HAZARD MITIGATION PLAN UPDATE
ANNEX FOR THE BOROUGH OF STONINGTON

Southeastern Connecticut Council of Governments
Multi-Jurisdictional Hazard Mitigation Plan Update

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1.0 INTRODUCTION

1.1 Purpose of Annex

The purpose of this HMP annex is to provide an update to the natural hazard risk assessment and capability assessment provided in the previous HMP, and to evaluate potential natural hazard mitigation measures and prioritize natural hazard mitigation projects specific to mitigating the effects of natural hazards to the Borough of Stonington. Background information and the regional effects of pertinent natural hazards are discussed in the main body of the Southeastern Connecticut Council of Governments (SCCOG) Multi-Jurisdictional Hazard Mitigation Plan. Thus, this annex is designed to supplement the information presented in the Multi-Jurisdictional HMP with more specific detail for the Borough of Stonington and is not to be considered a standalone document.

The primary goal of this hazard mitigation plan annex is to identify particular vulnerability to natural hazards and potential mitigation measures for such natural hazards in order to ***reduce the loss of or damage to life, property, infrastructure, and natural, cultural, and economic resources.*** This includes the reduction of public and private damage costs. Limiting losses of and damage to life and property will also reduce the social, emotional, and economic disruption associated with a natural disaster.

1.2 Setting

The Borough of Stonington is a densely developed political subdivision of the municipality of Stonington, Connecticut. The Borough was first settled in 1753 and established as a borough in 1801. Residents of the Borough are also considered residents of the Town of Stonington (the remaining political subdivision of Stonington) and the two jurisdictions share many municipal services. The Borough is approximately 205 acres in area and had a population of 929 as of the 2010 census. This population figure does not account for the seasonal influx of residents each summer; the population of the borough can increase as much as 25% during this time.

The borough is located in the southeastern portion of the Connecticut shoreline. It is bordered by the Town of Stonington to the north, Stonington Harbor to the west, and Little Narragansett Bay / Fishers Island Sound to the east and south. The borough can be accessed via Route 1A in Stonington, although State roads do not exist within the borough.

1.3 Plan Development

The 2005 HMP and its annexes were developed through a series of meetings and the completion of written questionnaires, personal interviews, and workshops as described in the Multi-Jurisdictional HMP update. Since that time, the HMP has been available in local governmental offices and available to emergency personnel. Residents were encouraged to contact the Burgesses with any concerns regarding emergency response or potential projects related to natural hazard damage.

Based on the existing plan, existing information, and hazards that have occurred since 2005, SCCOG determined that the following data collection program would be sufficient to collect data to update the Multi-Jurisdictional plan and each annex.

- The SCCOG issued a press release on November 20, 2011 announcing a public information meeting on the multi-jurisdictional HMP update. This press release was published in the Norwich Bulletin and The Day. This notice was also posted on the SCCOG website and the *Patch* (a popular internet newspaper). The public information meeting was held on December 13, 2011 at the SCCOG office.

- A data collection meeting was held with the on January 18, 2012 to discuss the scope and process for updating the plan and to collect information. The Fire & Emergency Management Commissioner coordinated the local planning team which included the Zoning Enforcement Officer. The meeting focused on reviewing each section of the existing hazard mitigation plan and annex, critical facilities, and various types of hazards that have affected the borough and that should be addressed in the update.

- The draft that is sent for State review will be posted on the Borough website (http://www.borough.stonington.ct.us/) as well as the SCCOG website (http://www.seccog.org) for public review and comment. In addition, a hard copy will be made available in the SCCOG office in Norwich. A press release will announce the availability of the HMP for review. This will provide residents, business owners, and other stakeholders throughout the SCCOG region the opportunity to review and comment on a relatively complete draft with all annexes. Comments received from the public will be incorporated into the final draft where applicable following State and Federal comments.

The adoption of this HMP update by the Borough of Stonington will be coordinated by SCCOG and the Fire & Emergency Management Commissioner. The HMP update must be adopted within one year of conditional approval by FEMA, or the Borough will need to update the HMP and resubmit it to FEMA for review. The adoption resolution is located in Appendix A of this annex.

1.4 Progress Monitoring

Following adoption, the Fire & Emergency Management Commissioner will administer this HMP under the authority of the Board of Warden & Burgesses and will be the local coordinator of the HMP. The Fire & Emergency Management Commissioner will coordinate with responsible departments as listed in Table 11-1 and ensure that the recommendations of this HMP are considered or enacted. Refer to Section 1.8 of the Multi-Jurisdictional HMP for a description of how the local coordinator will perform progress monitoring. The majority of recommendations in this annex can be accomplished within or with only a slight increase in the operating budgets of the various departments. Projects that require capital improvements or additional funding will need to be approved by the Board of Warden & Burgesses.

