

Westbrook, Connecticut Natural Hazards Mitigation Plan Update, 2014



Prepared for
Westbrook Planning Commission

Adopted by
Town of Westbrook, Connecticut
August 28, 2014



WESTBROOK, CT

Prepared by
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The Natural Hazard Mitigation Plan is updated every five years. Input from residents and business owners is important to ensure the plan addresses the needs of those potentially affected. Questions, comments or suggestions concerning the Plan or future updates to it may be sent at any time to any of the following staff of the Town or RiverCOG.

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On the Cover:

Photo 1: 482 Seaside Avenue after Superstorm Sandy
Source: Roger Zito, Westbrook Building Official

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i. Executive Summary

The primary purpose of a Natural Hazard Mitigation Plan is to identify natural hazards and risks, existing capabilities, and activities that can be undertaken by a community to prevent loss of life and reduce property damages associated with identified hazards. The Disaster Mitigation Act of 2000 requires local communities to have a Federal Emergency Management Agency (FEMA)- approved mitigation plan in order to be eligible to receive Pre-Disaster Mitigation Program grants and Post-Disaster Hazard Mitigation Grant Program funds under the Hazard Mitigation Assistance program. This Plan was prepared by the Lower Connecticut River Valley Council of Governments (RiverCOG) in conjunction with the Town of Westbrook. It is an update of a Multi – Jurisdictional NHMP first developed by the Connecticut River Estuary Regional Planning Agency (CRERPA) in 2006.

The town considers critical facilities to be those that serve the town on a day-to-day basis as well as during an emergency situation. The facilities include but are not limited to the Mulvey Municipal Center (which houses the Police Station), Public Works Garage, Fire Headquarters (next door to the EOC) and Fire North End Station, Ambulance Garage, Westbrook Public Library, the schools, including Daisy Ingraham School which serves as the emergency shelter, and Middlesex Hospital Shoreline Medical Center. The critical facilities are necessary to support emergency response before, during, and after natural hazard events.

Transportation is essential in any major event. The town of Westbrook has a variety of transportation options. The town is served by Interstate 95, a major limited access highway, as well as major arterials such as U.S. Route 1 and CT Route 153. Smaller town roads act as collectors to bring people to larger roads. The town is also served by several bus routes of the 9 Town Transit District and Amtrak’s Northeast Regional which carries both Amtrak and Shore Line East trains. The Connecticut DOT recently opened a new station for Shore Line East service just north of the downtown area.

This plan details natural hazards present in the town and steps that the town can take to mitigate long lasting effects from each hazard type. The Comprehensive Mitigation Action Item list is provided in Section III: Mitigation. This table includes the item, project status, the party responsible for carrying out the action item, and other pertinent information. The most prominent hazard in any of the towns within the region is flooding, and significant discussion is devoted to how best to mitigate flooding events. Other hazards discussed include high winds and tornadoes, hurricanes and tropical storms, sea level rise, and drought and wildfire. Each hazard type has a list of mitigation action items that the town could implement, some being a higher priority than others. For each of the hazard types presented in the plan, historic events are presented along with the probability of that event occurring again. The town’s specific impacts from each event are also noted.

The overall goal of this Natural Hazard Mitigation Plan is: *Reduction or elimination of injury to or loss of life and property and natural environments and the associated economic impacts from natural hazards.*

I. **PLANNING PROCESS**

A. **Authority (ELEMENT C1)**

Federal: The Robert T. Stafford Disaster Relief and Emergency Assistance Act (Public Law 93-288), as amended by the Disaster Mitigation Act of 2000, provides the legal basis for State, local, and Indian Tribal governments to undertake a risk-based approach to reducing risks from natural hazards through mitigation planning. The Federal Emergency Management Agency (FEMA) coordinates mitigation planning nationwide and provides funding for State-level natural hazard mitigation planning.

State: FEMA requires State, Indian Tribal, and local governments to develop hazard mitigation plans as a condition for receiving certain types of non-emergency disaster assistance, including funding for mitigation projects. The requirements and procedures for State, Tribal and Local Mitigation Plans are found in the Code of Federal Regulations (CFR) at Title 44, Chapter 1, Part 201 (44 CFR Part 201). The State of Connecticut Department of Energy & Environmental Protection (DEEP) administered the federal funds for this plan by providing grants and technical assistance to the regional planning organizations (RPOs) to write the hazard mitigation plans for each regional planning area and the municipalities within each. Moving forward, the Department of Emergency Services and Public Protection (DESPP) will be responsible for mitigation planning and administering all federal funds including all of FEMA's HMA grant programs to local communities as well as regional planning organizations.

Region: The Connecticut General Statutes (§8-35a.(d)) require the regional planning organization to assist the municipalities within its region in developing and carrying out any plans of regional importance. The Lower Connecticut River Valley Council of Governments (RiverCOG) intends that this plan stand alone so that the Town may include it as a section or supplement to its local Plan of Conservation & Development (POCD).

Municipal: The Connecticut General Assembly delegates certain powers of the state to its municipal subdivisions (city, town, borough, or special district), specifically that a municipality has the authorities in finance, public safety, and health that are necessary to effectuate the goals of this Plan (CGS §7-148).

B. Purpose & Benefits

Hazard mitigation is any sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards (44 CFR 201.2). Hazard mitigation actions may be implemented prior to, during, or after an event. However, hazard mitigation is most effective when based on an inclusive, comprehensive, long-term plan that is developed before a disaster occurs.

The Westbrook Natural Hazard Mitigation Plan provides information about the types of natural hazards that may affect the town and its residents and identifies specific mitigation actions.

The Town updates the NHMP every five years for two reasons: first, to keep abreast of changes to the physical environment, social fabric, and demographic composition of its people, as well as changes to ongoing efforts to mitigate the effects of natural hazards; second, to remain eligible for Federal funds for ongoing and future mitigation actions.

The purpose of the town's NHMP is to:

- Identify natural hazards that could potentially occur and the geographic areas most likely affected by the occurrence of those natural hazards;
- Assess potential threats from the occurrence of those natural hazards to natural resources, public infrastructure, private property and people;
- Review existing actions and capabilities of the town to mitigate threats from natural hazards;
- Recommend additional actions to improve or expand actions and capabilities that further prevent loss of life and reduce property damages associated with the occurrence of natural hazards; and
- Update plans to remain eligible at the time a community applies for and when the Federal/State agencies award funds for hazard mitigation actions.

The benefits of an up-to-date hazard mitigation plan include:

Home and business owners have information to help them make better decisions about protecting their properties.

Planners and local officials better understand the risks of natural hazards and may improve local planning actions.

Builders and developers have access to more accurate information for making decisions on where and how to build.

This information can better assist police, fire, emergency management, public health and town officials prepare for a response as well as organize efforts as part of the cycle of recovery from occurrences of natural hazards.

C. Plan Development (ELEMENT A & D)

1. Funding & Technical Assistance

FEMA Region 1 provided guidance to the Lower Connecticut River Valley Council of Governments (RiverCOG) in following federal guidelines for natural hazard planning, particularly subsequent to Hurricane Irene and the Snowstorm Alfred in September and October of 2011, respectively and Superstorm Sandy in 2012.

The Connecticut Department of Energy & Environmental Protection (DEEP) awarded a Hazard Mitigation Assistance (HMA) grant to RiverCOG to assist member towns update their Natural Hazard Mitigation Plans. Under this grant, J.H. Torrance Downes, Senior Regional Planner and Jeremy DeCarli, Regional Planner, helped prepare this update to the original 2006 CRERPA Multi-Jurisdictional Natural Hazard Mitigation Plan; and Daniel Bourret, GIS Specialist provided technical assistance with generating HAZUS reports.

The Town of Westbrook provided significant in-kind contributions from its Town Planner, Meg Parulis.

2. Preparation (A.1 & D.2)

The process began when RiverCOG staff met with the Westbrook Planner to discuss how best to begin the plan update. The 2006 CRERPA Multi-Jurisdictional Plan was reviewed. That plan included all of the 9 former CRERPA towns including Chester, Clinton, Deep River, Essex, Killingworth, Lyme, Old Lyme, Old Saybrook and Westbrook. Like all nine updates currently being prepared for the region, it was decided that the Westbrook Plan Update would be formed as a Stand-Alone Plan rather than a multi-jurisdictional Plan. This allows greater emphasis on the individual needs of the Town of Westbrook and affords greater local control over the maintenance of the Plan over the next five years. The 2006 plan was assessed, and mitigation measures taken since that time were noted. The 2010 US Census and Connecticut Economic Resource Center (CERC) data were used to understand the changes that have occurred in the town since the last iteration of the plan.

The Westbrook Planning Commission, which is responsible for the town's NHMP, established a special Natural Hazards Mitigation Technical Advisory Committee to provide input to the Planning Commission on problem areas, existing hazard mitigation activities and future hazard mitigation needs. This Technical Advisory Committee included: Meg Parulis, Town Planner; Zoning Official/Flood Mgr., Nancy Rudek; Inland Wetlands Agent, Heidi Wallace; Building Official, Roger Zito; Public Works Director, John Riggio; Town Engineer, Jeff Stearns; Emergency Mgmt.

Director, Don Izzo; Deputy Emergency Mgmt. Director, George Pytlik, FEMA Liaison, Gene Cieri; Fire Chief, Richard Tsou; Ambulance Chief, Gregg Prevost, Jr.; Resident State Trooper, Rob Hart; and Health Services Administrator, Deb Lovelette. The members of the committee provided information to the Town Planner and reviewed the draft plan.

The Town of Westbrook used the Connecticut Department of Energy and Environmental Protection's Coastal Management Tool in its evaluation of future threats, including hurricane inundation for Category 1-4 storms and the threat of Sea Level Rise. The CT DEEP Coastal Hazards Tool was developed through a partnership between the CT DEEP, the University of Connecticut's Marine Sciences Program, and the NOAA Coastal Services Center Coastal Management Fellowship Program.

It should be noted that all maps are for planning purposes only.

3. **Agency Comment (A.2)**

The Westbrook Planning Commission, through its Land Use staff and representatives at the Lower CT River Valley Council of Governments, solicited input from local agencies most likely to be involved in the plan's eventual implementation other than itself: the Board of Selectmen, the Board of Finance, the Zoning Commission, the Zoning Board of Appeals, the Conservation Commission, the Inland Wetlands Commission, Economic Development Commission, Harbor Management Commission, Water Pollution Control Commission, and Council of Beaches.

This Plan update is significantly different in format from the original 2006 Multi-Jurisdictional Plan. The new format was developed using the new FEMA standards for Hazard Mitigation Planning. This Plan update includes a more thorough analysis of natural hazards, including sea level rise, tsunami risk, high wind and tornadoes, drought and wildfires, earthquakes and hurricanes. The new format of this plan update addresses all requirements of FEMA for hazard mitigation and offers a way for incorporation into other planning documents such as the town Plan of Conservation and Development (POCD). For each hazard type, this format addresses past events, vulnerability of the town, likelihood of a future event, and mitigation specific to that hazard risk.

The purpose of a hazard mitigation plan is for communities to identify the natural hazards that impact them, to identify actions and activities to reduce any losses from those hazards, and to establish a coordinated process to implement the plan, taking advantage of a wide range of resources (44 CFR 201.1(a)). Notwithstanding this broader intent, local governments are required to prepare and adopt a hazard mitigation plan as a condition of receiving project grant funds under FEMA's hazard mitigation assistance programs such as the Hazard Mitigation Grant

Program (HMGP) and Pre-Disaster Mitigation (PDM) program (44 CFR §201.6(a)(1)).

FEMA's approval of a mitigation plan does not mean FEMA has approved funding for projects identified in the plan or approved an application for Federal assistance. An application for Federal assistance must be submitted to FEMA to be considered for funding and must meet the application requirements for the assistance program as described in the Catalog of Federal Domestic Assistance (www.cfda.gov).

Once a mitigation plan is approved, it is the community's decision to implement specific mitigation strategies or projects. As plans are updated every five years, the local government is required to document progress in local mitigation efforts; however, lack of resources, changes in priorities, community capacity to implement actions, or other concerns may limit a community's ability to implement actions. As described at 44 CFR 201.6, "The local mitigation plan is the representation of the jurisdiction's commitment to reduce risks from natural hazards, serving as a guide for decision makers as they commit resources to reducing the effects of natural hazards. Local plans will also serve as the basis for the State to provide technical assistance and to prioritize project funding."

4. Public Involvement (A.3)

All meetings and discussions of the Natural Hazards Mitigation Plan update preparation were open to the public with notice to the Town Clerk where required, as well as the Town's website. The draft plan was posted on the Town website prior to adoption and meetings were held with the Council of Beaches in Oct. 2013 and July 2014 to get input from those most vulnerable to natural disaster living along the coast. In addition, notices were posted in "Harbor News" and "The Day." The Westbrook Council of Beaches, which represents 17 beach communities in Town, also had a link to download the plan on their website. In addition, the draft Plan was referred to other towns in the regional planning area through the RiverCOG website. All surrounding towns are also developing individual NHMPs and are all aware of their neighboring towns NHMP. The public participation survey was open and available from September 3, 2013 to Oct. 30, 2014. In addition, anyone wishing to comment on the Plan was encouraged to do so through the Land Use Office, or using the contact information listed at the beginning of this Plan. The Planning Commission, which meets each month discussed the Plan at every meeting beginning in February 2013 continuing until July 2014. The Town Planner and representative from RiverCOG also attended a Council of Beaches meeting on July 7 to discuss the Plan. See Appendix VI and VII for meeting minutes, notices and screen shots. Public feedback was incorporated into the plan in the form of new and revised action items, key

flooding problems spots throughout town and other local issues not known to RiverCOG or Town staff prior to meeting with residents.

a. **Public Survey Results**

A total of 286 responses were collected. Information was used to update the plan, add mitigation action items and better understand problem areas in town. Of the respondents, 100% were Westbrook Residents and owners of Westbrook-based businesses. Overall, responses suggested that the “Harbor News,” “Westbrook Events,” the office of Emergency Management Website, and the Town of Westbrook website were the best places to get information regarding hazard mitigation information. With regards to natural hazards, 66% of the respondents have suffered losses in the past due to flooding, 43% have suffered losses due to hurricanes or tropical storms, while 67% are concerned about future sea level rise. With regard to mitigation actions, forty-three respondents offered their input on mitigation measures the town could include. A vast majority of responses centered on retro-fitting existing homes along the shoreline, prohibiting new construction along the shoreline, and minimizing risks with mandatory evacuations when needed. Another focus of respondents was the removal of trees in order to reduce the chance for power outage during storms and burying utilities where feasible. For the full survey and its responses, please see Appendices V and VI. Action Items and other information presented by survey respondents not already listed within the Plan were considered by the Town and many were incorporated into this Plan update.

5. **Incorporation of Existing Resource Materials (A.4 & D.)**

RiverCOG staff along with the Town Planner began the Plan update process by reviewing the implementation status of the 2006 CRERPA Multi-Jurisdictional Plan. Additionally, the Planning Commission surveyed and analyzed current data regarding the environment and ecological resources, geography and land uses, demographics and critical facilities, as well as economics and cultural resources. From this information, the Commission incorporated Elements of the original 2006 “Multi-Jurisdictional Natural Hazard Mitigation Plan, Town of Westbrook, Individual Town Mitigation,” into the 2014 Plan. Also included in this Plan are elements and information from other municipal documents such as the 2011 Plan of Conservation and Development, the Westbrook Zoning Regulations and the Westbrook Subdivision Regulations. See Appendix I - **Existing Plans, Studies, Reports & Technical Information.**

D. Plan Adoption (ELEMENT E)

The Board of Selectmen, as the “governing” body of the town [CFR § 201.6(c)(5)] officially adopted the Plan at a Board of Selectmen meeting on August 28, 2014. See Appendix V for resolution.

E. Plan Implementation (ELEMENT D)

The Plan prescribes specific actions and assigns priorities, responsibilities, and resources for each. The Plan uses three broad categories of actions:

- 1) Physical improvements**
- 2) Programs**
- 3) Planning/Regulatory**

*Some recommendations require regional or inter-town cooperation and are included in Section III **MITIGATION** (ELEMENT C).*

1. Priorities

Based on the planning process, this Plan suggests assignments of priority for implementation. Those agencies and officials to whom the Plan assigns responsibility will fine-tune these priorities based on availability of resources. Priority is defined for each mitigation action as a part of Figure 29.

2. Responsibilities

The Plan specifies those agencies and officials responsible for implementing the prescribed actions. The Town will track progress to ensure consistent and on-going implementation, as well as to update the Plan more readily. The Responsible Party for each Mitigation Action Item is included in Figure 29.

3. Resources (C.6)

The Town must allocate sufficient resources to implement the actions prescribed by the Plan, as well as to maintain the Plan through regular updates (every 5 years). Officials/agencies identified as having responsibility for specified actions need to establish and maintain operating or capital budgets with which to fund implementation (and continual maintenance).

These budgets are also necessary to leverage opportunities for Federal and State grants, which typically require a “match” in funding commitment (funds and in-kind services). All of the grants described below require an approved Natural Hazards Mitigation Plan at the time of application and must have an approved plan at time of award.

Potential funding sources for each Mitigation Action Item is included as part of Figure 29.

The following sources of external funding are available to the region and its towns on a limited and often competitive basis:

a. **Hazard Mitigation Grant Program (HMGP)**

The HMGP provides grants to States and local governments to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the HMGP is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster. The HMGP is authorized under Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act. This grant is administered by the Connecticut Department of Emergency Services and Public Protection (DESPP), Division of Emergency Management and Homeland Security (DEMHS).

b. **Flood Mitigation Assistance (FMA)**

The National Flood Insurance Reform Act (NFIRA) of 1994 (42 U.S.C. 4101) created the FMA program with the goal of reducing or eliminating claims under the National Flood Insurance Program (NFIP).

FEMA provides FMA funds to assist States and communities implement measures that reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insured under the National Flood Insurance Program. This grant is administered by the Connecticut Department of Energy and Environmental Protection (DEEP).

Three types of FEMA grants are available to states, regions and towns:

- **Planning Grants** to prepare Flood Mitigation Plans. Only NFIP-participating communities with approved Flood Mitigation Plans can apply for FEMA Project grant
- **Project Grants** to implement measures to reduce flood losses, such as elevation, acquisition, or relocation of NFIP-insured structures. States are encouraged to prioritize FEMA funds for applications that include repetitive loss properties; these include structures with 2 or more losses

each with a claim of at least \$1,000 within any ten-year period since 1978.

- **Management Cost Grants** for the State to help administer the FEMA program and actions. Up to ten percent (10%) of Project grants may be awarded to States for Management Cost Grants.

c. **Pre-Disaster Mitigation Grant (PDM)**

The PDM program provides funds to states, territories, Indian tribal governments, communities, and universities for hazard mitigation planning and the implementation of mitigation projects prior to a disaster event. Funding these plans and projects reduces overall risks to the population and structures, while also reducing reliance on funding from actual disaster declarations. PDM grants are to be awarded on a competitive basis and without reference to state allocations, quotas, or other formula-based allocation of funds. This grant is administered by both the Connecticut Department of Energy and Environmental Protection (DEEP) and the Connecticut Department of Emergency Services and Public Protection (DESPP).

F. **Plan Maintenance (ELEMENT A)**

1. **Method (A.5)**

The Planning Commission will monitor and evaluate progress in addressing action items in this Plan and include those accomplishments in its annual report to the Town. The Town will post its Annual Report on the Town website to inform and update the citizenry as a part of required ongoing citizen participation in implementation.

In order to evaluate progress made each year, responsible parties (Planning, Zoning and Public Works) will:

Conduct Review of Specific 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 these action items remain a priority for the town. Inspections will also determine whether the project remains on schedule, has been completed or has yet to be completed.

Annual Meetings

Matters to be reviewed on an annual basis will include the goals and objectives of the HMP, hazards or disasters that occurred during the preceding year (for example, the recent damage from Tropical Storm Irene along the shoreline), 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 annual meeting shall be during the fourth quarter of each fiscal year (April – June), before the annual application cycle for pre-disaster grants under the HMA programs. This will enable a list of possible projects to be circulated for Town departments to review, with sufficient time for developing applications. The Planning Commission and the First Selectman (or his designee) shall jointly prepare a report based on the review of recent events and ongoing or recent mitigation activities for review at this annual meeting. Results of the site inspection efforts will be reviewed as well. 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 from several coastal neighborhoods is anticipated to continue each year. The First Selectman and Planning Commission will continue to provide the linkage to other municipal departments throughout the plan monitoring and evaluations each year relative to communication and participation.

2. Maintenance and Update Schedule (A.6)

At a minimum, the Town 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 Figure 1 on the following page for a more detailed schedule. The Planning Commission will have the primary responsibility of maintaining and updating the NHMP; they may choose to designate certain portions of the responsibility to other parties as appropriate.

Progress and Update Schedule	FY 2015				FY 2016				FY 2017				FY 2018				FY 2019			
	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			
Budget Action Items Based on Review		X				X				X				X				X		
Action Progress Meeting - Public				X				X				X				X				X
Plan Update Committee Formation													X							
Begin Full Plan Review														X						
Begin 5 Year Update Process																X				
Completion of 5 Year Plan update (Submission to DEEP and FEMA and Adoption by Town)																	X	X	X	

Figure 1: Plan Update Process Schedule

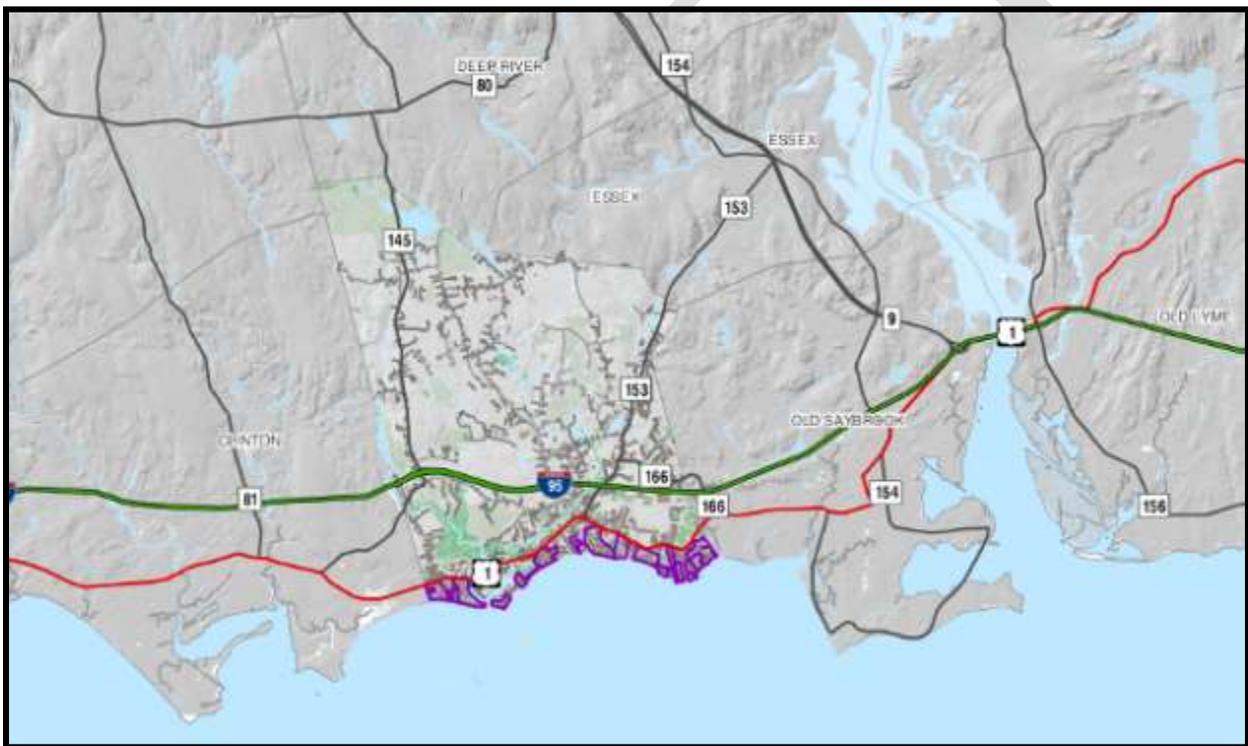
II. RISK ASSESSMENT & HAZARD IDENTIFICATION (ELEMENTS B & D)

The 2006 Natural Hazard Mitigation Plan (NHMP) identified a number of natural hazards that could potentially impact the Town of Westbrook, including flooding, wind and tornado, drought and wildfire, winter storm, earthquake, hurricane, sea-level rise, and tsunami. This section acknowledges changes in local development since 2006 and its effects on natural hazard mitigation.

A. The Town & the Vulnerability of its Resources (ELEMENT B)

Given Westbrook's topography, location on Long Island Sound and land use patterns, significant areas of the town are most vulnerable to flooding, hurricane, coastal flooding and high winds.

1. Geography & Land Use Patterns



Map 1: **Westbrook** and surrounding towns.

This map depicts Westbrook among surrounding towns. The map also shows major transportation routes including I-95, Route 1 and Route 153 and their connections to other towns and highways.

Source: Westbrook GIS

Westbrook lies within Middlesex County, located in south-central Connecticut, along its shoreline with Long Island Sound. To the west, Westbrook is bordered by the towns of Clinton and Killingworth; to the north, by the towns of Essex, and Deep River; and to the east, by the town of Old Saybrook. Although New York's Long Island serves as a southerly

barrier, Westbrook is susceptible to high winds and coastal storms due to its geographic location.

Westbrook's total area of 15.78 square miles has a relatively low-lying coastal topography, which is mostly tidal marsh and coastal plain with scattered projections of hills and knolls. The most significant inland rivers draining to the coast are the Patchogue and Menunketesuck Rivers. Rolling hills with a relatively thin veneer of glacial till amid ledge outcroppings typify upland areas north of Interstate 95. Additionally, the hilly ridge and valley topography of the northern area of town provides an opportunity for stream belt flooding that can be associated with either coastal storms or non-coastal heavy rain events. The topography, including belts of inland wetlands throughout Westbrook limits development of land to these fragmented geographic areas, some of which natural disasters isolate from each other due to a lack or deficiency of infrastructure between them.

Residential zoning dominates developable land in Westbrook, totaling 88% of its total area. Most of the land south of I-95 is completely developed. A total of 27% of land in Westbrook has been developed as housing units, mostly single family dwellings. Rural residential zoning dominates the area north of I-95, requiring a minimum of two acres. Low, and Medium Density Residential zones dominate the area south of I-95. High Density Residential zones exist along the shoreline where lot sizes are a minimum of 15,000 square feet. Approximately 33% of the area of the town is vacant land, not all entirely buildable. It is primarily large tracts north of I-95 (one- to two-acre zoning characterizes the northern upland areas of town), which are subject to significant set-asides of open space land at the time of development for the purposes of drainage capacity, habitat conservation, cultural preservation or recreational use. Similar to neighboring towns on Long Island Sound, relatively high-density residential development along the coast, both seasonal and year-round, exposes the town's residents, businesses and their properties to hazards associated with coastal storms, and the winds and flooding that often accompany them.

In recent years, new large acreage subdivision applications on vacant land in the outskirts of town have slowed with the market trending toward more affordable and convenient multi-family housing closer to the Town Center. Redevelopment of existing commercial and residential properties remains steady.

Commercial and industrial uses comprise approximately 12% of the total land area. Westbrook is a popular destination point for tourists due to its location on Long Island Sound with shoreline restaurants, Water's Edge Resort, several Bed & Breakfast Inns and many marinas. The Tanger Outlet Center is located at exit 65.

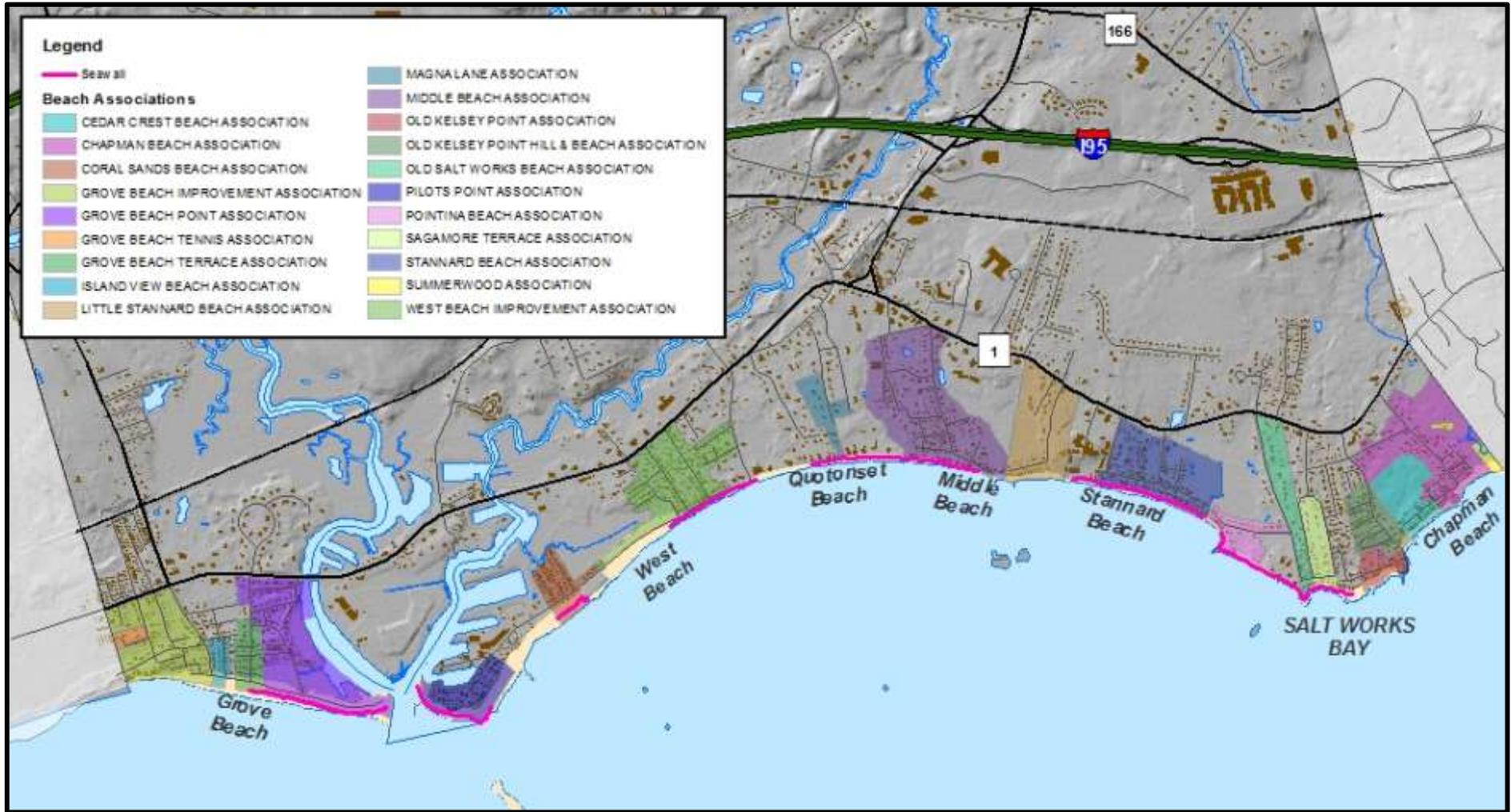
Preserved open space exceeds 19% of the total land area of Westbrook while about 33% of land in town is vacant. Open spaces serve many functions, including: recreation, drainage, natural habitats and natural communities, agriculture, or civic space. Open spaces often act as a buffer to mitigate the force of any given natural hazard. The Town supports dedication of open space to reduce areas at risk to loss of life or property damage from natural disaster.

Westbrook is relatively unique along the Connecticut coastline in that it has long continuous sections of beach. Approximately 95 percent of Westbrook's shoreline is comprised of beach (both sand and gravel) and dune. Along much of this length, the beaches and dunes are simultaneously classified as modified bluffs and escarpments, meaning that erosion control structures (revetments, bulkheads, or seawall) have been constructed behind the beaches, separating them from the adjacent uplands. This indicates that Westbrook's shoreline originally included long stretches of natural bluffs and escarpments. Approximately 14 percent of the shoreline is classified as "modified" beach, meaning that erosion control structures have been constructed within a beach system, often splitting the beach.

The modification of Westbrook's shoreline can be traced to its historical development, which was intimately tied to its very desirable natural beaches. Seasonal communities were built on or directly adjacent to the Town's wide and sandy beaches, resulting in the removal of coastal vegetation and leveling of dunes. Groins were constructed on some beaches, in efforts to protect against wave erosion and further loss of sand. However, in some cases, improper construction/placement of groins inhibited natural replenishment of sands and actually hastened beach erosion.

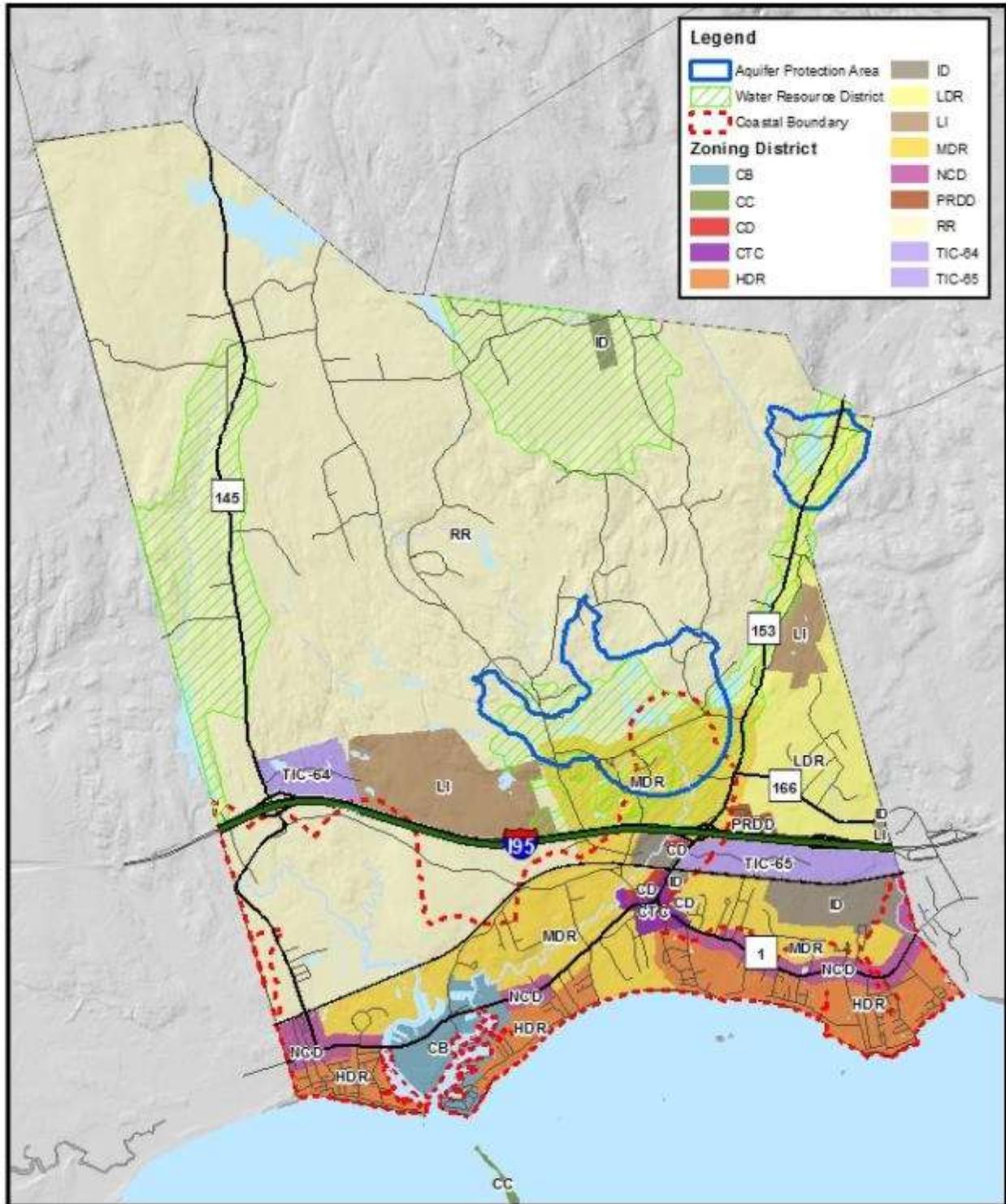
Beach sediments along Westbrook's shorefront are not very thick. The quality, depth, and width of beach sands or gravels are the result of the precarious balance between erosion and deposition by waves, wind, and longshore currents. Along Westbrook's shoreline, sand is generally transmitted from east to west, with the exception of the Chapman Beach area, where sands move west to east. Accordingly, the easterly sides of beaches tend to erode while the westerly sides (particularly adjacent to groins) tend to be replenished with sand. No beach or other shore feature can be considered strictly erosional, stable, or building, but rather, should be viewed as continuously changing.

The majority of beachfront property falls under individual private ownership, with a relatively small amount owned by private beach associations and the Town. The major beaches within Westbrook, from a geological perspective, from west to east, are the following: Grove Beach West Beach, Quotonset Beach, Middle Beach, Stannard Beach, Salt Works Bay/Long Rock Beaches, and Chapman Beach.



Map 2: **Beach Associations** along Westbrook Shoreline.

