#) on record by one day according to the Hurricaneville Info Center Database. Grace formed as a [depression](#) some four hundred miles to the south of Bermuda in the Western Atlantic on October 25, 1991.

Within a day, Grace had become a tropical storm. Meandering about in the relatively warmer waters of the Western Atlantic, the storm became a hurricane on October 28, 1991, and made its closest approach to the United States coastline on the same day. Hurricane Grace moved to within approximately 670 miles of the Southeastern U.S. shoreline before it changed course, and headed back toward Bermuda.

Grace peaked shortly afterward on October 29th with winds reaching strong Category Two intensity at 100 mph while its minimum central pressure dropped to 982 millibars, or 29.00 inches of Hg (Mercury). In the movie, [The Perfect Storm](#) by [Wolfgang Petersen](#), Hurricane Grace was depicted as a [Category Five](#) storm, but that was an embellishment done for effect. On the same day, the 29th, the storm made its closest approach to the island of Bermuda as it passed about 90 miles to the South of the island.

It didn't take long for the hurricane to begin losing its [tropical characteristics](#) though. As a matter of fact, its demise occurred also later in the day on the 29th. At about 61 degrees West Longitude, Grace became extratropical, and later became absorbed into what became the "Halloween Storm", or "[The Perfect Storm](#) ." This perfect storm was a hybrid or subtropical system in the sense that it had features that are seen in both tropical storms and extratropical storms.

The storm was the coming together of several different weather events happening at the time. Obviously, Hurricane Grace, which was dissipating east of Bermuda, was one of them. Another was an approaching cold front in the Eastern portion of the United States. The third was a developing low off Sable Island in the Canadian Maritime province of Nova Scotia. The combination of these weather systems formed a massive storm that exploded with energy.

Pressure in this hybrid system fell from 988 millibars or 29.18 inches of Hg to 972 millibars, or 28.70 inches of Hg in a period of 24 hours. Now, that pressure drop is eight millibars short or being what meteorologists call a "[bomb cyclone](#)", but that is still very explosive development. Looking at the satellite imagery from that time, the storm was located in the vicinity of the Gulf Stream so it is very likely that this warm current fed the storm energy while the metamorphosis of Grace to an extratropical system probably provided additional strength.

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## **RECOLLECTIONS OF HURRICANE GRACE**

Weather wise, it was a hot summer with over 30 days of 90 degree or better heat in the New York and New Jersey metropolitan area. The 1991 hurricane season was below average when compared to the 50 year average. There were only eight named storms, four hurricanes, and one major hurricane, which was Bob.

My personal recollections of the Halloween Storm were the news reports of what was occurring along the Jersey Shore and Long Island, where there was tidal flooding. That year there were several coastal storms: Hurricane Bob, which went east of Long Island, and into New England back in August, this storm, and then a Nor'easter in December, 1991. I didn't realize until many years later that Hurricane Grace was a component of the Halloween storm. There wasn't a whole lot of media coverage of hurricanes in October unless you followed the [Weather Channel](#), and by late October, Tropical Updates that were seen every day during the peak season, were no longer featured since the transition was taking place between summer and winter, and more focus was being made on winter storms. In light of what has happened in recent a year, that has changed to some extent.

Back to the storm, the Perfect Storm didn't cause as much damage along the Jersey coast, or Long Island as much as it did in New England. News footage from the movie adaptation of the book, [The Perfect Storm](#), written by [Sebastian Junger](#), showed tremendous waves pounding the shoreline. Nevertheless, I do recall my older brother saying how the storm produced much stronger winds than Hurricane Bob did here in Central Jersey. Keep in mind though that Bob was well off shore in the Atlantic, and even steered passed Long Island. In addition, since the hurricane was to the east of us,

we would have been on the western side of the storm, which is the weaker side thanks to the counterclockwise motion.

Hurricane Bob took a path up the United States coast that was to the east of the one [Hurricane Gloria](#) took in September, 1985, and Gloria was to the east of Jersey as well. In the case of the Halloween storm, New Jersey felt the effects of a frontal boundary that was passing through, and the pressure gradient created between the combined low pressure off the coast and the high pressure building in behind the front.

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## **STORM IMPACT: HURRICANE GRACE**

While Grace and its extratropical sibling didn't come ashore over land, they did produce plenty of [wave and heavy surf action](#) along the New England coastline, and create plenty of mayhem out over the open waters of the Atlantic. High seas presented tremendous obstacles for many ships such as the [Andrea Gail](#), which along with its crew, was the subject of Junger's book. Out at sea, waves were up to ten stories high while winds blew in excess of 120 mph.

This storm was a [nor'easter](#) for the ages. Lasting into the first few days of November, ranks as one of the memorable storms of the century. What made matters worse is that the storm wouldn't go away. Actually, it retrograded toward the Eastern United States coastline. For five consecutive days, the North Carolina coastline was hit with winds ranging from 35 to 45 mph. Meanwhile, in New England, Chatham, Massachusetts reported a peak wind gust of 78 mph while Thatcher Island had 74 mph gusts. Over at Marblehead, winds gusted to 68 mph while the [Blue Hill Observatory](#) recorded winds gusting to 64 mph. Over in Rhode Island, winds grew to be as high as 63 mph in Newport.

Waves between ten and thirty feet were commonplace anywhere from coastal North Carolina to Nova Scotia in the Canadian Maritimes. High tides ran anywhere between three to seven feet above normal. Here along the Jersey shore, the greatest tidal departures of winter storms were recorded with this weather event while tide heights themselves were only surpassed by those from the [Great Atlantic Hurricane of 1944](#).

Further South in Delaware, Maryland, and Virginia, water levels were on par with what occurred during the [Ash Wednesday Nor'easter of March, 1962](#). For instance, Ocean City, Maryland had a high tide of 7.8 feet on October 30th, which exceeded that from the Ash Wednesday storm. Meanwhile, in Massachusetts there were reports of waves as high as 25 feet coming in on top of the already higher than normal high tide. The storm caused hundreds of millions of dollars in damage while being responsible for ten deaths including those of the six crewmen aboard the Andrea Gail.

**Appendix G:**

**National Weather Service (NWS) NYC/Upton, NY**

**Winter Storm Fact Sheet**

Definitions:

**Ice Storm:** A storm producing heavy accumulations of ice. Such accumulations can bring down trees; producing widespread power and communication outages, structural damage, and poses an extreme danger to motorists and pedestrians.

A Winter Storm Watch is issued 12 to 48 hours before the event when there is the potential for ice accumulations to meet or exceed ½ inch. An Ice Storm Warning is issued within 36 hours when there is high level of confidence that the event will occur.

A Freezing Rain Advisory is issued within 36 hours when a trace or more of freezing rain and/or freezing drizzle is forecast, but is expected to remain below warning criteria. Patchy freezing rain events will be handled through the issuance of a Special Weather Statement and Hazardous Weather Outlook.

**Blizzard:** A storm producing winds of 35 mph or more with snow and/or blowing snow reducing visibility to less than ¼ mile for at least 3 hours.