The HMP will be on file with the Fire & Emergency Management Commissioner and at the Planning Department to assist in guiding growth decisions. See Section 2.5 for recommendations related to integrating the findings of this HMP into other Borough planning documents. The Borough will encourage residents to contact the Fire & Emergency Management Commissioner with concerns related to natural hazards or emergency response via the Borough's website. Such announcements will also state that the HMP is available for public review at the Borough Hall as well as available on the Borough's and the SCCOG's website.

The Borough of Stonington will review the status of plan recommendations each year. The Fire & Emergency Management Commissioner will be in charge of overseeing recommended projects and coordinating an annual meeting with applicable departments (those listed in Table 11-1) and other interested departments. Refer to Section 1.8 of the Multi-Jurisdictional HMP for a list of matters to be discussed at the annual meeting, including a review of each recommendation and progress achieved to date, or reasons for why the recommendation has not been enacted. The Fire & Emergency Management Commissioner will keep a written record of meeting minutes and the status of the recommendations. These records of progress monitoring will form the basis for the next HMP update.

The Borough of Stonington understands that the multi-jurisdictional HMP and this annex will be effective for five years from the date of FEMA approval of the first SCCOG jurisdiction regardless of the date of adoption by the Borough. The Fire & Safety Commissioner will coordinate with SCCOG for the next HMP update which is expected to occur in 2016-2017.

2.0 COMMUNITY PROFILE

2.1 Physical Setting

The Borough of Stonington is a coastal community located on the Connecticut shoreline. Elevations range from sea level to just over 30 feet in the northern portion of the borough. Two uninhabited islands also lie within the Borough limits.

Geology is important to the occurrence and relative effects of natural hazards such as earthquakes. Thus, it is important to understand the geologic setting and variation of bedrock and surficial formations in lands underlying the Borough of Stonington. The Borough lies above two bedrock types which trend southwest to northeast across the area. The majority of the borough is underlain by Rope Ferry Gneiss with a band of Hope Valley Alaskite Gneiss stretching northeast from Edwards Point. Each of these formations consists primarily of gneiss which is a relatively hard metamorphic rock. There are no faults mapped within or near the Borough of Stonington boundary.

The Borough's surficial geologic formations include glacial till, stratified drift, and coastal formations. Refer to the Multi-Jurisdictional HMP for a generalized view of surficial materials. The majority of the borough is underlain by glacial till. Till contains an unsorted mixture of clay, silt, sand, gravel, and boulders deposited by glaciers as a ground moraine. Most of the northwestern and northeastern portions of the borough are underlain by stratified drift, and a significant amount of tidal wetlands are mapped in this area as well. Sandy Point, an uninhabited island in Little Narragansett Bay, is mapped as beach (a coastal formation). The amount of stratified drift present is important as areas of stratified materials are generally coincident with floodplains. The amount of stratified drift also has bearing on the relative intensity of earthquakes and the likelihood of soil subsidence in areas of fill.

2.2 Land Use and Development Trends

The Borough of Stonington is fully developed with the exception of a few areas of tidal wetlands. According to the draft 2012 *Plan of Conservation and Development* for the Borough, undeveloped land was equal to 13% of the overall land area of the borough. Much of the developed area of the borough was established by 1905, and the percentage of undeveloped land has remained almost constant since 1981. While it is possible that infill growth may occur, space does not appear to exist for larger developments such as subdivisions. New homes have not been constructed in the borough since the time of the last HMP, and only nine housing units have been added since 2000.

The Borough includes 5.41 miles of improved streets and 34 rights-of-way. A mix of residential and commercial development is found along the borough's shoreline, with the only industrial areas located north of the Amtrak-Metro North railroad. High and medium-density residential development dominates the western peninsula, while low-density residential and undeveloped tidal wetlands are located in the eastern portion of the borough on Little Narragansett Bay. Open space and recreation areas are scattered throughout the borough.

According to the draft 2012 *Plan of Conservation and Development*, approximately 24% of the housing units in the borough are seasonal, recreational, vacation or rental homes. Home values are fairly expensive in the borough, resulting in a decline in year-round residents and an increase

in the overall age of the borough's population. The number of seasonal housing units has increased by 67% since 2000 and this trend is expected to continue in the future. As many housing units predate 1970, it is believed that most structures do not meet current building codes. Such structures may be more susceptible to damage from natural hazards. Fortunately, many homes have undergone recent renovation and many have installed flood and wind mitigation measures such as shutters and floodwalls.

2.3 Drainage Basins and Hydrology

The Borough lies within the southeast shoreline sub-regional watershed as delineated by the Connecticut DEEP. The western side of the borough drains directly to Stonington Harbor, while the eastern side drains into Little Narragansett Bay. The only notable water body in the borough that is not a tidal wetland is Island Road Pond located north of Bayview Avenue. This waterbody is impounded by a low-hazard dam registered with the Connecticut DEEP.