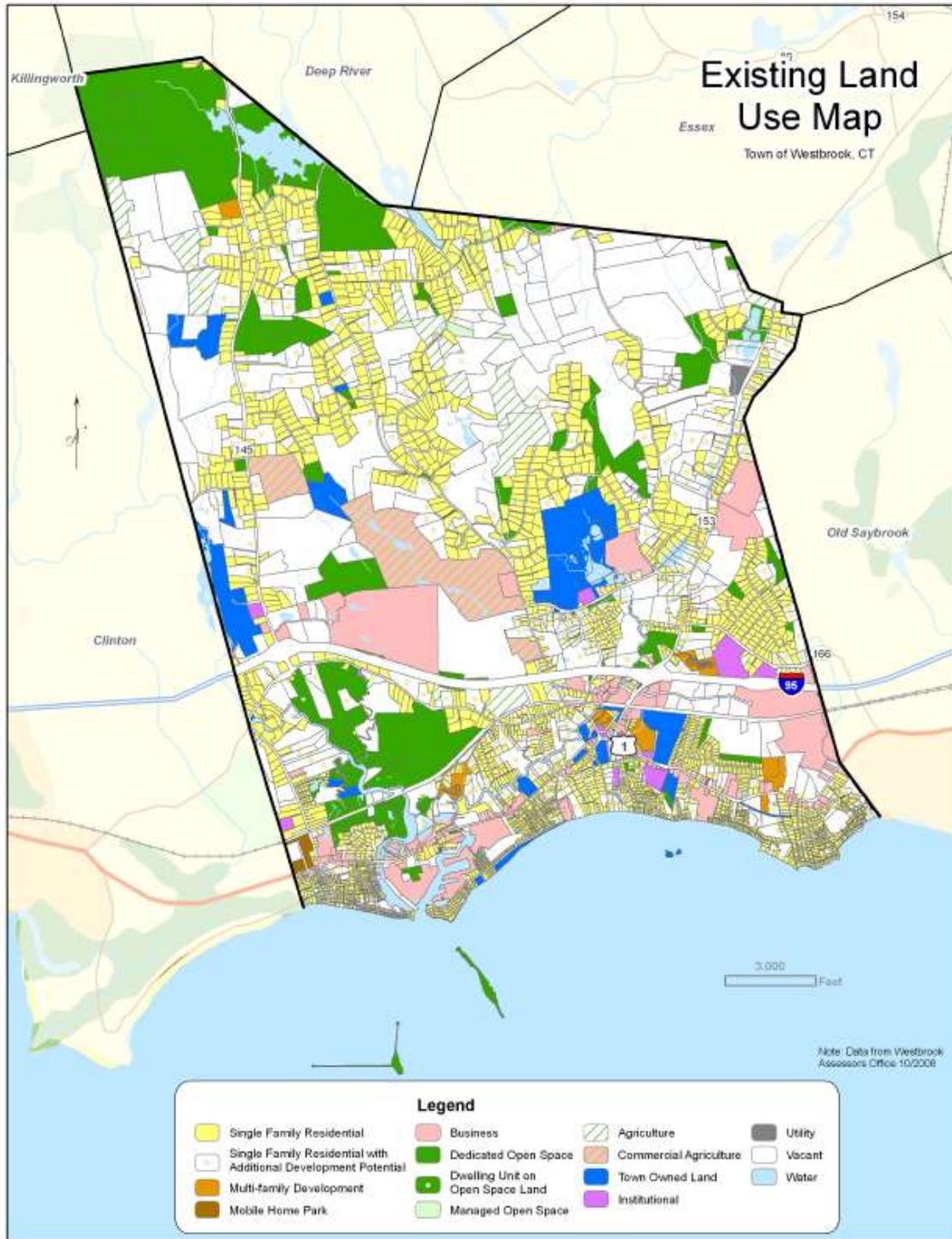
Source: Westbrook GIS



Map 3: Zoning Districts

This map depicts the Westbrook's Zoning Districts including the Coastal Boundary, Aquifer Protection Areas, and Water Resource District which are subject to more stringent requirements than the underlying zones.

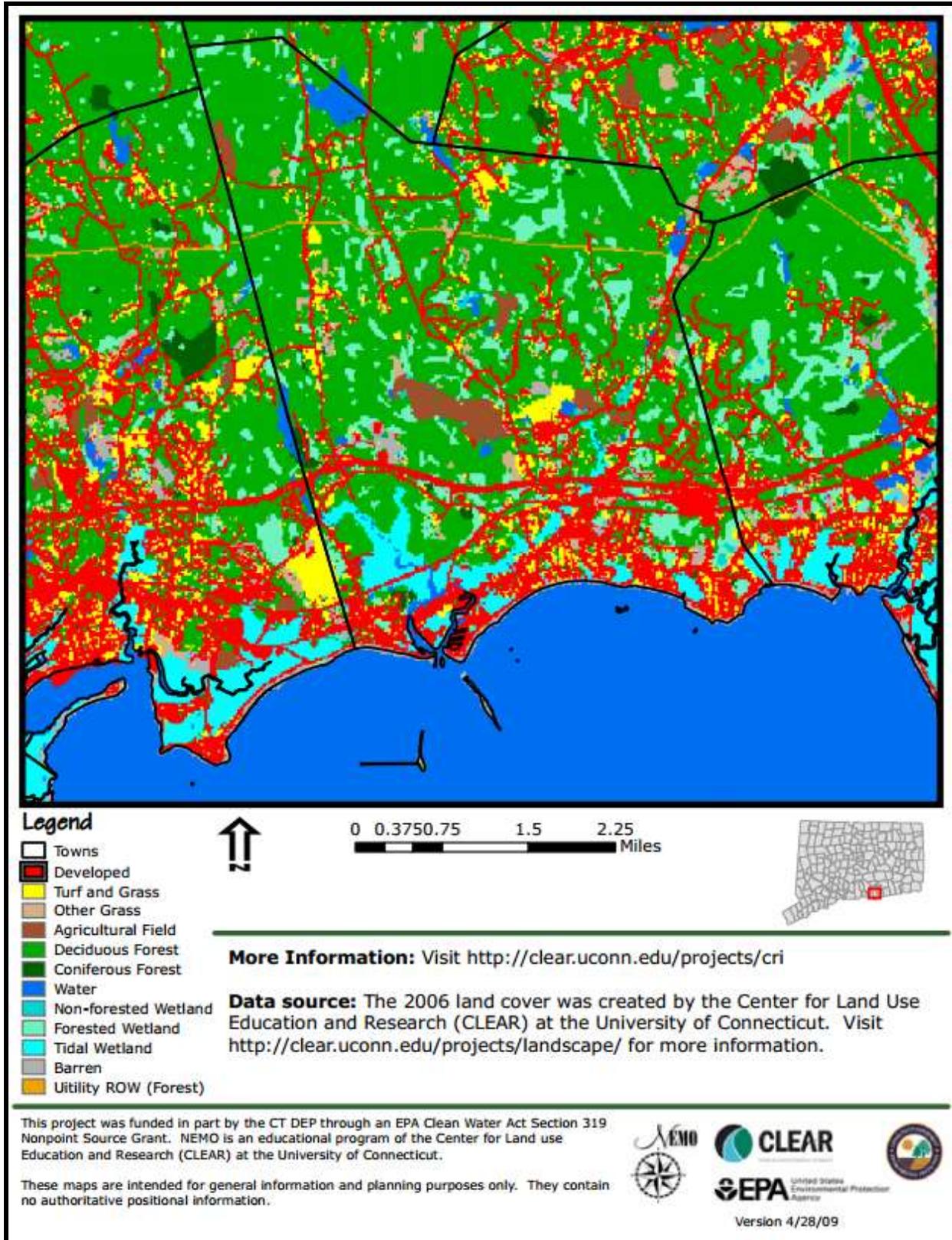
Source: Westbrook GIS



Map 4: **General Land Use**

This map depicts generalized land use categories based upon the Westbrook Assessors Land Use Codes. Each category represents the predominant land use or mix of uses in the area but may also include small sites of other land use classes. Vacant land is privately owned undeveloped land.

Source: Westbrook 2011 Plan of Conservation and Development



Map 5: Westbrook Land Cover

Source: CLEAR

2. Demographics & Critical Facilities

The 2010 Census reported a town population of approximately 6,963 people which represents a 10.3% increase from 2000. This compares to the previous decade when the population grew by 16.2%. Stagnation of population growth allows the Town to focus on factors in natural hazard mitigation's affects on population, such as its distribution and make-up.

20.3% of Westbrook's 2010 population was over age 65 which is more than the statewide average of 14%. The block-level data indicates that the majority of the over-65 population (67.7%) lives in areas south of I-95, much of which is flood-prone and subject to high winds from hurricanes. Age-related dispositions and disabilities are a specific factor for the Town to take into account in mitigating against natural hazards.

According to the 2000 census, **29.5% of the total population has disabilities**. According to the Westbrook Visiting Nurses Association and Westbrook Emergency Management Director, the Town has 90 residents who comprise of medically dependent, mobile restrictions and other unclassified ailments

544 or 8% of Westbrook's 2010 population was characterized as non-English speaking. The largest percentage, 6%, speaks Indo-European languages, the languages of Europe and southwest Asia excluding English. Next most common was Spanish or Creole spoken by 2% of the population. Such a small population with a lack of concentration in one specific language makes it difficult to provide printed educational materials about the potential natural hazards in languages other than English or to be able to anticipate those languages for which the Town might provide translators at public meetings or at evacuation centers during natural disasters.

The 2010 U.S. Census reported a total of 3,937 residential structures. Of the residential structures, 2,948 are "owner-occupied" leaving 766 renter occupied structures that may or may not have tenants during all or portions of the year. The census indicated a total of 989 unoccupied structures, of which 814 were seasonal structures. Tenants may be omitted inadvertently from ongoing education about natural hazards or may be difficult to contact through typical Town resources to warn of pending natural events.

In Westbrook, structures or facilities that produce, use, or store highly volatile, flammable, explosive, toxic or water-reactive materials exist primarily in the industrial districts and along Route 1 and at Exits 64 and 65 on Interstate 95. These areas are mostly outside of the 100-year floodplain.

There are no hospitals in Westbrook at present, but a medical emergency center associated with Middlesex Hospital exists on Flat Rock Place adjacent to Interstate 95 outside of the 100-year flood zone. This facility is likely to contain occupants who may not be sufficiently mobile to avoid death or injury during a natural disaster; however, there are no long term hospital beds.

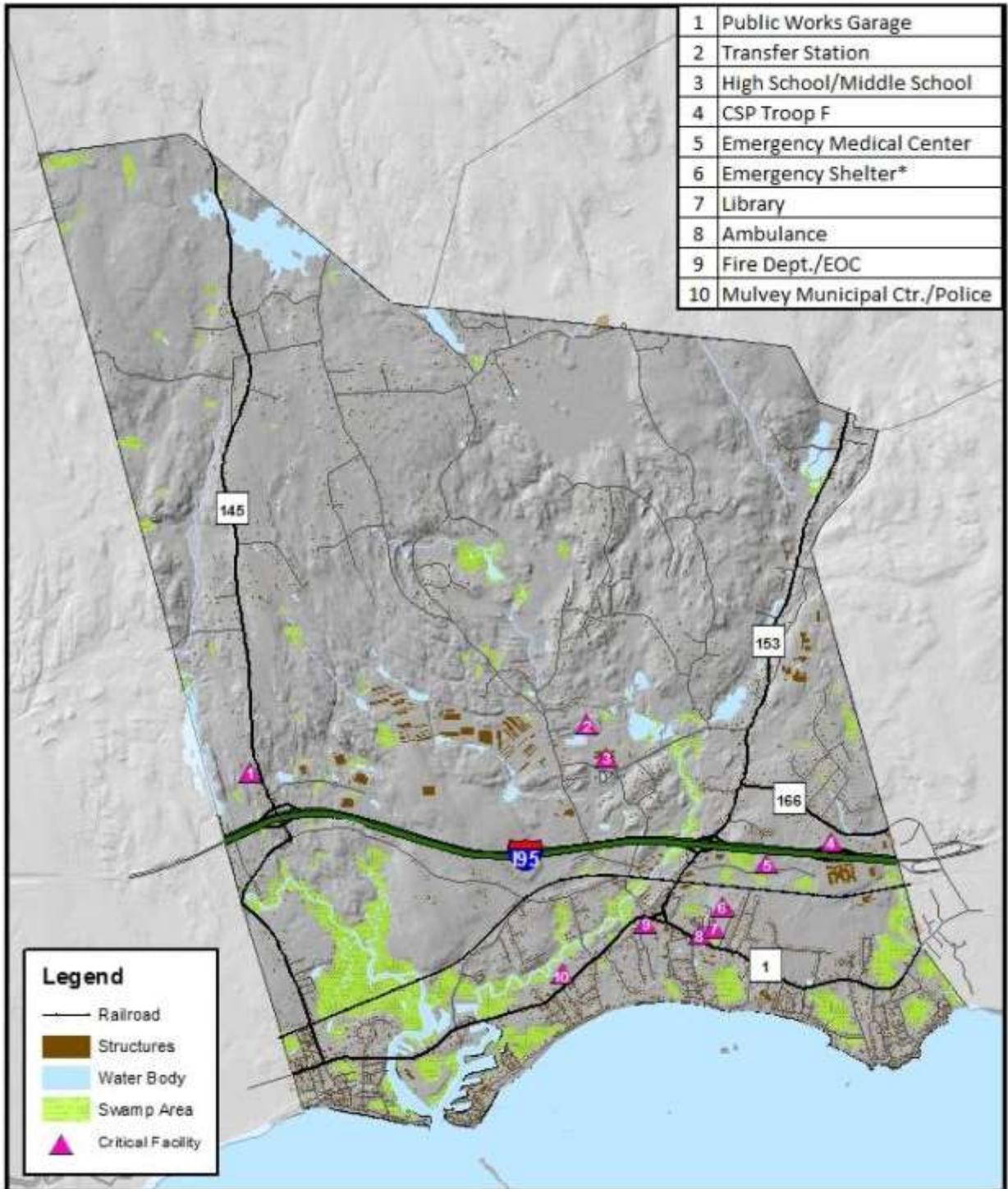
The Town's police station and town hall facilities are located adjacent to the upper Patchogue River and could be subject to extreme flooding events. The Westbrook fire station 2 and the public works vehicle and equipment storage facility are located north of I-95 on Horse Hill Road (Route 145) outside of flood zones. The Westbrook emergency operations center is located adjacent to the Westbrook Fire Department on South Main Street. Westbrook uses many of its public buildings for minor natural hazard events, such as cooling centers during heat waves. The Town's principal shelter, as stated previously, is the Daisy Ingraham School, located at 105 Goodspeed Drive off of Route 1 east of the town center, which is outside special flood hazard areas, however, access could be restricted due to flooding of Rte. 1. The building is currently rated only up to Cat I.

Although the Westbrook High School is a larger facility and more centrally located within the town, it is not considered for a shelter because of flooding and limited generator capacity. With a recent upgrade of the generator, use of the High School as a shelter should be re-evaluated. conditions that present themselves on roads leading to the high school during large flooding events. The shelter is limited but can accommodate pets that are crated and leashed and is capable of providing food, a place to sleep and shower as well as charging of personal electronic devices. Like the Daisy Ingraham School, the building is currently only rated up to a Category 1 storm.

The Westbrook YMCA has been evaluated for potential use as an emergency shelter. The all masonry facility is located centrally within the town with easy access to all roads, major routes and I95. While the facility could be used as an immediate, life threatening shelter due to an imminent tornado and/or severe thunder or lightening storm, it would need considerable upgrades to be used for short or long-term overnight sheltering. There is currently no fixed generator and fuel storage on site to provide alternate power and there is no industrial kitchen facility. Cots and blankets would also need to be acquired and stored on site. The facility has and will continue to provide shower services after storms as needed. Further sheltering options in need of more study. The Daisy Ingraham School, the town's principal shelter, is currently only rated for storms Category 1 and below. If winds speeds of more than a Category 1 hurricane were expected (96 + mph), the town would be without a shelter. Furthermore, as the Westbrook population grows considerably during the summer months, more and larger shelters may be necessary in order to

house all of those seeking shelter during large storms. More analysis is needed to determine the best steps to take.

Public and private utility facilities, such as public water wells, electric transmission lines and telecommunication towers are vital to maintaining or restoring normal services to areas of town before, during, and after a natural disaster. There are three gas stations in Westbrook located along Route 1 and Route 153. One gas station is located immediately adjacent to Exit 65 off Interstate 95 and is easily accessible in the event of a natural disaster. Gas stations in Westbrook are not equipped with back-up generators, nor do they supply diesel fuel. After Tropical Storm Irene in 2011 and Hurricane Sandy in 2012, residents were forced to travel outside of town if they were in need of gasoline for cars and generators. There are five telecommunication towers in Westbrook. Additional investigation is warranted to determine if they are equipped with back-up generators.



Map 6: **Critical Facilities**

Critical Facilities include facilities necessary to support emergency response before, during and after natural hazard events; utility infrastructure to support businesses and people; and those facilities that house populations of individuals who must evacuate prior to predicted extreme storm events.

Source: Westbrook GIS

3. Economics & Cultural Resources

The primary business and industry sectors in Westbrook are as follows:

<u>2005 sector</u>	% of total	
	establishments	employment
services	33.9%	31.1%
trade	33.0%	27.8%
const. and mining	10.7%	3.5%
finance, ins. & real estate	4.9%	2.4%
manufacturing	4.5%	24.2%
government	4.9%	2.1%
transportation & utilities	3.6%	5.9%
agriculture	4.5%	3.0%
	100%	100%

Figure 2: **Economic Sectors in Westbrook**

Source: Connecticut Dept. of Economic and Community Development, 2010

As might be the case with many natural disasters and as was demonstrated during and after Tropical Storm Irene in 2011 and Hurricane Sandy in October 2012, the economic core of Westbrook is vulnerable to loss of electricity and communication services due to downed utility lines. These storms resulted in many closed businesses and week-long school closings (and subsequent extension of the school year). The potential for services, the largest business sector, to be shut down for an extended period will affect the economic viability of the town and a long lag time for damage assessment and insurance adjustments can hinder rebuilding activities.

After a far-reaching disaster with a prolonged recovery, the Town would be faced with reduced or delayed collection of taxes on land, improvements and personal property, which serves as the Town's revenue base, yet the Town would expend a maximum output of a fixed annual budget to restore infrastructure.

Residential uses collectively provide the majority of tax receipts in Westbrook. However, the highest density of residential use lies within the beach communities located within special flood hazard area. Thus, damage from a major coastal storm could result in a reduction in the assessed value of any building so damaged as to be removed; damaged buildings would realize a tax adjustment in the subsequent year and the Town's grand list could decrease in value.



Figure 3: **Properties in Westbrook, CT with estimated appraised values**, summarized per square foot with red showing values from \$200 up to \$500, yellow to orange \$100 to \$200, and greens less than \$100.

Source: UCONN Ext. Service, J. Stocker

Open space land, while not a significant generator of tax revenue, may serve as a buffer to reduce storm effects, thus protecting the value of nearby developed land. Preservation of vacant land that also serves this function is encouraged.

4. **Environment and Ecological Resources**

Westbrook is endowed with many ecological and environmental assets. Beaches, dunes, tidal and inland wetlands and large tracts of uninterrupted forest are examples of some of the Town's valuable natural resources. The CT DEEP has created a statewide map of "Critical Habitats" that highlight ecologically significant areas and areas of species diversity (see Map 5). In Westbrook, shoreline critical habitat sites periodically suffer damage from flooding, high winds and waves associated with coastal storms.

Of great concern is the impact from sea level rise. These critical habitat sites initially will have to deal with increased frequency and magnitude of flooding events but eventually may become permanently flooded – assuming that the rate of sea-level rise exceeds naturally occurring rates of accretion. Of greatest concern in Westbrook is the potential loss of the extensive intertidal marsh habitats and the limited amount of sand dunes fronting Long Island Sound. Marshes provide breeding areas for a wide variety of terrestrial and aquatic organisms and are important visual components that add to the character of the town. The two largest intertidal marsh systems are located throughout the Patchogue and Menunketesuck River basins in the areas between Long Island Sound and Interstate 95. Given the elevation changes as one moves north from the coast, the marsh systems transition from true salt marshes at the mouths

of the rivers to more brackish tidal marsh environments in the area where they pass north of Route 1. These intertidal marshes support very different plant and animal communities. These sites are all located within the 100-year floodplain, are well adapted to diurnal tidal flooding, and can tolerate periodic longer term flooding associated with storm events. Those plant ecologies are not capable of surviving permanent flooding and would “drown” from sea level rise or be forced to migrate up-grade. However, in places where there are steep slopes, rocky outcrops, or other barriers along the wetland edges, the tidal wetlands may simply die off.

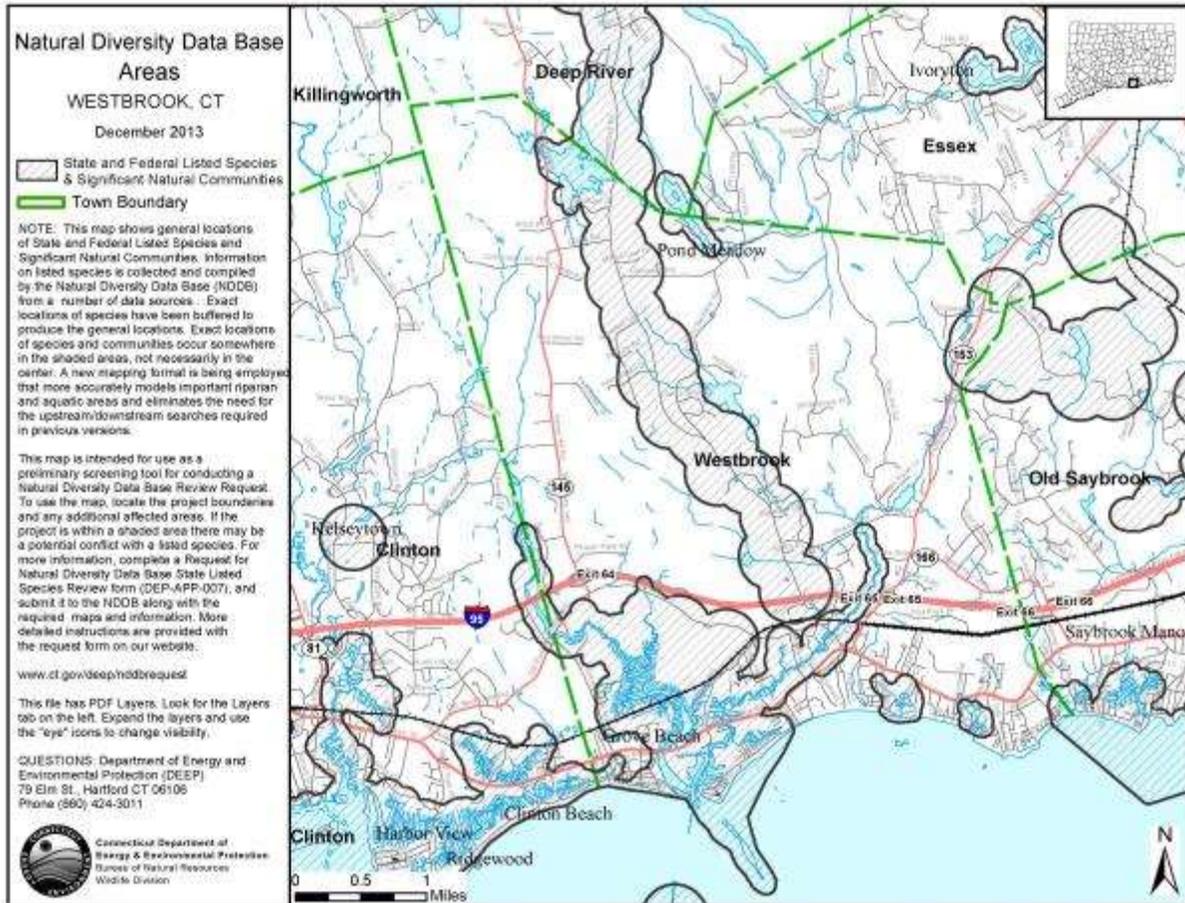
Similarly, the extent of the built environment surrounding Westbrook’s tidal marshes will prevent them from migrating upland in response to sea level rise. This is unfortunate for the built areas, as well, because the buffering effect tidal wetlands provide from storm surges, wave action and flooding will be lost. Engineered responses to natural hazards, such as sea walls, groins, etc., that “harden” the shoreline need to be further studied. The effects can be more or less desirable depending on the surrounding environment. These types of structures cannot be built as isolated structures, but rather part of a larger system of structures to protect an entire neighborhood.



Photo 2: **Area of residences and marina** at Brewers Point in the Westbrook Coastal Area.
Source: JH Torrance Downes

Photo 3: **Aerial View of Brewers Point** and the end of the Patchogue and Menunketesuck Rivers. Also visible is the large marsh up-stream that is part of the Stewart B. McKinney Wildlife Refuge.
Source: Google Earth, 2013





Map 7: Natural Diversity Data Base

Critical Habitats represent significant natural community types occurring in CT. These habitats are known to host a number of rare species including highly specialized invertebrates with very specific habitat associations. Critical Habitats also can be used to highlight ecologically significant areas and to target areas of species diversity.

Source: CTDEEP

B. Natural Hazards (ELEMENT B)

Westbrook is at risk from a variety of natural hazards, each occurring with different frequency, probability, and intensity of impact.

Effects & Impacts	Natural Hazard Type							
	<i>Hurricane and Tropical Storm</i>	<i>Summer Storm</i>	<i>Winter Storm</i>	<i>High Wind and Tornado</i>	<i>Earthquake</i>	<i>Wildfire</i>	<i>Drought</i>	<i>Tsunami</i>
Coastal Erosion (CE)	X	X	X					X
Building Damage (BD)	X	X	X	X	X	X		X
Downed trees & branches (DT)	X	X	X	X				X
Flooding – Coastal (FC)	X	X	X					X
Flooding – Dam Failure (FD)	X	X	X		X			
Flooding – Inland (FI)	X	X	X					
Flooding – Sea Level Rise (FSLR)	X	X	X					
Flooding – Storm Surge (FSS)	X	X	X					
Fire (F)		X			X	X	X	
High Wind (HW)	X	X	X	X				
Hail (H)		X						
Ice (I)			X					
Lightening (L)	X	X				X		
Power Failure (PF)	X	X	X	X	X	X		X
Infrastructure Damage (ID)	X	X	X	X	X	X		X
Snow (S)			X					
Water Rationing (WR)							X	

Figure 4: **Natural Hazard Effects & Impacts**

Natural Hazard Type	geographic scope 1 – localized 2 – large area 3 – townwide	frequency 0 – extremely rare 1 – infrequent (< ten years) 2 – occasional (< annual) 3 – often (> annual)	damage magnitude 1 – low 2 – medium 3 – high
<i>Hurricane and Tropical Storm</i>	3	2	3
<i>Summer Storm</i>	1-3	3	2
<i>Winter Storm</i>	3	3	2
<i>High Wind and Tornado</i>	2	1	2-3
<i>Earthquake</i>	3	0	2-3
<i>Wildfire</i>	1	0-1	1
<i>Drought</i>	3	0-1	1
<i>Tsunami</i>	2	0	3
<i>Flood</i>	2	3	3

Figure 5: **Natural Hazard Scope, Frequency & Magnitude**

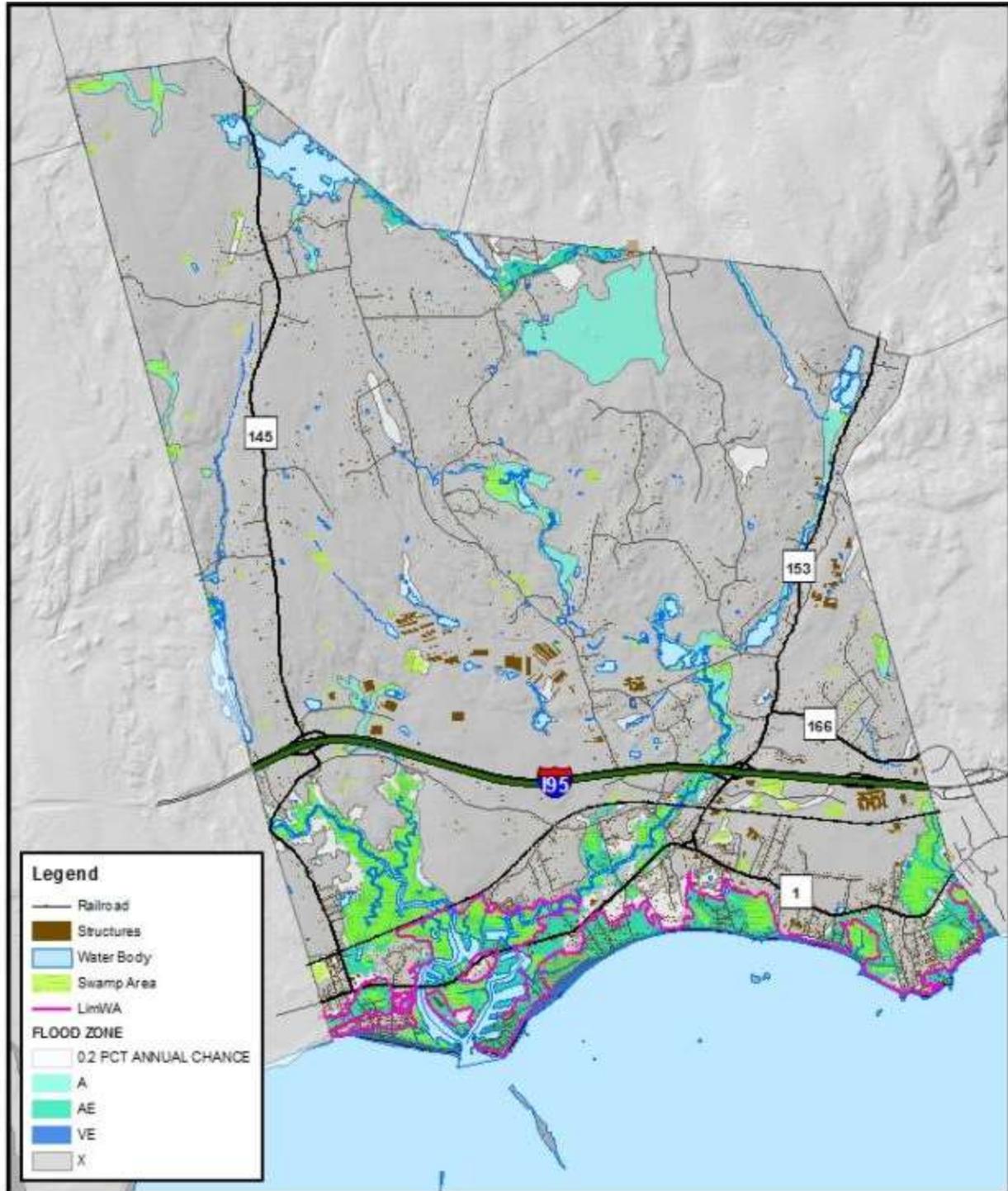
Natural hazard events can affect different parts of Westbrook, can range in occurrence from rare to often, and can cause varying degrees of damage. Figure 4 summarizes these differences among the types of natural hazards. The potential for each hazard event to occur in Westbrook is identified as being either not likely, likely, or very likely in. These labels are based on the Frequency defined in Figure 5 and relate as follows: **not likely**, 0, 1; **likely**, 2; and **very likely**, 3.

Westbrook, CT

Natural Hazards affecting the Lower Connecticut River Valley Region including Killingworth		
DATE	NAME / TYPE	IMPACTS*
March 1936	Flood of 1936	FI
September 1938	Great New England Hurricane (Cat. 1)	CE, BD, DT, FC, FI, FS,HW, PF, ID
September 1944	Great Atlantic Hurricane (Cat. 1)	CE, BD, DT, FC, FI, FS,HW, PF, ID
August 30, 1954	Hurricane Carol (Cat. 2)	CE, BD, DT, FC, FI, FS,HW, PF, ID
September 1960	Hurricane Donna (Cat. 1)	CE, BD, DT, FC, FI, FS,HW, PF, ID
March 2-5, 1960	snowstorm	S
February 2-5, 1961	snowstorm	S
January 1978	winter rainstorm	FI
February 1978	Blizzard of '78	BD, DT, HW, PF, ID
June 1982	rainstorm	FI
September 1985	Hurricane Gloria (Cat. 1)	CE, BD, DT, FC, FI, FS,HW, PF, ID
August 1991	Hurricane Bob (Cat. 1)	CE, BD, DT, FC, FI, FS,HW, PF, ID
October 1991	Hurricane Grace "The Perfect Storm"	CE, BD, DT, FC, FI, FS,HW, PF, ID
December 1992	nor'easter	S, HW, FC, FSS
March 12-14, 1993	snowstorm	S
January 6-8, 1996	snowstorm	S
July 1996	remnants of Hurricane Bertha (tropical storm)	CE, BD, DT, FC, FI, FS,HW, PF, ID
February 15-18, 2003	snowstorm	S
October 2005	remnants of Hurricane Tammy	CE, BD, DT, FC, FI, FS,HW, PF, ID
April 2007	nor'easter	HW, FC, FI
February 2011	Winter Storm Ella "Groundhog Day Blizzard"	S, HW
February 7, 2011	winter rainstorm	HW, FC, FI
August 2011	Tropical Storm Irene	CE, BD, DT, FC, FI, FS,HW, PF, ID
October 2011	Snowstorm Alfred	DT, PF, ID, S
October 2012	Hurricane Sandy (Cat.1)	CE, BD, DT, FC, FI, FS,HW, PF, ID
February 2013	Blizzard	S, HW, PF

Figure 6: Natural Hazards Affecting the Lower Connecticut River Valley Region
 A chronological summary of various types of natural hazards that have caused significant damages in Westbrook and the surrounding region. The IMPACTS column summarizes the categories of damages (see Figure 4) from each storm.

Coastal Erosion (CE)	Flooding – Coastal (FC)	Flooding – Sea Level Rise (FSLR)
Building Damage (BD)	Flooding – Dam Failure (FD)	Flooding – Storm Surge (FSS)
Downed trees & branches (DT)	Flooding – Inland (FI)	Fire (F)
High Wind (HW)	Hail (H)	Ice (I)
Lightening (L)	Power Failure (PF)	Infrastructure Damage (ID)
Snow (S)		Water Rationing (WR)



Map 8: Special Flood Hazard Areas

This map displays the Flood Zones as designated by FEMA on the Flood Insurance Rate Maps for the Town of Westbrook (Panels 310, 328, 329, 333, 337, 338, 339, 341, 343). Zones A, AE and VE are considered Special Flood Hazard Areas with a 1% chance of flooding in any given year. Areas designated as Zone X are outside of the Flood Zone. The Limit of Moderate Wave Action (LimWA) is the area within the AE Zone with projected wave heights between 1.5 feet and 3.0 feet.

Source: Westbrook GIS/FEMA

1. **Flooding**

A flood, as defined by the National Flood Insurance Program, is a general and temporary condition of partial or complete inundation of two or more acres of normally dry land area or of two or more properties from overflow of inland or tidal waters; unusual and rapid accumulation or runoff of surface waters from any source; or mudflow. A flood can also be a collapse or subsidence of land along the shore of a lake or similar body of water because of erosion or undermining caused by waves or currents of water exceeding anticipated cyclical levels that result in a flood as defined above.

In Westbrook flooding is the most significant recurring natural hazard. It can be broken into three general categories: 1) inland flooding along streams and low lying areas; 2) coastal flooding of areas along Long Island Sound and the Patchogue River; and 3) nuisance flooding primarily in coastal areas at low elevation. Inland flooding can be caused by any weather event with significant amounts of rain over a short time span. Coastal flooding typically occurs with hurricanes, tropical storms and nor'easters where low pressure and strong winds create storm surges that when coupled with rising tides can push sea water far inland. Nuisance flooding in low lying coastal areas is caused by extreme astronomical high tides, which can flood yards, basements, septic systems, storm water drainage systems and roads.

a. **Geographic Extent (B.1)**

FEMA provides Flood Insurance Rate Maps (FIRMs) that delineate areas in Westbrook vulnerable to 100-year and 500-year flood events. 100-year floods have a 1% chance of occurring in any given year; 500-year floods a 0.2% chance. Map 7 shows the FEMA special flood hazard area that officially was adopted by the Town in 2008. The majority of the 100-year flood zone lies to the south of US Route 95 with a small area along both the Menunketesuck and Patchogue Rivers north of Route 95. The 100-year flood zone is most susceptible to coastal flooding. Residents and businesses within these flood zones and directly adjacent to them are most susceptible to flooding.

There are two floodways in Westbrook; one along the Menunketesuck River and one along the Patchogue River north of Route 1.

b. **Occurrences (B.2 & B.4)**

For a list of notable occurrences of this natural hazard, see Figure 6 – Natural Hazards affecting the Lower Connecticut River Valley region.

Figure 7 below shows major flood events in the RiverCOG region since 1936.

Westbrook, CT

Month	Year	Event
March	1936	Heavy Rain and melting snow caused major flooding throughout the Northeast and Middle Atlantic states
September	1938	Widespread 10 inch rainfall caused by a hurricane resulted in major flooding throughout the Connecticut River valley
August	1955	Hurricanes Connie and Diane came a week apart to batter most of New England with the most significant flooding recorded at many locations
March	1968	Heavy rain combined with snowmelt caused small river flooding in southeast New England
June	1972	Up to 16 inches of rainfall resulted in major flooding throughout Connecticut
June	1982	Heavy rains combined with snowmelt resulted in major flooding throughout New England
March	1987	Heavy rains combined with snowmelt resulted in major flooding throughout New England
March	2010	Heavy rainfall caused heavy localized flooding along smaller streams.
August	2011	Heavy Rainfall and Storm Surge caused by Tropical Storm Irene caused severe flooding in coastal areas.
October	2012	Heavy Rainfall and Storm Surge caused by Tropical Storm Sandy caused severe flooding in coastal.