A Blizzard Watch is issued 12 to 48 hours before the event and a Blizzard Warning within 36 hours when there is a high level of confidence that the event will occur.

**Winter Storm:** When one or a combination of heavy snow, heavy snow and blowing snow, snow and freezing rain, snow and sleet, sleet and freezing rain, or snow, sleet and freezing rain meet or exceed locally defined 12 and/or 24 hour warning criteria for at least one of the precipitation elements.

A Winter Storm Watch is issued 12 to 48 hours before the event and a Winter Storm Warning within 36 hours when there is a high level of confidence that the event will occur.

A Winter Weather Advisory is issued within 36 hours when one or a combination of snow, snow and blowing snow, snow and freezing rain, snow and sleet, sleet and freezing rain, or snow, sleet and freezing rain meet or exceed locally defined advisory criteria for at least one of the precipitation elements, but remaining below warning criteria.

Weather Element	Local Warning Criteria	Local Advisory Criteria
Snow	6 inches in 12 hours, or 8 inches in 24 hours	3 or more inches
Freezing Rain	½ inch or more of ice	Trace
Wind Chill Temperature	< -25 °F	-15 °F to -24 °F

**Wind Chill Temperature:** A “Reel Feel” temperature that takes into account how wind and cold feels on exposed skin.

**Frostbite** is damage to body tissue caused by extreme cold. A wind chill temperature of -20 °F will cause frostbite in just 30 minutes.

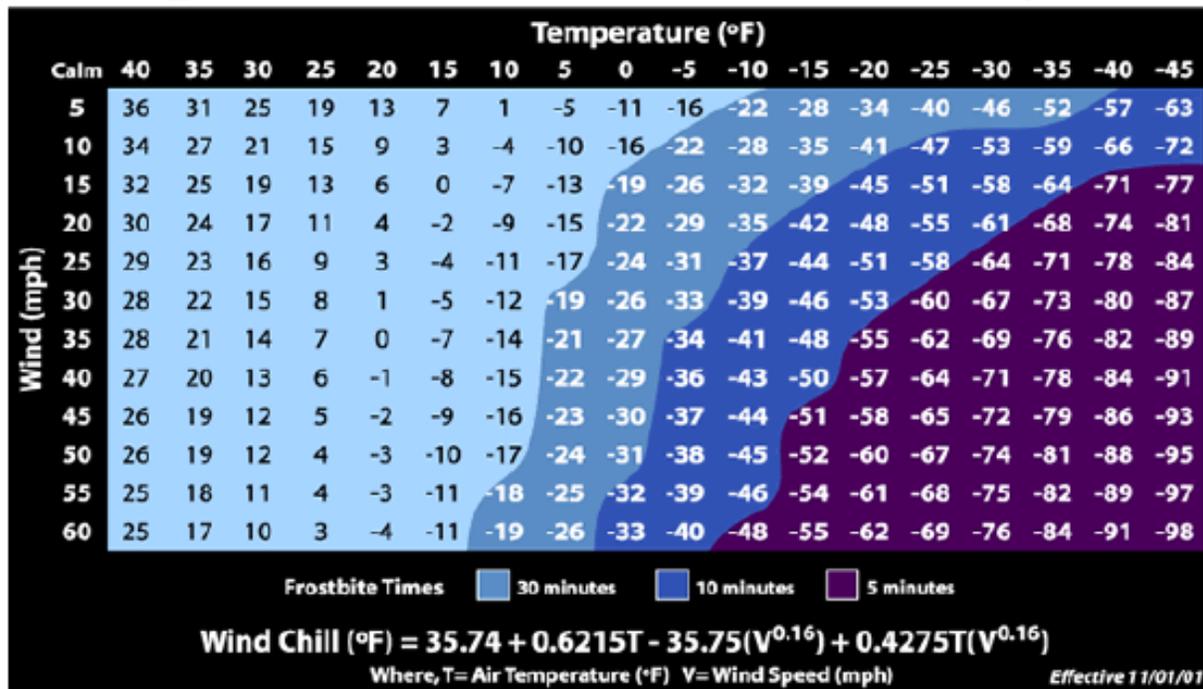
**Hypothermia** is a condition brought on when the body temperature drops to less than 95 ° F.

A **Wind Chill Watch** is issued 12 to 48 hours before the event when there is the potential for wind chill temperatures of minus 25 °F or colder. A **Wind Chill Warning** is issued within 36 hours when there is a high level of confidence that the event will occur.

A **Wind Chill Advisory** is issued within 36 hours when wind chill temperatures of minus 15 °F to minus 24 °F are forecast.



## NWS Windchill Chart



**Appendix H: Enhanced Fujita Scale**

The Enhanced Fujita scale (EF scale) rates the strength of tornadoes in the United States and Canada based on the damage they cause.

Implemented in place of the Fujita scale introduced in 1971 by Tetsuya Theodore Fujita, it began operational use in the United States on February 1, 2007, followed by Canada on April 1, 2013. The scale has the same basic design as the original Fujita scale—six categories from zero to five, representing increasing degrees of damage. It was revised to reflect better examinations of tornado damage surveys, so as to align wind speeds more closely with associated storm damage. Better standardizing and elucidating what was previously subjective and ambiguous, it also adds more types of structures and vegetation, expands degrees of damage, and better accounts for variables such as differences in construction quality.

DERIVED EF SCALE		OPERATIONAL EF SCALE	
EF Number	3 Second Gust (mph)	EF Number	3 Second Gust (mph)
0	65-85	0	65-85
1	86-109	1	86-110
2	110-137	2	111-135
3	138-167	3	136-165
4	168-199	4	166-200
5	200-234	5	Over 200

Source: NOAA

## **Appendix I: Forest Fire Information**

The following information was gathered from the Connecticut Department of Energy and Environmental Protection, Forestry Division:

### **Fire Weather Forecasts:**

Starting in early spring, the CT Division of Forestry begins monitoring the weather as it relates to Fire Danger. During the Spring Fire Season and at other times of the year when the fire danger is high or above, we broadcast daily predictions for fire danger for 1:00 pm. The predictions are normally out before 7:00 am.

### **Red Flag Warnings**

Red Flag Warnings are issued by the National Weather Service (NWS), which predicts weather and forecasts warnings nationwide. Connecticut is divided between three different National Weather Service stations. Predictions for Hartford, Tolland and Windham counties are made in Taunton, MA; predictions for Litchfield County are made in Albany, NY and predictions for Fairfield, New Haven, Middlesex and New London counties are made in Brookhaven, NY.

A Red Flag warning is a warning to the firefighting community that if there is a fire, the weather conditions can be expected to cause erratic fire behavior. Red Flag warnings are not a fire danger rating and they are not synonymous with High, Very High or Extreme fire danger. Red Flag warnings are issued when winds will be sustained or there will be frequent gusts above a certain threshold (normally 25 mph). In addition, relative humidity needs to be below 30% and precipitation for the previous 5 days has to have been less than 1/4-inch.