2.4 Governmental Structure

The Borough of Stonington is governed by the Board of Warden & Burgesses who are elected every two years in May as authorized by the Borough Charter of 1997. The Warden is the chief executive officer of the Borough and is directly responsible for the administration of all departments, agencies, and offices. The six Burgesses enact ordinances, adopt resolutions, undertake studies and investigations, provide for the administration of the Borough, determine rules of procedure, and take all steps necessary and proper for carrying out the powers given to the Borough. Together, Board of Warden & Burgesses review and approve all Borough business. Each Burgess acts as a Commissioner overseeing one or more aspects of government.

The Borough has several departments that provide municipal services. Departments pertinent to natural hazard mitigation include the Clerk-Treasurer and the Fire, Planning, and Highway Departments. In addition, there are several boards and commissions that can take an active role in hazard mitigation, including the Harbor Management Commission, the Planning & Zoning Commission, and the Zoning Board of Appeals. The general roles of most of these departments and commissions are common to most municipalities in SCCOG and were described in Section 2.8 of the Multi-Jurisdictional HMP. More specific information for certain departments and commissions of the Borough of Stonington is noted below:

- The Stonington Borough Volunteer Fire Department has one relatively recently-constructed fire station and serves the Borough as one of six fire districts in Stonington, but also serves a small area in the Town of Stonington. The Department provides fire suppression, fire/ disaster prevention, rescue, hazardous materials, and disaster mitigation to the Borough. Public Water Service for fire protection is provided by the Aquarion Water Company. Emergency medical and ambulance services are provided by Stonington Ambulance in the Town of Stonington.

- The Harbor Management Commission oversees the development and use of the coastal waters in and around the Borough of Stonington. They maintain a combined Borough/Town Harbor Management Plan and oversee the Borough's mooring program.

- The Planning & Zoning Commission oversees orderly and appropriate use and development of residential, commercial, and industrial land and the conservation of natural resources.

They review and approve a wide range of land use applications, zoning regulation amendments, planning and development projects, and grant opportunities to ensure that development and growth in the Borough is consistent with existing land use, environmental policy, and the objectives of the *Plan of Conservation and Development*. They are assisted by the professional staff of the Planning Department who administers the Borough's Zoning Regulations, administers the Coastal Management Program, performs planning studies, and provides technical assistance to developers. Building Inspection is provided by the Town of Stonington.

- Police services are provided by the Town of Stonington Police Department. One of the Burgesses acts as Police Commissioner and liaison to the Town Police Department.

- The Highway Department provides services including safe, efficient and well-maintained infrastructure of roads and rights-of-way, bridges and stormwater management. The Public Works Department also conducts snow removal and deicing on roads; tree and tree limb removal in rights-of-way; and maintains and upgrades storm drainage systems to prevent flooding caused by rainfall.

The roles of Borough departments have not changed since the time of the previous HMP. Thus, the Borough of Stonington is technically, financially, and legally capable of implementing mitigation projects for natural hazards to the extent that grant funding is available. As discussed in the next section and the historic record throughout this annex, the Borough is densely developed and thus has particular vulnerability to certain types of natural hazards.

2.5 Review of Existing Plans and Regulations

The Borough has several Plans and regulations that suggest or create policies related to hazard mitigation. These policies and regulations are outlined in the Emergency Operations Plan, *Plan of Conservation and Development*, *Harbor Management Plan* and Ordinance, and Zoning Regulations. The *Plan of Conservation and Development* has incorporated information from the previous HMP.

Emergency Operations Plan

The Borough has an Emergency Operations Plan (EOP) that is updated and certified by the Board of Warden and Burgesses annually. This document provides general procedures to be instituted by the Warden and/or designee and the Fire Department in case of an emergency. Emergencies can include but are not limited to natural hazard events such as hurricanes and nor'easters. The EOP is directly related to providing emergency services prior to, during, and following a natural hazard event.

Plan of Conservation and Development (2012)

The Borough's *Plan of Conservation and Development* was released in draft format in March 2012 for comment after being written with contributions from local boards and commissions, citizens, and citizen groups. The purpose of the plan is to balance growth with maintaining the quality of life that citizens within the borough embrace. Building on the information in the previous HMP, the Plan includes many strategies pertinent to hazard mitigation. The Plan encourages the Borough to protect natural resources and to control development in flood hazard

areas as much of the Borough's shoreline is subject to direct force from storm waves and as well as damage from high waters. It also encourages maximum cooperation between the Borough and the Fire Department, the Stonington Ambulance Corps, and Stonington Police in matters of emergency preparedness and response.