Figure 7: **Major Flood Events** in RiverCOG region since 1936.

Source: NOAA

c. Probability of Occurring Again (B.2)

Floods are a *very likely* hazard in Westbrook. High-intensity localized storms can cause flooding of the relatively short coastal and upland watercourses and tropical storms, hurricanes and nor'easters can cause significant coastal flooding.

d. Potential Impacts (B.1, B.3 & B.4)

The impacts from flooding can range from localized nuisance flooding to much more widespread coastal flooding affecting entire neighborhoods or sections of the town. Approximately 971 properties with improvements valued at \$175,450,530 are located within a Special Flood Hazard Area.

Similar to nearby communities along Long Island Sound, the densest residential development in Westbrook is located in the beach communities directly adjacent to Long Island Sound. Flood damage can be considerable when floods affect densely developed areas. Such areas in Westbrook are located south of Route 1. Much of this development occurred in the early 20th century at a time when there were no standards for construction within areas subject to flood hazards. Some of the densest and most flood prone areas are located in the Chapman Beach, Westbrook Town Beach (Seaside Avenue) to the east of the river mouths,

and the Old Mail Trail and Grove Beach neighborhoods to the west of the river mouths. Properties along Old Mail Trail and Grove Beach, in particular, are prone to storm surge and wave damage with other areas including Seaside Avenue and other areas on tidal marshes prone to storm surge.

There are a number of roads that are subject to nuisance flooding as well as to more significant coastal flooding (See Map 8). These include portions of Old Mail Trail, Grove Beach Road S, Riverview Road, Menunketesuck Road, Elm Avenue, Dolphin Avenue, Striper Avenue, Tarpon Avenue, Seaside Avenue, Salt Island Road, Pepperidge Avenue, Stokes Avenue, Gerard Avenue, Little Stannard Beach Road, Second Avenue, Old Kelsey Point Road, and Chapman Road.

North of Route 1 residential land uses are less dense, with few structures actually within the Special Flood Hazard Area. There are several roads that have experienced flooding including: Hammock Road, Doc's Hill Road, Old Clinton Road, McVeagh Road, Toby Hill Road, Meetinghouse Lane, Pond Meadow Road, E. Pond Meadow Road, and Winthrop Road.

Commercial development within the flood hazard area overall is light, although there are concentrations of marine trades along the lower Menunketesuck and Patchogue Rivers.

A HAZUS MH Flood Event Report was run using a 100 year return period. This report estimates total and partial losses within the town of Westbrook based on the return period. It is estimated that a flood of this magnitude would result in damage to many homes and businesses throughout town. For the full report, see Appendix VI: HAZUS-MH Flood Event Report.

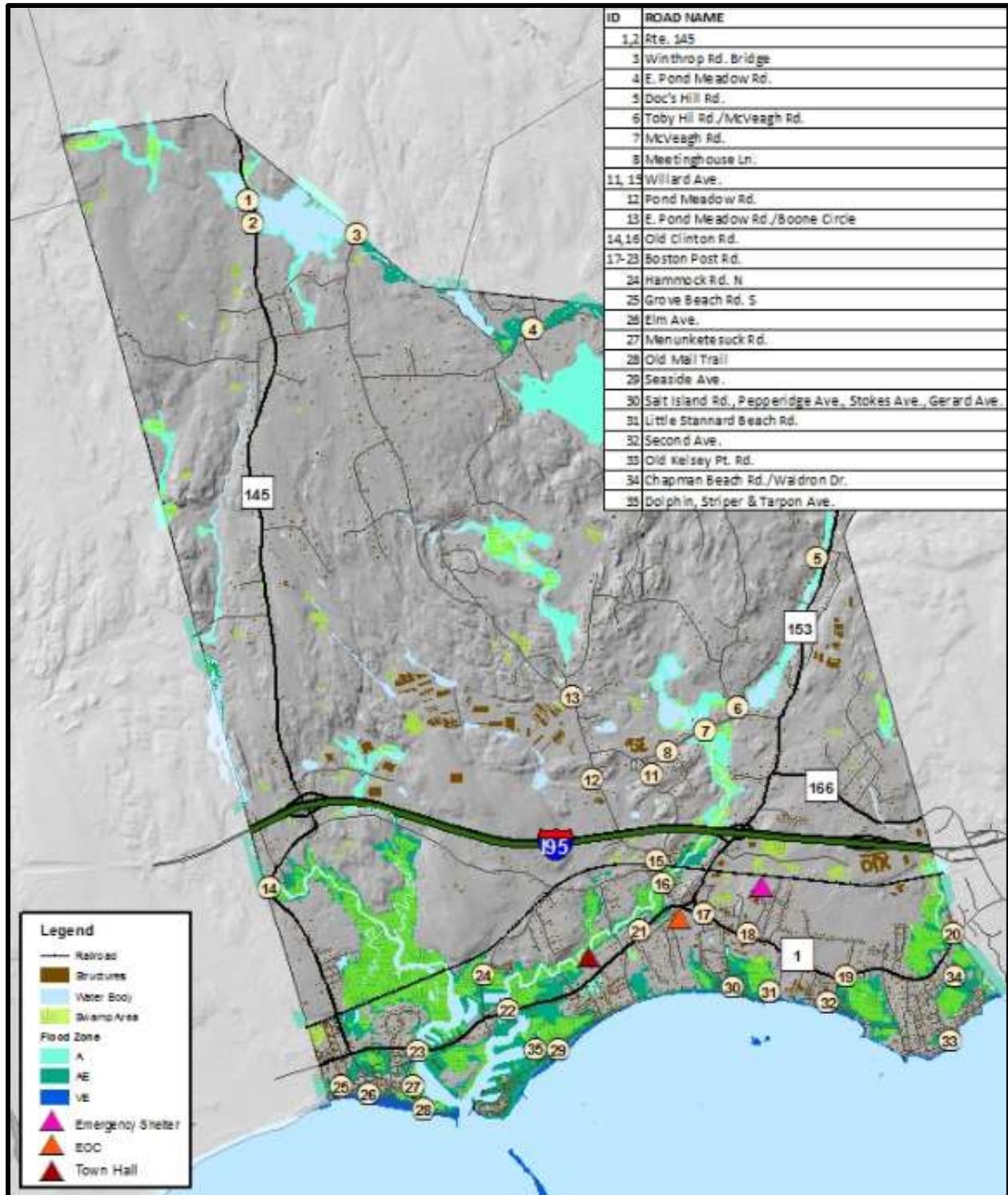
It's important to note that the HAZUS reports contained in this NHMP Update are based on 2000 Census Data and may not reflect the most current conditions; however, they provide a good base for mitigation actions.

Occupancy	Percent of Value Damage To Structure											
	1-10%		11-20%		21-30%		31-40%		41-50%		> 50%	
	#	(%)	#	(%)	#	(%)	#	(%)	#	(%)	#	(%)
Agriculture	0	0	0	0	0	0	0	0	0	0	0	0
Commercial	0	0	0	0	2	100	0	0	0	0	0	0
Education	0	0	0	0	0	0	0	0	0	0	0	0
Government	0	0	2	100	0	0	0	0	0	0	0	0
Industrial	0	0	0	0	0	0	0	0	0	0	0	0
Religion	0	0	2	100	0	0	0	0	0	0	0	0
Residential	0	0	40	2.54	374	23.75	466	29.59	589	37.4	106	6.73
Total	0		44		376		466		589		106	

Figure 8: **Expected Building Loss by Occupancy**

This table depicts the estimated building damage as a result of a 100 year flood.

Source: HAZUS-MH



Map 9: Westbrook Flood Problem Areas

This map depicts areas that are prone to nuisance and storm flooding throughout town. Also shows are the Town Hall, Daisy Ingraham School Emergency Shelter and the Emergency Operations Center.

Source: Westbrook GIS/FEMA

e. **Authorities, Policies, Programs and Resources (C.1 & C.2)**

The Town of Westbrook has participated in the National Flood Insurance Program (NFIP) since December 1982. A requirement of the program is the adoption of minimum floodplain regulations and Flood Insurance Rate Maps (FIRMs). When either the minimum regulations or mapping are updated, the town must also update its regulations in order to stay in the program. Mapping was most recently updated in Feb. 2013 based on a new Flood Insurance Study (FIS) for Middlesex County that includes updated factors on still water elevations, wave height analysis, wave breaking data, wave overtopping data, erosion, shoreline protection structures and development. FIRMs depict the limits of the floodwaters as special flood hazard areas within which “zones” establish the base flood elevation and, therefore, risk for flooding and flood-related damages. Westbrook is committed to continuing NFIP compliance and participation into the future.

The floodplain regulations contained in Section 5 of the Zoning Regulations include standards and criteria for construction within the Flood Plain Management Area. Below is a summary of the main requirements of the regulations:

- Construction prior to 1982 is considered “*pre-FIRM*”. Any construction after 1982 is considered “*post-FIRM*”. Repairs or additions on *post-FIRM* structures are considered new construction and must meet at least the NFIP requirements that were in effect when the building was originally constructed.
- *Substantial Improvement* – When improvements to a structure (over a period of 5 yrs.) exceed 50% of the value of the existing structure, the entire structure must be brought up to code. Applies to both *pre-* and *post-FIRM* structures.
- *Substantial Damage* – When the cost of repairs to a structure after an event exceeds 50% of the value of the existing structure, the entire structure must be brought up to code. Applies to both *pre-* and *post-FIRM* structures.
- All habitable areas shall be elevated above *Base Flood Elevation*.
- No basements are allowed in Flood Zones. Exceptions: Walk-out basements with flood vents, crawl spaces (max. 4’ in ht.) with flood vents. Areas below *Base Flood Elevation* must be constructed with flood resistant materials and can only be used for storage.
- No mechanical equipment is allowed below Base Flood Elevation
- Structures in the V Zone must have pile foundations and break-away walls below Base Flood Elevation. No structural fill allowed.

The Town has adopted the following measures that exceed NFIP requirements:

- 5 yr. cumulative substantial improvement and damage threshold (CSI)
- 1' freeboard for commercial structures
- Requirement that new and replacement mobile homes be properly elevated and anchored (MHP)
- Compensatory Storage (PSC)

In addition, the Zoning and Subdivision Regulations contain provisions in other sections that:

- 1) Require new developments to provide retention or detention of their stormwater runoff to minimize the increase in flood flows due to watershed urbanization (Section 11.70.00 Stormwater Management Regulations).
- 2) Require developers to implement appropriate "best management practices" that will improve the quality of stormwater runoff (Section 11.70.00 Stormwater Management Regulations)
- 3) Require erosions and sedimentation control during construction projects to reduce siltation and the resulting loss of channel carrying capacity (Section 11.40.00 Soil Erosion and Sediment Control Regulations)

Under the Coastal Site Plan Review process, new shoreline flood and erosion control structures can only be approved "*if the record demonstrates and the commission makes specific written findings that such structure is necessary and unavoidable for the protection of infrastructural facilities, cemetery or burial grounds, water-dependent uses fundamental to habitability or primary use of such property or inhabited structures or structure additions constructed as of January 1, 1995, that there is no feasible, less environmentally damaging alternative and that all reasonable mitigation measures and techniques are implemented to minimize adverse environmental impacts*" CGS 22a-109.

The Inland Wetland and Watercourses Regulations effectively prohibit dumping or placing of debris in stream channels

The Town of Westbrook has adopted the CT Building Code. Currently, the CT Building Code has adopted the 2009 International Residential Code and the 2003 International Building Code. Chapter 3, Building Planning, Sections R301 and R322 of the 2009 International Residential Code, addresses flood-resistant construction for residential structures. Chapters 14 & 16 of the 2003 International Building Code address the same for commercial structures.

For construction within the special flood hazard areas, the Zoning Enforcement Officer, Building Official and Town Engineer review and issue a flood permit and conduct follow-up inspections to confirm

compliance with the permit. FEMA Flood Elevation Certificates are required at the time of application and upon completion. The Certificates are kept on file in the Land Use Office.

The NFIP collects data on repetitive losses in special flood hazard areas. Repetitive loss properties (RLP) are those with insurance claims for multiple events. The number of RLP properties has increased significantly since 2006 from 7 properties to 80 properties. This is primarily due to the back to back storms experienced in 2011 and 2012 (Irene & Sandy). All eighty properties are located south of Route 1. All but three of these properties are single family residential properties. 2 are multi-family residential properties while one is considered an “other residential” property. None of the properties have been mitigated.



Photo 4: **Flooding near Westbrook Beach** in January 2011
Source: WTNH

f. **Mitigation Specific to this Hazard (C.2)**

See Appendix III MITIGATION (Figure 29) for the Comprehensive Mitigation Action Items (ELEMENT C). The following are representative mitigation activities specific to this hazard:

Land Use Regulation. Maintain, and strengthen as appropriate, subdivision and zoning regulations to make safer new roads, lots and structures within flood zones. Consider increasing freeboard requirements.

Community Rating System. Continue to evaluate the benefits to the community of participating in the Community Rating System Program. Align current practices with program requirements in the event that the Town chooses to participate.

Public Utilities. Limit extension of public utilities that would encourage new development in areas vulnerable to natural hazards.

Stormwater Infrastructure Inventory – Complete mapping and monitoring of catch basins, stormwater outfalls and related infrastructure outside of MS4 area

Stormwater Infrastructure Maintenance – Provide for annual maintenance of stormwater infrastructure, including catch basins, detention basins and outfalls. DPW annually cleans catch basins.

Stormwater Management – Continue land use permitting that encourages stormwater retention within new and redeveloping areas (rain gardens, curb less roads, etc.).

Road Elevation – Evaluate roads to develop plans for improvement or elevation for emergency access and evacuation.

Road Standards. Update existing road standards to reflect current best management practices for low impact development and amend Subdivision Regulations accordingly.

Permit Tracking System. Upgrade existing system to enable collection of data regarding development activities in Flood Hazard Areas.

SFHA Structure Inventory. Conduct an inventory of the elevation of all homes (including basements and crawl spaces) in the special flood hazard area with relation to base flood elevation to assess the need for mitigation and develop program to address.

Shore Protection Systems. Conduct a study of existing shore protection systems along the entire Westbrook coast to analyze overall impacts and develop recommendations for mitigation including identification of opportunities for compensation for the hardening of one part of the shoreline by removing the equivalent extent of flood and erosion control structures from another part of the shoreline.

Certified Floodplain Manager. Have one or more staff members obtain CFM certification through the Association of State Flood Plain Managers (ASFPM).

2. Hurricane & Tropical Storm

A hurricane is an intense tropical cyclone often with torrential rain and strong thunderstorms and with a well-defined surface circulation and maximum sustained winds of 74 MPH (64 knots) or higher. A tropical storm is similar but with winds from 39 to 73 MPH (34-63 knots).

a. Geographic Extent (B.1)

Hurricanes and tropical storms will affect the entire town; however affects will vary depending on proximity to the shore. Strong winds and rain will affect the entire town while storm surges and coastal flooding will affect coastal areas. See Section 1 for a discussion of coastal flooding and FEMA's flood insurance rate maps that depict the 100-year flood zone and Section 2 for a discussion of high winds.

Map 10, Hurricane Surge Inundation with Storm Categories, depicts the extent of worst-case coastal flooding that could occur in Westbrook from category 1 through category 4 hurricanes.

b. Occurrences (B.2)

See Figure 6 for a summary of hurricanes that have affected Westbrook.

According to the article "List of New England hurricanes," from the on-line [Wikipedia: The Free Encyclopedia](#), since the infamous New England Hurricane in 1938, there have been over 50 hurricanes that have affected New England and 11 for which there is specific mention of damage in Connecticut.

Most recently Westbrook was hit by Hurricane Sandy and Tropical Storm Irene on October 29, 2012 and September 2, 2011, respectively, which caused significant coastal flooding, property damage, damage to homes and downed power lines.

c. Probability of Occurring Again (B.2)

As a coastal community, Westbrook is *highly likely* to experience hurricanes and tropical storms.

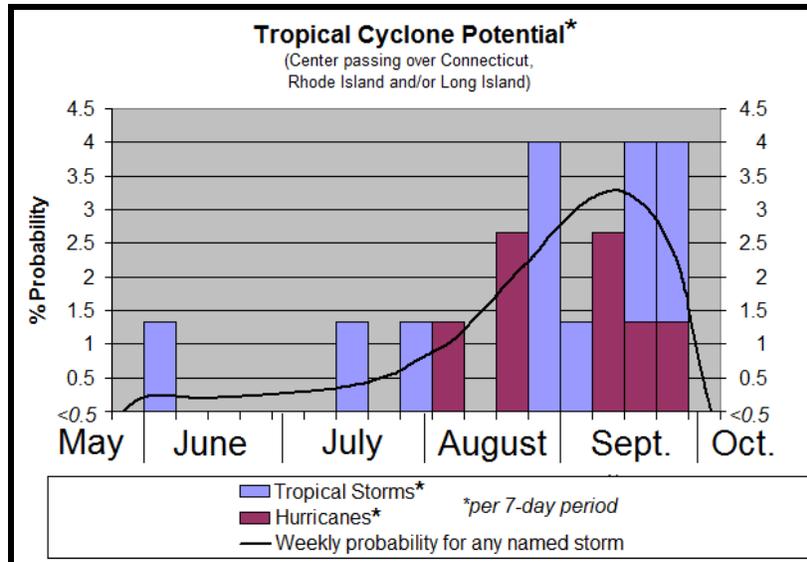


Figure 9: **Potential for Hurricane Occurrence**
 Source: *www.WXEdge.com*

d. **Potential Impacts (B.1, B.3)**

In the event of a hurricane or tropical storm, the primary risks in Westbrook are from high wind, storm surges and coastal flooding and inland flooding on small streams and rivers from heavy rain. See Sections 1 and 2 for a discussion of potential impacts.

Because of the frequency of hurricanes and their potential severity, they are the natural disaster likely to cause the greatest damage.



Photo 5 **Stannard Beach**
 before 1938 Hurricane
 Source: *Cathie Doane*

Photo 6 **After 1938 Hurricane**
 Source: *Westbrook Historical Society*



Category	Sustained Winds	Types of Damage Due to Hurricane Winds
1	74-95 mph 64-82 kt	Very dangerous winds will produce some damage: Well-constructed frame homes could have damage to roof, shingles, vinyl siding and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
2	96-110 mph 83-95 kt	Extremely dangerous winds will cause extensive damage: Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
3 (major)	111-129 mph 96-112 kt	Devastating damage will occur: Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.
4 (major)	130-156 mph 113-136 kt	Catastrophic damage will occur: Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
5 (major)	157 mph or higher 137 kt or higher	Catastrophic damage will occur: A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.

Figure 10: **Saffir Simpson Scale** and potential impacts.

A HAZUS – MH Hurricane Event Report was generated using a 100 Year Probabilistic Scenario. This report tallies the number of buildings and infrastructure segments that exist throughout town and estimates damage that would occur after the specified event. For the full report, see Appendix III: HAZUS-MH Hurricane Event Report.

Occupancy	No Damage	Minor Damage	Moderate Damage	Severe Damage	Destroyed
Agriculture	15	2	0	0	0
Commercial	184	22	6	1	0
Education	4	0	0	0	0
Government	5	1	0	0	0
Industrial	63	6	1	0	0
Religion	12	1	0	0	0
Residential	2,896	482	63	3	3
Total	3,180	515	71	4	4

Figure 11: **Estimated Building Damage** after a 100 Year Hurricane, by building use.
Source: HAZUS-MH Hurricane Event Report

e. **Authorities, Policies, Programs, and Resources (C.1)**

Section II.B.1, Flooding discusses policies regarding Flood Zone regulations.

In a 2014 amendment to the CT Building Code, the area south of I95 in Westbrook was newly designated as a wind-borne debris region. This designation requires that windows in residential buildings be impact resistant or protected with an impact-resistant covering such as shutters or wood structural panels (if mean roof height 33 feet or less). Window and door assemblies must be strong enough to withstand wind pressures acting on them and be fastened securely enough to transfer those wind pressures to the adjacent wall. The design wind speed for residential buildings was also changed from 110 miles per hour to 105 miles per hour. The design speed for commercial buildings is currently 115 mph. The Town Building Official enforces the Connecticut State Building Code.

In addition to enforcing building standards to better withstand the forces of wind and water associated with hurricanes and tropical storms, the most critical mitigation strategy is to have an evacuation plan in place. The Town of Westbrook Office of Emergency Management maintains an Emergency Operations Plan. The Emergency Operations Plan (EOP) was prepared in accordance with Section 28-7 of the Connecticut General Statutes following the guidelines provided in "SLG-101 Guide for All Hazard Emergency Operations Planning" (FEMA). The Plan is reviewed annually and updated at least every 4 years. The Plan contains protocols for Communication, Warning, Emergency Public Information, Evacuation and Shelter/Mass Care for all hazards.

There are currently no designated evacuation routes for hurricanes; however, evacuation signs are posted with water measurements and arrows pointing back to Route 1. The Town communicates with the public through the Emergency Management website, social media (Facebook and Twitter), a low power AM Radio Station and CT ALERT. The Town should explore the merits of establishing formal evacuation zones in the next update of the Emergency Operations Plan.

The primary shelter, Daisy Ingraham School, cannot be used pre-storm for hurricanes greater than Category 1. The Emergency Operations Plan (EOP) estimates that approx. 20% of the population at risk will require shelter with 80% seeking shelter with relatives and friends or in motels. The percentages of those who would require shelter was even higher (33% - 58%) in the Natural Hazard Mitigation Survey. The local YMCA has been evaluated for its potential to serve as an emergency shelter. Additional study is warranted to determine the cost of upgrades that would be necessary to make it a viable emergency shelter. With population increases during the summer months as seasonal homes along the shoreline fill up, it is possible that more sheltering capability is needed.

Another option would be to pursue agreements with other municipalities for shared facilities. More analysis is necessary in order to evaluate shelter needs and determine the best options for additional sheltering capabilities.

f. **Mitigation Specific to this Hazard (ELEMENT C)**

See Appendix III MITIGATION (Figure 29) for the Comprehensive Mitigation Action Items (ELEMENT C). The following are representative mitigation activities specific to this hazard:

Public Information. Provide information on the town's website about hurricane preparedness and links to town, regional, state and federal sites for information on reducing hurricane damage. Continue to use EM website and social media for broadcasting announcements.

Building Code. Insure that all new residential and commercial construction meets state building codes for high wind zones.

Boats. Identify places where people could store their boats during flooding and hurricane events that would reduce the damage to them and that they cause to the waterfront infrastructure when they break from moorings.

Immobile Evacuees. Review annually the program to evacuate persons without means of transport, including registration and house numbering.

Refuges of Last Resort. Identify refuges of last resort for those unable to reach designated shelter.

Emergency Shelter. Evaluate the feasibility of upgrading an existing facility or building a new facility for use as an emergency shelter that can withstand a Cat III hurricane. The current facility is only rated up to a Cat I hurricane.

Cooperative Agreements for Shelters. Establish agreements for shelters that can provide specialized services, throughout the region. Shelters with the capacity to provide for companion pets and medical equipment needs for individuals with disabilities are two examples of such specializations.



Map 10: Hurricane Surge Inundation

The Sea, Lake and Overland Surges from Hurricanes (SLOSH) Map is a computerized model run by the National Hurricane Center (NHC) to estimate storm surge heights and winds resulting from historical, hypothetical, or predicted hurricane by taking into account pressure, size, forward speed, track and winds. It does not, however, take into account rainfall or riverine flooding conditions or Sea Level Rise.

Source: CT DEEP



Map 11: Hurricane Inundation in the Town Center

Visible in Map 11 is the extensive territory a Category 1 Hurricane would cover with water. The Mulvey Municipal Center on Boston Post Road would be cut off from surrounding areas by a Category 3 Hurricane and inundated by a Category 4 Hurricane

3. **Sea Level Rise**

Projected increases in sea level associated with a warming global climate will lead to coastal inundation, causing greater flooding, erosion, and impacts from storm surges.

a. **Geographic Extent (B.1)**

Low lying coastal areas adjacent to Long Island Sound and the Menunketesuck and Patchogue Rivers will be affected. Areas at higher elevations or further inland will be affected during coastal flood events due to the cumulative effect of storm surge and sea level rise.

b. **Occurrences (B.2)**

Unlike the event-driven natural hazards discussed previously, sea level rise is a relatively slow-moving process – a slow-motion natural disaster.

Global sea level has been rising for more than ten thousand years, leading to the establishment and expansion of coastal salt marshes (e.g., Redfield and Rubin, 1962; Redfield, 1967, 1972; Lambeck, 1990). For most of the last 1000 years the rate of relative sea-level rise (RSLR) was between 1.3 and 1.8 [millimeters per year] mm/yr, but over the last 300-400 years it increased to 2.9-3.3 mm/yr, and has been faster than the accretion rate, especially in the middle marsh. [Source: A sea-level rise curve Koren R. Nydick, Alison B. from Guilford, Connecticut, USA Bidwell, Ellen Thomas I, Johan C. Varekamp Department of Earth and Environmental Sciences, Wesleyan University, Middletown, CT 06459, USA Received 13 April 1994; revision accepted 21 September 1994]

c. **Probability of Occurring Again (B.2)**

Sea level rise is an ongoing phenomenon that should be considered an increasingly significant natural hazard. It is not caused by short term storm events; rather it is a change to baseline conditions. It is highly likely that SLR-related problems will worsen. Figure 12 shows a mean sea level trend in New London of 2.25 millimeters/year with a 95% confidence interval of +/- 0.25 mm/yr based on monthly mean sea level data from 1938 to 2006 which is equivalent to a change of 0.74 feet in 100 years.

According to the Third National Climate Assessment by the U.S. Global Change Research Program, “Global sea levels are projected to rise 1 to 4 feet by 2100 depending in large part on the extent to which the Greenland and West Antarctic Ice Sheets experience significant melting. Sea level rise along most of the coastal Northeast is expected to exceed the global average rise due to local land subsidence, with the possibility of even greater regional sea level rise if the Gulf Stream weakens as some models suggest.”

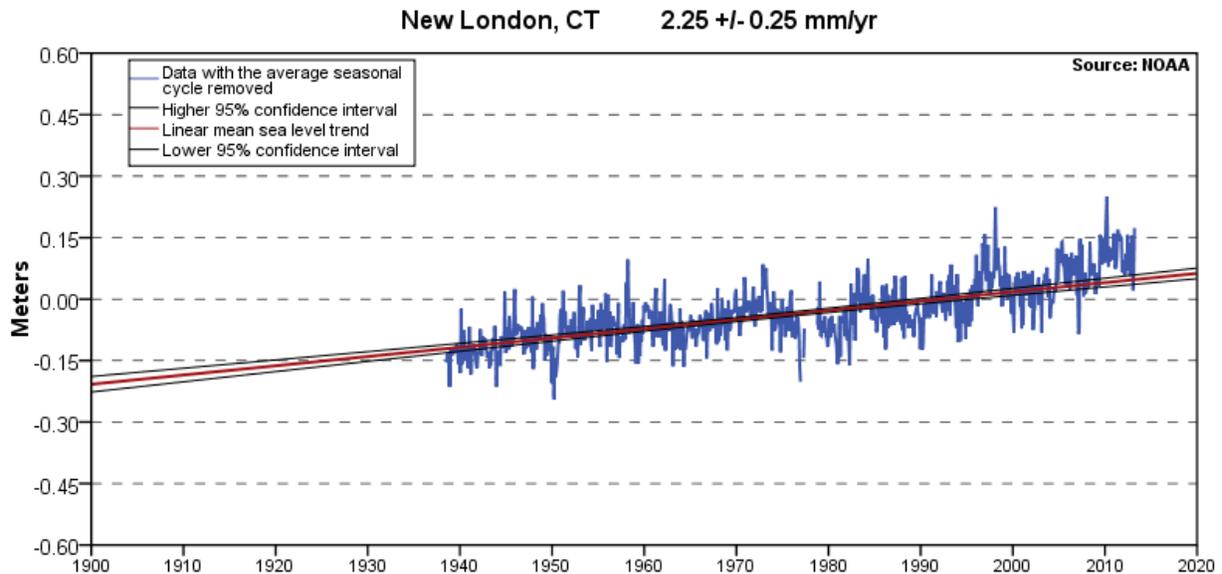


Figure 12: Mean Sea Level Trend

d. **Potential Impacts (B.1, B.3)**

(B.3 & B.4) Unlike other natural hazards that are event driven, SLR is a slow motion incremental disaster that will take decades to unfold; however, the potential impacts to the natural and built environments could be significant and have serious financial ramifications. Research cited in the Third National Climate Assessment indicates that “sea level rise of two feet, without any changes in storms, would more than triple the frequency of dangerous coastal flooding through most of the Northeast.”

Tidal marshes and mud flats, critical and irreplaceable natural habitats, will be at risk of drowning from accelerating sea level rise. Loss of these unique habitats could have far reaching consequences affecting aquatic organisms that breed, feed and live in them as well as water fowl that use the habitats for nesting and feeding.

Shoreline erosion will increase due to sea level rise and will increase the need to construct hardened shorelines to protect public and private properties, further eliminating natural shorelines and habitats.

The Town utilized the CT DEEP Coastal Hazards mapping tool to evaluate various sea level rise scenarios to better understand which areas might be affected. One difficulty in using these data is that they are predicated on estimates of future SLR that vary greatly. Figure 12 illustrates differences in areas that will flood at “average monthly maximum water level” under current conditions and with 2 and 5 foot rises in sea level. Sea Level Rise will affect the towns Tax revenue over time. As seen in Figure 3 the most valuable properties lie along the shore and may be affected by Sea Level Rise.

At this time, estimates of economic loss are near impossible to create; however, HAZUS estimates that a 100-year flood event with current sea level is capable of producing an economic loss of \$312.99 Million. It can be expected that that number will only rise as sea levels rise.

e. **Mitigation Specific to this Hazard (ELEMENT C)**

See Section III MITIGATION (Figure 29) for the Comprehensive Mitigation Action Items (ELEMENT C). The following are representative mitigation activities specific to this hazard:

Open Space Planning. Consider preserving as open space those areas that flood waters are projected to inundate.

Marsh Migration. Identify areas where tidal marshes are likely to advance upslope as sea levels continue to rise and develop conservation strategy.

Research Sea Level Rise Impacts. Seek grant funds to collaborate with an academic institution to research and study the social, economic, environmental and policy-related impacts from Sea Level Rise.

4. **High Wind & Tornado**

Straight-line winds, responsible for most thunderstorm wind damage, can exceed 100 mph. One type of straight-line wind, the downburst, is a small area of rapidly descending air beneath a thunderstorm. A downburst can cause damage equivalent to a strong tornado and can be extremely dangerous to aviation. A “dry microburst” is a downburst that occurs with little or no rain.

A tornado is a violently rotating column of air, pendant from a cumuliform cloud or underneath a cumuliform cloud, and often visible as a funnel cloud. High winds are typically 1-minute average surface winds of 40 mph or greater lasting for 1 hour or longer, or winds gusting to 58 mph or greater regardless of duration that are either expected or observed over land.

a. **Geographic Extent (B.1)**

Other than hurricane- and storm-associated winds, high winds in Connecticut tend to be localized microbursts. In comparison to the tornados that occur in the Midwest’s “tornado alley”, New England tornados tend to have much shorter and narrower paths due to the hillier terrain. Tornados are unlikely to occur in Middlesex County. Historically there have been tornados and microburst wind events in other parts of the state. Thus, these events should not be dismissed entirely. Severe thunderstorms have been known to occur and spawn small tornados. Damage from sheer downburst winds has been suspected as another source of damage in the state. Areas closer to the shoreline may sustain more damage as land is more densely developed and a tornado there would likely effect more properties than in less developed areas of Town, such as north of Interstate 95.

b. **Occurrences (B.2)**

As recently as February 27, 2012, high winds plagued Connecticut. “More than 300 United Illuminating customers were without power in Fairfield Saturday afternoon. As of 5 p.m., there were 1,298 CL&P customers without power.” [Connecticut Post newspaper, February 27, 2012]. Deadly and destructive tornados do occur in New England, including Connecticut. Of the 7 recorded to have occurred in Middlesex County none were confirmed to have touched down in Westbrook. However, these storms have been recorded in surrounding towns: on August 7, 1918, there was a *possible* tornado in Westbrook; on June 30, 1998, F1 tornados, in Killingworth and Lyme, and an F0 tornado, Chester. In 2008, the National Weather Service was asked to determine if a tornado had occurred in Old Saybrook after some residents thought they had seen a funnel cloud; it was inconclusive. Westbrook-area historical tornado action is near the Connecticut state average, which is 25% smaller than the overall U.S. average (Source: City Data). On July 31, 2009, an F1 tornado touched down in Madison, while Old Lyme and Chester experienced many downed trees.

EF 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

Figure 13: **Recorded Tornadoes** in the RiverCOG region, 1950-2014

c. Probability of Occurring Again (B.2)

Tornados are *not likely* to occur in Westbrook. According to Significant Tornadoes 1680–1991 by Thomas Grazulis from 1953 to 1991, Connecticut recorded an average of about 1.3 tornadoes per year, ranked 43rd in the United States. As shown in the chart above, one of those occurred in town.

d. Potential Impacts (B.1, B.3)

EF-Scale Number	Intensity	Wind Speed (mph)	Impact
EF-0	Gale Tornado	65-85	Some damage to chimneys; branches broken off trees; shallow-rooted trees knocked over; damage to sign boards.
EF-1	Moderate Tornado	86-110	Peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages may be destroyed.
EF-2	Significant Tornado	111-135	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.
EF-3	Severe Tornado	136-165	Roof and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted.
EF-4	Devastating Tornado	166-200	Well-constructed houses leveled; structures with weak foundations blown off for some distance; cars thrown and large missiles generated.
EF-5	Incredible Tornado	201-240	Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile-sized missiles fly through the air in excess of 100 meters; trees debarked; steel-reinforced concrete structures badly damaged.

Figure 14: **Enhanced Fujita Scale Definition** and Potential Impacts.

Source: NOAA

Figure 14 defines the Enhanced Fujita Scale, intensity, wind speed, and potential impacts of tornadoes. Impacts are generalized and can depend on local conditions.

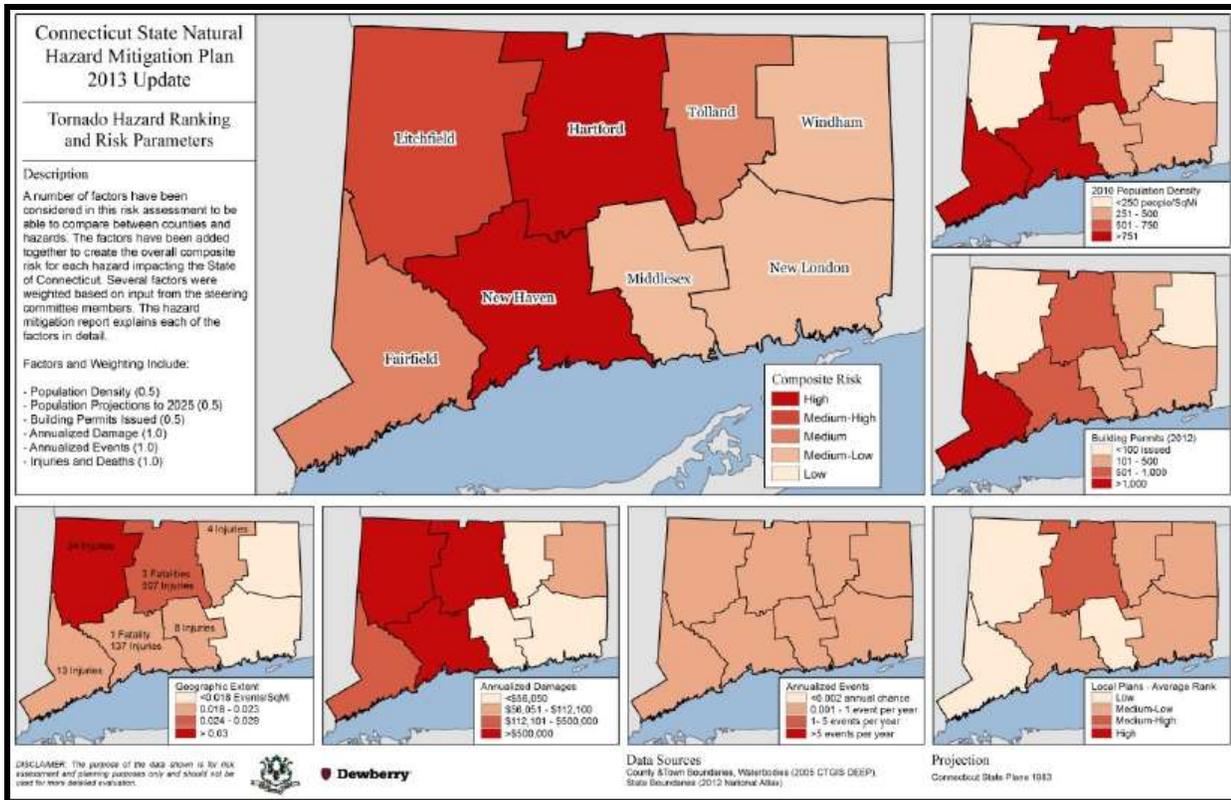


Figure 15: Tornado Hazard Ranking and Risk Parameters
 Source: CT NHMP, 2013

Figure 15 above taken from the Connecticut State NHMP, shows the relative risk of tornado to be Medium-Low for all Middlesex County towns. This risk is based upon population density, population projections to 2025, building permits and other factors.