### **Forest Fire Danger Rating**

The DEP Division of Forestry issues Forest Fire Danger Ratings for Connecticut. A National Fire Danger Rating system that utilizes two indexes is used in Connecticut. The "spread" of a fire is predicted with the Spread Index, which is a numeric rating that corresponds with how fast a fire travels in 'Chains per Hour' (a chain is 66'). For example, if a prediction is made that the Spread Index will be 19, it means the fire is predicted to spread 1254 feet (19 x 66') in an hour

## **Forest Fire Seasons in Connecticut**

### **Spring** Fire Season: Normally mid-March to mid-May

After the snow melts in the northeastern part of the U.S. we enter into a traditional spring fire season. This is the time of the year when deciduous trees are bare and the warm spring sun heats up the forest fuels. Forest fuels are made up of anything that burns; typically grasses, leaves, twigs, branches and decaying material in the soil. As the days grow longer and sun gets hotter, the fuels that are most exposed dry out very fast. Grasses, twigs, and very small branches are called '1-hour fuels'. That is, they can take on atmospheric conditions within an hour. Consequently we can receive precipitation and if the sun comes out and a breeze picks up, the fine fuels can be available for burning within an hour. Larger fuels take longer to dry out. Typically fires that start this time of the year burn just the surface leaves and can spread very fast. Generally they cause little, long term damage to the forest.

During the spring, the Spread Index usually drives the fire danger. Wind is most critical.

### **Summer** Fire Season: Normally mid-May through September

After the trees are fully leafed out we enter a different fire season. The Build Up Index is the driving factor with past precipitation (drought) being critical. Forest fuels dry slowly because of lower temperatures in the shaded woods with correspondingly higher humidity. Remember, temperature and relative humidity have an inverse relationship. The vegetation is growing and sucking moisture from the soil. When the woods get dry enough and a fire gets started the fire tends to grow more slowly than a spring fire but tends to burn deeper into the ground. Fires that burn deeper into the ground burn organic matter in the soil (including tree roots), are more difficult to suppress, and cause extensive mortality to vegetation.

### **Fall** Fire Season: Normally October through snow fall

Fall fire season takes on some of the characteristics of both the spring and the summer. Falling leaves are dry but not quite cured. We go back to the 'transition stage' in fire danger predictions. The sun is getting lower and is diminishing in drying capacity. Fires can spread rapidly.

**Open Burning:**

*Open burning of brush is allowed in Connecticut if a resident has a permit from the local open burning official. There are conditions attached to that permit that restricts its use when there is an increased potential for degradation of air quality or when the Forest Fire Danger is high or above.*

*For further information, please contact the Division of Forestry at 860-424-3630 or [dep.forestry@po.state.ct.us](mailto:dep.forestry@po.state.ct.us).*

## Appendix J: Pet Evacuation Legislation

FYI – Effective October 1, 2007  
The Office of Governor M. Jodi Rell

STATE OF CONNECTICUT  
EXECUTIVE CHAMBERS  
HARTFORD, CONNECTICUT 06106

M. JODI RELL  
GOVERNOR

FOR IMMEDIATE RELEASE  
May 8, 2007

Contact:  
Adam Liegeot  
860-524-7313  
[Adam.Liegeot@ct.gov](mailto:Adam.Liegeot@ct.gov)

### Governor Rell Signs Pet Evacuations Bill

Governor M. Jodi Rell has signed a bill requiring the inclusion of the evacuation of pets and service animals in state and local emergency plans of operation.

"In the past, no provisions were made to safeguard animals and their owners," Governor Rell said. "This law will do so. The elderly and the disabled are the least likely to have the proper means to help themselves and their animals. Special consideration will now be paid to their needs. Many states have passed similar legislation and it is time for Connecticut to do the same."

Emergencies and disasters requiring evacuation are problems which can often be exacerbated by citizens who refuse to evacuate without ensuring the safety of their pets and service animals. In the past, essentially no provisions have been made for the evacuation of these animals. The problem has become quite prevalent in recent years, most notably in the aftermath of natural disasters in the Gulf Coast region.

The bill requires that local civil preparedness plans include provisions for evacuating pets and service animals during emergencies. It prohibits the emergency management and homeland security commissioner from approving a plan unless it includes such provisions and strategies addressing the other civil preparedness activities and measures required by existing law.

The 2006 federal Pets Evacuation and Transportation Standards Act requires states accepting Stafford Act funds for homeland security to ensure that state and local emergency preparedness plans "take into account the needs of individuals with household pets and service animals prior to, during, and following a major disaster or emergency."

Each town, or combination of towns, must have an emergency plan of operations. The plan must include measures towns must take to prepare for, and following, an attack, major disaster, or emergency and, when appropriate, measures addressing the nonmilitary evacuation of civilians.

An Act Concerning the Evacuation of Pets and Service Animals and Approval of the Local Emergency Plan of Operations takes effect on **October 1, 2007**.

Mary Rose Duberek  
CT DEMHS Region 2 Coordinator  
Public Safety HQ  
1111 Country Club Road, PO Box 2794  
Middletown, CT 06457-9294  
Phone 860-685-8105

**Appendix K: Regional Public Works Directors**

<b><i>Town</i></b>	<b><i>First Name</i></b>	<b><i>Last Name</i></b>	<b><i>Phone (860)</i></b>
<i>Cromwell</i>	<i>Jon</i>	<i>Harriman</i>	<i>632-3420</i>
<i>Durham</i>	<i>Kurt</i>	<i>Bober</i>	<i>349-1816</i>
<i>East Hampton</i>	<i>Philip</i>	<i>Sissick</i>	<i>267-4747</i>
<i>East Haddam</i>	<i>J. Richard</i>	<i>Toolan</i>	<i>873-5023</i>
<i>Haddam</i>	<i>Phil</i>	<i>Goff</i>	<i>345-2100</i>
<i>Middlefield</i>	<i>John</i>	<i>Wyskiel</i>	<i>349-7188</i>
<i>Middletown</i>	<i>William</i>	<i>Russo</i>	<i>344-3408</i>
<i>Portland</i>	<i>Richard</i>	<i>Kelsey</i>	<i>342-6733</i>

**Appendix L: Summary of Public Meetings**

The following table shows each public meeting that took place within the eight towns, along with a brief summary of the events that took place at the meeting.