Tornados and high winds destroy vegetation and structures within the storm’s path. For example, “October 3, 1979: The Windsor Locks, Connecticut tornado, an extremely destructive F4 tornado, one of the worst in Connecticut history, killed 3 persons and injured 500 more in northern Hartford County. The tornado struck without warning, tearing through Bradley International Airport destroying more than a dozen airplanes, and narrowly missing a Boeing 727, which was attempting to land. About 100 homes were completely leveled. Most of the \$200+ million in damage was done in Windsor Locks and Suffield. This was the sixth-most damaging tornado in US history.” [Wikipedia, 2012]

All areas of Westbrook are equally susceptible to damages form High Wind and Tornadoes; however a high wind event in more densely populated areas along the shoreline and near Downtown Westbrook would result in more property damage than in other areas of town. Specific Damage estimates are not available. However, Figure 3 demonstrates higher property values along the immediate shoreline.

e. **Authorities, Policies, Programs, and Resources (C.1)**

In a 2014 amendment to the CT Building Code, the area south of I95 in Westbrook was newly designated as a wind-borne debris region. This designation requires that windows in residential buildings be impact resistant or protected with an impact-resistant covering such as shutters or wood structural panels (if mean roof height 33 feet or less). Window and door assemblies must be strong enough to withstand wind pressures acting on them and be fastened securely enough to transfer those wind pressures to the adjacent wall. The design wind speed for residential buildings was also changed from 110 miles per hour to 105 miles per hour. The design speed for commercial buildings is currently 115 mph. The Town Building Official enforces the Connecticut State Building Code. The largest threat from high wind events comes as a result of fallen trees and branches which disrupt electrical service, block traffic, and cause damage to buildings. The role of the Tree Warden will take on increasing importance as the utilities ramp up their tree trimming efforts and property owners look for the Town to address perceived safety issues from public trees that overhang their properties. As part of facilitating increased tree trimming activities, the local Tree Warden has the responsibility to ensure that the work is done in a manner that retains the health and beauty of the remaining trees. Replanting of any new trees on public property should be done following “the right tree in the right place” principle. In recognition of the expertise required to manage trees properly, the state now requires that all municipal tree wardens complete coursework in tree biology, maintenance and pruning, urban forest management and tree laws. The Tree Warden is appointed by the Board of Selectman every two years. The powers and duties of the Tree Warden are mandated in [Chapter 451 Sec. 23-59](#) of the CT General Statutes. The Tree Warden has jurisdiction over the care and control of all trees within the limits of the town right-of-ways and municipal properties. Currently the Public Works Director is the Tree Warden for the Town of Westbrook.

f. **Mitigation (ELEMENT C)**

See Appendix III MITIGATION (Figure 29) for the Comprehensive Mitigation Action Items (ELEMENT C). The following are representative mitigation activities specific to this hazard:

Building Standards. Continue to implement State Building/Fire Code and local Flood Code for construction that minimizes loss of life and property damage due to NHs including mandatory wind code compliance.

Underground Utilities. Require underground utilities for new development; require retrofitting during redevelopment of existing sites to bury utilities where appropriate to mitigate NHs.

Landscaping. Promote landscaping practices that encourage the planting of species that are less susceptible to damage from ice storms to reduce the probability of damage to structures.

5. Dam Failure

A dam is a barrier that impounds water or underground streams. Dams generally serve the primary purpose of retaining water. Many dams built within Westbrook were built to power mills during the early years of industrial revolution. There are several different types of dams including earthen, cement, and stone.

a. Geographic Extent (B.1)

Although dams are man-made structures and thus not a true natural hazard, the consequences of dam failure resemble those of natural disasters. With over 4,000 dams state-wide, nearly every town in Connecticut is subject to the hazard of dam failure. There are fourteen dams in Westbrook.

Of the dams within Westbrook, two are rated as Hazard Type C. One dam is at the south end of Messerschmidt Pond, a large body of water in the northwest section of Town. Failure of that dam would seriously exacerbate flooding downstream and could cause damage to or the failure of the Wrights Pond Dam. Both dams are owned and maintained by the CT DEEP. The Chapman Pond Dam, located in the Town of Clinton, is also rated as Hazard Type C. Ownership of the dam was recently transferred to CT DEEP through its acquisition of the Sciongay property. Failure of this dam would cause serious damage to downstream properties in the Town of Westbrook.

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, or 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. Of dams in Connecticut, 83% fall within the negligible to moderate hazardous categories while only 17% fall within the significant and high hazard categories. Map 9 depicts locations of dams in and adjacent to the Town of Westbrook along with the CTDEEP classification. Figure 16 Below includes a list of the most hazardous dams in Westbrook.

Dam ID	Dam Name	Pond Name	Ownership	Dam Hazard Class
15401	Messerschmidt Pond Dam	Messerschmidt Pond	CT DEEP	C
15402	Wrights Pond Dam	Wrights Pond	CT DEEP	C
2709	Chapman Pond Dam	Chapman Mill Pond	CT DEEP	C

Figure 16: **Significant and High Hazard Dams** in Westbrook.

Source: CT DEEP

b. **Occurrences (B.2)**

There are no records of a dam break in Westbrook. However, the most recent significant dam breaks in Connecticut took place during the June 1982 flood when 17 dams failed and 31 were damaged causing \$70 million in damage. Bushy Hill Pond Dam in nearby Deep River failed at that time causing severe flooding in nearby Essex.

c. **Probability of Occurring Again (B.2)**

Old dams, some dating to the 1700's can become over- burdened during flooding events and heavy rain storms. The dams, if not maintained properly could collapse under the stress of more water than normal. Overall, Dam Failure is *not likely* in Westbrook.

d. **Potential Impacts (B.1, B.3)**

A dam break could cause downstream flooding and potentially cause other dams to break in succession. A dam break would release a significant amount of water at high velocity with high pressure. This wall of water could cause other dams to break.

A dam break could cause flooding outside of normal flood hazard areas, meaning residents and businesses might be especially unprepared for dam breaks. For example, a failure at the Messerschmidt Pond Dam could cause failure or damage to many other downstream dams along the Falls River causing significant damage in neighboring Essex.

There are no dam breaks in Westbrook to derive damage estimates from; however, the 1982 flood caused approximately \$70 million in damage statewide, nearly \$170 million in 2014 dollars.

According to the National Performance of Dams Program (NPDP), since 1877 there have been a total of 14 dam failures in Middlesex County resulting in \$7,258,996 worth of property damage. A large enough flood could cause similar damage throughout the State. There are no critical Town facilities in the path of the Hazard Class C Dams in Town; however, there are commercial and residential areas downstream of these dams that would be affected by a dam break. A rough estimate based on assessed property values within the area shows that a severe enough dam failure upstream could cause well over \$1,000,000 in damage to surrounding properties. Overall, based on HAZUS-MH Flood Event Report, a 100 year storm could result in as much as \$312.99 Million in damages throughout Town.

Figure 17 below taken from the Connecticut State NHMP, shows the relative risk of dam failure to be Medium-High for all Middlesex County towns. This risk is based upon population density, population projections to 2025, building permits and other factors.

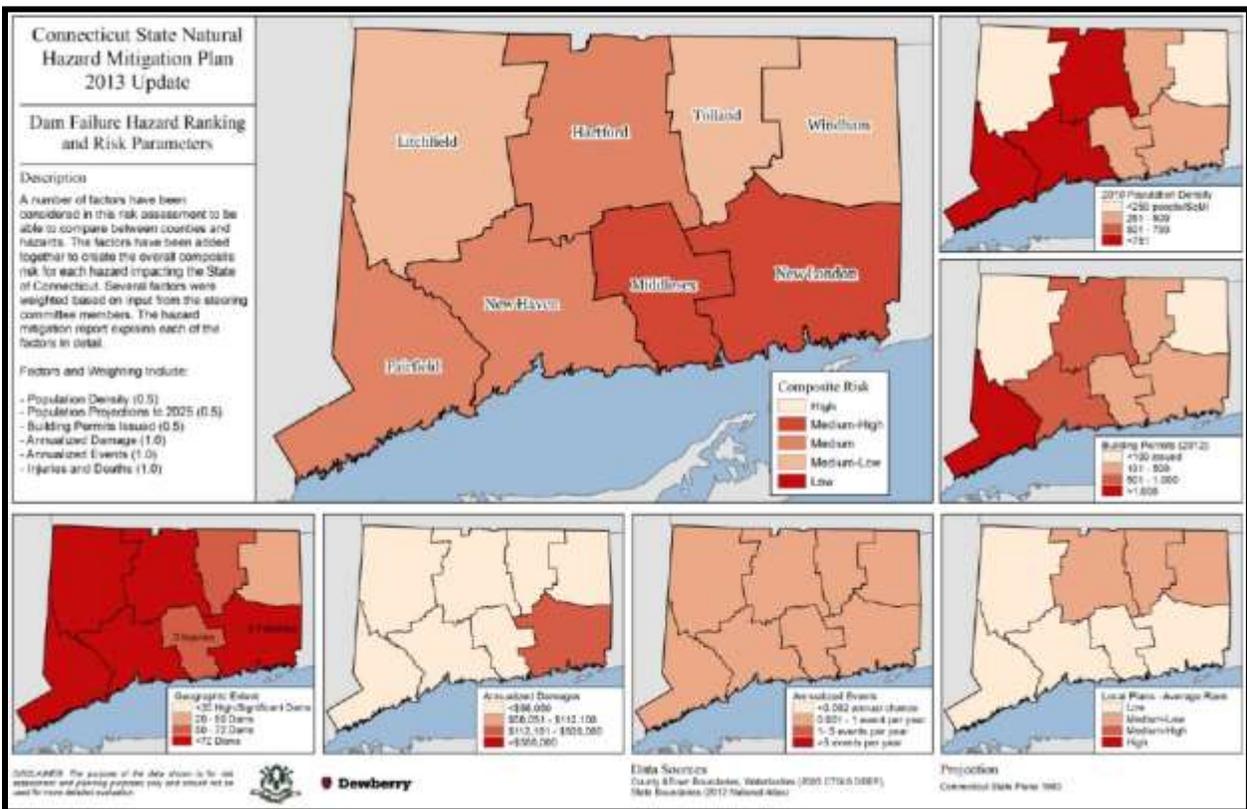


Figure 17: Dam Failure Hazard Ranking and Risk Parameters
Source: CT State NHMP 2013 Update

e. **Authorities, Policies, Programs, and Resources (C.1)**

The State Department of Environmental Protection (DEEP) 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 Energy and Environmental Protection (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.

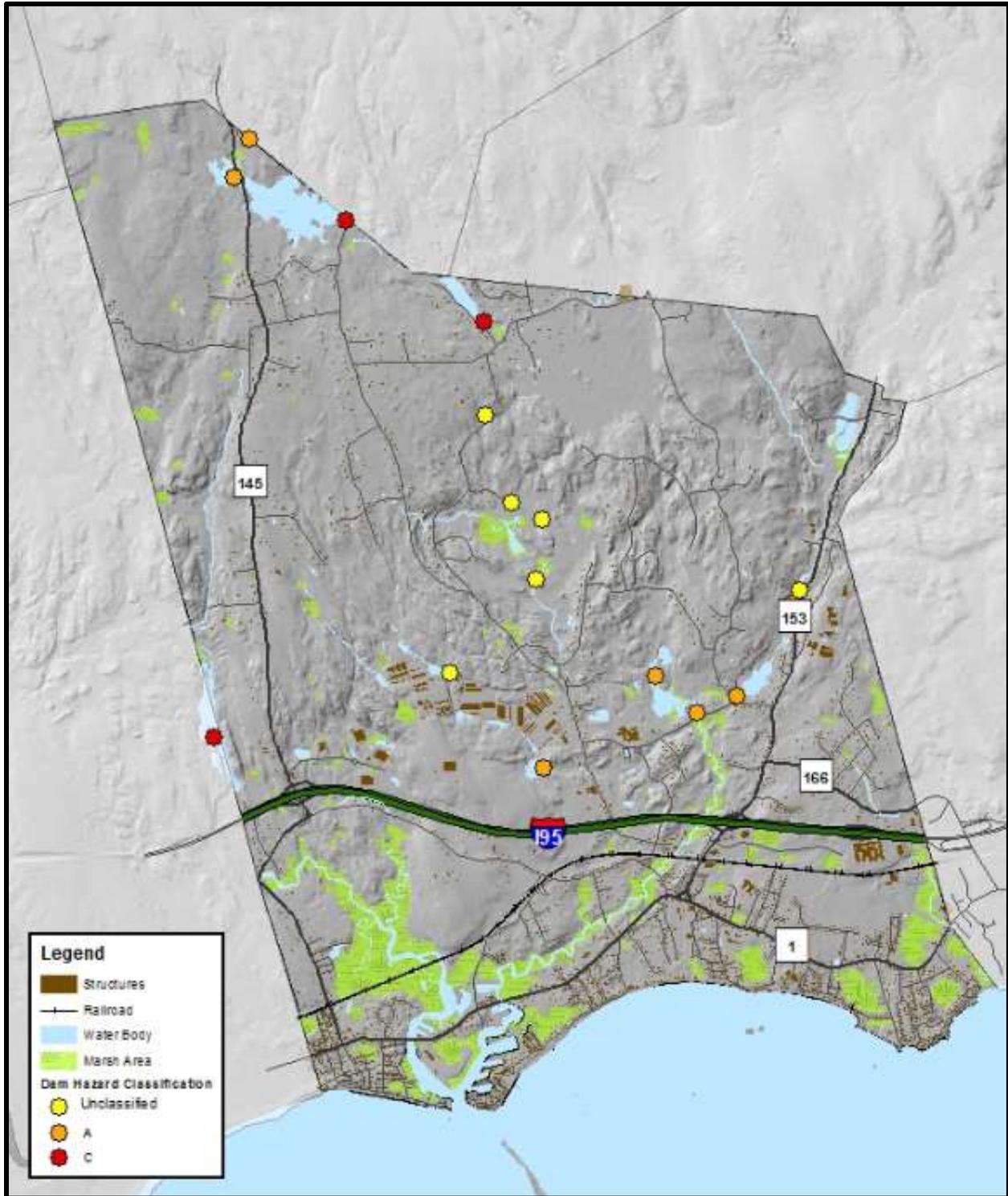
DEEP keeps track of which dams have emergency plans but not all of them would be up to date and not all dam owners will want those plans shared publically. Only the larger significant and high hazard dams would typically have an emergency plan with inundation areas but not all do as it is not yet mandated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

f. **Mitigation (C.3, C.4 & C.5)**

See Section III Mitigation (Figure 29) for Comprehensive Mitigation Action Items (Element C). The following are representative mitigation activities specific to this hazard.

Mitigation includes regular inspection and classification of dams. The Town should work together with CTDEEP and private dam owners to ensure that these inspections are performed and that dams are properly maintained.

Of the 14 dams in Westbrook, the ones that possess the highest hazard rating are owned by the Connecticut Water Company and by the State of Connecticut. These dams are routinely inspected and repaired as necessary by both the Connecticut Water Company and the State of Connecticut. The State has identified inundation areas for the Messerschmidt Dam and Wrights Pond Dam. This information should be reviewed at the local level to gain a better understanding of the potential downstream impacts and taken into consideration in the design of new or upgraded infrastructure within the area.



Map 12: **Dam Hazard Classification**

Source: CT DEEP/Westbrook GIS

6. Winter Storms

A winter storm is an event in which the dominant varieties of precipitation are forms 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 temperate continental climates, these storms are not necessarily restricted to the winter season, but may occur in the late autumn and early spring as well. Winter storms also can be accompanied by strong winds (e.g. nor'easters) that can cause coastal flooding and damage.

a. Geographic Extent (B.1)

Winter storms typically will impact the entire town; however, effects can vary locally depending on weather conditions (e.g. snowfall in upland areas with rain along the shore) or coastal flooding from nor'easters.

Below is a list of potential winter weather advisories and the extent of weather than can be expected.

Winter Weather Alerts	Extent of Weather Event
Winter Weather Advisory	This alert may be issued for a variety of severe conditions. Weather advisories may be freezing drizzle, freezing rain, or a combination of weather events. Announced for snow, blowing or drifting snow, freezing drizzle, freezing rain, or a combination of weather events.
Winter Storm Watch	Severe winter weather conditions may affect your area (freezing rain, sleet, or heavy snow may occur separately or in combination).
Winter Storm Warning	Severe winter weather conditions are imminent.
Freezing Rain or Freezing Drizzle	Rain or drizzle is likely to freeze upon impact, resulting in a coating of ice glaze on roads and all other exposed objects.
Sleet	Small particles of ice usually mixed with rain. If enough sleet accumulates on the ground, it makes travel hazardous.
Blizzard Warning	Sustained wind speeds of at least 35mph are accompanied by considerable falling or blowing snow. This alert is the most perilous winter storm with visibility dangerously restricted.
Frost/Freeze Warning	Below freezing temperatures are expected and may cause significant damage to plants, crops, and fruit trees.
Wind Chill	A strong wind combined with a temperature slightly below freezing can have the same chilling effect as a temperature nearly 50 degrees lower in a calm atmosphere. The combined cooling power of the wind and temperature on exposed flesh is called the wind-chill factor.

Figure 18: **Winter Weather Events** and potential impacts.

b. Occurrences (B.2)

There is a history of powerful winter storms that have affected Westbrook and the region. See Figure 6 for a summary. Some of the more notable storms are listed below.

- 1888 – Blizzard
- 1978 – Blizzard
- 1993 – “Storm of the Century”
- 1996 – Blizzard
- 2000 – Blizzard
- 2011 – October Nor’easter
- 2013 – February Blizzard

According to the NCDC, Middlesex County experiences 4.35 annualized events and \$0 in annualized damages.

c. Probability of Occurring Again (B.2)

Winter storms are *very likely* to occur in Westbrook during winter months. They have caused significant damage and are second only to hurricanes in terms of the potential damage they can cause in Westbrook.

d. Potential Impacts (B.1, B.3)

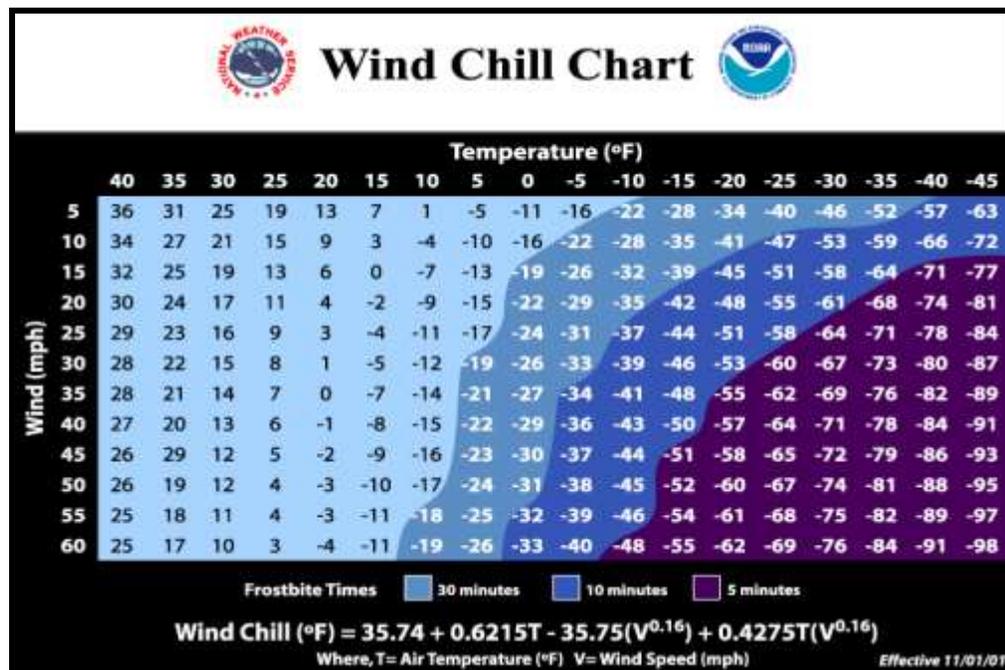


Figure 19: Wind Chill Chart

This chart displays wind speed and ambient temperature as they relate to frostbite on skin.

Source: NOAA, NWS

Depending upon the severity and duration of the storm, impacts can be varied. Those of which require attention for hazard mitigation can cripple transportation, communications and threaten provision of basic needs for health, safety and the general welfare. Significant snowfall rates or ice accumulation can exceed the ability of crews to keep roads open for travel and can bring down electric, telephone and cable wires. With the advent of cellular systems, reliance upon landline communications is less; however, severe storms can affect cellular communication towers. Most homes are dependent upon electricity to either provide heat or to ignite other fuel sources. Depending on outside temperatures, a prolonged electrical outage in the winter can result in freezing of pipes and can be life threatening. If travel becomes impossible, the provision of food, medicines and other necessary goods can be delayed or halted and economic losses can occur as people are unable to get to and from work.

NOAA's National Climatic Data Center is now producing the Regional Snowfall Index (RSI) for significant snowstorms that impact the eastern two thirds of the U.S. The RSI ranks snowstorm impacts on a scale from 1 to 5, similar to the Fujita scale for tornadoes or the Saffir-Simpson scale for hurricanes. The RSI differs from these other indices because it includes population. RSI is based on the spatial extent of the storm, the amount of snowfall, and the juxtaposition of these elements with population. Including population information ties the index to societal impacts. Currently, the index uses population based on the 2000 Census (Source: NOAA).

CATEGORY	RSI VALUE	DESCRIPTION
1	1-3	Notable
2	3-6	Significant
3	6-10	Major
4	10-18	Crippling
5	18.0+	Extreme

Figure 20: **Regional Snowfall Index**

Source: NOAA

Typically property losses only occur during unprecedented storms or during winters when snow events come one after the other creating a deep snow pack, overloading roof structures causing collapse. During the unusually snowy winter of 2010-2011, at least 46 buildings and more than 130 barns collapsed under the intense weight of the snow causing an unknown amount of damage across Connecticut. There is no way to reliably estimate damage figures from snowfall. Damage will depend on the ability to remove snow from roofs in a timely manner, temperature, and other factors.

Winter storms also can cause significant coastal flooding, the impacts of which are discussed in Section II.B.1.

e. **Authorities, Policies, Programs, and Resources (C.1)**

In anticipation of severe winter storms, the Town has the authority to order parking bans and can order evacuations in extreme situations if there is a significant threat of localized flooding.

The Department of Public Works maintains a fleet of trucks and other snow removal equipment and monitors weather forecasts during the winter months to mobilize in advance of storms. These measures are successful in mitigating winter weather. The DPW only experiences difficulty keeping roads clear in extreme conditions, such as the February 2013 Blizzard.

The town of Westbrook takes several steps to mitigate winter storm hazards. The town purchases adequate salt and sand supplies to apply to roads and conducts routine maintenance and replacement of equipment used for snow removal. A maintenance schedule is in place for all snow removal equipment to guarantee that the equipment is in good working order when the need arises. The Board of Finance and the Board of Selectmen work together to ensure proper funding is available to support these mitigation efforts.

f. **Mitigation Specific to this Hazard (C.2)**

See Appendix III MITIGATION (Figure 29) for the Comprehensive Mitigation Action Items (ELEMENT C). The following are representative mitigation activities specific to this hazard:

Landscaping. Promote landscaping practices that encourage the planting of species that are less susceptible to damage from ice storms to reduce the probability of damage to structures.

Underground Utilities. Continue to require underground utilities for new development; require retrofitting during redevelopment of existing sites to bury utilities where appropriate to prevent damage from ice, snow and falling tree limbs.

Public Information. Provide information on the town's website about pending storms and links to town, regional, state and federal sites for information on reducing damage from natural hazards. Westbrook uses Emergency Management website and social media sites (Facebook and Twitter) as these sites are the primary location for providing information to our residents on reducing damage from natural hazards.

7. Extreme Heat / Heat Waves

A heat wave is a prolonged period of excessively hot weather, which may be accompanied by high humidity. While definitions vary, a heat wave is measured relative to the usual weather in the area and relative to normal temperatures for the season. A heat wave in the northeastern United States is defined as a period in which daytime high temperatures reach 90°F or higher for three days in a row. The term is applied both to routine weather variations and to extraordinary spells of heat which may occur only once a century. Severe heat waves have caused catastrophic crop failures, thousands of deaths from hyperthermia, and widespread power outages due to increased use of air conditioning.

a. Geographic Extent (B.1)

Westbrook falls in the humid continental climate zone, the same as much of interior Connecticut. Summer is hot and humid throughout the state, with average highs in New London of 81 °F (27 °C) and 87 °F (31 °C) in Windsor Locks. July and August tend to be the hottest months of the year with average temperatures in Hartford being 84°F and 82°F, respectively. With the elevated summer temperatures comes a risk of extreme heat. With its dense forest coverage and abundant water features, Westbrook is slightly more protected from extreme heat than some of its neighbors, but heat waves do occur. A heat wave in Connecticut is defined as any period of time in which daytime high temperatures reach more than 90°F for three consecutive days or longer. All areas of Westbrook are equally susceptible from impacts of extreme heat.

All areas of Westbrook are equally susceptible to extreme heat. Depending on wind direction, areas directly along the shoreline may stay slightly cooler as a result of the water temperature in Long Island Sound having a cooling effect on the surrounding air.

b. Occurrences (B.2)

Heat waves are a regular summer season event in Connecticut, including Westbrook. Summer 2012 was a particularly hot period with many days in which temperatures in Hartford reached 100°F and humidity levels were much higher than average. The entire northeast and much of the US was under the intense heat for much of July. In June alone, 164 all-time high temperature records were broken across the country. In many areas, severe thunderstorms associated with the heat caused lengthy power outages.

c. **Probability of Occurring Again (B.2)**

Extreme heat and heat waves are *very likely* during the summer months in Westbrook. As global temperatures continue to climb, it seems likely that heat waves will occur more frequently in the future.

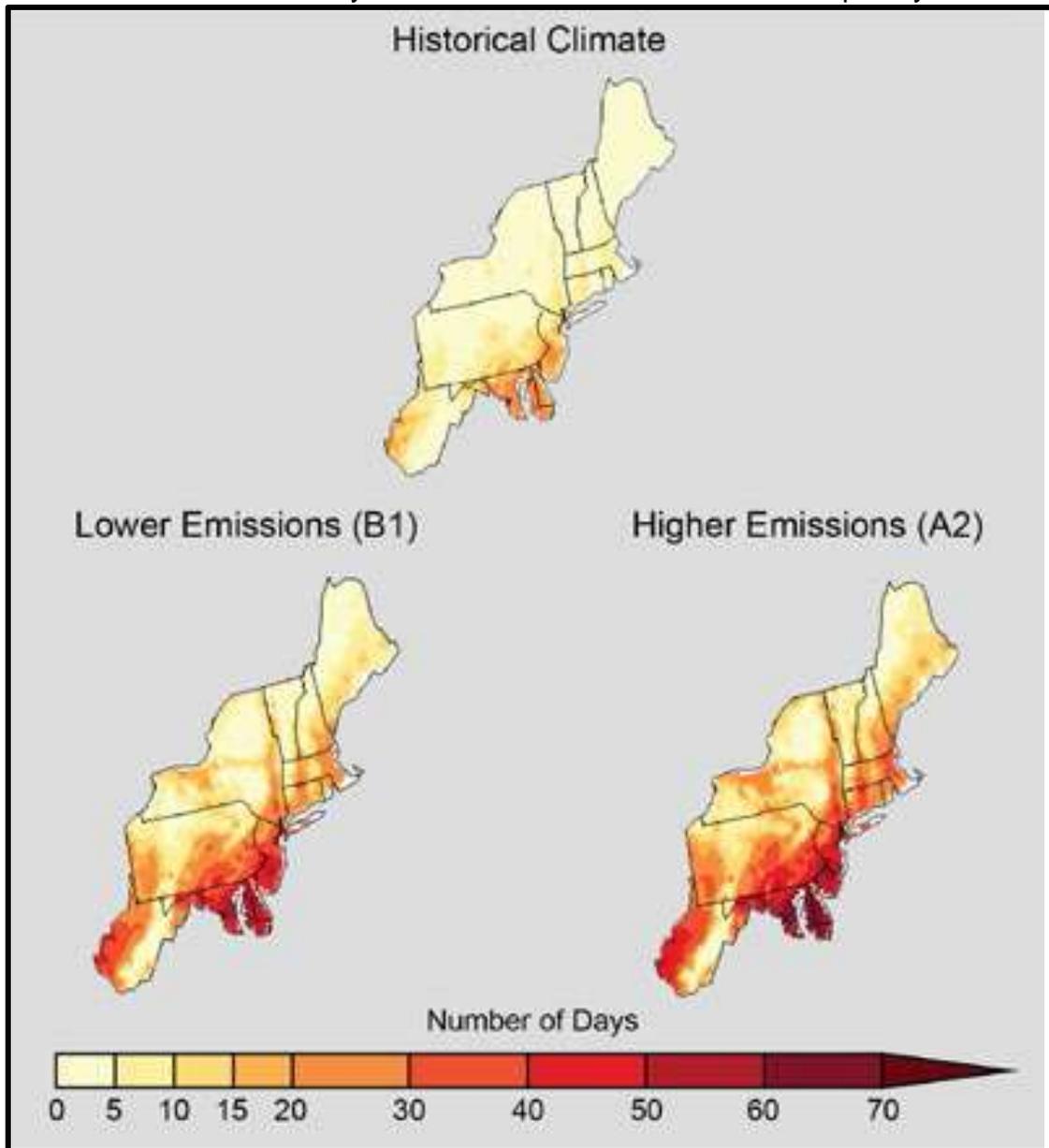


Figure 21: **Projected Increases in the Number of Days over 90°F**

Projected increase in the number of days per year with a maximum temperature greater than 90°F averaged between 2041 and 2070, compared to 1971-2000, assuming continued increases in global emissions (A2) and substantial reductions in future emissions (B1).

Source: NOAA NCDC / CICS-NC.

d. **Potential Impacts** (B.1, B.3)

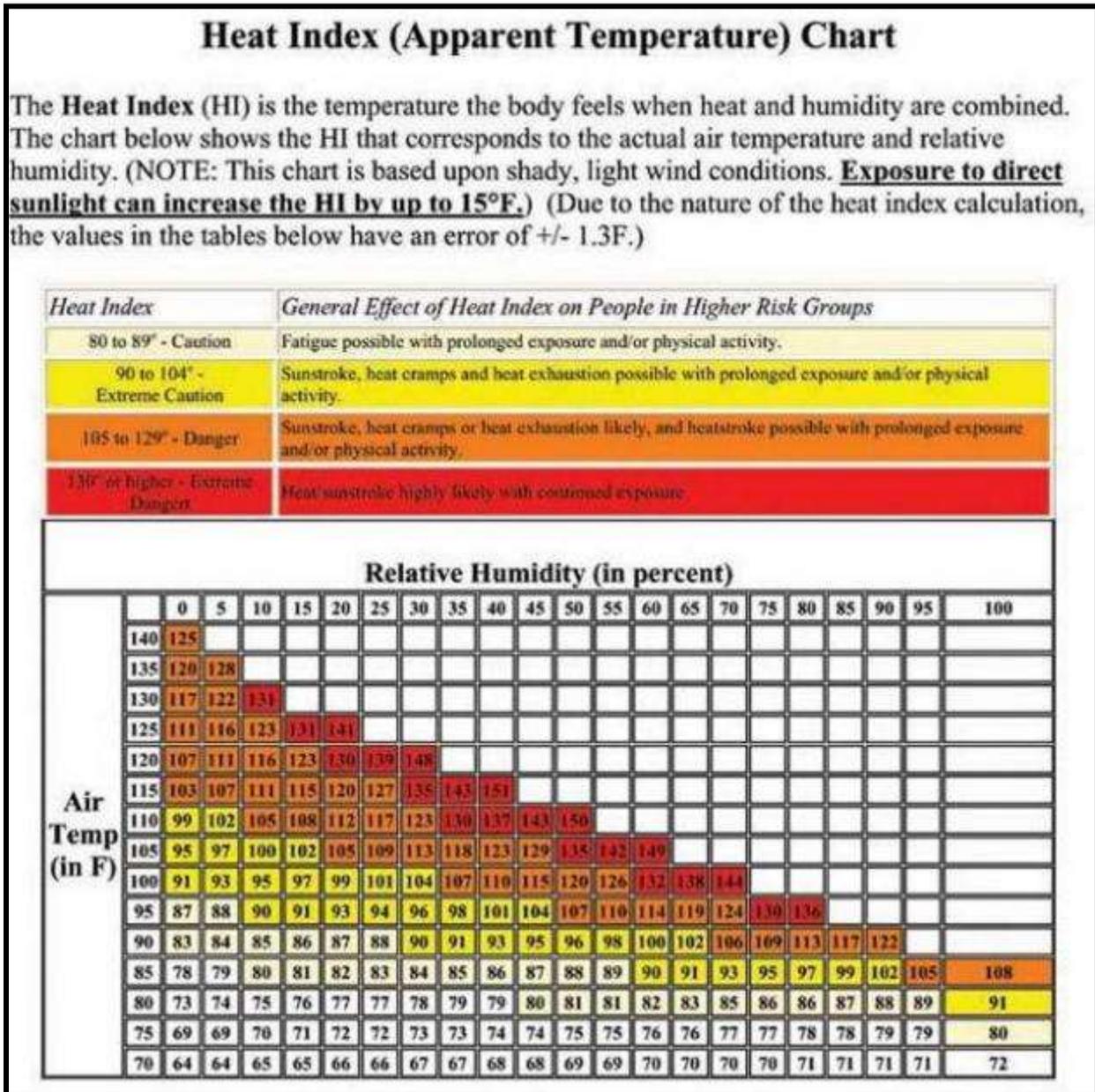


Figure 22: **Heat Index** and impacts on people.
Source: NOAA

Elderly and very young populations, especially those living in homes with no air conditioning are most likely to be adversely impacted by extreme heat. Dehydration, heat stroke, and other negative health effects are likely during high event events.

Physical infrastructure can also be impacted negatively by extreme heat. Heat always brings with it the potential for strong thunderstorms which could knock out power due to downed trees. Asphalt, especially

in places where there is not a substantial base can buckle or crack significantly under heat. Drought conditions can also become exacerbated by extended periods of significantly high temperatures.

Extreme heat events can cause severe storms which have the ability to knock out power. In Westbrook, a lack of power can mean lack of potable water for the majority of the town which lacks municipal water sources. In addition, elderly and very young population may be at risk without air conditioning. The lack of water and cooler temperatures during a heat wave can be deadly.

There is no record of property damage due to extreme heat conditions in Westbrook to base an estimated loss upon, and no way to reliably predict the cost of damage. However, the greatest threat of damage comes from high wind during strong thunderstorms that may be present during high heat events. Details of those threats are discussed in Section II.B.3. As with other hazards profiled, any damage would be far costlier along the shoreline as development is much more dense and property values are higher.

e. **Authorities, Policies, Programs, and Resources (C.1)**

The Towns Emergency Management Director has the authority to establish a designated cooling center for those living without air conditioning should the need arise. These places provide a place for people to escape the heat as well as providing water.

These measures have been successful in the past at mitigating damages from high heat.

f. **Mitigation Specific to this Hazard (C.3 & C.4)**

See Section III Mitigation (Figure 29) for Comprehensive Mitigation Action Items (Element C). The following are representative mitigation activities specific to this hazard:

It is difficult to mitigate the effects of extreme heat on the physical infrastructure. That being said, the best mitigation when it comes to the public is information. Public information, especially for senior citizens should be made available so they know when an extreme heat wave is coming. Reminders about drinking water and staying indoors can help.

The Senior Center in the Mulvey Municipal Center has been designated as cooling center for use during periods of excessive heat.

8. Drought & Wildfire

A drought is defined as a period of dry weather: a long period of extremely dry weather when there is not enough rain for the successful growing of crops or the replenishment of water supplies. A wildfire is any uncontrolled fire in combustible vegetation that occurs in the countryside or a wilderness area. 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.

a. Geographic Extent (B.1)

As with all the towns in the region, Westbrook is small enough that a drought would most likely be town-wide. Under extreme drought conditions, areas of concern for wildfire include the deciduous forest located in the northern areas of town or areas of *Phragmites* in coastal tidal marshes. Drought also can exacerbate potential for small wildfires and hinder the ability of the town to control outbreaks.

Large areas of phragmites within the tidal wetlands in Westbrook have the potential for wildfires under extreme drought conditions. Large expanses of deciduous forest are located in the northern areas of town and areas of phragmites in coastal areas are prime areas of concern. At times of severe drought, communities face growing wild land-urban interface (WUI) problems. Drought can exacerbate potential for small wildfires and hinder the ability of the town to control outbreaks. The primary issue for Westbrook, along with other Connecticut towns that rely on aquifers and local well systems, even public water supplies such as the Connecticut Water Company, is that potential for increase problems during drought conditions can increase with population growth and increased demands for water. Land-use planning techniques can be applied to existing, new, and redeveloping areas alike.

The severity of a fire depends on several factors including, fuel type, weather, and topography. There are four types of fuels of concern for wild fires which will affect how a fire behaves:

- Ground Fuels – organic soils, forest floor duff, stumps, dead roots, and buried fuels;
- Surface Fuels – litter layer, downed woody materials, dead and live plants to two meters in height;
- Ladder Fuels – vine and draped foliage fuels; and
- Canopy Fuels – tree crowns.

The weather can also play an important role in the spread of fire. Three important weather factors are:

- Wind – most important factor since it dries out fuel and drives a fire;
- Relative humidity – affects fuel moisture; and
- Precipitation.

A fire is much more likely to spread and cause significant damage when there is high wind, little humidity and a period of little no rainfall.