Municipality	Date	Type of Meeting	Public Input
Cromwell	6/16/2009	Public Officials	Other town planners and First Selectmen joined the planning team. Contribution of areas of concern.
Durham	8/24/2009	Public Workshop	Open dialogue of purpose and current content of draft plan. Lengthy discussion of individual needs. Major concern of flood-prone access to the high school. Issues with state roads.
East Haddam	8/4/2009	Public Officials	Local historical photographer (EMD) provided many photographs of storm damage. Town planner attended and contributed to the Plan.
East Hampton	1/13/2009	Public Workshops/Meet Public	Historical Society attended and provided many photographs of historic storm damage.
	7/12/2009		Debate between competing individual needs and the planning teams priority list.
	8/11/2009		Meeting held prior to Town Meeting. Well attended.
Haddam	4/16/2009	Public Workshop	31 Attendees. Open dialogue of purpose and current content of draft Plan. Valuable input to the Haddam Plan. Historical Society attended and provided many photos of historic storm damage.
Middlefield	12/15/2008	Public Officials	Town engineer engaged to assist in preparation of Plan. First Selectman very engaged in contributing to the Plan. Office staff provided valuable input.
Middletown	3/9/2009	Public Workshops/ Meetings	Open dialogue regarding the Plan. Input solicited.
	4/12/2009		
	5/13/2009		Many public officials attended. Waterworks/wastewater meeting for input and non-disclosures discussion
	6/3/2009		At large meeting in Council Chambers. Plan presentation and discussion. No disagreements regarding mitigation prioritization.
Portland	8/19/2009	Public Workshop	Prior to Town Meeting. Contribution of areas of concern. Competing interests in Plan mitigation priorities. New vulnerabilities added to the Plan.
Regional CEO Meeting	6/24/2009	Final draft Plan progress review.	
Regional Planning Team	8/9/2009	Final draft review by representatives from all municipalities at MRPA office.	
	12/1/2011	New final draft of reformatted Plan (R-4) review by representatives from all the municipalities in Council Chambers of City of Middletown - open to the public.	

**Appendix M: Minutes from Public Meetings, Durham and Portland**

RECV'D: Office of the Town Clerk  
August 28, 2009 at 11:17am

*Board of Selectmen's Meeting*

*7:00 p.m., Monday, August 24, 2009*

*3<sup>rd</sup> Floor Meeting Room, Town Hall*

**8:00 Natural Hazard Mitigation Planning Workshop**

Joel Severance, Emergency Management Consultant with Midstate Regional Planning Agency, presented a PowerPoint presentation on a Regional Mitigation Disaster Plan. The purpose of the plan is to identify and assess risks which the town would plan to mitigate or fix to minimize or prevent damage from a major storm. The benefits of the plan would be to draw local planner's attention to vulnerable areas in town, eligibility for grant funding, and priority funding for public assistance for repairs due to storms. A list of the Towns vulnerabilities was distributed to everyone in attendance and reviewed. Additional items added to the list were:

Page 6 of 7

Board of Selectmen's Meeting  
August 24, 2009

- 
- The elevation of the Maple Avenue pump house that provides water to Main Street residents.
  - A study of flooding vulnerability at White's Farm.
  - Forest roads need to be cleared for Fire Vehicle access at Cockaponsete.
  - Addition of a generator for Town Hall.
  - Mill Pond Dam needs to be replaced.
  - Culvert at Route 68.

**Adjourn**

MOTION BY JAMES MCLAUGHLIN SECONDED BY LAURA FRANCIS TO ADJOURN MEETING AT 8:35 P.M. ALL AYE

Respectfully submitted,

Beth Moncata

**BOARD OF SELECTMEN  
REGULAR MEETING  
August 19, 2009 at 7:30 PM**

Present: Susan Bransfield-First Selectwoman, Carl Chudzik, Brian Flood, Mark Finkelstein, Kathy Richards  
Absent: Sharon Peters and John Anderson  
Others: Richard Kelsey-Director of Public Works, David Kuzminski-Technology Coordinator, Joel Severance-Midstate Regional Planning Agency, members of the public and press

1. FIRST SELECTWOMAN CALL REGULAR MEETING TO ORDER

First Selectwoman Bransfield called the meeting to order at 7:30 p.m.

Present: Susan Bransfield-First Selectwoman, Carl Chudzik, Brian Flood, Mark Finkelstein, Kathy Richards  
Absent: Sharon Peters and John Anderson  
Others: Richard Kelsey-Director of Public Works, David Kuzminski-Technology Coordinator, Joel Severance-Midstate Regional Planning Agency, members of the public and press

1. FIRST SELECTWOMAN CALL REGULAR MEETING TO ORDER

First Selectwoman Bransfield called the meeting to order at 7:30 p.m.

8. NEW BUSINESS:

A) Natural Hazard Mitigation Planning - Joel Severance, Midstate Regional Planning

Joel Severance explained that the purpose of Natural Hazard Mitigation Planning is to identify natural hazards that are most likely to cause damage during major storms. The benefit is that once approved, grant money can be applied for that can be used to make improvements and upgrades.

There was a motion by Mark Finkelstein, seconded by Brian Flood to adjourn the meeting. Vote unanimous, motion carried. The meeting was adjourned at 8:38 p.m.

Respectfully Submitted,

Laura Siena, Board Clerk

**Appendix N: Regional Planning Team**

The following tables depict the various officials from RiverCOG communities that were present at various stages of plan preparation. For privacy, contact information was not included.

<b>2009 Regional Planning Team</b>		
<b>Name</b>	<b>Position</b>	<b>Town</b>
Alan Alonzo	EMD	Haddam
Susan Bransfield	First Selectwoman	Portland
John Brayshaw	First Selectman	Middlefield
Geoff Colegrove	Executive Director, Town Planner	MRPA
Fred Curtin	EMD	Cromwell
Brian Curtis	Engineer for Nathan L Jacobson & Associates	Middlefield, Haddam
Robert Dobmeir	Deputy Director of Public Works	Middletown
Bruce Driska	ZEO	Middletown
Laura Francis	First Selectwoman	Durham
Rick Kelsey	Director Of Public Works	Portland
Richard Klotzbier	Fire Marshall	East Hampton
Keith Hayden	Director Of Public Works	East Hampton
Eric Hood	Director Of Public Works	Cromwell
Craig Mansfield	EMD	East Haddam
Jim Ventres	Land Use Administrator	East Haddam
Bill Warner	Planner	Middletown

<b>August 6, 2009 Regional Planning Team Meeting Attendance</b>		
<b>Name</b>	<b>Position</b>	<b>Town</b>
Eric Hood	Director Of Public Works	Cromwell
Frank Rosca	Hunters Ambulance	Region
Fred Curtin	EMD	Cromwell
Geoff Colegrove	Executive Director, Town Planner	MRPA
Jennifer Doncet	Engineer for Nathan L Jacobson & Associates	
Jim Sipperly	Environmental Specialist	Middletown
Joe Mazurek	Building Officials	Cromwell
Joel Severence	Emergency Management Planner	MRPA
Keith Hayden	Director Of Public Works	East Hampton
Laura Francis	First Selectwoman	Durham
Steven Krol	Deputy Chief/ Fire Marshall, South District	Middletown
Susan Bransfield	First Selectwoman	Portland

Appendix N

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<b>December 1, 2011 Regional Planning Team Meeting Attendance</b>		
<b>Name</b>	<b>Position</b>	<b>Town</b>
Geoff Colegrove	Executive Director, Town Planner	MRPA
Joel Severence	Emergency Management Planner	MRPA
Alan Alonzo	EMD	Haddam
Brian Curtis	Engineer for Nathan L Jacobson & Associates	Middlefield, Haddam
Eric Hood	Director Of Public Works	Cromwell
Laura Francis	First Selectwoman	Durham
Craig Mansfield	EMD	East Haddam
Keith Hayden	Director Of Public Works	East Hampton
Robert Dobmeir	Deputy Direcotr of Public Works	Middletown
Susan Bransfield	First Selectwoman	Portland
Rick Kelsey	Director Of Public Works	Portland
Staff (Did not sign in)	Staff	Mattabassett Wastewater Treatment Facility

## **Appendix O: The Mattabassett District Flood Hazard Plan**

The Mattabassett District  
Wastewater Treatment Facility  
Municipal Flood Hazard Planning  
October 22, 2009  
Brian W. Armet, Executive Director

The Mattabassett District is a 20 mgd Regional Wastewater Treatment Facility Located at the south end of Cromwell, Connecticut, at the junction of Main Street, Cromwell and Route 9 at exit 18, is in a 100 year flood hazard area. The facility is operated and manned 24/7 365 days/year. While all buildings, structures, tank walls, onsite parking areas and the majority of on-site roads are above the 100 year flood elevation, 24.5-feet, The District's access road and adjacent highways are not.

As a result access to the facility will be difficult and restricted during flooding events, see attached memo, and some employees may not be allowed to come to work. The District must maintain/operate the facility during flood events otherwise untreated wastewater could be discharged to the environment: a potential health hazard.

### Vulnerable Areas:

1. At Connecticut River Flood Elevation 18.5-feet, Route 9 between Exit 19 and Exit 12 will be closed, and the south end of Main Street, Cromwell will be closed to all but local traffic. The District is considered local traffic.
2. At Flood Elevation 20.5-feet, the south end of Main Street, Cromwell will be flooded and closed to all traffic. Alternate access to The District will be gained as outlined in the attached memo.
3. At Flood Elevation 22.5-feet, the District's access road will be partially flooded. Employees will be required to park their cars in the non-flooded area and walk along the railroad tracks to the plant proper.
4. At Flood Elevation 24.5-feet The District's south on-site road will be flooded, and access to the south end of the facility will be restricted.

### **MATTABASSETT DISTRICT MITIGATION STRATEGY**

Elevation is the most effective way to prevent flood damage to The District's structures and treatment units and to ensure access to these units to maintain their operation. As a result:

- All new structures, treatment components, etc. finished floor elevations will be above the 100 year flood elevation, 24.5-feet.
- All new on-site access roads and walkways will be constructed above the 100 year flood elevation, 24.5-feet.
- The existing south on-site road will be raised to above the 100 year flood elevation, 24.5-feet.
- During the upgrade The District will evaluate raising its access road to above the 100 year flood elevation, 24.5-feet.

**THE MATTABASSETT DISTRICT Memorandum**

Date: January 13, 2009 Subject: River Flooding and Access Road Closings

---

To: Staff From: Brian W. Armet, Executive Director

Predictions of flood levels are made by the National Weather Service Northeast River Forecast Center. These forecasts are accessible on line at <http://www.erh.noaa.gov/er/nerfc/>. In addition to the National Weather Service all the major Local Television Stations will provide this information.

If river levels rise high enough, the main routes to the plant will be closed and it will be necessary to use alternate routes to access and leave the plant.

Route 9 Closure — Route 9 will be closed between Exit 19 and Exit 12 (Cromwell through Middletown) when the Connecticut River reaches elevation 18.5 feet. In addition, the south end of Main Street in Cromwell will be closed to all but local traffic.

Main Street Cromwell Flooding & Closure — The south end of Main Street in Cromwell will be flooded and closed when the Connecticut River reaches elevation 20.5 feet.

If Route 9 is closed **and the south end of Main Street in Cromwell is closed** but not flooded, travel to work as you normally would. Show your plant identification to any emergency personnel restricting access to the south end of Main Street, Cromwell.

**If Route 9 and the south end of Main Street in Cromwell are both flooded and closed**, call ahead for access information. Depending on how high the flood waters are will determine which of the two below listed access routes are available and whether you should report to work. The two access routes are:

- Route 9 south bound at Exit 19: show the emergency personnel guarding access to Route 9 south at Exit 19 your District ID; enter Route 9 south at this entrance ramp and travel south on Route 9 to south bound Entrance Ramp 18 and back down the ramp to The District's driveway; and/or
- Travel to work as you normally would, park in the Public parking lot adjacent to Mitchell on Main, and walk to the plant along the Railroad tracks.

In addition to the above flood impacts to access, on- site access will be restricted as follows:

Access Road — portions will be under water at elevation 22.5.

**Appendix P: Abbreviations**

CBRN	Chemical Biological, Radiological and Nuclear (including fire)
CEO/CEO	Chief Elected Official/Chief Executive Officer
CL&P	Connecticut Light and Power
CRS	Community Rating System
CT-Alert	Connecticut Automated Local Evaluation in Real Time
DEMHS	Division of Emergency Management & Homeland Security & Department of Emergency Services & Public Protection
DEEP	Department of Energy & Environmental Protection
DMP	Debris Management Plan
DPH	Connecticut Department of Public Health
DMA2000	Disaster Mitigation Act of 2000
DOT	Department of Transportation
EM	Emergency Management
EPA	Environmental Protection Agency
EOC	Emergency Operations Center
ESRI	Environmental Science Research Institute
FEMA	Federal Emergency Management Agency
Fire/FD	Fire Department
FIRM	Flood Insurance Rate Map
GIS	Geographic Information System
HAZUS-MH	Hazards United States – Multi-Hazards
HD	Health Department/Health District
HMPG	Hazard Mitigation Grant Program
HSA	Hazard Specific Annex
LEPC	Local Emergency Planning Committee
LoCIP	Local Capital Improvement Program
LUO:	Land Use Office
MAP	Mitigation Action Plan
Midstate	Midstate Regional Planning Agency
MRPA	Midstate Regional Planning Agency
NFIP	National Flood Insurance Program
NGVD	National Geodetic Vertical Datum
NIMS	National Incident Management System
NOAA	National Oceanic & Atmospheric Administration
NWS	National Weather Service
OPM	Office of Policy and Management
P&Z	Planning and Zoning
PDM	Pre-Disaster Mitigation
PW	Public Works
REPT	Regional Emergency Planning Team
STEAP	Small Town Economic Assistance Program
USACE	United States Army Corps of Engineers
USGS	United States Geological Survey
ZEO	Zoning Enforcement Officer

**Appendix Q: Sample Mitigation Project Form.**

**PROJECT MITIGATION FORM: City/Town of \_\_\_\_\_**

**Proposed Mitigation Project**

**Project Title:** \_\_\_\_\_

**Priority Status:** High  Medium  Low

**Project Description: (Briefly describe nature of project, location, etc.)**

**Estimated Cost:** \_\_\_\_\_

**Possible Barriers to Project Implementation/Completion:**

**Identify Stakeholders of the Project Identify Stakeholders of the Project**

**Identify Funding Sources:**

**Project #:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Project Sponsor (Agency/Title/Name)** \_\_\_\_\_

**Operations Group Signature** \_\_\_\_\_

**Coordination Group Signature** \_\_\_\_\_

**Policy Group Signature** \_\_\_\_\_

## Appendix R

**Appendix R:** The following tables detail major weather incidents. Information was gathered from NOAA.

The following table is lists all major storms affecting the RiverCOG region since 1993.