Different areas throughout town are susceptible to different types of fires. Inland areas where thick forest cover is abundant is more susceptible to fires feeding on ground fuels ladder fuels. Areas closer to the densely developed shoreline where more roads are present are more susceptible to fires feeding on surface fuels. Overall Connecticut does not have a history of fire feeding on the canopy of trees. Most fires remain on the ground.

b. Occurrences (B.2)

Below is a table of historic data for drought that includes coastal Connecticut. [Northeast Regional Climate Center (**NRCC**) in the [Department of Earth and Atmospheric Sciences](#) at Cornell University]

Coastal Climate Division --		
Drought Periods	Duration	Lowest PDSI
1/1901 - 2/1901	2 months	-3.79 in 2/1901
8/1910 - 7/1911	12 months	-4.30 in 7/1911
7/1913 - 9/1913	3 months	-3.68 in 8/1913
12/1924 - 6/1925	7 months	-3.64 in 6/1925
4/1930 - 3/1931	12 months	-4.26 in 9/1930
11/1949 - 1/1950	3 months	-3.13 in 12/1949
9/1964 - 1/1965	5 months	-4.16 in 11/1964
3/1965 - 2/1967	24 months	-5.19 in 12/1965
3/1985 - 4/1985	2 months	-3.84 in 4/1985
8/1995 - 9/1995	2 months	-3.61 in 8/1995
7/1999 - 8/1999	2 months	-3.50 in 7/1999
1/2002 - 4/2002	4 months	-3.67 in 2/2002

Figure 23: Historic Periods of Drought in the Region Based on the monthly Palmer Drought Severity Index as computed by the National Climatic Data Center. Period of record: January 1895 through June 2012

In the spring of 2012 headlines on the local network television stations such as, “Mar 28, 2012 – Brush fires have been reported in East Haddam,

East Windsor and Fairfield,” were common. “The largest of the fires consumed more than 50 acres in Devil’s Hopyard State Park in East Haddam and fire officials made the decision to let the fire burn.” [NBC Connecticut website, March 28, 2012] “Brush fires are not uncommon[,] since 2009 there has been 130 brush fires in Connecticut, fortunately none have been terribly large other than that 60 + acre fire in remote Salisbury that fire fighters had a tough time getting to last year.” [WXedge.com, Connecticut Brush Fire 101, Brandon Gervais (a 22 year old Environmental Science senior at the University of New Haven) on March 19, 2012]

c. **Probability of Occurring Again (B.2)**

Extreme Drought and large wildfires are both *not likely* to occur in Westbrook. However, dry periods and brushfires are *likely* during certain parts of the year.

d. **Potential Impacts (B.1, B.3)**

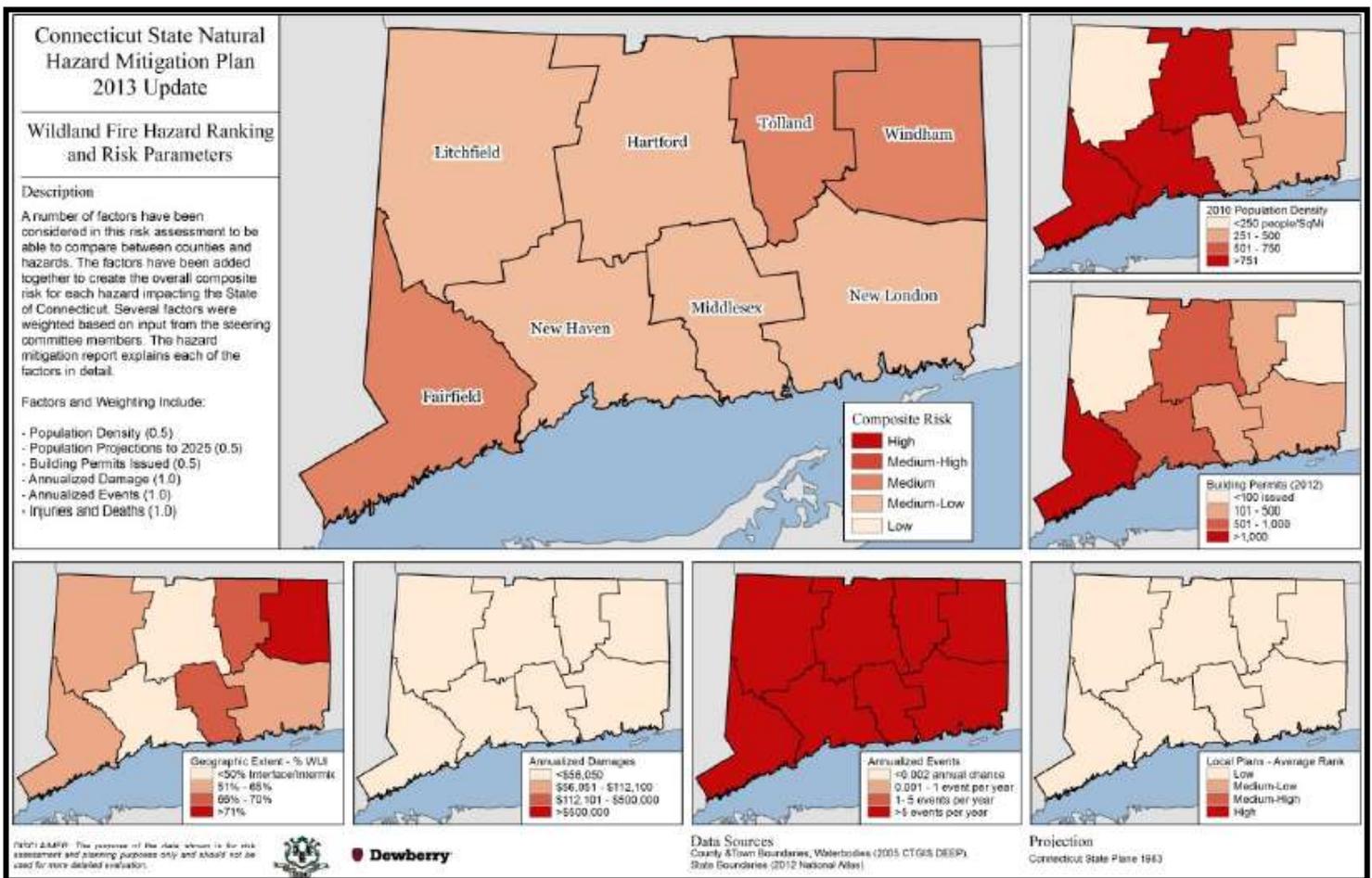


Figure 24: Wild Fire Hazard Ranking and Risk Parameters.

Source: CT State NHMP 2013 Update

Figure 24 as shown in the Connecticut State NHMP 2013 Updated shows that the overall risk of wildfires in Middlesex County is Medium. This is based up population density, population projections to 2025, building permits, forest cover and other factors.

Because they are not often severe, response to droughts in the region most often begin with voluntary water conservation. Under severe drought conditions water use restrictions may be mandatory.

A significant portion of the population in Westbrook relies on ground water for domestic water supply. Under extreme and prolonged drought conditions, these water sources could be affected.

With an intricate network of wetlands and watercourses in Westbrook there are more natural breaks that would contain fire than in other parts of the country. That being said, a brushfire can still threaten houses and other structures.

Damage estimates cannot reliably be predicted due to the lack of severe and long lasting drought in New England as a whole. However, a severe drought could impact many facets of everyday life financially. Food producers could be at risk of crop loss, which would cause some local food prices to rise. Crop damage would have some local impact. A large wildfire could threaten many homes which lie within the WUI and could cause considerable damage. Homes near to the phragmites, which can ignite easily, may be at more risk than others. Homes near phragmites will likely have high values as they are likely to be along the coast. A larger fire will likely result in more costly damage. A small brush fire will have limited costs associated with it.

e. Authorities, Policies, Programs and Resources (C.1)

The current Subdivision Regulations requires that any subdivider install a fire hydrant for each 1,000 feet of water main or major fraction thereof within any new subdivision. Where public water is not available, it is the policy of the Planning Commission to require dry hydrants.

The DEEP Division of Forestry issues Forest Fire Danger Ratings for Connecticut (See Figure 20). 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. Connecticut also uses a Build Up Index (BUI) that measures drought. The BUI is a relative measure of the cumulative effect of daily drying factors and precipitation on fuels with a ten-day time-lag.

Rating or Class Days	Spread Index	Build Up Index
LOW	0-10	0-22
MODERATE	15-Nov	23-44
HIGH	16-29	45-59
VERY HIGH	30-39	60-74
EXTREME	> 40	> 75

Figure 25: **Five Forest Fire Danger Ratings**

Source: CT DEEP

The CT DEEP is responsible for issuing these warnings. The Fire Danger Warning is easily accessible on the DEEP web page. These measures are largely successful at reducing the risk from large wildfires.

f. **Mitigation (ELEMENT C)**

See Appendix III MITIGATION (Figure 29) for the Comprehensive Mitigation Action Items (ELEMENT C). The following are representative mitigation activities specific to this hazard:

Wildfire Management Plan. Work with the Fire Department and Valley Shore Mutual Aid Association, Inc. and neighboring towns to develop a wildfire management plan and protocol to ensure that outside fire-fighting resources, such as the National Guard, are available.

Firefighter Training and Education. Training and education of firefighters should include brush and forest fires, with consideration for large areas of phragmites

Forest Management Plans. Include provisions in existing and future forest management plans to provide emergency access to firefighters in the event of wildfires in Town-owned Open Space.

Water Conservation. Coordinate with CWC on public education and public service announcements during droughts.

Aquifer Recharge. Continue to protect areas of high groundwater recharge potential as identified in the Recharge Mapping Study conducted by Wesleyan through open space acquisition and minimization of impervious surfaces.

9. Earthquake

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.

a. Geographic Extent (B.1)

The entire town could be affected by an earthquake in this region; however, impacts could vary locally depending on the age of a structure and the quality of construction.

b. Occurrences (B.2)

While there is no record of damages in Westbrook from an earthquake, they have occurred in the region and have been felt locally.

Date	Distance (miles)	Magnitude	Depth (miles)
11/29/2011	3.09	2.2	2.7
6/17/1982	2.30	3.0	2
10/21/1981	9.07	3.8	5.6
10/25/1980	2.68	3.0	0
10/24/1980	1.14	3.1	0

Figure 26: **Earthquakes** within 30 miles of Westbrook
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 Westbrook experienced a 1.3 on the Richter scale tremor.

c. Probability of Occurring Again (B.2)

Earthquakes in Westbrook are *not likely*. The USGS database shows that there is a 1.31% chance of a major earthquake within 50 kilometers of Westbrook, Connecticut within the next 50 years. [Source: USGS website, 2012] Westbrook-area historical earthquake action is slightly below the Connecticut state average and is 91% lower than the overall U.S. average. [Source: City Data]

d. Potential Impacts (B.1, B.3)

In Westbrook and the surrounding region, recorded impacts have been limited to shaking to the extent that things were knocked off shelves and people were alarmed. Structural damage has been limited to building components such as chimneys and buildings in poor repair; but failing structures have caused property damage in nearby towns.

A HAZUS – MH Earthquake Event Report was generated using a 100 year Probabilistic scenario. This report generates total loss estimates for the town of Westbrook in this type of event. It is estimated that there would be no building damage and no infrastructure damage after an earthquake event.

Likewise, the report estimates that there will be no loss of life nor will there be economic loss. (For the full report, see **Appendix IV: HAZUS –MH Earthquake Event Report.**)

Figure 27 details each earthquake magnitude, its intensity, and the average impacts from each magnitude. These impacts are generalized and depend on the location of the earthquake. Depth of the earthquake, size of the fault, and surrounding rock type can all impact the impacts of the earthquake.

Magnitude	Type	Mercalli Intensity	Average earthquake effects
< 2.0	Micro	I	Micro-earthquakes, not felt, or felt rarely by sensitive people. Recorded by seismographs.
2.0–2.9	Minor	I to II	Felt slightly by some people. No damage to buildings.
3.0–3.9		II to IV	Often felt by people, but very rarely causes damage. Shaking of indoor objects can be noticeable.
4.0–4.9	Light	IV to VI	Noticeable shaking of indoor objects and rattling noises. Felt by most people in the affected area. Slightly felt outside. Generally causes none to minimal damage. Moderate to significant damage very unlikely. Some objects may fall off shelves or be knocked over.
5.0–5.9	Moderate	VI to VIII	Can cause damage of varying severity to poorly constructed buildings. At most, none to slight damage to all other buildings. Felt by everyone. Casualties range from none to a few.
6.0–6.9	Strong	VII to X	Damage to a moderate number of well-built structures in populated areas. Earthquake-resistant structures survive with slight to moderate damage. Poorly-designed structures receive moderate to severe damage. Felt in wider areas; up to hundreds of miles/kilometers from the epicenter. Strong to violent shaking in epicentral area. Death toll ranges from none to 25,000.
7.0–7.9	Major	VIII or Greater	Causes damage to most buildings, some to partially or completely collapse or receive severe damage. Well-designed structures are likely to receive damage. Felt across great distances with major damage mostly limited to 250 km from epicenter. Death toll ranges from none to 250,000.
8.0–8.9	Great		Major damage to buildings, structures likely to be destroyed. Will cause moderate to heavy damage to sturdy or earthquake-resistant buildings. Damaging in large areas. Felt in extremely large regions. Death toll ranges from 1,000 to 1 million.
9.0 >			Near or at total destruction - severe damage or collapse to all buildings. Heavy damage and shaking extends to distant locations. Permanent changes in ground topography. Death toll usually over 50,000.

Figure 27: **Earthquake Magnitude** and Potential Impacts

e. **Authorities, Policies, Programs and Resources (C.1)**

The Town enforces the State building code construction standards. There are no recorded damages due to earthquake in Westbrook.

f. **Mitigation Specific to this Hazard (ELEMENT C)**

See Appendix III MITIGATION (Figure 29) for the Comprehensive Mitigation Action Items (ELEMENT C). The following are representative mitigation activities specific to this hazard:

Public Information. Provide information on the town's website about earthquakes and links to town, regional, state and federal sites for information on reducing earthquake property damage.

Building Code. Insure that all new residential and commercial construction meets state building codes.

10. **Tsunami**

A tsunami, also known as a seismic sea wave (mistakenly called “tidal wave”), is a series of enormous waves created by an underwater disturbance such as an earthquake, landslide, volcanic eruption, or meteorite. A severe storm over ocean waters can also cause a tsunami in some cases. A tsunami can move hundreds of miles per hour in the open ocean and smash into land with waves of 100 feet or more.

a. **Geographic Extent (B.1)**

In theory, a tsunami could inundate large areas of coastal Westbrook. The area south of I- 95 would likely be inundated, as well as areas near streams where water can wash up from Long Island Sound. There is no extensive mapping showing potentially inundated areas available.

b. **Occurrence (B.2)**

There is no record of a tsunami having occurred in Westbrook. However, according to NOAA, a small tsunami did affect the Narragansett Bay in Rhode Island on June 13, 2013. The water level rose and fell over a period of 20 minutes as a result of a straight line of thunderstorms out at sea that caused the pressure over the ocean to suddenly drop.

c. **Probability of Occurring Again (B.2)**

A tsunami is *a not likely* occurrence in Connecticut.

d. **Potential Impacts (B.1, B.3)**

Long Island is a barrier to smaller events in the Atlantic. Smaller events in the Sound could impact Westbrook but they would most likely resemble a flood event originating from other sources. A tsunami would cause water levels similar to a storm surge for a Category 3 or 4 hurricane, which could cause significant damage to shoreline areas (see Maps 10 &11). The Town would need to expend considerable resources on recovery while losing much of its tax revenue as valuable properties along the shoreline would be lost.

There is no record of Tsunami damage to base a damage estimate on; however, damage would likely be equal to, or greater than that caused by a 100 year storm as suggested in the HAZUS-MH Hurricane Event Report or HAZUS-MH Flood Event Report found in Appendices III and IV. The flood and hurricane event reports estimate a \$312.99 Million and \$11.1 Million building loss, respectively. Losses from a Tsunami would likely be somewhere between these two figures.

e. **Authorities, Policies, Programs and Resources (C.1)**

Warning systems from off shore buoys would be the most logical form of mitigation. Currently the town utilizes a reverse 911 system for warnings along with making Public Announcements from emergency vehicles in affected areas, which could aid in evacuations if time allows.

f. **Mitigation Specific to this Hazard (C.2)**

See Section III MITIGATION (Figure 29) for the Comprehensive Mitigation Action Items (Element C). The following are representative mitigation activities specific to this hazard:

An event in the Atlantic Ocean large enough that Long Island Sound is overrun will most likely be beyond the capability of Westbrook to plan or respond to on its own. Prevention measures for flood damage in the flood zones adjacent to the Menunketesuck and Patchogue Rivers are likely to provide the required mitigation for the unlikely possibility of a tsunami reaching the east coast of the United States. A benefit cost analysis would show that the *very unlikely* probability of its occurrence would not merit extensive mitigation.

Incident Notification System – Enlist public participation through public workshops to develop methods for notification of hazard events and emergencies.

Recovery & Reconstruction Plan – Develop a post-disaster recovery and reconstruction plan to re-establish infrastructure and public services, etc. damaged or destroyed by any NH event, including establishment of a "rainy day" fund in case Federal assistance is insufficient or delayed.

III. MITIGATION (ELEMENTS C & D)

A. Evaluation of Prior Plan (ELEMENT D)

1. Changes in Development

New development has been very limited since the 2006 CREPRA Multi-Jurisdictional Plan due to the downturn in the economy. However, the number of new building permits appears to be on the rise again. In recent years, new large acreage subdivision applications on vacant land in the outskirts of town have slowed with the market trending toward more affordable and convenient multi-family housing closer to the Town Center. The following table summarizes by calendar year the number of building permits issued and total value of new construction for residential units and commercial buildings. Very few of the new structures have been built within hazard prone areas. Overall, changes in hazard prone areas have not affected the vulnerability of the Town as a whole.

Year	New Construction Permits			
	Residential	Value	Commercial	Value
2006	20	\$5,309,112	0	\$0
2007	11	\$3,266,780	2	\$5,660,900
2008	14	\$4,768,890	2	\$870,875
2009	13	\$4,223,496	1	\$2,900,000
2010	2	633,000	2	\$526,830
2011	Data not available			
2012	14	\$3,367,600	3	\$5,062,715
2013	22	\$6,504,427	4	\$15,475,475

Figure 28: **New Construction Permits** since 2006

2. Progress in Local Mitigation Efforts

The Town has made progress in implementing many of the recommendations prescribed by the 2006 draft Plan. Those action items that were completed from the 2006 Plan are included in the list of Comprehensive Mitigation Action Items in Figure 29 and shaded green to denote progress. The focus of the initial mitigation efforts was to strengthen the existing Flood Plain Management Program through a comprehensive review of regulatory requirements and institution of a separate permit review process. In recognition of the flooding that can be caused by upstream stormwater runoff, the Town enacted strict requirements for retaining and infiltrating stormwater on-site for all new development. With the implementation of a town-wide GIS system in 2008, the Town was able to better assess vulnerabilities to natural hazards and develop the mitigation strategies recommended in this plan. The impacts from Hurricane Irene and Storm Sandy in 2012 served to

heighten awareness and strengthen resolve to continue to plan for these types of events and adapt to more frequent and intense weather patterns associated with global warming.

3. **Changes in Priorities (C.5)**

In 2006, the Town set a priority for implementation of each action item in the Plan using the STAPLE-E criteria described in FEMA's "How-to Guide #3: Developing the Mitigation Plan" (FEMA 386-3). The Town reviewed its progress in updating the Plan, and continues to maintain the same priority but with qualitative rating labels (**1, Very Low; 2-3, Low; 4-5, Medium; 6-7, High**). The Town assigned the same rating system for **new** action items, many of which reflect an increased concern for the long-term effects of sea level rise and a need for more in depth analysis to refine mitigation strategies. The 2006 items were also reprioritized at the time of this Update due to the changing financial status since 2006 as well as the fact that the 2006 Plan was not adopted by the Town. Future priority ratings may change again based on availability of funding or other factors.

Priorities in Town have changed since as a result of Tropical Storms Irene and Sandy. The Town is more aware of the types of damage possible by even Tropical Storms. The biggest problem for the Town during those storms was flooding, which is forcing the Town to evaluate drainage infrastructure as well as upstream infrastructure which may cause shoreline flooding to flow upstream through culverts, causing flooding in unexpected areas. In addition, more attention is being paid to trees near power lines. After both storms, power outages persisted more than a week for some residents as a result of downed trees and tree limbs.

B. **Goals to Reduce or Avoid Long-term Vulnerability (C.3)**

The goal of the Plan can be summarized as: *reduction or elimination of injury to or loss of life and property and natural environments and the associated economic impacts from natural hazards.*

C. **Integration into Other Planning Mechanisms (C.6)**

Although the 2006 CRERPA Multi-Jurisdictional Natural Hazard Mitigation Plan was developed and approvable according to FEMA requirements, the Plan was not adopted by the Town of Westbrook and as a result was not incorporated into any other planning mechanisms. However, as Figure 29 notes, many action items were implemented.

Plan of Conservation and Development. The Plan of Conservation and Development (POCD) was adopted pursuant to Section 8-23 of the Connecticut General Statutes. The Plan was developed through a series of public workshops and provides guidance for Town decisions related to land use and capital

improvements. The plan seeks to balance conservation and growth while ensuring the long-term social, economic and environmental health and vitality of the community. The Plan must be updated at least every 10 years.

While the Town of Westbrook did not officially adopt the 2006 Hazard Mitigation Plan, many of the goals and objectives were incorporated in the 2011 update of the Plan of Conservation and Development. Chapter 2 identifies Flood zones as a natural resource element of Westbrook's "green infrastructure" and recommends protection of green infrastructure through dedication as Open Space. Chapter 4 of the Plan entitled, "Sustainability and Resiliency", addresses the need to manage flood risks, prepare for sea level rise and evaluate impacts from other natural hazards. Adoption and implementation of a Hazard Mitigation Plan is specifically recommended along with minimization of new non-water dependent development in flood zones, continued compliance with NFIP requirements, participation in the Community Rating System program, updating flood studies, and using the Town's Geographic Information System to educate residents about the types of risks and vulnerable locations. In Chapter 6, "Facilities and Services", the Plan recommends maintaining emergency services at acceptable levels, locating and/or re-locating community facilities outside of vulnerable locations, and continuing to plan for capital needs. This Plan will be made an addendum to the Plan of Conservation and Development by reference.

5-year Capital Improvement Plan. The Five Year Capital Improvement Plan (CIP) presents a schedule of major public facility improvements and capital equipment acquisitions that will be implemented over the next five years. The projects included in the Plan are derived from a number of sources including the Plan of Conservation and Development and are intended to be responsive to the officially stated direction of the Board of Selectmen. The CIP presents the highest priority projects which can be funded from available resources. The CIP can be used to establish reserve accounts for recommended capital improvements in the Hazard Mitigation Plan which will be adopted as part of the Plan of Conservation and Development.

Emergency Operations Plan. The Emergency Operations Plan (EOP) was prepared in accordance with Section 28-7 of the Connecticut General Statutes following the guidelines provided in "SLG-101 Guide for All Hazard Emergency Operations Planning" (FEMA). The Plan is reviewed annually and updated at least every 4 years. The EOP serves as the overall local planning document for coordination of preparedness and emergency response activities for all man-made, national security or natural hazards. This plan will help to identify opportunities to enhance emergency preparedness and response and identify locations of vulnerable areas.

Municipal Coastal Program. The Coastal Resources Management Plan (CRMP) contains recommended policies and goals for the protection of coastal resources in accordance with CGS 22a-90 through 22a-112 (CT Coastal

Management Act). The purpose and intent of the CRMP is to assist and guide the Town on land use decisions within the Coastal Area Management (CAM) boundary. The Plan is incorporated by reference in the POCD. The Plans, together with the Coastal Site Plan Review requirements in the Subdivision (Sect. 2.2.18) and Zoning regulations (Sect. 11) constitute the Town's Municipal Coastal Program.

The policies set forth in the CRMP and the Coastal Site Plan Review process ensures protection of coastal resources such as beaches and dunes, coastal barriers, tidal wetlands, and rocky shorefronts that dissipate wave energy, thus acting as natural shore-land buffers from coastal flooding and erosion.

D. Discussion of Benefit-Cost Review (C.4, C.5, D.2, D.3)

Although Westbrook may implement recommendations as prioritized by the STAPLEE method, an additional consideration is important for those recommendations that may be funded under the FEMA mitigation grant programs. To receive federal funding, the mitigation action must have a benefit-cost ratio (BCR) that exceeds one. Calculation of the BCR is conducted using FEMA's Benefit Cost Analysis (BCA) toolkit. The calculation may be complex, varying with the mitigation action of interest, and is dependent on detailed information such as property value appraisals, design and construction costs for structural projects, and tabulations of previous damages or NFIP claims.

Although it is beyond the scope of this plan to develop precise BCRs for each recommendation, a cost estimate and possible funding source for each mitigation action item is included in Figure 29. When pursuing grants for selected projects, this information can be used to help select the projects that have the greatest chance of successfully navigating through the application review process. In many cases, benefit to the community may outweigh financial costs, and therefore priority may be increased.

E. Comprehensive Town-Specific Mitigation Action Items (C4.)

Figure 29 below, describes and details the entire Mitigation Action Item List for the Town of Westbrook. A schedule is listed for each action item determining when the Town plans to carry out the project. Items that are shaded green are items carried over from the 2006 Multi-Jurisdictional Plan; other items are new to this 2013 Plan. Each Mitigation Action Item status is noted.

A column has been dedicated to a Benefit Cost Review, which considers the cost to the municipality and the Public. Costs are rated as Minimal, Up to \$100,000, and Over \$100,000.

In addition, each item has a Responsible Party listed. It should be noted that for each item which has more than one Party noted, the first party is the primary responsible party.

The columns marked “Status” includes the current status of each Mitigation Action Item. Action items that were included in the 2006 Plan are shaded grey, while all other items are new to this 2014 Plan Update. Items that are new are marked as such, other items that may be partially implemented or are otherwise in process describe their status.

While some of the 2006 Action items were completed, many were not due to lack of funding and lack of staff time. Work on other items was begun, but is not yet finished. For example, Paper Records Preservation has begun, but is only done as records are needed, and therefore converting them is a slow process. It will take several more years to finish the project. Items that have a status of “not yet begun” were 2006 items that were not worked on due to lack of staff time and funding, but are still a priority for the Town.

A time line for completion or occurrence of each mitigation action item is included and is specified as Daily, Monthly, Annually, 2013-2016, and 2017- 2019. It should be noted that items with a schedule of Daily are those that are items used on a day-to-day basis, such as Best Management Practices. These are items that the Town currently partakes in, and the status for each of these items reflects that. If resources become available, the schedule for these future projects could change.

The individual town review was important for the development of goals and objectives within Westbrook. After the supporting tasks were compiled, town personnel evaluated each task using the STAPLEE criteria described in FEMA’s “How-to Guide #3: Developing the Mitigation Plan” (FEMA 386-3. The evaluation yielded priority ratings based on the following: High (if the task met 6-7 of the STAPLEE criteria), Medium (if the task met 4-5 of the STAPLEE criteria), Low (if the task met 2-3 of the STAPLEE criteria), and Very Low (if the task met 1 of the STAPLEE criteria). The STAPLEE method was used for the 2006 Plan as well; however, each item has been reviewed again, and a new STAPLEE total has been given to all items (including those from the 2006 Plan) for this Plan update. With a significant change in the Town budget after the 2008 financial crisis, it was decided that all projects need to be reprioritized to better reflect 2014 conditions.

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Figure 29: Comprehensive Mitigation Action Items ^{1,2}	Category *	Natural Hazards										Status	Responsible Party **4,5	Schedule A. Daily B. Monthly C. Annually D. 2013-2016 E. 2017-2019	Cost ⁶	Possible Funding Source*** (where applicable)	Weighted STAPLEE Criteria							
		Flooding	High Wind & Tornado	Drought and Wildfire	Winter Storm	Earthquake	Hurricane	Sea Level Rise	Tsunami	Heat Wave	Costs (0)/ Benefits (1)													
											Social						Technical	Administrative	Political	Legal	Economic	Environmental	STAPLEE Total	

1. NHMP Implementation, Maintenance and Review

	Annual Review of Mitigation Efforts & Plan Implementation. Prepare progress report for inclusion in Annual Town Report .	2	X	X	X	X	X	X	X	X	X	Occurs annually	PC	C	\$	OB	1	1	1	1	1	1	1	1	7
R	5-Year Review & Update of Natural Hazard Mitigation Plan. Continue to work with RiverCOG to update plan within the required time period.	2	X	X	X	X	X	X	X	X	X	Will next occur in July 2018	PC/RiverCOG	D	\$\$	HMGP	1	1	1	1	1	0	1	1	6
	Capital Improvement Program. Use Capital Improvement Program (CIP) to set aside funds for infrastructure improvements to reduce loss of life and property during natural hazard (NH) events.	2	X	X	X	X	X	X	X	X	X	Occurs annually	BOS / BOF, DPW, OEM, CC, HC	C	\$\$	CIP	1	1	1	1	1	1	1	1	7
	Benefit-Cost Analysis. Evaluate opportunities for public funding of mitigation projects where public benefits exceed the cost.	2	X	X	X	X	X	X	X	X	X	Occurs for each project	TE, TP ,DF	C	\$\$	HMGP, CIP	1	1	1	1	1	1	1	1	7
R	Grants. Identify and apply for grants to fund infrastructure improvements and other mitigation tasks identified in this plan.	2	X	X	X	X	X	X	X	X	X	Occurs for each applicable project	TE, TP, CC, OEM	B	\$\$	HMGP, CIP	1	1	0	1	1	1	1	1	6

2. Local Planning & Regulation

	Risk Assessment. Use GIS to conduct NH risk assessments that identify potentially affected areas and assess emergency access.	3	X	X	X	X	X	X	X	X		Completed for this update	TP	C	\$	CIP, HMGP	1	0	1	0	1	1	1	1	5
	Land Use Regulation. Maintain, and strengthen as appropriate, subdivision and zoning regulations to make safer new roads, lots and structures within flood zones. Consider increasing freeboard requirements.	3	X									Reviewed annually, changes made as necessary	ZC, PC, LUD, TE	C	\$	OB	1	1	1	1	1	1	1	1	7
	Enforcement. Ensure that flood proof construction standards are strongly enforced.	3	X									Instituted technical review of Floodplain Development Permit Applications by Prof. Engineer.	ZC, TE, BO	A	\$\$	OB	1	1	1	1	1	1	1	1	7
	Road Standards. Update existing road standards to reflect current best management practices for low impact development and amend Subdivision Regulations accordingly.	3	X			X					X	Draft standards prepared.	BOS, PC, TE	D	\$	OB	1	1	1	1	1	1	1	1	7
	Building Standards. Continue to implement State Building/Fire Code and local Flood Code for construction that minimizes loss of life and property damage due to NHs including mandatory wind code compliance.	3	X	X	X	X	X	X	X	X		Enforcing 2013 Amendment to the 2005 State Building Code eff. 2/28/14	BO, FM, TE	A	\$	OB	1	1	1	1	1	1	1	1	7

Figure 29: Comprehensive Mitigation Action Items ^{1,2}	Category *	Natural Hazards									Status	Responsible Party **4,5	Schedule A. Daily B. Monthly C. Annually D. 2013-2016 E. 2017-2019	Cost ⁶	Possible Funding Source*** (where applicable)	Weighted STAPLEE Criteria							
		Flooding	High Wind & Tornado	Drought and Wildfire	Winter Storm	Earthquake	Hurricane	Sea Level Rise	Tsunami	Heat Wave						Costs (0)/ Benefits (1)							
																Social	Technical	Administrative	Political	Legal	Economic	Environmental	STAPLEE Total
Structural Reports. Continue to require structural engineering reports for expansion or alteration of buildings within the V zone.	3	X							X		Currently required	BO, TE	A	\$	OB	1	1	0	1	1	0	1	5
FIRMs. Continue to work with Federal Emergency Management Agency (FEMA) to incorporate updated Flood Insurance Rate Maps (FIRMs) into town's planning, regulatory, outreach and mitigation actions.	3	X							X		Revised FIRMs adopted 2/6/13	LUD, TE	A	\$	HMGP, FMA, OB	1	1	1	1	1	1	1	7
Floodplain Management. Continue to ensure that all new construction or substantial improvements meet or exceed NFIP requirements.	3	X						X	X		Required through Zoning Regulations	PC, ZC, LUD, TE	A	\$	FMA, HMGP, OB	1	1	1	1	1	1	1	7
Community Rating System. Continue to evaluate the benefits to the community of participating in the Community Rating System Program. Align current practices with program requirements in the event that the Town chooses to participate.	2	X						X	X		Currently, benefit of program does not justify cost. Reviewed annually.	BOS/BOF, LUD	C	\$	OB, HMGP	1	0	0	0	1	1	1	4
Stormwater Management. Continue land use permitting that requires storm water retention as appropriate within new and redeveloping areas to avoid downstream impacts.	3	X						X	X		Complete - Required through Subdivision and Zoning Regulations	ZC, PC, LUD, TE	A	\$	OB	1	1	1	1	1	1	1	7
Coastal Area Management. Continue to evaluate all land use proposals within the Coastal Boundary for consistency with the relevant policies and standards of the CT Coastal Management Act in accordance with CGS 22a-90 through 22a-112.	3	X						X	X		Complete - Required through Subdivision and Zoning Regulations	ZC, ZBA, PC, LUD, TE	A	\$	PDM, OB, HMGP, FMA	1	1	1	1	1	1	1	7
Underground Utilities. Require underground utilities for new development; require retrofitting during redevelopment of existing sites to bury utilities where appropriate to mitigate NHs.	3		X		X			X			Complete - Required through Subdivision and Zoning Regulations	ZC, PC, TE, CL&P	A	\$	HMGP, Private Developers	1	1	1	1	1	0	1	6
Critical Facilities. Locate new critical facilities outside of known hazardous locations to the extent feasible.	1	X		X		X	X	X	X		Recommended in POCD. No work has begun. Considerable analysis is needed.	BOS, PC, ZC, OEM	D	\$\$\$	CIP, HMGP	1	0	0	0	1	0	1	3
Street Tree Management Plan. Develop and implement a tree hazard management program to encourage appropriate planting and maintenance practices to minimize future storm damage to buildings, utilities and streets with consideration of the need to reduce heat island effects from extreme heat and preserving community character.	2		X		X			X		X	New	BOS, DPW, TW	D	\$	HMGP, CIP	1	1	1	0	1	1	1	6

Figure 29: Comprehensive Mitigation Action Items ^{1,2}		Category *	Natural Hazards								Status	Responsible Party **4,5	Schedule A. Daily B. Monthly C. Annually D. 2013-2016 E. 2017-2019	Cost ⁶	Possible Funding Source*** (where applicable)	Weighted STAPLEE Criteria									
			Flooding	High Wind & Tornado	Drought and Wildfire	Winter Storm	Earthquake	Hurricane	Sea Level Rise	Tsunami						Heat Wave	Costs (0)/ Benefits (1)								
																	Social	Technical	Administrative	Political	Legal	Economic	Environmental	STAPLEE Total	
	Debris Management Plan. Develop plan to facilitate and coordinate the removal, collection, and disposal of debris following a disaster, to mitigate against any potential threat to the health, safety, and welfare of the impacted citizens, expedite recovery efforts in the impacted area, and address any threat of significant damage to improved public or private property.	2	X	X		X	X	X		X		New	BOS, DPW, OEM	D	\$	CIP, PDM	1	1	1	1	1	1	1	1	7
R	Recovery & Reconstruction Plan. Develop a post-disaster recovery and reconstruction plan to re-establish infrastructure and public services, etc. damaged or destroyed by any NH event, including establishment of a "rainy day" fund in case Federal assistance is insufficient or delayed.	2	X	X	X	X	X	X	X	X		New	OEM, DPW, BOS/BOF	D	\$\$\$	CIP, PDM, RPIP	1	0	0	1	1	1	1	1	5
	Forest Management Plans. Include provisions in existing and future forest management plans to provide emergency access to fire-fighters in the event of wildfires in Town-owned Open Space.	2			X							New	CC, FD	D	\$	OP	1	1	1	1	1	1	1	1	7
R	Wildfire Management Plan. Work with the Fire Department and Valley Shore Mutual Aid Assoc. to develop a wildfire management plan and protocol to ensure that outside fire-fighting resources, such as the National Guard, are available	2			X							New	FD, OEM	D	\$	HMGP, CIP	1	1	1	1	1	0	1	1	6
	Open Space Plan. Consider adding sea level rise to the Town's considerations for preserving as open space those areas that flood waters are projected to inundate.	2	X							X		New	CC, PC	E	\$	HMGP, CIP	0	1	1	1	1	1	1	1	6
	Zones Changes. Discourage zone changes that allow greater intensity or density of use in areas vulnerable to natural hazards.	3	X				X	X	X	X		New	PC, ZC	A	\$	CIP	0	1	1	0	1	1	1	1	5
	Public Utilities. Limit extension of public utilities that would encourage new development in areas vulnerable to natural hazards.	3	X				X	X	X	X		New	BOS, WPCC, CWC, PC	D	\$	HMGP, CIP, PDM	0	1	1	0	1	1	1	1	5
R	Food Security. Promote agricultural uses to improve food security in the event of energy crisis or natural disaster. Support producers interested in expanding and intensifying greenhouse production of food and encourage season extension for food crops. Develop an inventory of land suitable and available for agricultural use, including protected land.	3	X	X		X	X	X		X		New	RiverCOG, Ag Council, PC, ZC, TP	D	\$\$	OP, EMPG	1	1	1	1	1	1	1	1	7