<b>Location:</b>	<b>Year:</b>	<b>Event:</b>	<b>Damage:</b>
<u>21 CTZ002&gt;004 - 006&gt;012</u>	12/4/1993	Heavy Rain	N/A
<u>22 CTZ001&gt;013</u>	12/26/1993	High Winds	0 kts.
<u>23 CTZ003 - 004 - 007 - 011</u>	12/29/1993	Heavy Snow	N/A
<u>24 CTZ003 - 004 - 008 - 011 - 012</u>	1/3/1994	Heavy Snow	N/A
<u>25 CTZ005&gt;012</u>	1/7/1994	Heavy Snow	N/A
<u>26 CTZ005&gt;012</u>	1/8/1994	Glaze	N/A
<u>27 CTZ001&gt;013</u>	1/15/1994	Cold	N/A
<u>28 CTZ001&gt;013</u>	1/18/1994	Cold	N/A
<u>29 CTZ001&gt;013</u>	1/18/1994	Cold	N/A
<u>30 CTZ001&gt;013</u>	2/8/1994	Heavy Snow	N/A
<u>31 CTZ001&gt;013</u>	2/11/1994	Heavy Snow	N/A
<u>32 CTZ001&gt;013</u>	3/10/1994	Heavy Rain	N/A
<u>36 CTZ002&gt;004 - 006&gt;008</u>	9/22/1994	Heavy Rain	N/A
<u>37 CTZ001&gt;013</u>	11/2/1994	High Winds	0 kts.
<u>38 CTZ001&gt;013</u>	11/6/1994	High Winds	0 kts.
<u>39 CTZ001&gt;013</u>	12/23/1994	High Winds	0 kts.
<u>40 CTZ001&gt;013</u>	1/12/1995	Freezing Rain	N/A
<u>41 CTZ001&gt;013</u>	1/13/1995	Record Warmth	N/A
<u>42 CTZ001&gt;004 - 007 - 008 - 011 - 012</u>	2/4/1995	Heavy Snow	N/A
<u>43 South Connecticut</u>	2/4/1995	Heavy Snow	N/A
<u>44 CTZ001&gt;013</u>	2/5/1995	High Winds	0 kts.
<u>45 South Connecticut</u>	2/27/1995	Ice Storm	N/A
<u>48 CTZ001&gt;013</u>	4/5/1995	High Winds	0 kts.
<u>49 CTZ001&gt;008</u>	4/5/1995	Cold	N/A
<u>54 CTZ001&gt;013</u>	7/15/1995	Record Heat	N/A
<u>58 CTZ005&gt;012</u>	12/19/1995	Heavy Snow	N/A
<u>59 CTZ009&gt;012</u>	12/20/1995	Coastal Flood	N/A
<u>60 CTZ007</u>	1/3/1996	Heavy Snow	N/A
<u>61 CTZ007</u>	1/7/1996	Blizzard	N/A
<u>62 CTZ011</u>	1/7/1996	Blizzard	N/A
<u>63 Southern Middlesex</u>	1/12/1996	Urban/small Stream	N/A

Appendix R

<b>Location:</b>	<b>Year:</b>	<b>Event:</b>	<b>Damage:</b>
		Flooding	
<u>64 CTZ005&gt;011</u>	1/19/1996	Flood	N/A
<u>65 CTZ005&gt;012</u>	1/19/1996	High Wind	0 kts.
<u>66 Southern Middlesex</u>	1/27/1996	Urban/sml Stream Fld	N/A
<u>67 CTZ005&gt;011</u>	1/27/1996	High Wind	0 kts.
<u>68 CTZ005&gt;012</u>	2/3/1996	Heavy Snow	N/A
<u>69 CTZ005&gt;007 - 009&gt;012</u>	2/16/1996	Heavy Snow	N/A
<u>70 CTZ005&gt;012</u>	2/25/1996	High Wind	0 kts.
<u>71 CTZ005&gt;007</u>	3/7/1996	Winter Storm	N/A
<u>72 CTZ005&gt;012</u>	4/9/1996	Heavy Snow	N/A
<u>82 CTZ005&gt;008 - 011&gt;012</u>	10/19/1996	Wind	N/A
<u>85 CTZ005&gt;012</u>	12/6/1996	Coastal Storm	N/A
<u>86 CTZ007&gt;012</u>	12/7/1996	Coastal Storm	N/A
<u>87 CTZ005&gt;012</u>	3/6/1997	High Wind	66 kts.
<u>88 CTZ005&gt;008 - 011</u>	4/1/1997	Winter Storm	N/A
<u>91 Countywide</u>	7/24/1997	Heavy Rain	N/A
<u>94 Along Route 66</u>	8/5/1997	Hail	0.75 in.
<u>95 Countywide</u>	11/7/1997	Heavy Rain	N/A
<u>96 CTZ007</u>	1/10/1998	Flood	N/A
<u>97 CTZ005&gt;007</u>	1/15/1998	Ice Storm	N/A
<u>98 Countywide</u>	1/24/1998	Flood	N/A
<u>99 Countywide</u>	3/9/1998	Flood	N/A
<u>100 CTZ011</u>	4/23/1998	Wind	N/A
<u>101 Countywide</u>	5/9/1998	Heavy Rain	N/A
<u>103 Countywide</u>	6/13/1998	Heavy Rain	N/A
<u>110 Central Portion</u>	8/17/1998	Flood	N/A
<u>111 Countywide</u>	1/15/1999	Flood	N/A
<u>112 Middletown</u>	2/2/1999	Heavy Rain	N/A
<u>113 CTZ008 - 011&gt;012</u>	2/25/1999	Heavy Snow	N/A
<u>114 CTZ005&gt;012</u>	3/15/1999	Heavy Snow	N/A
<u>115 CTZ005&gt;012</u>	7/4/1999	Excessive Heat	N/A
<u>118 Countywide</u>	9/16/1999	Flood	N/A
<u>119 CTZ005&gt;012</u>	1/17/2000	Extreme Windchill	N/A
<u>120 CTZ005&gt;012</u>	1/21/2000	Extreme Windchill	N/A
<u>121 CTZ005&gt;008</u>	2/18/2000	Winter Storm	N/A
<u>133 CTZ005&gt;012</u>	12/12/2000	High Wind	54 kts.

Appendix R

<b>Location:</b>	<b>Year:</b>	<b>Event:</b>	<b>Damage:</b>
<u>134 CTZ011&gt;012</u>	12/17/2000	High Wind	60 kts.
<u>135 CTZ007 - 010</u>	12/30/2000	Winter Storm	N/A
<u>136 CTZ005&gt;010</u>	1/21/2001	Heavy Snow	N/A
<u>137 CTZ011&gt;012</u>	1/21/2001	Winter Storm	N/A
<u>138 CTZ005&gt;011</u>	2/5/2001	Heavy Snow	N/A
<u>139 CTZ005&gt;011</u>	3/5/2001	Winter Storm	N/A
<u>142 CTZ007</u>	4/13/2001	Flood	N/A
<u>143 CTZ007</u>	4/23/2001	Flood	N/A
<u>144 CTZ005 - 009&gt;012</u>	5/21/2001	Wind	N/A
<u>150 CTZ005&gt;011</u>	8/8/2001	Excessive Heat	N/A
<u>154 CTZ005&gt;012</u>	4/1/2002	Drought	N/A
<u>155 CTZ005&gt;012</u>	5/1/2002	Drought	N/A
<u>156 CTZ005&gt;012</u>	6/1/2002	Drought	N/A
<u>158 CTZ005&gt;010</u>	7/2/2002	Excessive Heat	N/A
<u>159 CTZ005&gt;012</u>	9/11/2002	Wind	N/A
<u>161 CTZ005&gt;008</u>	11/27/2002	Heavy Snow	N/A
<u>162 CTZ005&gt;012</u>	12/5/2002	Heavy Snow	N/A
<u>163 CTZ005&gt;012</u>	2/7/2003	Heavy Snow	N/A
<u>164 CTZ005&gt;012</u>	2/17/2003	Heavy Snow	N/A
<u>165 CTZ005&gt;012</u>	3/6/2003	Heavy Snow	N/A
<u>167 CTZ005&gt;012</u>	12/5/2003	Heavy Snow	N/A
<u>168 CTZ005&gt;012</u>	1/15/2004	Extreme Cold/wind Chill	N/A
<u>169 CTZ005&gt;012</u>	1/28/2004	Heavy Snow	N/A
<u>171 CTZ005&gt;008 - 011&gt;012</u>	1/6/2005	Winter Storm	N/A
<u>172 CTZ005&gt;012</u>	1/22/2005	Heavy Snow	N/A
<u>173 CTZ005&gt;008 - 011&gt;012</u>	2/25/2005	Heavy Snow	N/A
<u>174 CTZ005&gt;012</u>	3/8/2005	Winter Weather/mix	N/A
<u>175 CTZ005&gt;008</u>	3/24/2005	Heavy Snow	N/A
<u>182 CTZ005&gt;011</u>	10/8/2005	Flood	N/A
<u>184 CTZ005&gt;010</u>	12/9/2005	Heavy Snow	N/A
<u>185 CTZ006&gt;009</u>	1/18/2006	High Wind	66 kts.
<u>186 CTZ005&gt;008</u>	2/12/2006	Heavy Snow	N/A
<u>187 CTZ009&gt;012</u>	2/12/2006	Heavy Snow	N/A
<u>188 CTZ005&gt;008 - 010</u>	2/17/2006	High Wind	54 kts.
<u>189 CTZ005&gt;012</u>	3/2/2006	Winter Storm	N/A
<u>194 CTZ005&gt;007 - 009</u>	8/1/2006	Excessive Heat	N/A

Appendix R

<b>Location:</b>	<b>Year:</b>	<b>Event:</b>	<b>Damage:</b>
<u>197 CTZ011</u>	12/1/2006	High Wind	50 kts.
<u>199 CTZ006 - 007</u>	3/16/2007	Winter Storm	N/A
<u>200 CTZ011 - 012</u>	4/15/2007	High Wind	61 kts.
<u>201 CTZ011 - 012</u>	4/16/2007	Coastal Flood	N/A
<u>208 CTZ007</u>	5/12/2008	High Wind	50 kts.
<u>218 CTZ005&gt;012</u>	9/6/2008	Tropical Storm	N/A
<u>219 CTZ007</u>	10/25/2008	Strong Wind	45 kts.
<u>222 CTZ008 - 011</u>	12/19/2008	Heavy Snow	N/A
<u>223 CTZ005&gt;012</u>	3/1/2009	Heavy Snow	N/A

The following table shows storms resulting in disaster declarations for the state of Connecticut. Source: Record developed by Staff at CEMP, LLC from a variety of sources and edited by DEMHS.

<b>Date:</b>	<b>Storm:</b>	<b>Type:</b>	<b>Category:</b>	<b>Disaster/Em. Declaration:</b>	<b>DR/ED #:</b>
August, 1635	Hurricane of 1635	Hurricane			
October 18-19, 1778	Tropical Storm of 1778	Tropical Storm			
Nov 17-21, 1798	Great New England Blizzard	Winter Storm			
October 9, 1804	Hurricane of 1804	Hurricane			
September 23, 1815	Gale of 1815	Winter Storm			
September 8, 1869	Tropical Storm of 1869	Tropical Storm			
March 11, 1888	1888 Blizzard	Snow		-	-
1888	Hurricane of 1888	Hurricane			
1888	Ice Storm of 1888	Hurricane			
March 30, 1905	Hurricane Of 1905	Hurricane			
1903	Hurricane of 1903	Hurricane			
1916	Hurricane of 1916	Hurricane			

Appendix R

Date:	Storm:	Type:	Category:	Disaster/Em. Declaration:	DR/ED #:
Mach 12, 1936	1936 Flood - Freshet	Flood		-	-
September 21, 1938	Great Hurricane of '38	Hurricane	III	-	
September 15, 1944	Great Atlantic Hurricane		III/	-	-
July 12, 1950	Mx Cty Tornado	Tornado	F2	-	-
August 21, 1951	Mx Cty Tornado	Tornado	F3	-	-
August 31, 1954	Carol	Hurricane	III/	September 17, 1954	25
1954	Edna	Hurricane	III/		
1954	Hazel	Hurricane			
August, 1955	Connie	Hurricane		August 20, 1955	42
October 15-17, 1955	Diane	Hurricane			
September, 1960	Donna	Hurricane	III/I		
July 19, 1963	Mx Cty Tornado	Tornado	F1	-	-
1969	Gerda	Hurricane			
1972	Agnes	Hurricane	I		
July 21, 1972	Mx Cty Tornado	Tornado	F1	-	-
December 17, 1973	Ice Storm Felix	Ice Storm		December 17 1973	
July 27, 1974	Mx Cty Tornado	Tornado	F1	-	-
1976	Bell	Hurricane	III/I		
February 6-7, 1978	Winter Storm	Snow		February 7, 1978	3060
October 3, 1979	Severe Storm, Tornado	Tornado	F4	October 4, 1979	608
June 4-7, 1982	Severe Storm, Flood	Flood		June 14, 1982	661
August 1, 1983	Mx Cty Tornado	Tornado	F0	-	-
May 28-June 2, 1984	Severe Storm, Flooding Freshet	Flooding		June 18, 1984	711
September 28, 1985	Gloria	Hurricane	III/I	October 11, 1985	747
July 10, 1989	Severe Storm, Tornado	Tornado		July 17, 1989	837
August 19, 1991	Bob	Hurricane	III/I	August 30, 1991	916
October, 1991	Tropical Storm/Hurricane Grace - The Perfect Storm	Tropical Storm			
December 10, 1992	Winter Storm Beth Nor'easter	Winter Storm		December 17, 1992	972
1993	Great Blizzard	Snow		March 16, 1993	3098