Figure 29: Comprehensive Mitigation Action Items ^{1,2}	Category *	Natural Hazards									Status	Responsible Party **4,5	Schedule A. Daily B. Monthly C. Annually D. 2013-2016 E. 2017-2019	Cost ⁶	Possible Funding Source*** (where applicable)	Weighted STAPLEE Criteria							
		Flooding	High Wind & Tornado	Drought and Wildfire	Winter Storm	Earthquake	Hurricane	Sea Level Rise	Tsunami	Heat Wave						Costs (0)/ Benefits (1)							
																Social	Technical	Administrative	Political	Legal	Economic	Environmental	STAPLEE Total

3. Information Systems, Data Management & Analysis																								
	Geographic Information System. Maintain updated GIS data to better identify and assess areas, structures and populations potentially affected by natural disasters. These data will provide the town with information necessary to assess natural hazard risks and develop plans to mitigate risks to people and property.	2	X	X	X	X	X	X	X	X	X	GIS maintained annually. New data developed as needed for planning projects.	BOS/BOF, PC, OEM, FD	C	\$	OB, HMGP	1	1	1	1	1	0	1	6
	GIS Mobile Applications. Create Mobile GIS application for emergency responders and outfit vehicles with mobile devices.	2	X	X	X	X	X	X	X	X	New	BOS/BOF, OEM, FD	E	\$\$	OB, HMGP	1	0	1	1	1	1	1	1	6
R	Orthophoto & Planimetric data. Over the next five (5) years obtain updated aerial imagery and planimetric data in order to allow for assessment of such factors as extent of damage from NHs, compliance with building standards, identification of shoreline hardening and shoreline erosion and accretion.	2	X	X	X	X	X	X	X	X	Town currently relies on State flights for data, last updated in 2012.	PC, LUD, Assessor, OEM	D	\$	CIP	1	1	1	1	1	0	1	6	
	Asset Management. Develop and implement an asset management program to facilitate maintenance of stormwater systems, develop estimates for upgrades and assess repair costs in the event of damage from NHs.	2	X	X	X	X	X	X	X	X	Catch basins and outfalls mapped for MS4 area	BOS/BOF, DPW, TE, DF	E	\$\$	CIP	1	1	0	1	1	0	1	5	
	Document Management. Convert paper records maintained by the Land Use Dept. to an electronic format, consistent with any State recommendations, to ensure their survival. Establish protocols for practices going-forward including back-up of existing electronic records in another location.	2	X	X	X	X	X	X		X	Large format scanner acquired in 2013. Digital submissions required for new applications.	LUD	D	\$\$	CIP	1	1	1	1	1	0	1	6	
	Permit Tracking System. Upgrade existing system to enable collection of data regarding development activities in Flood Hazard Areas.	2	X							X	New	LUD	D	\$\$	CIP	1	1	1	1	1	1	1	7	
	Special Assistance Registry. Continue to maintain registry of individuals that may have unique vulnerabilities or be less able to respond and recover during a disaster utilizing the best available technology. Create Maps for use by emergency responders.	2	X	X	X	X	X	X	X	X	Registry maintained by VNA using Excel	OEM, VNA, SS, TP	A	\$	OB	1	1	0	1	1	1	1	6	
	Damage Assessment. Develop & implement system to collect geo-coded damage data during and after storm events.	2	X	X	X	X	X	X	X	X	New	OEM, LUD	E	\$\$	HMGP, FMA, PDM, RLP	1	1	1	1	1	1	1	7	

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		Flooding	High Wind & Tornado	Drought and Wildfire	Winter Storm	Earthquake	Hurricane	Sea Level Rise	Tsunami	Heat Wave						Costs (0)/ Benefits (1)							
																Social	Technical	Administrative	Political	Legal	Economic	Environmental	STAPLEE Total

4. Natural Systems Protection																										
Riparian Buffers. Promote the implementation of riparian buffers for existing and new waterfront development utilizing the Coastal Riparian Landscaping Guide for Long Island Sound http://clear.uconn.edu/crlg	1	X			X		X	X					New	CC, ZC	D	\$	HMGP, PDM, FMA, RFLP, OB	1	1	1	1	1	1	1	1	7
Patchogue & Menunketesuck River Mitigation Plan. Develop and implement mitigation plans for previously identified nutrient and sediment nonpoint source pollution sites to reduce vulnerability to coastal storms, sea level rise, flooding, and erosion.	1	X			X		X	X					NFWF Sandy Coastal Resiliency Grant application recently submitted. Awaiting response.	CC, TE	D	\$	NHMP, PDM, FMA, RFLP, CIP	1	0	1	1	1	0	1	5	
West Beach Dune Restoration. Evaluate potential alternatives for the restoration of dunes along West Beach to develop a range of solutions that will renew the coastal beach and dune system, provide storm damage protection for local residents, increase flood control for adjacent properties, and restore an important Town resource.	1	X			X		X	X	X				NFWF Sandy Coastal Resiliency Grant application recently submitted. Awaiting response.	BOS/BOF, DPW,TE	D	\$	HMGP, PDM, FMA, RFLP, CIP	1	1	1	1	1	0	1	6	
Grove Beach Flood Mitigation/Wetland Study. Conduct a comprehensive hydraulics/hydrology study to identify the cause of flooding and to recommend mitigation measures that focus on reducing flooding within the area. The study will focus on improving watershed connectivity by increasing culvert sizes and improving wetland holding capacity and natural function. The study will evaluate the need for wetland restoration including: fragmentation caused by human activity, the effects of surrounding impervious surfaces, and the presence of non-native invasive species.	1	X						X	X				NFWF Sandy Coastal Resiliency Grant application recently submitted. Awaiting response.	BOS/BOF, DPW, TE, GBA	D	\$\$	HMGP, PDM, FMA, RFLP, CIP	1	1	1	1	1	0	1	6	
Barrier Island Stabilization/Restoration. Develop and implement plans, in cooperation with local, state and federal landowners, to stabilize and restore Westbrook's three barrier islands; Salt Island (local), Duck Island (CTDEEP) and Menunketesuck Island (USFW).	1	X	X		X		X	X					NFWF Sandy Coastal Resiliency Grant application recently submitted. Awaiting response.	CC, HC, FWBI	D	\$\$\$	HMGP, PDM, FMA, CIP	1	1	1	1	1	0	1	6	
Salt Island Overlook Habitat Restoration - Develop & Implement Forest Tree Planting Plan for Salt Island Overlook to restore a coastal forest habitat and increase coastal storm resiliency.	1	X	X					X	X				NFWF Sandy Coastal Resiliency Grant application recently submitted. Awaiting response.	CC	D	\$\$	HMGP, PDM, FMA, CIP	1	1	1	1	1	0	1	6	

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Aquifer Recharge. Continue to protect areas of high groundwater recharge potential as identified in the Recharge Mapping Study conducted by Wesleyan through open space acquisition and minimization of impervious surfaces.	3	X		X			X				Enforced through Water Resource District Zoning & Stormwater Mgmt. regulations	CC, ZC, PC	A	\$	HMGP, PDM, FMA, CIP	1	1	1	1	1	1	1	1	7
Marsh Migration. Identify areas where tidal marshes are likely to advance upslope as sea levels continue to rise and develop conservation strategy.	2	X			X		X	X			New	CC, PC	D	\$	HMGP, PDM, FMA, RFLP, CIP	1	0	1	1	1	1	1	1	6
Shore Protection Systems. Conduct a study of existing shore protection systems along the entire Westbrook coast to analyze overall impacts and develop recommendations for mitigation including identification of opportunities for compensation for the hardening of one part of the shoreline by removing the equivalent extent of flood and erosion control structures from another part of the shoreline.	1	X			X		X	X			New	BOS, CC, HC, DPW, TE	D	\$\$	HMGP, PDM, FMA, RFLP, CIP	1	1	1	1	1	1	1	1	7

5. Physical and Infrastructure Improvements

Stormwater Maintenance. Continue to provide for annual maintenance of stormwater infrastructure, including catch basins, detention basins and outfalls.	2	X			X		X	X			Catch basins maintained annually	BOS/BOF, DPW	C	\$\$	OB	1	1	1	1	1	1	1	1	7
Emergency Generators. Assess the adequacy of emergency generators in all critical facilities including private telecommunication towers and gas stations. Make upgrades as necessary.	1	X	X	X	X	X	X	X	X	X	New	BOS/BOF, BOE, OEM	D	\$\$\$	HMGP	1	1	1	1	1	0	1	1	5
MicroGrid. Investigate feasibility of linking critical facilities (i.e. gas station, grocery store, emergency shelter, hospital, public safety).	1	X	X		X	X	X		X	X	New	EC, TE, OEM	D	\$	HMGP, CIP, OP	1		0	0	1	0	1	1	3
Culvert Capacity. Assess existing culvert capacity for extreme precipitation events and develop plan for upgrades.	1	X					X	X			New	BOS/BOF, DPW, TE	D	\$\$	HMGP, CIP, STIP	1	0	1	1	1	0	1	1	5
SFHA Structure Inventory. Conduct an inventory of the elevation of all homes (including basements and crawl spaces as defined in Sect. 5 of Zoning Regs.) in the special flood hazard area with relation to base flood elevation to assess the need for mitigation and develop program to address.	2	X					X	X			New	PC, LUD, TE	D	\$\$	HMGP, FMA, PDM, RLP	0	0	1	0	1	0	1	1	3
Road Evaluation. Evaluate the following roads to develop plans for improvement or elevation for emergency access and evacuation in flood conditions.	1	X					X	X			New	BOS/BOF, DPW, OEM, TE	D+E	\$\$\$	HMGP, LOCIP, STIP, RTP	1	1	1	1	1	0	1	1	6

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Willard Ave. Underpass.	1	X					X	X			New	BOS/BOF, DPW, TE	E	\$\$\$	HMGP, LOCIP, STIP, RTP	1	1	1	1	1	0	1	6
Boston Post Road (Rte. 1).	1	X					X	X			New	BOS/BOF, DPW, TE	E	\$\$\$	HMGP, LOCIP, STIP, RTP	1	1	1	1	1	0	1	6
Grove Beach - Old Mail Trail, Grove Beach Rd. S, Riverview, Menunketesuck, Elm Ave.	1	X					X	X			Survey work & preliminary discussions with CTDEEP for planned improvement of Grove Beach Rd. S drainage swale in progress.	BOS/BOF, DPW, TE	D	\$\$\$	HMGP, LOCIP, STIP, RTP	1	1	1	1	1	0	1	6
Coral Sands - Dolphin, Striper, Tarpon	1	X					X	X			New	BOS/BOF, DPW, TE	E	\$\$\$	HMGP, LOCIP, STIP, RTP	1	1	1	1	1	0	1	6
West Beach - Seaside Ave.	1	X					X	X			New	BOS/BOF, DPW, TE	E	\$\$\$	HMGP, LOCIP, STIP, RTP	1	1	1	1	1	0	1	6
Middle Beach - Salt Island Rd., Pepperidge, Stokes, Gerard	1	X					X	X			New	BOS/BOF, DPW, TE	E	\$\$\$	HMGP, LOCIP, STIP, RTP	1	1	1	1	1	0	1	6
Little Stannard Beach Rd.	1	X					X	X			New	BOS/BOF, DPW, TE	E	\$\$\$	HMGP, LOCIP, STIP, RTP	1	1	1	1	1	0	1	6
Stannard Beach- Second Ave.	1	X					X	X			New	BOS/BOF, DPW, TE	E	\$\$\$	HMGP, LOCIP, STIP, RTP	1	1	1	1	1	0	1	6
Old Kelsey Point Rd.	1	X					X	X			New	BOS/BOF, DPW, TE	E	\$\$\$	HMGP, LOCIP, STIP, RTP	1	1	1	1	1	0	1	6
Chapman Beach Rd./ Walden Dr.	1	X					X	X			New	BOS/BOF, DPW, TE	E	\$\$\$	HMGP, LOCIP, STIP, RTP	1	1	1	1	1	0	1	6
Hammock Rd.	1	X					X	X			New	BOS/BOF, DPW, TE	E	\$\$\$	HMGP, LOCIP, STIP, RTP	1	1	1	1	1	0	1	6
Doc's Hill Rd.	1	X					X	X			New	BOS/BOF, DPW, TE	E	\$\$\$	HMGP, LOCIP, STIP, RTP	1	1	1	1	1	0	1	6
Old Clinton Road (Rte. 145)	1	X					X	X			New	BOS/BOF, DPW, TE	E	\$\$\$	HMGP, LOCIP, STIP, RTP	1	1	1	1	1	0	1	6
McVeagh & Toby Hill Rd.	1	X					X	X			New	BOS/BOF, DPW, TE	E	\$\$\$	HMGP, LOCIP, STIP, RTP	1	1	1	1	1	0	1	6
Meetinghouse Lane	1	X					X	X			New	BOS/BOF, DPW, TE	E	\$\$\$	HMGP, LOCIP, STIP, RTP	1	1	1	1	1	0	1	6

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											Social						Technical	Administrative	Political	Legal	Economic	Environmental	STAPLEE Total	

Pond Meadow Rd.	1	X					X	X				New	BOS/BOF, DPW, TE	E	\$\$\$	HMGP, LOCIP, STIP, RTP	1	1	1	1	1	0	1	6
E. Pond Meadow Rd.	1	X					X	X				New	BOS/BOF, DPW, TE	E	\$\$\$	HMGP, LOCIP, STIP, RTP	1	1	1	1	1	0	1	6
Stevenstown Rd. (Rte. 145)	1	X					X	X				New	BOS/BOF, DPW, TE	E	\$\$\$	HMGP, LOCIP, STIP, RTP	1	1	1	1	1	0	1	6
Winthrop Rd. Bridge Replacement	1	X					X	X				Application for CTDOT Local Bridge Program funding submitted.	BOS/BOF, DPW, TE, DF	D	\$\$\$	HMGP, LOCIP, STIP, RTP	1	1	1	1	1	0	1	6

6. Public Information and Outreach

R	Multi-Hazard Public Awareness Program. Develop and implement a multi-hazard public awareness program. Provide information on all types of hazards, preparedness and mitigation measures, responses during hazard events and financial assistance programs.	2	X	X	X	X	X	X	X	X	X	Land Use Office maintains library of information. NHMP to be posted on town website.	OEM, LUD	D	\$	HMGP, PDM, CIP	1	1	1	1	1	1	1	1	7
	OEM website/Facebook. Continue to maintain and update website with NH preparedness & recovery information.	2	X	X	X	X	X	X		X	X	OEM maintains website and regularly updates. Very active during events.	OEM	A	\$	HMGP, PDM, OB	1	1	1	1	1	1	1	1	7
	Westbrook Events Articles. Contribute quarterly articles on Hazard Mitigation to Westbrook Events.	2	X	X	X	X	X	X	X	X	X	New	OEM, LUD	D	\$	OB	1	1	1	1	1	1	1	1	7
	Voluntary Actions. Promote and highlight voluntary mitigation actions taken by individual property owners and Beach Associations to protect their properties.	2	X	X				X	X			New	LUD	B	\$	OB	1	1	1	1	1	1	1	1	7
	Council of Beaches. Engage the Council of Beaches to participate in developing and implementing hazard mitigation recommendations.	2	X	X				X	X			Meetings held with CoB during development of NHMP. CoB will be involved with maintenance of Plan	OEM, LUD	C	\$	HMGP, PDM, CIP	1	1	1	1	1	1	1	1	7
	Repetitive Loss Properties. Annually distribute flood protection safety pamphlets or brochures to the owners of flood-prone property. Encourage RL property owners to obtain assistance from DEEP and FEMA to acquire hazard mitigation funds to elevate structures where appropriate.	2	X					X				New	LUD	C	\$	HMGP, PDM, RFLP, OB	1	1	1	1	1	1	1	1	7

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																Social	Technical	Administrative	Political	Legal	Economic	Environmental	STAPLEE Total	
On-Line Mapping. Continue to publicize the availability of GIS hazard mapping on the town web site.	2	X						X			Public Access terminal in Land Use & Assessor Office. Press releases submitted to local publications	LUD	D	\$	HMGP, PDM, OB	1	1	1	1	1	1	1	1	7
Vulnerable Populations. Continue to reach out through Visiting Nurses Association and Social Services to provide individual instruction on emergency preparedness to vulnerable populations	2	X	X	X	X	X	X		X	X	VNA conducts surveys and regularly distributes flyers to clients	VNA, SS, OEM	B	\$	HMGP, PDM, OB	1	1	1	1	1	1	1	1	7
Water Conservation. Coordinate with CWC on public education and public service announcements during droughts.	2			X							New	BOS, OEM, CWC	D	\$	HMGP, PDM, OB	1	1	1	1	1	1	1	1	7
NWS Storm Ready Community. Implement required practices and submit application to become designated as a "Storm Ready Community".	2	x	x		x			x			Application submitted by OEM	OEM	D	\$	HMGP, PDM, CIP	1	0	1	1	1	1	1	1	6
7. Actions to Reduce Risk and Minimize Impacts During NH Events																								
Stormwater Management. Complete mapping of catch basins, stormwater outfalls and related infrastructure outside of MS4 area .	2	X						X	X		New	BOS/BOF, DPW, TE	D	\$	PDM, HMGP, CIP	1	1	1	1	1	1	1	1	7
Landscaping. Promote landscaping practices that encourage the planting of species that are less susceptible to damage from ice storms to reduce the probability of damage to structures.	2				X						New	LUD,PC, ZC	D	\$	CIP	1	1	1	1	1	1	1	1	7
Refuges of Last Resort. Identify refuges of last resort for those unable to reach designated shelter.	2	X	X	X	X	X	X		X	x	New	OEM	D	\$	HMGP, PDM, FMA, OB	1	1	0	1	1	1	1	1	6
Immobile Evacuees. Review annually the program to evacuate persons without means of transport, including registration and house numbering.	2	X	X	X	X	X	X		X	X	Reviewed annually, changes made when necessary	OEM	C	\$	PDM, HMGP, OB	1	1	1	1	1	1	1	1	7
Natural Hazard Training. Continue to train and educate emergency responders about mitigating NHs.	2	X	X	X	X	X	X	X	X	x	Training occurs annually	OEM	C	\$	PDM, HMGP, EMPG, OB	1	1	1	1	1	1	1	1	7
Firefighter Training and Education. Training and education of firefighters should include brush and forest fires, with consideration for large areas of phragmites	2			X							Training occurs annually	FD	C	\$	EMPG, PDM, OB, CIP	1	1	1	1	1	1	1	1	7

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	Group Homes Disaster Plans. Continue to work with Group Homes and other facilities housing populations with unique vulnerabilities to develop Disaster Plans.	2	X	X	X	X	X	X	X	X	X	All Group Homes have Disaster Plans in place per Dept. of Health requirements. DEMHS Region 2 will provide funding next year to enhance these plans	OEM	D	\$	PDM, HMGP, EMPG, OB	1	1	1	0	1	0	1	5
	Emergency Shelter. Evaluate the feasibility of upgrading an existing facility or building a new facility for use as an emergency shelter that can withstand a Cat III hurricane. The current facility is only rated up to a Cat I hurricane.	1		X								Westbrook YMCA evaluated, but no actions have been taken	BOS/BOF, OEM	D	\$\$	PDM, HMGP, EMPG, CIP	1	1	1	1	1	0	1	6
R	Cooperative Agreements for Shelters. Establish agreements for shelters that can provide specialized services, throughout the region. Shelters with the capacity to provide for companion pets and medical equipment needs for individuals with disabilities are two examples of such specializations.	2	X	X	X	X	X	X			X	New	BOS/BOF, OEM	E	\$	PDM, HMGP, EMPG, CIP	1	1	0	1	1	1	1	6
	Evacuation Zones. Explore the merits of establishing formal evacuation zones in the next update of the Emergency Operations Plan.	2	X	X								New	OEM	D	\$	PDM, HMGP	1	1	1	1	1	1	1	7
R	Post Disaster School Arrangements. Establish reciprocal arrangements with other school districts for getting students back into classes during extended recovery periods.	2	X	X	X	X	X	X			X	New	BOS, BOE	E	\$	HMGP, CIP	1	1	0	1	1	1	1	6
	Caches. Consider creating stores of emergency supplies in areas of town that will be cut off during major flooding events.	1	X								X	New	OEM	E	\$\$	HMGP, PDM, FMA, CIP	1	1	1	0	1	0	1	5
	Drinking Water Cache. Install drinking water tanks with a supply of bleach for private well water purification.	1	X		X						X	New	OEM, HD	E	\$\$	HMGP, PDM, FMA, CIP	1	1	1	0	1	0	1	5
	Boats. Identify places where people could store their boats during flooding and hurricane events that would reduce the damage to them and that they cause to the waterfront infrastructure when they break from moorings.	1	X	X							X	New	PC, ZC, HC	D	\$	HMGP, PDM, FMA, CIP	1	1	0	1	1	0	1	5
	Temporary Housing. Evaluate the need for post disaster housing for residents displaced by flood or another natural disaster.	2	X	X	X		X	X			X	New	BOS, OEM, Social Services	D	\$	HMGP, PDM, FMA, CIP	0	1	1	0	1	1	1	5

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	Dam Safety. Assess downstream risks due to catastrophic failure.	2	X	X			X	X				New	BOS / BOF, DPW, DEEP, TE, OEM	E	\$\$	HMGP, PDM, FMA, CEP	1	0	1	1	1	0	1	5
R	Sea Level Rise. Seek grants funds to collaborate with an academic institution to research and study the social, economic, environmental and policy-related impacts from SLR.	2	X					X	X	X		New	BOS/BOF, PC, CC, OEM	D	\$\$	HMGP, PDM, FMA, CIP	1	1	1	0	1	0	1	5
	Private Wells. Conduct an inventory of private wells including an assessment of vulnerability to drought and salt water intrusion due to sea level rise.	2	X		X				X			New	BOS/BOF, HD, LUD	E	\$	HMGP, PDM, FMA, CIP	1	1	1	1	1	0	1	6
	Floodplain Management Studies. Update Floodplain Management studies for Patchogue River, Town Center and Cold Springs Brook Watersheds.	2	X						X		Grant submitted for Town Center Watershed. Awaiting response.		CC, LUD, TE	E	\$\$\$	HMGP, PDM, VMA, CIP	1	1	1	1	1	1	1	7
	Certified Floodplain Manager. Have one or more staff members obtain CFM certification.	2	X					X	X			New	LUD, TE	D	\$	FMA, PDM, RFLP, HMGP, OB	1	1	1	1	1	0	1	6
	Building Official Training. Provide advanced training to Building Official through programs such as <i>FORTIFIED for Safer Living</i> developed by the Insitute for Business and Home Safety.	2	X	X	X	X	X	X	X	X	X	New	BO	D	\$	OB	1	1	1	1	1	1	1	7
R	Regional Hazard Mitigation Grant Program Manager. Provide grant administration services for member communities participating in Hazard Mitigation Grant Programs.	2	X	X	X	X	X	X	X	X	X	New	BOS/BOF, RiverCOG	D	\$\$	HGMP, OB	1	1	1	1	1	0	1	6
R	Public Transit Funding. Continue to support regional transportation district (RTD) to facilitate movement of people without means of transportation prior to NH events.	2	X	X	X	X	X	X		X	Westbrook contributes to 9 Town Transit		BOS/BOF, CREMPO	C	\$\$\$	OB, RTP	1	1	1	1	1	1	1	7
	Septic Systems. Continue to design and install septic systems within flood zones in a manner that avoids impairment or contamination during flooding.	2	X					X	X		Sanitarian routinely requires GeoMatrix systems in Flood Zone		HDW/PCC	A	\$	OB	1	1	1	1	1	1	1	7

Notes:

1. Green shading indicates mitigation activities completed since 2006.
2. "R" in left-hand column denotes potential for regional coordination
3. Category: 1=physical/infrastructure improvement
2=program
3=planning/regulatory
4. Responsible Party and Funding Source Definitions are as follows:

*Responsible Party Code		**Funding Source Code	
ACO	= Animal Control Officer	CIP	= Capital Improvement Plan
BO	= Building Official	EMPG	= Emergency Management Program Grant
BOE	= Board of Education	FMA	= Flood Mitigation Assistance
BOF	= Board of Finance	HMGP	= Hazard Mitigation Program Grant
BOS	= Board of Selectman	OB	= Operating Budget
CC	= Conservation Commission	OP	= Other Program
CWC	= CT Water Company	PDM	= Pre-Disaster Mitigation
DEEP	= CT Dept. of Energy and Env. Protection	RFLP	= Repetitive Flood Loss Program
DF	= Director of Finance	RPIP	= Regional Performance Incentive Program
DPW	= Dept. of Public Works	RTP	= Regional Transportation Program
EC	= Energy Committee	STIP	= State Transportation Improvement Program
EDC	= Economic Development Commission		
FD	= Fire Department		
FM	= Fire Marshal		
FWBI	= Friends of Westbrook Islands		
HMC	= Harbor Management Commission		
IWWC	= Inland Wetlands and Watercourses Commission		
LUD	= Land Use Department		
OEM	= Office of Emergency Management		
PC	= Planning Commission		
PRC	= Parks & Rec. Commission		
TE	= Town Engineer		
TP	= Town Planner		
TW	= Tree Warden		
ZC	= Zoning Commission		
ZEO	= Zoning Enforcement Officer		

5. Many mitigation action items have more than one responsible party listed. For those items, the first party listed is the primary contacts.
6. Cost Benefit Review definitions are as follows:
\$ = Minimal; current staff time, copying/printing costs, etc.
\$\$ = Up to \$100,000
\$\$\$ = Over \$100,000

Sources of Information (A.4)

BOOKS AND ARTICLES:

Climate of Connecticut, Joseph Brumbach, State Geological and Natural History Survey of Connecticut, 1965

Flood Insurance Studies, Federal Emergency Management
Deep River, 1980 Old Lyme, 1983
Essex, 1986 Westbrook, 1984
Killingworth, 1981 Lyme, 1978
Westbrook, 1986

Realizing the Risk, L.R. Johnston Associates, Westport, CT, 1983, Natural Resources Center

A New England Tropical Cyclone Climatology 1938-2000, Abstract, Marc, Mailhot, EMA Storm Coordinator Center, Westbrook, ME

Tidal Marshes of Long Island Sound, Ecology, History and Restoration, Bulletin No. 34, The Connecticut College Arboretum, New London, CT, edited by Glenn Dreyer and William Niering, 1995

Soil Survey of Middlesex County, USDA, Connecticut Agricultural Experiment Station, 1979

Suboceanic Landslides, Steven N. Ward and Simon Day, 2002 Yearbook of Science and Technology, McGraw Hill

Landslide tsunami, Steven Ward, Journal of Geophysical Research, Vol. 106, No. 6, Pages 11, 201,-11,125, June 10, 2001

The Face of Connecticut, People, Geology, and the Land, Bulletin 110, State Geological and Natural History Survey of Connecticut, Michael Bell, 1985, reprint, 1997

Movable Shore, Peter C. Patton, and James M. Kent, Sponsored by the National Audubon Society and the Connecticut Department of Environmental Protection, 1992

The Ocean's Reach, Digest of a Workshop on Identifying Coastal Flood Hazard Areas and Associate Risk Zones, New England River Basins Commission, February 1976

TOPO, Interactive Maps, Connecticut, Wildflower Productions, 1999

Primer on Natural Hazard Management in Integrated Regional Development Planning, *Department of Regional Development and Environment Executive Secretariat for Economic and Social Affairs, Organization of American States, With support from the Office of Foreign Disaster Assistance United States Agency for International Development, Washington, D.C., 1991*

Public Safety, What is Hazard Mitigation, *Commonwealth of Massachusetts, The Official Website of the Executive Office of Public Safety and Security (EOPSS), 2011*

Best Practices::Disaster Mitigation Working in Massachusetts; High Marks for Buildings Higher: Hull's Freeboard Incentive Program; Get 'em Up: Situate's Grant Committee Gets Homes in the Air; New Culvert Works: No Flooding at East Street; and New Drainage System Averts Flooding in Melrose; *FEMA Region 1 Mitigation Division as part of DR-1985-MA, June and July 2010*

Mitigation...In Massachusetts, *U.S. Department of Homeland Security, Federal Emergency Management Agency produced in cooperation with the Commonwealth of Massachusetts, circa 2011*

The Non Slippery Slope of Gravel Road Stabilization; Best Practices, *Federal Emergency Management Agency produced in cooperation with Massachusetts Emergency Management Agency, July 2007*

CT-Westbrook town, 2010 Census Interactive Population Search, <http://2010.census.gov>, November 2011

Ch. 16: Northeast. Climate Change Impacts in the United States; *The Third National Climate Assessment*, Horton, R., G. Yohe, W. Easterling, R. Kates, M. Ruth, E. Sussman, A. Whelchel, D. Wolfe, and F. Lipschultz, 2014; J.M. Melillo, Terese (T.C.) Richmond, and G.W. Yohe, Eds., U.S. Global Change Research Program, 371-395. Doi:10.7930/JOSF2T3P

Mitigation Ideas *A Resource for Reducing Risk to Natural Hazards* January 2013 FEMA

Dams in Middlesex County East.jpg / Dams in Middlesex County West.jpg, *Connecticut Department of Energy and Environmental Protection, Inland Water Resources Division, Dam Safety Program, August 4, 2011*

Your Town, Westbrook, Connecticut, *Version 2 Connecticut's Changing Landscape*, *University of Connecticut, College of Agriculture & Natural Resources, Center for Landuse Education & Research (CLEAR), 2006*

CT 2014 Natural Hazard Mitigation Plan Update, CT DEEP Jan. 2014

PICTURES AND NEWS ARTICLES:

New Haven Register, Monday June 7, 1982, Tuesday June 8, 1982

Harford Courant, Monday, June 7, 1982 / Tuesday, June 8, 1982 / July 24, 1982 / July 26, 1982 /

The Gazette, July 28, 1982

Middletown Press, Monday, June 7, 1982 / July 21, 1982

Hartford Courant, "Retreat To High Ground: Hurricane Danger What if Irene had been a major hurricane?", Tuesday, August 30, 2011

MUNICIPAL DOCUMENTS:

Town of Westbrook Subdivision Regulations, *Amended to 11/15/11*

Town of Westbrook Zoning Regulations, *Revised to 2/21/14*

Town of Westbrook Plan of Conservation and Development, *Adopted June 30, 2011*

Westbrook Inland Wetlands and Watercourses Regulations, *Revised to 8/4/2009*

Building Permits, 2006 - 2013 *Prepared by the Westbrook Building Department*

Emergency Operation Plan 8/2/11

Wesleyan Aquifer Recharge Mapping Project May 2010

Patchogue River Watershed Floodplain Management Study October 1984 USDA Soil Conservation Service

Town Center Watershed Floodplain Management Study March 1992 USDA Soil Conservation Service

FEMA Flood Study, Westbrook, CT – *February 16, 2013*

FEMA Flood Insurance Study Supplement – Wave Height Analysis, *February 2013*

Acronyms

For the sake of brevity, this Plan identifies certain terms and entities with particularly long names by their commonly-known acronyms, as follows:

BFE:	Base Flood Elevation
CGS:	Connecticut General Statute
CLEAR:	Center for Land Use Education and Research, University of Connecticut, College of Agriculture and Natural Resources.
CL&P:	Connecticut Light and Power
CRERPA:	Connecticut River Estuary Regional Planning Agency
RiverCOG:	Lower Connecticut River Valley Council of Governments
DEEP:	Department of Energy & Environmental Protection, Connecticut
DOT:	Department of Transportation
DWP:	Department of Public Works
EOC:	Emergency Operation Center
EOP:	Emergency Operations Plan
FEMA:	Federal Emergency Management Agency
FIRM:	Flood Insurance Rate Map
FIS:	Flood Insurance Study
FMA:	Flood Mitigation Assistance
GIS:	Geographical Information System
HMA:	Hazard Mitigation Assistance
HMGP:	Hazard Mitigation Grant Program
LID:	Low Impact Development
LiMWA:	Limit of Moderate Wave Action
MPH:	Miles per Hour
MRPA:	Midstate Regional Planning Agency
NFIP:	National Flood Insurance Program
NFIRA:	National Flood Insurance Reform Act of 1994
NOAA:	The National Oceanic and Atmospheric Administration
NRCC:	Northeast Regional Climate Center
PDM:	Pre-Disaster Mitigation
POCD:	Plan of Conservation and Development
RFC:	Repetitive Flood Claims
RLP:	Repetitive Loss Property
SFHA:	Special Flood Hazard Area
SLOSH:	Sea, Lake, and Overland Surges from Hurricanes
SLR:	Sea Level Rise
SRL:	Sever Repetitive Loss
STAPLEE:	Social, Technical, Administrative, Political, Legal, Economic, and Environmental (Method for Prioritization)
TNC:	The Nature Conservancy
USGS:	United States Geological Survey

Hazus-MH: Hurricane Event Report

Region Name: Westbrook

Hurricane Scenario: Probabilistic 100-Year Return Period

Print Date: Wednesday, January 23, 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 16.16 square miles and contains 1 census tracts. There are over 2 thousand households in the region and has a total population of 6,292 people (2000 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 3 thousand buildings in the region with a total building replacement value (excluding contents) of 794 million dollars (2006 dollars). Approximately 91% of the buildings (and 70% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 3,773 buildings in the region which have an aggregate total replacement value of 794 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

Occupancy	Exposure (\$1000)	Percent of Tot
Residential	553,848	69.8%
Commercial	159,937	20.2%
Industrial	47,626	6.0%
Agricultural	4,812	0.6%
Religious	9,519	1.2%
Government	4,977	0.6%
Education	12,993	1.6%
Total	793,712	100.0%

Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds. There are 4 schools, 1 fire stations, 2 police stations and no 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.

Scenario Name:	Probabilistic
Type:	Probabilistic

Building Damage

General Building Stock Damage

Hazus estimates that about 78 buildings will be at least moderately damaged. This is over 2% of the total number of buildings in the region. There are an estimated 4 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

Occupancy	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	15	85.49	2	10.67	0	2.56	0	1.18	0	0.11
Commercial	184	86.59	22	10.47	6	2.64	1	0.30	0	0.00
Education	4	87.70	0	10.37	0	1.86	0	0.07	0	0.00
Government	5	89.55	1	8.98	0	1.43	0	0.05	0	0.00
Industrial	63	89.38	6	8.47	1	1.80	0	0.34	0	0.02
Religion	12	87.71	1	10.64	0	1.56	0	0.09	0	0.00
Residential	2,896	84.00	482	13.99	63	1.83	3	0.08	3	0.10
Total	3,180		515		71		4		4	

Table 3: Expected Building Damage by Building Type : 100 - year Event

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	11	89.69	1	8.77	0	1.51	0	0.03	0	0.00
Masonry	146	83.80	21	12.18	6	3.70	0	0.28	0	0.03
MH	220	98.54	2	1.02	1	0.34	0	0.01	0	0.10
Steel	119	87.99	12	9.03	4	2.61	1	0.38	0	0.00
Wood	2,487	83.53	437	14.68	48	1.62	3	0.08	3	0.09

Essential Facility Damage

Before the hurricane, the region had no hospital beds available for use. On the day of the hurricane, the model estimates that 0 hospital beds (0%) are available for use. After one week, none of the beds will be in service. By 30 days, none 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%	
Fire Stations	1	0	0	1
Police Stations	2	0	0	2
Schools	4	0	0	0

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 8,138 tons of debris will be generated. Of the total amount, 5,232 tons (64%) is Other Tree Debris. Of the remaining 2,906 tons, Brick/Wood comprises 43% 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 50 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 1,652 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 0 households to be displaced due to the hurricane. Of these, 0 people (out of a total population of 6,292) will seek temporary shelter in public shelters.

Economic Loss

The total economic loss estimated for the hurricane is 11.1 million dollars, which represents 1.39 % 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 11 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 84% 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	7,144.50	724.51	124.49	120.39	8,113.89
	Content	1,564.64	176.73	49.65	27.98	1,819.00
	Inventory	0	4.09	5.81	1.46	11.36
	Subtotal	8,709.13	905.33	179.96	149.83	9,944.25
<u>Business Interruption Loss</u>						
	Income	0	110	2.65	14.22	126.87
	Relocation	375.56	139.76	13.75	21.45	550.52
	Rental	184.88	82.16	2.58	1.52	271.15
	Wage	0	84.75	4.34	78.1	167.19
	Subtotal	560.44	416.68	23.32	115.29	1,115.73
<u>Total</u>	Total	9,269.57	1,322.00	203.28	265.13	11,059.98

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
Connecticut				
Middlesex	6,292.00	553,848	239,864	793,712
Total	6,292	553,848	239,864	793,712
Study Region				
Total	6,292	553,848	239,864	793,712

Hazus-MH: Earthquake Event Report

Region Name: Westbrook, CT

Earthquake Scenario: 100 Year Probablistic

Print Date: January 23, 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 16.15 square miles and contains 1 census tracts. There are over 2 thousand households in the region which has a total population of 6,292 people (2002 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 3 thousand buildings in the region with a total building replacement value (excluding contents) of 793 (millions of dollars). Approximately 91.00 % of the buildings (and 70.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 302 and 0 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

Hazus estimates that there are 3 thousand buildings in the region which have an aggregate total replacement value of 793 (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 79% 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 0 hospitals in the region with a total bed capacity of 0 beds. There are 4 schools, 1 fire stations, 2 police stations and 0 emergency operation facilities. With respect to high potential loss facilities (HPL), there are 3 dams identified within the region. Of these, 2 of the dams are classified as 'high hazard'. The inventory also includes 0 hazardous material sites, 0 military installations and 0 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 302.00 (millions of dollars). This inventory includes over 33 kilometers of highways, 13 bridges, 268 kilometers of pipes.