Appendix R

Date:	Storm:	Type:	Category:	Disaster/Em. Declaration:	DR/ED #:
	of 1993, hurricane force winds				
January 8-9, 1996	Winter Storm Ginger	Snow		January 24, 1996	1092
September 15, 1999	Floyd	Tropical Storm		September 23, 1999	1302
2003	Snowstorm	Snow		March 11, 2003	3176
2004	Snow	Snow		January 15, 2004	3192
2005	Snow	Snow		February 17, 2005	3200
2005	Katrina Evacuees In	Hurricane		September 13, 2005	3246
2005	Severe Storm, Flooding	Flood		December 16, 2005	1619
2006	Snow	Snow		May 2, 2006	3266
April 15, 2007	Severe Storm, Flooding ,Tax Day Storm	Flood		May 11, 2007	1700
March 2010	Wind Storm and Flooding	Flood/Wind		April 23, 2010	1904
January 2011	January 1123 Nor'easter	Blizzard		March 3, 2011	1958
August 28, 2011	Tropical Storm Irene	Tropical Storm		August 27/September 2, 2011	4023/3331
October 29-30, 2011	Halloween Nor'easter	Wind/Snow		October 21,November 17, 2011	3342/4046
October 28, 2012	Hurricane Irene	Hurricane	1	October 30, 2012	4087
February 8, 2013	Blizzard of 2013	Blizzard		March 21, 2013	4106

Appendix R

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The following table shows wind events that have place in Middlesex County affecting the northern towns of the RiverCOG Region.

<b>Middlesex County:</b>	<b>Date:</b>	<b>Disaster #:</b>	<b>Event:</b>	<b>Intensity:</b>
<u>1 MIDDLESEX</u>	7/12/1950	1600	Tornado	F2
<u>2 MIDDLESEX</u>	8/21/1951	1630	Tornado	F3
<u>3 MIDDLESEX</u>	4/24/1960	1800	Hail	2.00 in.
<u>4 MIDDLESEX</u>	8/30/1960	1300	Hail	1.00 in.
<u>5 MIDDLESEX</u>	7/19/1963	1620	Tornado	F1
<u>6 MIDDLESEX</u>	8/1/1963	1500	T'storm Wind	0 kts.
<u>7 MIDDLESEX</u>	5/17/1965	1330	Hail	1.00 in.
<u>8 MIDDLESEX</u>	6/8/1971	1730	T'storm Wind	0 kts.
<u>9 MIDDLESEX</u>	7/21/1972	1725	Tornado	F1
<u>10 MIDDLESEX</u>	6/21/1974	1315	Hail	0.75 in.
<u>11 MIDDLESEX</u>	6/27/1974	1315	Tornado	F1
<u>12 MIDDLESEX</u>	6/29/1976	1630	T'storm Wind	0 kts.
<u>13 MIDDLESEX</u>	8/10/1979	1630	T'storm Wind	0 kts.
<u>14 MIDDLESEX</u>	5/20/1982	1630	T'storm Wind	0 kts.
<u>15 MIDDLESEX</u>	7/30/1983	1600	T'storm Wind	0 kts.
<u>16 MIDDLESEX</u>	8/1/1983	1630	Tornado	F0
<u>17 MIDDLESEX</u>	9/6/1985	1715	T'storm Wind	0 kts.
<u>18 MIDDLESEX</u>	7/10/1989	1541	T'storm Wind	50 kts.
<u>19 MIDDLESEX</u>	8/9/1992	1340	Hail	1.00 in.
<u>46 MIDDLESEX</u>	4/4/1995	1400	T'Storm	0 kts.
<u>47 MIDDLESEX</u>	4/4/1995	1400	T'storm Winds	0 kts.

## **Appendix S: Sources of Information**

*Significant Floods in the United States during the 20th Century: USGS Measures a Century of Floods* - Charles A. Perry, March 2000

*A Guide for Including People with Disabilities in Disaster Preparedness Planning*, Connecticut Council on Developmental Disabilities

### **Other Natural Hazard Mitigation Plans**

Connecticut River Estuary Regional Planning Agency  
Southeast Council of Governments  
Southwest Regional Planning Agency and the  
Windham Council of Governments  
Town of Guilford

### **Department of Energy and Environmental Protection Library:**

Answers to Questions about the National Flood Insurance Program  
Mitigation of Flood and Erosion Damage to Residential Buildings in Coastal Areas  
Reducing Losses in High Risk Flood Hazard Areas: A Guidebook for Local Officials  
Flood plain Management Bulletin – Historic Structures  
Protecting Building Utilities from Flood Damage  
Protecting Flood plain Resources  
Addressing Your Community's Flood Problems  
Planning for a Sustainable Future  
Reducing Damage from Localized Flooding

Technical Bulletin 10-01 Ensuring That Structures Built on Fill in or Near Special Flood Hazard Areas are Reasonably Safe from Flooding.

Connecticut Disasters, Elsworth Grant  
Connecticut Climate Book, Dr. Mel Goldstein

### **Sources of the State of Connecticut ([www.ct.gov](http://www.ct.gov)):**

State of Connecticut: Executive Order 11988, Flood plain Management.  
State of Connecticut: Connecticut, DEEP, State Hazard Mitigation Plan, October, 2007  
Connecticut Natural Hazard Mitigation Plan  
State of Connecticut DEMHS: assistance in developing the local Emergency Operations Plan.  
State of Connecticut Office of Policy and Management: Energy Assurance Plan  
Historical Societies from the Eight Northern LCVRCOG Municipalities  
Middletown Area Historic Preservation Society Report, 1970 through 1990.  
Management Plan for the Mattabassett River Watershed, September 2000

### **FEMA Documents ([www.fema.gov](http://www.fema.gov)):**

Local Multi-Hazard Mitigation Planning Guidance, July 1, 2008  
FEMA 386-7, Phase 2, Step: Integrating Manmade Hazards into Mitigation Planning  
HAZUS-MH: Information data layers based on national statistics

fema.gov/plan/prevention/hazus and www.ready.gov  
American Red Cross: [www.redcross.org](http://www.redcross.org)

**Municipal Sources:**

**Plans of Conservation and Development:**

Cromwell, September, 2007  
Durham, March 1, 2003  
East Haddam, August 27, 2008  
East Hampton, July 1, 2006  
Haddam, January 24, 2007  
Middlefield, June 10, 2008  
Middletown, Amended to May 12, 2010  
Portland, March 18, 2006

**Zoning Regulations:**

Cromwell, Amended to November 18, 2011  
Durham, Amended to November 1, 2009  
East Haddam, Amended September 2011  
East Hampton, Amended to July 5, 2012  
Haddam, Amended to April 15, 2013  
Middlefield, Amended to February 24, 2010  
Middletown, Amended to June 5, 2009  
Portland, Amended to April 15, 2010

**Subject Matter Experts Consulted:**

Robida, LLC – Dams  
Ken Kells, Engineer – Repetitive Loss Study

**News Articles**

All News Articles are credited individually

**Maps**

All Maps were produced by RiverCOG staff unless otherwise noted

**Photos**

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