Table 1: Transportation System Lifeline Inventory

System	Component	# Locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	13	90.40
	Segments	10	179.10
	Tunnels	0	0.00
	Subtotal		269.50
Railways	Bridges	0	0.00
	Facilities	0	0.00
	Segments	4	18.20
	Tunnels	0	0.00
	Subtotal		18.20
Light Rail	Bridges	0	0.00
	Facilities	1	2.70
	Segments	2	12.00
	Tunnels	0	0.00
	Subtotal		14.60
Bus	Facilities	0	0.00
	Subtotal		0.00
Ferry	Facilities	0	0.00
	Subtotal		0.00
Port	Facilities	0	0.00
	Subtotal		0.00
Airport	Facilities	0	0.00
	Runways	0	0.00
	Subtotal		0.00
	Total		302.40

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	2.70
	Facilities	0	0.00
	Pipelines	0	0.00
	Subtotal		2.70
Waste Water	Distribution Lines	NA	1.60
	Facilities	0	0.00
	Pipelines	0	0.00
	Subtotal		1.60
Natural Gas	Distribution Lines	NA	1.10
	Facilities	0	0.00
	Pipelines	0	0.00
	Subtotal		1.10
Oil Systems	Facilities	0	0.00
	Pipelines	0	0.00
	Subtotal		0.00
Electrical Power	Facilities	0	0.00
	Subtotal		0.00
Communication	Facilities	0	0.00
	Subtotal		0.00
	Total		5.40

Earthquake Scenario

Hazus uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.

Scenario Name	100 Year Probabilistic
Type of Earthquake	Probabilistic
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	100.00
Longitude of Epicenter	NA
Latitude of Epicenter	NA
Earthquake Magnitude	5.00
Depth (Km)	NA
Rupture Length (Km)	NA
Rupture Orientation (degrees)	NA
Attenuation Function	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	(%)
Agriculture	18	0.48	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	212	5.62	0	0.00	0	0.00	0	0.00	0	0.00
Education	4	0.11	0	0.00	0	0.00	0	0.00	0	0.00
Government	6	0.16	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	71	1.88	0	0.00	0	0.00	0	0.00	0	0.00
Other										
Residential	650	17.23	0	0.00	0	0.00	0	0.00	0	0.00
Religion	14	0.37	0	0.00	0	0.00	0	0.00	0	0.00
Single Family	2798	74.16	0	0.00	0	0.00	0	0.00	0	0.00
Total	3,773		0		0		0		0	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	2,989	79.23	0	0.00	0	0.00	0	0.00	0	0.00
Steel	155	4.12	0	0.00	0	0.00	0	0.00	0	0.00
Concrete	36	0.95	0	0.00	0	0.00	0	0.00	0	0.00
Precast	10	0.27	0	0.00	0	0.00	0	0.00	0	0.00
RM	61	1.62	0	0.00	0	0.00	0	0.00	0	0.00
URM	262	6.95	0	0.00	0	0.00	0	0.00	0	0.00
MH	259	6.86	0	0.00	0	0.00	0	0.00	0	0.00
Total	3,773		0		0		0		0	

*Note:

RM Reinforced Masonry
URM Unreinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had 0 hospital beds available for use. On the day of the earthquake, the model estimates that only 0 hospital beds (0.00%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 0.00% of the beds will be back in service. By 30 days, 0.00% will be operational.

Table 5: Expected Damage to Essential Facilities

Classification	Total	At Least Moderate Damage > 50%	# Facilities	
			Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	0	0	0	0
Schools	4	0	0	4
EOCs	0	0	0	0
PoliceStations	2	0	0	2
FireStations	1	0	0	1

Transportation and Utility Lifeline Damage

Table 6 provides damage estimates for the transportation system.

Table 6: Expected Damage to the Transportation Systems

System	Component	Number of Locations				
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 % After Day 1	After Day 7
Highway	Segments	10	0	0	10	10
	Bridges	13	0	0	13	13
	Tunnels	0	0	0	0	0
Railways	Segments	4	0	0	4	4
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Light Rail	Segments	2	0	0	2	2
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	1	0	0	1	1
Bus	Facilities	0	0	0	0	0
Ferry	Facilities	0	0	0	0	0
Port	Facilities	0	0	0	0	0
Airport	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.

Table 7 : Expected Utility System Facility Damage

System	Total #	With at Least	# of Locations		
			With Completeness	With Functionality > 50 %	
		Moderate Damage	Damage	After Day 1	After Day 7
Potable Water	0	0	0	0	0
Waste Water	0	0	0	0	0
Natural Gas	0	0	0	0	0
Oil Systems	0	0	0	0	0
Electrical Power	0	0	0	0	0
Communication	0	0	0	0	0

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (kms)	Number of Leaks	Number of Breaks
Potable Water	134	0	0
Waste Water	80	0	0
Natural Gas	54	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	2,605	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 6,292) 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

Table 10: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	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
	Total	0	0	0	0
2 PM	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
	Total	0	0	0	0
5 PM	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
	Total	0	0	0	0

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
<u>Income Losses</u>							
	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
	Subtotal	0.00	0.00	0.00	0.00	0.00	0.00
<u>Capital Stock Losses</u>							
	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
	Total	0.00	0.00	0.00	0.00	0.00	0.00

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.

Table 12: Transportation System Economic Losses
(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	179.09	\$0.00	0.00
	Bridges	90.41	\$0.00	0.00
	Tunnels	0.00	\$0.00	0.00
	Subtotal	269.50	\$0.00	
Railways	Segments	18.23	\$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	18.20	\$0.00	
Light Rail	Segments	11.96	\$0.00	0.00
	Bridges	0.00	\$0.00	0.00
	Tunnels	0.00	\$0.00	0.00
	Facilities	2.66	\$0.00	0.01
	Subtotal	14.60	\$0.00	
Bus	Facilities	0.00	\$0.00	0.00
	Subtotal	0.00	\$0.00	
Ferry	Facilities	0.00	\$0.00	0.00
	Subtotal	0.00	\$0.00	
Port	Facilities	0.00	\$0.00	0.00
	Subtotal	0.00	\$0.00	
Airport	Facilities	0.00	\$0.00	0.00
	Runways	0.00	\$0.00	0.00
	Subtotal	0.00	\$0.00	
	Total	302.40	\$0.00	

Table 13: Utility System Economic Losses
(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.00	\$0.00	0.00
	Facilities	0.00	\$0.00	0.00
	Distribution Lines	2.70	\$0.00	0.00
	Subtotal	2.68	\$0.00	
Waste Water	Pipelines	0.00	\$0.00	0.00
	Facilities	0.00	\$0.00	0.00
	Distribution Lines	1.60	\$0.00	0.00
	Subtotal	1.61	\$0.00	
Natural Gas	Pipelines	0.00	\$0.00	0.00
	Facilities	0.00	\$0.00	0.00
	Distribution Lines	1.10	\$0.00	0.00
	Subtotal	1.07	\$0.00	
Oil Systems	Pipelines	0.00	\$0.00	0.00
	Facilities	0.00	\$0.00	0.00
	Subtotal	0.00	\$0.00	
Electrical Power	Facilities	0.00	\$0.00	0.00
	Subtotal	0.00	\$0.00	
Communication	Facilities	0.00	\$0.00	0.00
	Subtotal	0.00	\$0.00	
	Total	5.36	\$0.00	

Table 14. Indirect Economic Impact with outside aid
(Employment as # of people and Income in millions of \$)

LOSS	Total	%
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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
Connecticut	Middlesex	6,292	553	239	793
Total State		6,292	553	239	793
Total Region		6,292	553	239	793

Hazus-MH: Flood Event Report

Region Name: Westbrook

Flood Scenario: Westbrook Flooding

Print Date: Monday, March 04, 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 16 square miles and contains 176 census blocks. The region contains over 3 thousand households and has a total population of 6,292 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 3,773 buildings in the region with a total building replacement value (excluding contents) of 794 million dollars (2006 dollars). Approximately 91.39% of the buildings (and 69.78% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 3,773 buildings in the region which have an aggregate total replacement value of 794 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

Occupancy	Exposure (\$1000)	Percent of Total
Residential	553,848	69.8%
Commercial	159,937	20.2%
Industrial	47,626	6.0%
Agricultural	4,812	0.6%
Religion	9,519	1.2%
Government	4,977	0.6%
Education	12,993	1.6%
Total	793,712	100.00%

Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure (\$1000)	Percent of Total
Residential	542,028	69.4%
Commercial	159,724	20.4%
Industrial	47,460	6.1%
Agricultural	4,812	0.6%
Religion	9,519	1.2%
Government	4,977	0.6%
Education	12,993	1.7%
Total	781,513	100.00%

Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds. There are 4 schools, 1 fire station, 2 police stations and no 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.

Study Region Name:	Westbrook
Scenario Name:	Westbrook Flooding
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-ifs

Building Damage

General Building Stock Damage

Hazus estimates that about 1,581 buildings will be at least moderately damaged. This is over 76% of the total number of buildings in the scenario. There are an estimated 106 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	0	0	0	0	0	0	0	0	0	0
Commercial	0	0	0	0	2	100	0	0	0	0	0	0
Education	0	0	0	0	0	0	0	0	0	0	0	0
Government	0	0	2	100	0	0	0	0	0	0	0	0
Industrial	0	0	0	0	0	0	0	0	0	0	0	0
Religion	0	0	2	100	0	0	0	0	0	0	0	0
Residential	0	0	40	2.54	374	23.75	466	29.59	589	37.4	106	6.73
Total	0		44		376		466		589		106	

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	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	103	100
Masonry	0	0	1	1.96	7	13.73	13	25.49	30	58.82	0	0
Steel	0	0	1	50	1	50	0	0	0	0	0	0
Wood	0	0	40	2.82	368	25.95	453	31.95	554	39.07	3	0.21

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 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	1	1	0	1
Hospitals	0	0	0	0
Police Stations	2	1	0	1
Schools	4	1	0	1

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 1,115 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 2,714 people (out of a total population of 6,292) will seek temporary shelter in public shelters.

Economic Loss

The total economic loss estimated for the flood is 312.99 million dollars, which represents 40.05 % 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 311.66 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 63.98% of the total loss.

Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates
(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
<u>Building Loss</u>						
	Building	117.79	27.12	2.75	2.78	150.44
	Content	82	59	5	13	158.9
	Inventory	0	1	1	0	2.32
	Subtotal	200	87	9	16	311.66
<u>Business Interruption</u>						
	Income	0.01	0.28	0	0.03	0.32
	Relocation	0.2	0.06	0	0.02	0.28
	Rental Income	0.05	0.04	0	0	0.09
	Wage	0.02	0.27	0	0.36	0.64
	Subtotal	0.27	0.65	0	0.41	1.33
	Total	200.24	87.93	8.87	15.95	312.99

ALL

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
Connecticut				
Middlesex	6,292	553,848	239,864	793,712
Total	6,292	553,848	239,864	793,712
Total Study Region	6,292	553,848	239,864	793,712

Appendix VI – Meeting Agendas and Minutes (A.2)

**Westbrook Planning Commission
Regular Meeting Minutes
June 10, 2013
Mulvey Municipal Center, 866 Boston Post Road
Multi-Media Room**

MEMBERS PRESENT: William Neale, Vice Chair; Phil Bassett, Secretary; Carole Ketelsen, Eric Reeve, Libby Waldron, (alt.), Marie Farrell (alt.), Bob Furno (alt.)

ALSO PRESENT: Meg Parulis, Town Planner and Lisa DeMaria, Recording Secretary

Mr. Neale called the meeting to order at 7:00 p.m. In Ms. Ozols absence, Mr. Neale acted as Chairman and seated Libby Waldron in place of Ms. Ozols.

OLD BUSINESS:

1. Draft Hazard Mitigation Plan – Progress update – Ms. Parulis stated that to help reduce and avoid damages from natural hazards, the Town, working with the Lower CT River Valley Council of Governments, (RiverCOG), is preparing “Natural Hazards Mitigation Plan” (NHMP). The plan will identify actions that could and should be taken by residents and the Town to prepare for and mitigate natural hazard related impacts. The Federal Emergency Management Agency (FEMA) requires that towns adopt and update their NHMP every 5 years to be eligible for planning and mitigation grants.

The Commission reviewed a sample survey. Ms. Parulis explained that the general purpose of the survey is to help measure public opinion and support for natural hazard mitigation actions and to collect comments and ideas on how we can better protect people and property from future hazards. Recently the Town looked into getting into the Community Rating System. Comments were received from property owners that they are not in favor of mandating or making the regulations more cumbersome than they already are with regards to flood hazard mitigation.

Ms. Parulis reported that she has recently attended seminars structured to educate towns about the benefits of more strict building codes to withstand storm events. Ms. Parulis would like to educate and raise awareness about becoming more resilient to property loss rather than impose more stringent regulations.

Ms. Parulis stated that she is looking into the need for an upgraded Community Shelter as part of the Plan.

Ms. Waldron asked if the schools were considered shelters. Ms. Parulis stated that the schools are only safe shelter up to a Category 2 hurricane. It has been suggested that construction of a new shelter could also serve as a Community/Recreation Center. While building to Community Shelter standards would be more costly, there might be grant funds to offset the extra cost.

Mr. Furno suggested that a town shelter could be used to house an indoor marketplace when not being used during a storm.

Ms. Ketelsen asked if the existing school or Town building roofs could be fixed and used as shelters. Ms. Parulis believes that was looked into by the town and it may take more than roof repairs. Ms. Parulis will look into options for community shelters and the possibility of funding.

Ms. Parulis noted that she still has work to refine the survey with specific examples of preparing for natural disasters and some of the mitigation strategies that will be considered in the Plan.

Ms. Farrell suggested that respondents be asked if they would like to know more about Hazard Mitigation. She asked when the survey would go out to the community. Ms. Parulis indicated that she would like to get the survey out before the end of July in order to get feedback from the beach associations and summer residents.

The discussion continued with a review of the Natural Hazard Types listed in the draft Plan and the impacts they would have on the town. Ms. Parulis suggested adding Sea Level Rise to the list. Ms. Ketelsen would like to add fires, coastal erosion and earthquakes to the list. The Town cannot receive funding for hazard types that are not listed in the Hazard Mitigation Plan. Ms. Parulis will talk with Jeremy DeCarli at RiverCOG to determine if this list is based on past or projected hazard types.

ADJOURNMENT:

Ms. Ketelsen made a motion to adjourn at 8:35 p.m. The motion was seconded by Mr. Bassett and unanimously approved.

Respectfully submitted,

Lisa DeMaria, Recording Secretary

**Westbrook Planning Commission
Regular Meeting Minutes
August 12, 2013
Mulvey Municipal Center, 866 Boston Post Road
Multi-Media Room**

OLD BUSINESS:

1. **Hazard Mitigation Plan Review** – Ms. Parulis reported that she is reviewing the state’s draft Hazard Mitigation Plan that was recently made available. The Westbrook Plan will need to be consistent with the state plan.

Ms. Waldron stated that she had seen a news article regarding \$30 million dollars that the State has received to aid homeowners in raising their homes to meet FEMA Regulations. Ms. Parulis explained that the grant money is for the Town to apply for, not individual homeowners. These grants can be applied for after the Town has a Hazard Mitigation Plan in effect.

The Hazard Mitigation survey is nearly finished and will be emailed to the Commission Members for their review.

**Westbrook Planning Commission
AGENDA
February 11, 2013
Mulvey Municipal Center, 866 Boston Post Road
Multi-Media Room
7:00 PM**

NEW BUSINESS:

1. Proposed Amendment to Section 1.1 of the Subdivision Regulations concerning Subdivisions in Incentive Housing Zones (IHZ) *set public hearing date 4/8/13*
2. Discussion of Participation in FEMA Community Rating System
3. Draft 2013 Hazard Mitigation Plan Progress Report

**Westbrook Planning Commission
Special Meeting Minutes
May 19, 2014
Mulvey Municipal Center, 866 Boston Post Road
Multi-Media Room**

MEMBERS PRESENT: Marilyn Ozols, Chair; Eric Reeve, Libby Waldron (alt.), Bob Furno (alt.)

ALSO PRESENT: Meg Parulis, Town Planner and Lisa DeMaria, Recording Secretary

Also in attendance: Attorney Ed Cassella; Helen Bosch, VISTA Vocational; Peter Springsteel, Architect; Scott Desmond, Developer; Bob Doane, Engineer.

Ms. Ozols called the meeting to order at 7:02 p.m. Ms. Waldron and Mr. Furno, alternates, were seated.

OLD BUSINESS:

1. Hazard Mitigation Plan Review – Ms. Parulis reviewed the List of Comprehensive Mitigation Action Items (Fig. 25) with the Commission. She noted that many of the items on the list were included in and supported by the Public Opinion Survey. Others action items were added based on review of the State NHMP, other NHMPs in the region, and FEMA publications. Commission members expressed agreement with the list as presented. Ms. Parulis made note of the items that would be the responsibility of the Planning Commission including the annual reviews. The draft Plan will be completed and mailed out for review prior to the next meeting. The Plan will also be circulated to the Technical Advisory Committee, the Council of Beaches and adjoining towns through posting on the RiverCOG website.

**Westbrook Planning Commission
Special Meeting Minutes
June 30, 2014
Mulvey Municipal Center, 866 Boston Post Road
Multi-Media Room**

MEMBERS PRESENT: Marilyn Ozols, Chair; Bill Neale, Vice-Chair; Libby Waldron (alt.), Marie Farrell (alt.)

ALSO PRESENT: Meg Parulis, Town Planner and Lisa DeMaria, Recording Secretary

Also in attendance: Jeremy DeCarli, RiverCOG

Ms. Ozols called the meeting to order at 7:02 p.m. Ms. Waldron and Ms. Farrell, alternates, were seated.

OLD BUSINESS:

1. Hazard Mitigation Plan Review – Ms. Parulis explained that the Plan was initially prepared by the regional planning agency, RiverCOG, with information from a previous plan that was never adopted. Ms. Parulis updated the information along with a description of the Town’s current mitigation programs and activities. The recommendations included in the Plan were in part based on feedback from a public opinion survey conducted at the end of last summer and review of other NHMP’s and FEMA guidance documents.

Adoption of the Plan is necessary for the Town to be eligible for grant funding through the Hazard Mitigation Grant Program. The Planning Commission will review all comments received at their meeting on July 14, 2014 and prepare a final draft for submission to DEEP and FEMA. Once approved by FEMA, the Plan will be forwarded to the Board of Selectmen for adoption.

Commission Members discussed the Plan and made the following suggestions:

Table of Contents - Ms. Farrell suggested grouping related items in Section II B. Natural Hazards. The Commission agreed that like items should be grouped together and in order of importance as they relate to Westbrook. The Commission would like to see the following order: *Hurricane, Flood, High Wind & Tornado, Sea-Level Rise, Winter Storm & Dam Failure* with the remaining hazards listed last.

Page 11 – Superstorm Sandy is not referenced in paragraph 1.

Page 22 – Ms. Farrell suggested adding a map of beaches that corresponds with the list in paragraph 3.

Page 26 – Mr. Neale suggested a clarification of *Indo-European Languages* in paragraph 4. Ms. Farrell suggested a chart showing which languages are most needed to communicate with the area residents. The Commission would also like a better description of vulnerable populations. Ms. Farrell inquired about the disabled having access to transportation, the need for a public warning system and evacuation routes. Ms. Parulis indicated that she had spoken to Don Izzo, Emergency Management Director about these issues. Mr. Izzo does not feel a need to have a public warning system (such as a siren) or mapped evacuation routes. Emergencies are handled on an individual

basis according to the type and severity of the emergency. The VNA (Visiting Nurse Association) is active and aware of the disabled people in town and assisting them in emergencies.

Page 28 – Ms. Farrell suggested there be more detail regarding public and private utility facilities.

Page 33 - The Commission agreed that it was not easy to understand or see the Critical Habitats map clearly.

Page 36 – Mr. Neale noted that Hurricane Bob was out of order on the Natural Hazards chart.

Page 38 – Mr. Neale noted that *Connecticut River* in paragraph 2 should be changed to *Patchoug and Menunketesuck Rivers*.

Page 39 – It was noted that the storms of 2012 and 2013 were not included.

Page 40 – Ms. Farrell noted that the columns in the chart under *substantially* should be defined better. The term *substantially* refers to a structure being damaged, with costs of repairing, at or above 50% of the appraised value. The chart does not explain that.

Page 46 – Classifications of Dam Hazards on p. 47 should be moved near chart on page 46.

Page 56 – The unit of measure for Precipitation should be specified as inches.

Page 57 – 2000 Blizzard not referenced.

Page 67 – There is an opportunity under e. to mention that given the size of the population, there is a need for multiple shelters due to a possible lack of access to Daisy Ingraham School by some residents because of low lying areas that flood the roadways. Ms. Parulis indicated that the Emergency Management Director is interested in re-visiting the use of the High School/Middle School.

Page 74 – A legend is needed to explain the Sea Level Rise map. After some discussion, it was decided to remove the map from the plan.

Page 75 – The Tsunami definition in the first paragraph references the cause as *earthquake, landslide, volcanic eruption, or meteorite*. The explanation under b., however, states that a tsunami occurred in Westbrook caused by a *straight line of thunderstorms*. The language is inconsistent.

Page 77 – Under b., 8th sentence, Ms Farrell suggested that a *lack of water* be added as result of lengthy power outages.

Mr. DeCarli will amend the draft Plan as requested. Comments from the Technical Advisory Committee and the Council of Beaches will also be incorporated in the next draft.

NEW BUSINESS:

1. Draft Application form for Naming or Re-naming Street –

This application is intended for the purpose of maintaining GIS mapping and notifying emergency responders of name changes and clarifies who the approving authority is (Planning Commission or Selectmen) for various types of streets, provides general guidelines

for street names, and indicates the potential properties to be affected by the name change. The Commission Members agreed to forward the application to the Board of Selectmen for consideration.

ADJOURNMENT:

Mr. Neale made a motion to adjourn at 8:37 p.m. The motion was seconded by Ms. Farrell and unanimously ap

Respectfully submitted,

Lisa DeMaria, Recording Secretary

MINUTES
Westbrook Council of Beaches
7pm, Thursda October 10, 2013
Multimedia Room, Mulvey Center

Associations represented:

- Cedercrest Tax District
- District of Chapman Beach
- Grove Beach Improvement Association
- Island View Beach Association
- Middle Beach Association
- Old Kelsey Point Association
- Old Salt Works Road Beach Association
- Pilots Point Association
- Pointina Beach Association
- West Beach Association

1) Meg Parulis, Town Planner, presented information and discussion concerning the Hazard Mitigation Plan:

Meg Parulis stated that WCOB members are major stakeholders in the Hazard Mitigation plans and that she wants to work together for a plan that will work for all. She said that the plan was drafted by the Regional Planning Agency without input from the Town and then Meg Parulis ran it backwards.

She said that there is potential to receive grants from FEMA. The National Flood Insurance program was joined in 1982. This mandates that residents are able to get flood insurance. Zoning regulations contain the rules and regulations for flood insurance. In 2013, the flood zoning maps changed based on a whole new model of projected flood heights.

Hazard Mitigation grants could be used for structure elevations, dry proofing, structural retro-fitting, safe room construction (Westbrook's current structure is only rated for a hurricane), studies, staff training, looking at the impact of the whole shoreline regarding seawalls and understanding the impact.

Meg Parulis said that she would like to do more planning than reacting. When there are improvements of more than 50 percent made to your home or your home suffered more than 50 percent damage, your home would then need to be brought up to the new code with upgrades made.

She said that the NFIT requirements are minimum requirements that strongly recommend improvement for your own flood protection. Insurance rates are affected by going above and beyond fifty percent resulting in approximately 25 percent increase in

premiums. If you sell your home, the new buyer will be paying “astronomical amounts” in flood insurance. The flood regulations are mirrored in the building codes. She stated that there are steps that the Town can take as there is some funding to help people.

She stated that the original Regional Planning Agency plan was never adopted. Research is being done while updating the Hazard Mitigation plan. She said that once things are updated, insurance costs should be less and the updates will protect the home owner better.

She discussed the Community Rating System which, based on what we already do, would yield a 5 percent discount. She stated that with a little more effort, we could get to a 10 percent discount mark. This is a voluntary program which is an incentive to go above and beyond the minimum requirements. The Hazard Mitigation Plan implemented would get us closer to the 6 percent discount. In Connecticut, only eight communities participate.

Implementing the plan means everything has to go through the process of public hearings, notifications, etc. The hope is that funding will help to look at a neighborhood perspective and not an individual home perspective.

The public hearing on Board of Selectmen draft has been extended to June. It needs to be submitted to FEMA by April. This plan would need to be updated every five years. There is no funding for second residences.

Question posed to Meg Parulis: (How is the money used from the Plan?)

- Answer: The money would be used for projects that benefit the whole town and prioritizing projects. To apply for grants for the town that are meant for being proactive not reactive.

Question posed to Meg Parulis: (Can a flood plain be contested?)

- Answer: There was a process and a public hearing for the adoption of the new maps, and there was a period for public comment to protest. If you think that your elevations are higher and can get a surveyor to agree, you can file a letter of map amendment and/or revision

Question posed to Meg Parulis: (Who does the grant writing for the Town?)

- Answer: Meg Parulis does the grants for the Town Planning Department. The Town will probably need to hire someone on a regional level or Town Engineers oversee the grants and find funding.

Question posed to Meg Parulis: (As there are 17 beaches in Westbrook, how will the grants be distributed?)

- Answer: Opportunities and resources change. The cost benefit analysis at the state will help us and the town will distribute the monies.

2) A motion was made and approved to accept the 2013 WCOB meeting minutes.

3) A motion was made and approved to amend Article III of the Bylaws to allow email notice.

4) Treasurer's Report:

- The closing checking account balance as of October 1, 2013 is \$1,971.74.
- The closing statement savings balance as of October 1, 2013 is \$6,382.13.

A motion was and approved to accept the Treasurer's Report.

5) There was no new business.

6) A motion was made and approved to adjourn the meeting.

The meeting was followed by the Candidate's Forum.

AGENDA
Westbrook Council of Beaches
7pm, Monday July 7, 2014
Multimedia Room, Mulvey Center

Establish Quorum

Call to Order

Old Business

1. Presentation of 2014 Scholarship to Stacey Wnek
2. Proposed Hazard Mitigation Plan - Discussion with Meg Parulis, Town Planner
3. Motion to approve Minutes from June 2014 meeting
4. Treasurer's Report and motion to accept treasurer's report
5. Committee Reports and status reports on ongoing projects and issues

New Business:

1. Zoning issues in beach areas
 2. Information sharing among beaches (hammer laws, by-laws, beach restoration, traffic, etc.)
 3. Upcoming meetings – schedule and programming
- Adjournment

Appendix VII – Public Notices and Screen Shots (A.2)

The following notice was posted on the Town website from Sept. 3 to Oct. 15. It was distributed to Council of Beaches on Sept. 9:

Town Begins Work on Natural Hazard Mitigation Plan

The Westbrook Planning Commission is working with the Lower Connecticut River Valley Council of Governments (RiverCOG) to adopt a Natural Hazards Mitigation Plan (NHMP). The Regional Planning Agency sought and received a FEMA grant to assist the Town in preparing the Plan. Adoption of an NHMP was recommended in the 2011 Plan of Conservation and Development.

The purpose of the Plan is to develop proactive mitigation policies and actions to help reduce risk and create a safer, more disaster resistant community. The hazards that could potentially impact the Town of Westbrook to varying degrees include flooding, wind and tornado, drought and wildfire, winter storm, earthquake, hurricane, sea level rise, and tsunami. The Plan will include an assessment of the vulnerability of critical resources and identify mitigation opportunities specific to the various natural hazards.

Adoption of the Plan will make the community eligible for various grant programs that could assist with implementing recommendations in the Plan. Other benefits include increasing public awareness of threats and hazards, communicating priorities to State and Federal officials and helping the Town to focus resources on the greatest risks and vulnerabilities.

A key component of the Plan is development of a process to keep the Plan current. Progress on implementing the Plan must be monitored on an annual basis and the Plan must be updated every five (5) years.

A Technical Advisory Committee, consisting primarily of Public Safety and Land Use Officials, has been appointed to assist the Planning Commission with reviewing the Plan. Workshops and public meetings will be scheduled over the summer months as work progresses on the Plan. Once the Final Draft of the Plan has been completed and approved by FEMA, it will be forwarded to the Board of Selectmen for adoption.

Submitted by Meg Parulis, Town Planner

The following was published on September 12, 2013 in the Harbor News which is distributed throughout the communities in the shoreline area:

PRESS RELEASE

As part of developing a Natural Hazard Mitigation Plan, the Westbrook Planning Commission is surveying residents to gauge their support for measures currently under consideration to make the Town more resilient to natural hazards such as coastal flooding, hurricanes, winter storms, nor'easters and other events. The Commission also hopes to collect comments and ideas from residents on what they think the Town could do to better protect people and property from future hazards. Results from the survey will be used to finalize recommendations in the Natural Hazard Mitigation Plan. A draft of the Plan will be made available for review prior to its adoption by the Board of Selectmen.

The on-line survey is available at www.westbrookct.us. Paper copies of the survey can be picked up at either the Westbrook Library or the Land Use Department in the Mulvey Municipal Center. The survey must be completed/returned by October 1st.

Submitted by: Meg Parulis, Town Planner

Login / Register | 3 premium articles left before you must register. MAY 1, 2014



Local News

HOME NEWS BUSINESS SPORTS OPINION ENTERTAINMENT MULTIMEDIA classifieds jobs business

Natural Hazard Mitigation Planning Meeting

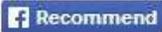
Published September 11, 2013 4:00AM

COMMENTS (0) SHARE PRINT

Press release from Westbrook Town Planner Meg Parulis

As part of developing a natural hazard mitigation plan, the Westbrook Planning Commission is surveying residents to gauge their support for measures currently under consideration to make the town more resilient to natural hazards such as coastal flooding, hurricanes, winter storms, Nor'easters, and other events. The commission also hopes to collect comments and ideas from residents on what they think the town could do to better protect people and property from future hazards. Results from the survey will be used to finalize recommendations in the Natural Hazard Mitigation Plan. A draft of the plan will be made available for review prior to its adoption by the Board of Selectmen.

The online survey is available at www.westbrookct.us. Paper copies of the survey can be picked up at either the Westbrook Library or the Land Use Department in the Mulvey Municipal Center. The survey must be completed/returned by Tuesday, Oct. 1.

 Recommend Be the first of your friends to recommend this.

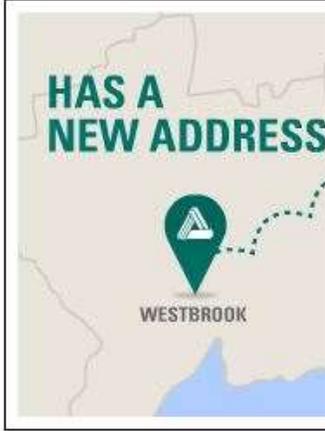


Figure A: Press Release in The Day, September 11, 2013.

HAVE
YOU
TAKEN
THE
NHMP SURVEY!

GO TO
WWW.WESTBROOKCT.US

OR PICK UP A COPY
IN THE LAND USE OFFICE

Figure B: This flyer was posted in locations throughout town to raise awareness of the Plan creation and the Survey.

**Westbrook Planning Commission
SPECIAL MEETING AGENDA
June 30, 2014
Mulvey Municipal Center, 866 Boston Post Road
Multi-Media Room
7:00 PM**

CALL TO ORDER:

OLD BUSINESS:

1. Hazard Mitigation Plan Review – *draft Plan available for public review in Land Use Office and*

http://www.rivercog.org/NHMP/NHMPDraft3_Westbrook061614.pdf

NEW BUSINESS:

1. Draft Application Form for Naming or Re-naming Street – *intended for the purpose of maintaining GIS mapping and notifying emergency responders of name changes. Also clarifies approving authority (Planning Commission or Selectmen) for various types of streets, provides general guidelines for street names, and indicates the potential properties to be affected by the name change. To be forwarded to the Board of Selectmen for consideration.*

ADJOURNMENT:

Attested to: Meg Parulis, Town Planner

Figure C: Agenda for June 30 Meeting Concerning Natural Hazard mitigation Plan.

WESTBROOK COUNCIL OF BEACHES **HOME** ABOUT LINKS CONTACT ARCHIVES

LIVE: Westbrook Weather

WELCOME

2014 MEETINGS

All meetings are in the Multi-Media Room of the Teresa Mulvey Municipal Building 866 Boston Post Road, unless otherwise indicated.

- Monday, May 7, 2014 at 7pm
- Monday, June 2, 2014 at 7pm
- Monday, July 7, 2014 at 7 pm
- Monday, August 4, 2014 at 7 pm
- Monday, August 25, 2014 at 7pm
- Monday, October 6, 2014 at 7pm

CURRENT ISSUES

[Anything in red is a link - click on it]

PROPOSED HAZARD MITIGATION PLAN

[Draft No. 3 - latest draft of Hazard Mitigation Plan](#)

PROPOSED HARBOR MANAGEMENT PLAN & ORDINANCES

Town Meeting Vote - July 1, 2014

[Summary of Revisions to Ordinances](#) - after our 5/5/14 meeting

NEWS

[Anything in red is a link - click on it]

Special Town Meeting

—including voting by Westbrook registered voters on Harbor Management and on a new town wide radio system and low power AM radio station. All items are listed in this [Legal Notice](#).

When: Tuesday, July 1, 2014 at 7:00 P.M.
Where: Multi Purpose Room at the Teresa Mulvey Municipal Center, 866 Boston Post Road, Westbrook, CT

Route 1 Construction Alert Repaving work June 22 - June 30. [Click here](#) for details.

[Flood Insurance - 5/8/14 - FEMA tells](#)

Figure D: Westbrook Council of Beaches Website with link to NHMP.

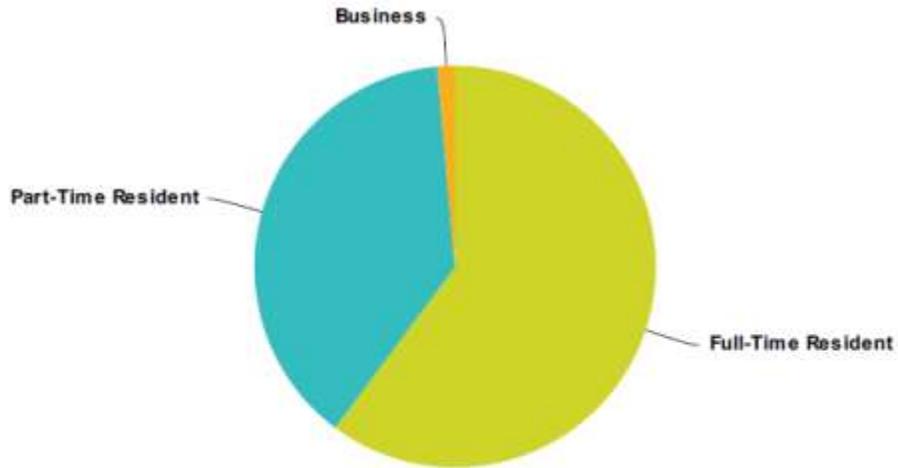
The screenshot shows the RiverCOG website with a navigation menu and a main content area. The navigation menu includes: Home, About, Council of Governments, Transportation, Environment, Regional Planning, Current Projects, Waste Management and Recycling, and Reports & Maps. The main content area features a sidebar with buttons for: PUBLIC NOTICES Air Quality Conformity, Agendas and Minutes, Upcoming Meetings/Agendas, Municipal Resources, and Employment & RFQs. The main content area displays the title "Westbrook Natural Hazard Mitigation Plan (NHMP)" and the following text: "The NHMP for the Town of Westbrook is in the process of being reviewed by the CTDEEP and FEMA. When FEMA approves the Plan, it can then be adopted by the Town of Westbrook. At that time, the Town becomes eligible for whatever natural hazard mitigation funds that may be available from FEMA through the CTDEEP. The final approved NHMP will be posted on this page. A link to the Draft Plan can be found below; more information on the Natural Hazard Mitigation program can be found on the [Natural Hazard Mitigation Plan Home Page](#)." Below this text is a link: "Draft NHMP of the Town of Westbrook". The website header includes a list of member municipalities: Chester, Clinton, Cromwell, Deep River, Durham, East Haddam, East Hampton, Essex, Haddam, Killingworth, Lyme, Middlefield, Middletown, Old Lyme, Old Saybrook, Portland, and Westbrook. There are also banners for "2014 HHW Paper Shredding Schedule" and "Lyme Town Survey".

Figure E: Westbrook NHMP posting on the RiverCOG website.

Appendix VIII – Survey Results

Q1 Are you responding as a:

Answered: 284 Skipped: 2



Answer Choices	Responses	
Full-Time Resident	60.21%	171
Part-Time Resident	38.38%	109
Business	1.41%	4
Total		284

Q2 Please indicate the neighborhood or general area of Westbrook in which you are located:

Answered: 284 Skipped: 2

Answer Choices	Responses	
Cedar Crest	1.41%	4
Chapman Beach	1.06%	3
Coral Sands	0.70%	2
Grove Beach	21.48%	61
Island View	7.04%	20
Little Stannard Beach	4.58%	13
Magna Lane	1.06%	3
Middle Beach	9.86%	28
Old Kelsey Point	5.28%	15
Old Salt Beach	1.41%	4
Pilots Point	5.99%	17
Pointina Beach	5.28%	15
Quonset Beach	0.35%	1
Sagamore Terrace	1.76%	5
Stannard Beach	0.35%	1
Summerwood	0.00%	0
West Beach	9.51%	27
Other	22.89%	65
Total		284

Q3 There are many types of natural hazards that have affected or could affect Westbrook. From the list on the left, indicate if you have experienced each hazard while in Westbrook and if you have had any losses as a result.

Answered: 274 Skipped: 12

	I have suffered losses due to this type of event	I have been inconvenienced but have not suffered any losses	I have neither been inconvenienced nor had any losses	I have not experienced this type of event	Total
Flood	26.94% 66	31.84% 78	15.92% 39	25.31% 62	245
Hurricane/Tropical Storm	43.12% 116	48.70% 131	5.95% 16	2.23% 6	269
Tomado	0.00% 0	3.13% 7	9.38% 21	87.50% 196	224
Winter Storm	13.25% 33	58.23% 145	14.86% 37	13.65% 34	249
Nor'easter	13.01% 32	59.35% 146	16.67% 41	10.98% 27	246
Drought/Wildfire	0.00% 0	2.19% 5	8.33% 19	89.47% 204	228
Earthquake	0.00% 0	2.67% 6	8.89% 20	88.44% 199	225
Heat Wave	1.74% 4	33.04% 76	33.48% 77	31.74% 73	230
Tsunami	0.00% 0	0.44% 1	4.85% 11	94.71% 215	227
Sea Level Rise	9.83% 23	21.79% 51	19.23% 45	49.15% 115	234

Q4 From the list of natural hazards on the left, please indicate your level of concern about the hazard recurring in the future.

Answered: 272 Skipped: 14

	I am not concerned	I am somewhat concerned	I am very concerned	Total
Flood	24.03% 62	40.31% 104	35.66% 92	258
Hurricane/Tropical Storm	4.10% 11	36.19% 97	59.70% 160	268
Tomado	51.26% 122	35.29% 84	13.45% 32	238
Winter Storm	24.90% 64	47.47% 122	27.63% 71	257
Nor'easter	16.14% 41	52.36% 133	31.50% 80	254
Drought/Wildfire	72.92% 175	21.25% 51	5.83% 14	240
Earthquake	74.15% 175	19.49% 46	6.36% 15	236
Heat Wave	59.66% 142	30.67% 73	9.66% 23	238
Tsunami	77.97% 184	15.25% 36	6.78% 16	236
Sea Level Rise	31.45% 78	43.15% 107	25.40% 63	248

Q5 Do you maintain emergency supplies in the event you are unable to leave your home or lose electricity due to a natural disaster?

Answered: 269 Skipped: 17

Answer Choices	Responses	
Yes	77.70%	209
No	22.30%	60
Total		269

Q6 Do you have an emergency back-up generator?

Answered: 269 Skipped: 17

Answer Choices	Responses	
Yes	33.46%	90
No	66.54%	179
Total		269

Q7 Were you aware that the Westbrook Office of Emergency Management has a website www.westbrookem.com to provide information to residents about preparing for natural hazards?

Answered: 269 Skipped: 17

Answer Choices	Responses	
I did not know of the website	34.57%	93
I have visited the website	36.43%	98
I know of the website but have not visited the website	29.00%	78
Total		269

Q8 Have you signed up with CT Alert www.ctalert.gov to receive emergency notifications?

Answered: 268 Skipped: 18

Answer Choices	Responses	
Yes	60.45%	162
No	39.55%	106
Total		268

Q9 If you were required to evacuate your home due to a natural disaster, would you consider going to an emergency shelter if it were available?

Answered: 268 Skipped: 18

Answer Choices	Responses	
Yes	33.21%	89
Maybe	26.12%	70
No, I'd go elsewhere	40.67%	109
Total		268

Q10 Are you interested in receiving information on what you can do to minimize impacts from natural hazards and prevent future losses?

Answered: 266 Skipped: 20

Answer Choices	Responses	
Yes	77.07%	205
No	22.93%	61
Total		266

**Q11 What are the more effective ways for you to get information about making your property more resilient to natural hazards?
Please select up to 5 choices.**

Answered: 262 Skipped: 24

Answer Choices	Responses
Harbor News	49.24% 129
Westbrook Events	35.50% 93
Public Meetings / Informational Workshops	27.86% 73
Town of Westbrook Website	62.60% 164
Office of Emergency Management Website	46.56% 122
Direct Mail	58.02% 152
Beach Association	54.20% 142
Chamber of Commerce	3.82% 10
Library	12.60% 33
Westbrook Land Use Dept.	4.96% 13
Total Respondents: 262	

#	Other (please specify)	Date
1	Flyers/ signs	10/7/2013 9:15 AM
2	Mailed to winter address off season or email or text to go to website.	10/4/2013 1:57 PM
3	e mail	10/1/2013 11:34 AM
4	Internet	9/28/2013 8:06 AM
5	email	9/25/2013 4:54 PM
6	email	9/24/2013 7:28 AM
7	WESTBROOK EMERGENC MANAGEMENT FACEBOOK/TWITTER SOCIAL MEDIA SITES	9/22/2013 6:52 PM
8	telephone notification	9/17/2013 11:13 AM
9	automated phone calls	9/17/2013 10:33 AM
10	Email	9/16/2013 8:23 PM
11	cell txt,	9/16/2013 7:46 PM
12	news reports	9/12/2013 4:38 PM
13	Email	9/12/2013 7:38 AM
14	Facebook Page - Westbrook Emergency Management	9/11/2013 10:07 PM
15	E-mail/texting	9/11/2013 10:39 AM
16	email	9/11/2013 9:48 AM
17	Email	9/11/2013 8:56 AM
18	email	9/11/2013 6:37 AM

Westbrook, CT

19	Office of Emergency Management Facebook	9/10/2013 10:27 PM
20	Red Cross	9/10/2013 8:50 PM
21	email	9/9/2013 5:44 PM
22	email	9/9/2013 4:13 PM
23	We have had no losses...600 ft. to the water and 22 ft. above sea level	9/9/2013 5:57 AM
24	Facebook through the Westbrook Emergency Management Dept	9/8/2013 9:03 PM
25	Email. Text messages	9/7/2013 10:10 PM
26	internet	9/7/2013 6:16 PM
27	Email	9/7/2013 9:17 AM
28	Emails	9/6/2013 10:45 PM
29	Emergency Management Facebook Page	9/6/2013 10:10 PM
30	Various web sites	9/6/2013 9:52 PM
31	I am signed up on Facebook with Emergency Management	9/6/2013 1:40 PM
32	Office of Emergency Management Twitter and Facebook Social Media accounts	9/6/2013 8:53 AM
33	E-mail	9/5/2013 9:49 PM
34	Emerg. Management Facebook Page	9/5/2013 9:07 PM
35	Emergency Management Facebook	9/5/2013 8:49 PM
36	Facebook - Emergency Management	9/5/2013 8:41 PM
37	EM's Facebook and CT Alert	9/5/2013 8:32 PM
38	radio, tv	9/5/2013 4:05 PM
39	Facebook	9/5/2013 3:14 PM
40	Westbrook Emergency Management's Facebook and Twitter Accounts	9/4/2013 6:23 PM

Q12 Is your home or business located in a flood zone?

Answered: 251 Skipped: 35

Answer Choices	Responses	
Yes	51.79%	130
No	36.65%	92
I don't know	11.55%	29
Total		251

Q13 What flood zone is your home or business located in?

Answered: 211 Skipped: 75

Answer Choices	Responses	
Zone A	6.64%	14
Zone AE	8.06%	17
Zone AO	0.47%	1
Zone VE	3.32%	7
I don't know	81.52%	172
Total		211

Q14 When was your home or business constructed?

Answered: 211 Skipped: 75

Answer Choices	Responses	
Before 1984 (Pre-FIRM)	72.04%	152
After 1984 (Post-FIRM)	25.59%	54
I don't know	2.37%	5
Total		211

Q15 Does your home or business meet current Flood Zone standards?

Answered: 211 Skipped: 75

Answer Choices	Responses	
Yes	32.70%	69
No	10.43%	22
I don't know	56.87%	120
Total		211

Q16 Is any habitable area (including unfinished basements) of your home or business below base flood elevation?

Answered: 211 Skipped: 75

Answer Choices	Responses	
Yes	23.70%	50
No	46.45%	98
I don't know	29.86%	63
Total		211

Q17 Are any of your utilities or service equipment located in a basement or crawlspace below base flood elevation? This includes furnaces, oil or propane tanks, air conditioners, heat pumps, hot water heaters, ventilation ductwork, washer and dryer hook-ups, electrical junction boxes, and circuit breaker boxes.

Answered: 211 Skipped: 75

Answer Choices	Responses	
Yes	42.18%	89
No	57.82%	122
Total		211

Q18 Do you currently have flood insurance?

Answered: 211 Skipped: 75

Answer Choices	Responses	
Yes, it is required by my mortgage lender	30.81%	65
Yes, I voluntarily purchased it	21.80%	46
No	47.39%	100
Total		211

Q19 If you do not have flood insurance, why not?

Answered: 131 Skipped: 155

Answer Choices	Responses	
Too expensive	28.24%	37
Not necessary because it never floods	29.01%	38
Not necessary because my home/business is elevated or otherwise protected	42.75%	56
Total		131

#	Other (please specify)	Date
1	I was only able to get CT FAIR plan insurance - I'm not specifically sure if it covers flood.	9/23/2013 3:57 PM
2	N/A	9/16/2013 10:33 PM
3	We are not that close to the water.	9/12/2013 10:20 AM
4	My house was built elevated in 2006.	9/11/2013 8:28 PM
5	Just the corner of my property is in the flood zone. Just about 12" . Acc. To the new survey	9/11/2013 10:08 AM
6	Am considering dropping because we went up to flood zone	9/10/2013 8:35 PM

Westbrook, CT

7	Our house is high enough so - if we flooded - all of the Westbrook coastline would be under 12-15 feet of water.	9/10/2013 7:39 PM
8	It is expensive for the coverage it provides we choose to self insurance and thankfully, we have not had any water in our residence just in a dirt crawl space with no mechanicals.	9/9/2013 12:13 PM
9	I have it because of fema re-zone but I've never had an issue	9/9/2013 9:24 AM
10	After my mortgage was paid off I carried it for many years, then the cost became prohibitive. The fine print indicated very specific coverage and a high deductible. I now "self insure" by setting aside funds for any damages.	9/9/2013 8:07 AM
11	I have flood insurance. Glitch in this program. I answered yes I have flood insurance in question 18 but am still required to answer 19.	9/8/2013 8:58 PM
12	We Have flood insurance. This question should not require an answer if you answer yes to question 18.	9/8/2013 5:28 PM
13	I do have flood insurance	9/8/2013 1:47 PM
14	Have heard it does not provide much protection	9/8/2013 1:02 PM
15	Have it as in previous question	9/8/2013 12:02 PM
16	I do have flood insurance. This question assumes that I do not have flood insurance. Therefore, there is no answer to check	9/8/2013 11:47 AM
17	I am insured	9/7/2013 9:08 PM
18	I have flood insurance	9/7/2013 7:16 PM
19	after Irene ant damage we had flood insurance said it was not covered.....yet we have never submitted a claim but they took our payments for 34 years - all on time I might add. Flood insurance is a sick joke!	9/7/2013 6:21 PM
20	We have flood ins.	9/7/2013 3:20 PM
21	I have insurance because I choose to.	9/7/2013 1:28 PM
22	I have flood insurance	9/7/2013 9:46 AM
23	Have insurance	9/7/2013 9:46 AM
24	Already have flood ins	9/7/2013 9:26 AM
25	I have it! Bad survey design to require answer to this question even if I have insurance	9/7/2013 9:08 AM
26	I have flood insurance - and my house is elevated to FEMA standards. There are only propane tanks below base flood elevation.	9/7/2013 8:51 AM
27	I have flood insurance	9/7/2013 8:48 AM
28	I live in an apartment community that has to take care of that.	9/7/2013 8:19 AM
29	Have flood insurance- this question requires fixing to avoid having come up as unanswered. Needs N/A as an option.	9/7/2013 8:06 AM
30	Was paying \$300/year New map (fema said grandfathered) went to \$3500/year Appealed said that is grandfather rate no help from any agencies	9/7/2013 7:18 AM
31	I have flood but can not go on unless I answer this question! Also you can't check other.	9/7/2013 7:17 AM
32	I have flood insurance	9/7/2013 6:50 AM
33	Also, I have requested information from my insurance broker but she has not been helpful.	9/6/2013 10:47 PM
34	was told I didn't need it	9/6/2013 6:02 PM
35	I do have insurance-- you need to add a button for other because I had to fill in something.	9/6/2013 5:27 AM
36	not in flood zone	9/5/2013 10:08 PM
37	Have flood ins	9/5/2013 10:01 PM

38	have flood insurance	9/5/2013 8:10 PM
39	have ins	9/5/2013 4:21 PM
40	actually never priced it...but I'm answering that it is too expensive because an answer is required by this software.	9/5/2013 10:19 AM
41	I have flood insurance. Please see above	9/5/2013 9:54 AM
42	I dont know if I have flood insurance, and I am curious to see who else on my street does and how much coverage they have and if they ever had to make a claim. I would love to have a seminar at the town hall with other fellow neighbors to brainstorm ideas and combine our knowledge to see what we can learn and maybe come up with a general rule of thumb for flood insurance in the south of route one region of Westbrook. alot of people could benefit from a quick seminar explaining this and I would volunteer.	8/30/2013 12:08 AM

Q20 Would you be in favor of the Town adopting any of the following more stringent regulatory standards for new construction (as recommended by FEMA) in order to get a min.10% reduction in flood insurance premiums? (New construction includes additions/remodeling/repairs.)

Answered: 204 Skipped: 82

	Yes	Maybe	No	Don't Know	Total
Raise the required min. floor height above base flood elevation from 1' to 3'	32.02% 65	21.67% 44	28.57% 58	17.73% 36	203
Consider cumulative repair costs over a period of 5 years in determining substantial damage (repair costs exceeding 50% of value of structure). Structures that have been substantially damaged are required to be upgraded to meet current flood zone standards. At present time, this determination is based on repair costs from a single event	23.96% 46	28.13% 54	25.52% 49	22.40% 43	192
Extend V-Zone standards (i.e. breakaway walls, pier foundations, no structural fill) to Coastal A-Zone (areas subject to wave heights up to 3')	28.13% 54	20.31% 39	20.83% 40	30.73% 59	192
Prohibit new construction in V-Zone	21.99% 42	16.75% 32	30.37% 58	30.89% 59	191

Q21 If your main floor is below base flood elevation, would you be willing to elevate your house?

Answered: 151 Skipped: 135

Answer Choices	Responses	
Yes	8.61%	13
No	53.64%	81
Depends on cost	37.75%	57
Total		151

Westbrook, CT

#	Other (please specify)	Date
1	Not below base flood level	9/22/2013 11:41 PM
2	My main floor is not below flood elevation.	9/13/2013 9:41 AM
3	Main floor is not below base flood elevation	9/12/2013 2:59 PM
4	It is already elevated.	9/11/2013 8:28 PM
5	n/a	9/11/2013 9:04 AM
6	We elevated house after Katrina/Wilma hurricanes to new FEMA standards. We have had no damage in the recent storms due to this investment and do not foresee any future damage due to flooding.	9/10/2013 8:57 PM
7	Does not apply - not in a realistic flood zone.	9/10/2013 7:39 PM
8	N/A	9/10/2013 8:37 AM
9	I think all approaches should be considered - ie walling off etc as opposed to dictating elevation.	9/8/2013 8:58 PM
10	does not apply	9/8/2013 1:52 PM
11	main floor is not below base flood elevation	9/8/2013 1:02 PM
12	our home was raised 27 years ago.	9/7/2013 6:21 PM
13	live in a ranch and don't want stairs to climb. I suggest doing something about the building in town that goes on in marsh areas that have caused the water to rise in our neighborhood. Houses have been built around us that should never have been built. This caused our water level to rise in our neighborhood. New streets were put in. Now they are suggesting a walk for the Academy near the marsh that will cause more water to rise. Maybe think about putting in sewers and get rid of septic systems. More and more people are moving into Westbrook and other beach areas. There is no baffle at the end of pipes that go into the waterways, which cause water to back up during storms in our basins and cause streets to flood. Population is increasing at the beach areas and the towns should be treating the areas as such by putting in sewers. This would help to elevate the flooding in streets and homes.	9/7/2013 1:28 PM
14	Main floor is above BFE	9/7/2013 10:36 AM
15	If I lived in a house like that I would do my best to elevate it but I do not.	9/7/2013 8:19 AM
16	It is not below.	9/7/2013 7:29 AM
17	above 100 year flood mark	9/7/2013 7:18 AM
18	Not relevant	9/6/2013 10:47 PM
19	It would be way to much money. The river is on one side and the sound 1800' so the back of my house is in flood zone since they changed the map	9/6/2013 5:27 AM
20	N/A IN OUR CASE	9/5/2013 9:54 PM
21	na	9/5/2013 3:40 PM
22	It's not below base flood level - but the basement is.	9/5/2013 10:19 AM
23	Does not apply to me	9/5/2013 9:54 AM
24	If I could get a grant to build a very nice garage underneath it then yes why not. I am all for change but there has to be incentive.	8/30/2013 12:08 AM

Q22 Have you taken any of the following actions to protect your home or business from natural hazards that might occur? (check all that apply)

Answered: 222 Skipped: 64

Answer Choices	Responses
Replace windows with wind resistant glass	28.83% 64
Install storm shutters	12.61% 28
Remove large trees close to your house or business	39.64% 88
Elevate your home above projected flood heights	6.76% 15
Remove valuables from basement/crawl space	39.64% 88
Reinforce roof deck sheathing	15.77% 35
Maintain seals on exterior wall penetrations and around windows and doors	33.78% 75
Re-locate mechanical equipment above projected flood height	13.96% 31
Re-locate fuel storage tanks above projected flood height	3.60% 8
Reinforce existing seawall	12.61% 28
Build new seawall	5.86% 13
Properly anchor sheds and other outbuildings	14.86% 33
Properly anchor propane tanks	26.58% 59
Keep yard clear of objects that can be carried by the wind if storm is predicted	85.14% 189
Total Respondents: 222	

#	Other (please specify)	Date
1	Home totally renovated in 2004/2005—all has been done that needs to.	9/21/2013 10:29 PM
2	install water bug in basement on alarm system	9/17/2013 10:34 AM
3	We are not in flood zone so most would not apply.	9/16/2013 8:43 PM
4	Put plywood on windows and doors.	9/16/2013 8:50 AM
5	Trees are periodically trimmed and maintained.	9/12/2013 10:22 AM
6	Installed Flood Vents in lower level.	9/12/2013 7:40 AM
7	The house was built with wind resistant glass, steel reinforced piers and steel beams. I maintain my seawall and repair it as needed.	9/11/2013 8:31 PM
8	Installed pavers around property to prevent sand wash off from front and sides into street parking area.	9/11/2013 10:45 AM
9	Breakaway walls	9/10/2013 8:59 PM
10	IT would be nice if there was a boat ramp that was SOUTH of route one to haul boats out when an incoming hurricane or tropical storm was approaching.. Clinton and Old Saybrook are too far in some boats & too time consuming when a storm is coming	9/9/2013 1:41 PM
11	None	9/8/2013 9:50 PM

Westbrook, CT

12	This house has stood a hundred of feet above projected flood heights for 150 years—see the older diorama displayed at the library. Whatever the town does will increase taxes, maintenance, and insurance. Yet the town itself is a huge part of the problem, the vast majority of residents are not the problem. We are dismayed by the town's negligence: the impunity with which dunes have been bulldozed at the beach, the wetland between Rte 1 and Riverside is filled continuously to create bigger lawns, a tiny piece of land expands annually near the corner of Old Mail Trail and Riverview as the river is being filled in by public works [dumps sand there] and others, jet ski speeds close to shore are not monitored, motor boats discharge gasoline and oil near the swimming areas...and so on. Please get your own house in order. That would be great.	9/8/2013 2:07 PM
13	In the process of installing removable, engineered flood barriers to my "walk-out on grade" basement to add 3 feet of protection.	9/7/2013 10:39 AM
14	Tried to fix sea wall and raise to the same height as my neighbors, told not allowed. Seems quite irresponsible !!	9/7/2013 9:48 AM
15	So many of these things need to be done in this complex but we can't get the owners in NH to get things done that really need it. We are lucky to have a place to live I guess.	9/7/2013 8:20 AM
16	Took most of these in consideration when built house in 1998	9/7/2013 7:19 AM
17	Didn't install storm shutters but have material precut to cover windows.	9/7/2013 7:19 AM
18	built brand new house with all of the proper flood & hurricane requirements met, high up on safe ground	9/5/2013 10:12 PM

Q23 Please indicate how you feel about each of the mitigation actions listed below.

Answered: 216 Skipped: 70

	Strongly support	Support	Neither support or oppose	Oppose	Strongly oppose	Total
Use Capital Improvement Program (CIP) to set aside funds for infrastructure improvements to reduce loss of life and property during natural hazard events.	29.72% 63	41.04% 87	22.64% 48	4.72% 10	1.89% 4	212
Develop a strategy and funding program to assist property owners with elevating or relocating structures on flood-prone properties.	15.71% 33	24.76% 52	32.86% 69	19.05% 40	7.62% 16	210
Evaluate the benefit of purchasing destroyed or repetitive loss properties as open space as an alternative to rebuilding or repairing.	18.31% 39	27.23% 58	26.76% 57	18.31% 39	9.39% 20	213
Identify and target areas that might be inundated by sea level rise or marsh migration for potential open space acquisition.	21.70% 46	35.85% 76	18.87% 40	14.62% 31	8.96% 19	212
Implement dune restoration and marshland protection techniques for flood storage and surge protection.	38.68% 82	41.04% 87	15.09% 32	2.83% 6	2.36% 5	212
Maintain, and strengthen as appropriate, subdivision and zoning regulations to ensure that new lots and roads are safe from flooding.	35.38% 75	43.40% 92	14.62% 31	3.77% 8	2.83% 6	212
Continue land use permitting that requires stormwater retention within new and redeveloping areas to avoid downstream flooding.	28.57% 60	39.05% 82	25.24% 53	4.76% 10	2.38% 5	210
Educate builders and homeowners on design and construction techniques to increase a new or renovated home's resistance to natural hazards.	36.49% 77	50.24% 106	9.48% 20	2.37% 5	1.42% 3	211
Assess existing culvert capacity for extreme precipitation events and sea level rise.	30.48% 64	39.05% 82	27.14% 57	2.38% 5	0.95% 2	210
Continue to maintain existing stormwater infrastructure on an annual basis.	34.12% 72	46.92% 99	15.64% 33	1.42% 3	1.90% 4	211
Establish a comprehensive GIS database to better identify and assess areas, structures and populations potentially affected by natural disasters. These data will provide the town with information necessary to assess natural hazard risks and develop plans to mitigate risks to people and property.	29.52% 62	39.05% 82	24.29% 51	3.81% 8	3.33% 7	210

Westbrook, CT

Assess downstream risks due to dam failure.	23.67% 49	36.23% 75	34.30% 71	3.38% 7	2.42% 5	207
Evaluate the feasibility of upgrading an existing facility or building a new facility for use as an emergency shelter that can withstand a Category III hurricane. The current facility is only rated up to a Category I hurricane.	29.47% 61	34.78% 72	25.60% 53	8.21% 17	1.93% 4	207
Establish reciprocal arrangements with other school districts for getting students back into classes during extended recovery periods.	26.19% 55	44.76% 94	26.67% 56	2.38% 5	0.00% 0	210
Increase contingency fund to cover potential lost revenue and needed repairs in the event of a natural disaster.	20.10% 42	42.58% 89	28.23% 59	7.66% 16	1.44% 3	209
Encourage all privately-owned gas stations to install and maintain emergency back-up generators to insure availability of fuel during prolonged power outages.	44.08% 93	41.23% 87	11.37% 24	1.90% 4	1.42% 3	211
Evaluate the feasibility of establishing a MicroGrid linking critical facilities (i.e. gas station, grocery store, emergency shelter, hospital, public safety)	39.71% 83	39.71% 83	16.27% 34	3.35% 7	0.96% 2	209
Promote agricultural uses to improve food security in the event of energy crisis or natural disaster	24.52% 51	35.10% 73	35.58% 74	4.33% 9	0.48% 1	208

Q24 Please add any suggestions you may have about how individuals and the Town can reduce or eliminate damages from future natural hazard events.

Answered: 43 Skipped: 243

#	Responses	Date
1	Have regular meetings with stakeholders (Fire, Police, EMS, Board of ED and Community Groups). Use the EMAP (Emergency Management Standard) for a guide to improve Emergency Management to the Community. Evaluate cost to homeowners in flood zones and determine the effect of cost/benefit to owner. No mandatory regulations.	10/7/2013 9:50 AM
2	Plan ahead	10/5/2013 8:36 AM
3	Are there benefits/ways to coordinate/cooperate with the other shoreline towns?	10/4/2013 2:21 PM
4	Continue to trim back all trees that threaten power and tel. wires. Build more and bigger sea walls and jettys.	10/1/2013 11:40 AM
5	Limit extended or enhanced development in flood zones and coastal management areas.	9/28/2013 2:19 PM
6	rebuild Westbrooks Barrier Islands to provide Storm protection to the Waterfront and Riverfront properties and to prevent sand buildup in the Channel. Provide Funding for Home Generators. Provide Funding for Residential River Wall Construction for Homes along the Tidal Rivers.	9/25/2013 7:09 PM
7	WE WENT TO THE DISASTER SHELTER FOR BOTH TROPICAL STORMS AND WILL CONTINUE TO DO SO AS NEEDED. WE FEEL THE TOWN HAS THE RESPONSIBILITY TO UPGRADE THE SHELTER TO A STRONGER BUILDING OR BUILD A NEW ONE FOR ITS RESIDENTS. THE NEW EMERGENCY MANAGEMENT GROUP WAS WONDERFUL DURING BOTH STORMS. THE DIRECTOR PROVIDED US WITH TIMELY UPDATES BEFORE AND AFTER THE STORMS.	9/22/2013 6:56 PM
8	The Emergency Management group was wonderful providing us with information for the last three storms. Mr. Izzo is doing a wonderful job and feel lucky we have him. Keep up the good work.	9/20/2013 7:27 PM
9	Increase the sea wall height	9/20/2013 4:36 PM

Westbrook, CT

10	Rent emergency Tanks (on standby) from local Fuel Suppliers that can dispense gasoline or diesel fuel in the event of an prolonged emergency. These are tanks that can be put in place by the supplier when notice of a storm is on the horizon.	9/19/2013 11:06 AM
11	My husband and I would like to thank Mr. Izzo from Emergency Management for his assistance to our town. His professional demeanor is a credit to this town. We support his plans and communication to us through the Emergency Management website, Facebook and Twitter sites.	9/16/2013 10:37 PM
12	We endorse upgrading the Daisy Ingraham School or build a new facility that will support disaster shelter for a storm. The current building does not meet the needs of our town.	9/14/2013 11:40 PM
13	The town should clean-up the salt water marshes after the hurricanes. There were no clean-up efforts in our marsh. I know for one that there is a kayak, house doors, house windows and other debris in the marsh caused by the last two storms. All the garbage that comes off the homes that are directly on the beach end up in my cul de sac area and the marsh. I tried to clean-up as much as I could, returning items if I knew where they came from but I think a more town wide effort would help in this clean-up effort.	9/13/2013 8:26 AM
14	We appreciate all Emergency Management has done for our family. The new Director has been wonderful in helping us. Thank you!	9/11/2013 10:11 PM
15	Ok. It really doesn't make sense to set up a program to purchase properties in flood prone areas when the town continues to issue NEW BUILDING PERMITS in those same areas. It could be argued that new construction would be built to new codes however would it not be preferable to stop building in those areas where we know that it is likely that rising sea levels will affect home owners.	9/11/2013 8:46 PM
16	I strongly urge the town to become proactive in beach restoration including use of valuable dredge materials, permitting of groin repair/replacement, repair of existing sea walls, and dune creation/restoration. This will require working with the DEEP to help modify/reduce it's overly stringent and costly permitting procedures.	9/11/2013 10:58 AM
17	make is easier for people to raise their sea walls. the process makes no sense.	9/11/2013 9:47 AM
18	We use the school for an emergency shelter for both storms. We fully support the funding upgrade or build a stronger building to support residents for a Hurricane CAT 3. Also, our gas stations need a generator. It should be required based upon the basic need for gasoline.	9/10/2013 10:31 PM
19	Visit RedCross.org and download preparedness apps to prepare your residents for free at no cost to the town. Create a CERT team to support your first responders during natural disasters.	9/10/2013 9:07 PM
20	E-mail notification on a daily basis when there is an emergency. We have them in NY and they work well in our town. they let you know where shelters are; fod; gas; medical services; babysitting etc. Formulate a plan with the new hospital that is being built in Westbrook	9/9/2013 4:17 PM
21	Install city sewers to all homes to mitigate the damage caused by flooding and septic seepage.	9/9/2013 2:01 PM
22	The emergency warning for floods is too vague. (Seek higher Ground.) What does that mean? Where is it safe to go, for instance, in the middle of the night?	9/9/2013 12:17 PM
23	Our gas stations should be required to have a generator	9/8/2013 10:35 PM
24	None	9/8/2013 9:52 PM
25	Our family went to Daisy Ingraham twice for both storms, Irene and Sandy. The Emergency Management volunteers were awesome and kept us comfortable as possible. We are sad to hear our school can't support a Hurricane CAT 1 or higher event. Our town NEEDS this facility increased to standards as noted in the question above or build an appropriate building. Its a shame this was not done originally. Now is the time for it. The residents of Westbrook request it.	9/8/2013 9:08 PM
26	First--do no harm. In Ask the state to study electric utility companies' response time and obligations following outages, and develop guidelines to restore power more quickly. Request a local university to study the affects of proliferating beachfront sea walls on either side of the Mennenletesuck River to beach erosion, and a strategy to ameliorate the situation with the cooperation of the beach associations. Maintain a database of the housebound and infirm residents who need help not only during outages and personal emergencies. Integrate and extend information resources in these areas. Monitor the discharge from the marinas and from boats moored in the harbor for days. Tax slips at the marinas, according to boat length, at the marinas; these spaces are often used as de facto summer homes, to pay for environmental restoration, water quality monitoring, and natural disaster preparation. Recognize that Indians lived here for centuries in balance and a reverential posture toward the natural environment--introduce their heritage and philosophy into the school curriculum--as well as the massacre that took place in this area.	9/8/2013 2:22 PM

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27	-form an allience with area contractors including dump truck, plowing, excavation equipment, water pumping, electrical generator equipment including set up. To establish an on call list in the event they are needed. -tell gov Dannel Malloy not to stage water and supplies at UConn stadium so far from the hardest hit areas. While they were patting themselves on the back the shoreline couldn't get water for the men and women working to restore operations. Somehow educate people on how to treat workers that are restoring operations. These are hardworking men and women and are sometimes spit at and spoken to very harshly because people believe they are entitled to having utilities restored overnight after a devastating storm.	9/8/2013 6:34 AM
28	Don't continue to build on Marshes filling in the land and building it raises other areas that have never had problems before. Contain the Marsh areas and put in sewers that will help prevent streets from flooding. Keep the basins cleans at all times and put baffles on the pipes leading into the water, so when a storm does occur the water doesn't flood through the pipes and project up through the basins and into the streets which seem to increase our flooding problems. I understand the beaches don't want to put in sewers to having more people move into town but the people are moving in anyway and more and more people are living at the beach year round. We need sewers. Maybe higher seawalls on the beaches would help to protect us from water flooding the streets and neighborhoods.	9/7/2013 1:46 PM
29	Work with utilities to remove vegetation under, around & above all power lines.	9/7/2013 9:34 AM
30	Continue efforts to inform residents of increased base flood elevation and implications of continuing sea level rise combined with storm surges. Many are blissfully unaware.	9/7/2013 8:10 AM
31	My wife and I enjoy the time and effort Mr. Izzo has placed into Emergency Management for our town. His sincere efforts are encouraging and an inspiration to us. We have listened to him speak and support his efforts. The Facebook page provides us with regular information and emergency notifications throughout the year. Our older son is considering a career in this field. Our family was encouraged to leave our home from Hurricane Sandy. We didn't leave for Irene and it was a mistake since our roads were blocked. We were happy to stay at the school shelter for two nights and felt safe. Yet we are puzzled why the school is not upgrade and improved for a larger storm. We approved the support of new fire trucks for the fire department. Like the new trucks, the shelter is for us too!	9/6/2013 10:20 PM
32	Since our town has only three gas stations, at least two should have generators. My family stayed at the Daisy Shelter for both storms. Emergency Management staff were great. We are not happy hearing the school, the town's only shelter can't provide a safe, location for our residents. What are the plans to improve this situation?	9/6/2013 10:02 PM
33	My wife and I appreciate the new Emergency Management website and Facebook. The information is professional and extremely helpful. We did not need the shelter for Irene, but we did need it for Sandy. We are very surprised the school is not build stronger for higher rating for our safety. When will this happen? They state there is no building in town to meet this important specification so when will the Board of Selectman and Board of Finance fix this problem. We were told you have been aware of it for quite some time now. We are getting ready to retire in a few years. But are we truly safe?	9/6/2013 1:47 PM
34	After reviewing the Office of Emergency Management's budget for the last 10 years, I would like to know why the town does not provide additional funding for the department? Especially after the last two years of storms, the officials I elect are not taking this seriously? What about grants? My other topic is the school shelter. The Director states the school can't be used for a Hurricane Category 2 and 1 is even a possible problem. Why isn't the town reenforcing this building, using a different building or building a new one? New fire trucks are slated for replace, about time. Now its long over due for a shelter.	9/6/2013 9:00 AM
35	I found that the portion of Boston Post Rd near the Town Hall was the last to have the power turned back on. We were 2 or 3 days after each side of town was on. Also, with the snowstorm route one from Bills to the center was not plowed until the end of the storm. It seems the State and CL&P don't like this part of town. We were out 5 days both times and being in town it seemed strange to me	9/6/2013 5:33 AM
36	Great Emerg. Management website. Not sure why the Daisy Ingraham School is not built to higher storm standard. It must be done. Its needed. Based upon reports it doesn't meet the town's need. Are you going to do anything about it? Please.	9/5/2013 9:12 PM
37	My family and I attended the shelter for the last two storms. The workers were great. My concerns are why didn't Westbrook leaders build a stronger school for a category 2 or 3 storm? Even when upgrades were made a few years ago. You failed us knowing this but didn't act. We have the money or access to funds! Very disappointing.	9/5/2013 8:58 PM

Westbrook, CT

38	I love the Facebook post from emergency management. Very appropriate in today's age.	9/5/2013 8:45 PM
39	We deeply appreciate all the communications from Emergency Management on their website and Facebook. Very timely and well planned. Thanks!	9/5/2013 8:37 PM
40	Public information sessions	9/5/2013 3:44 PM
41	More frequent cleaning of catch basins to keep our drainage ways clear and functioning optimally.	9/5/2013 10:08 AM
42	Why did you build that damn train station?	9/5/2013 9:58 AM
43	1. Hand out M.R.E's (Meals ready to eat) to families requesting them in emergency situations. 2. Sell Emergency Ready Kits to families requesting.	8/30/2013 12:19 AM

Appendix IX – Resolution to Adopt

RESOLUTION

TOWN OF WESTBROOK HAZARD MITIGATION PLAN

WHEREAS, the Disaster Mitigation Act of 2000 encourages communities to prepare a Natural Hazard Mitigation Plan to outline natural hazard vulnerabilities and potential mitigation measures; and

WHEREAS, the primary goal of the Natural Hazard Mitigation Plan Update, 2014 is to reduce the loss of or damage to life, property, infrastructure, and natural, cultural, and economic resources from natural disasters; and

WHEREAS, in light of continuing natural disasters that severely impacted public infrastructure and private properties in the Town of Westbrook, the Town developed a Natural Hazard Mitigation Plan update to understand local conditions and plan accordingly; and

WHEREAS, public information meetings were held between June 10, 2014 and July 14, 2014 to solicit public input and recommendations and to review the plan as required by law;

WHEREAS, the Natural Hazard Mitigation Plan Update, 2014 recommends many hazard mitigation actions that will protect the people and property affected by the natural hazards that potentially face the town; and

WHEREAS, some of the recommended mitigation actions may qualify for Federal funding but only if the Town of Westbrook officially adopts the Natural Hazard Mitigation Plan Update, 2014; and

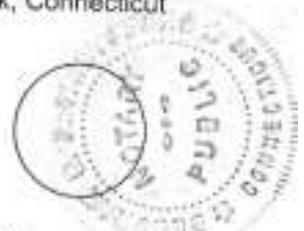
WHEREAS, the Town of Westbrook shall implement, maintain, and update the Hazard Mitigation Plan Update, 2014 through the appropriate municipal departments and commissions;

BE IT RESOLVED by the Board of Selectmen of the Town of Westbrook that the Natural Hazard Mitigation Plan is hereby adopted as an official plan of the Town of Westbrook, and that the appropriate municipal departments will report annually on their activities, accomplishments, and progress relative to the Natural Hazard Mitigation Plan Update, 2014 for the Town of Westbrook.

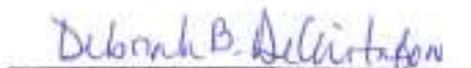
BE IT FURTHER RESOLVED that the Town of Westbrook, through its Board of Selectmen, is authorized to apply for and accept any future Federal or State grant assistance to accomplish the goals of the Natural Hazard Mitigation Plan Update, 2014.

Adopted this 28 day of Aug, 2014 by the Board of Selectmen of Westbrook, Connecticut


Noel Bishop, First Selectman



IN WITNESS WHEREOF, the undersigned has affixed his/her signature and the corporate seal of the Town of Westbrook this 29 day of August, 2014.


Deborah DeCristoforo, Asst. Town Clerk

DEBORAH B. DECRISTOFORO
NOTARY PUBLIC
MY COMMISSION EXPIRES MAY 31, 2018