Harbor Management Plan

The Stonington Harbor Management Plan as adopted May 3, 2000, authorizes the Harbor Master to carry out harbor management directives and enforce all provisions of the Plan, including collecting fees for mooring permits and assigning mooring locations; standardizing mooring tackle requirements; and enforcing wake and speed, waterskiing, motor, noise, and refuse regulations. In particular, this ordinance allows the Borough to have a list of persons who currently have boats moored such that removal or emergency response can be coordinated. This plan also notes that storm surge was an issue of concern at the Town of Stonington Dock.

Zoning Regulations

The Zoning Regulations of the Borough of Stonington, Connecticut were last updated in July 2011. The recent updates were performed concurrently with the release of the FIS and DFIRM for New London County in July 2011. They include a variety of preventative regulations pertinent to mitigating flooding hazards. These regulations are applied during the permitting process for new construction and during substantial improvement of existing structures.

- Section 3.31 discusses coastal area management and potential exemptions from local permitting. Construction of new homes within 100 feet of any tidal water body or watercourse or from coastal resource areas within the Coastal Area Management Boundary defined by the Connecticut DEEP requires a Coastal Site Plan.

- Section 3.32 of the regulations covers flood protection. The Borough utilizes the 1% annual chance floodplain (commonly referred to as the "100-year" floodplain) to manage development in floodplains. The 1% annual chance floodplain is depicted on the DFIRM published in July 2011 by FEMA and includes areas in Zone AE and Zone VE. The degree of protection required by this regulation is the minimum reasonable for regulatory purposes. Proposed subdivisions much locate public utilities and facilities to minimize flood damage.

2.6 Critical Facilities, Sheltering Capacity, and Evacuation

The Borough of Stonington considers three facilities to be critical to ensure that emergencies are addressed while day-to-day management of the Borough continues. Critical facilities are presented on figures throughout this annex and summarized in Table 2-1.

TABLE 2-1
Critical Facilities

Facility	Address or Location	Emergency Power Supply?	Shelter?	In Floodplain or Coastal Flood Hazard Area?	In Surge Zones?
Fire Station / EOC	100 Main Street	✓		✓	✓
Borough Hall & Public Works	26 Church Street			✓	✓
Water Pollution Control Facility	High Street			✓	✓

Fire Department

The Borough of Stonington Fire Department is located on Main Street near the viaduct leading into the borough. It has a generator and is the Borough's Emergency Operations Center. This building is floodproofed with flood barriers located at the building doors. The Fire Department also provides service to a portion of the Town of Stonington. The Fire Department has a ladder truck, two pump trucks, and a van.

Borough Hall

The Borough offices and the Highway Department are located in a former fire house on Church Street. The Borough plans to acquire a generator for this facility.

Water Pollution Control Facility

The Water Pollution Control Facility located adjacent to Stonington Harbor is considered a critical facility. It is operated by the Town of Stonington. This facility is a high priority for power restoration following any outage to prevent sewer backups.

Shelters

Stonington High School in the Town of Stonington is the Borough's shelter. This facility can shelter approximately 800 people, but is also the primary shelter for Town of Stonington residents. It has a generator and is staffed by the American Red Cross. Mystic Middle School is the Town of Stonington's backup shelter and has a generator, but it has a limited capacity. In addition, the American Red Cross and the Salvation Army help provide shelter and vital services during disasters and participate in public education activities.

Communications

The Borough's communication capability is considered to be adequate. Most communication by Borough personnel is performed by telephone, cellular phone, or electronic mail. Emergency personnel can communicate between departments and with the Town of Stonington. The Borough has access to the Statewide CT Alerts "Everbridge" Reverse 9-1-1 system and can utilize it to contact residents during emergencies. A link to this service is located on the

Borough's website. The Borough utilizes a fire alarm to announce emergencies to the public. When an evacuation is announced, Borough officials go door to door to alert residents of how they should proceed.

Other Facilities

No advanced care, health care, assisted living, or nursing home facilities are located in the Borough. Residents of the borough typically access Lawrence & Memorial Hospital in New London or Westerly Hospital in Westerly, Rhode Island for advanced care needs.

Marine Transportation

There are several marinas of varying sizes located in Stonington Harbor. No major ferries operate out of the Borough.

Evacuation Routes

The borough has one vehicular evacuation route along Alpha Avenue via the viaduct to Route 1A in the Town of Stonington. The Borough considers this to be a critical facility and while Alpha Avenue is located in the 1% annual chance floodplain, the bridge itself is likely elevated above the associated base flood. Residents located north of the railroad tracks can access Route 1A via Elm Street or Cutler Street.

The Borough is planning a second mode of egress over the railroad tracks for Borough residents. This may be an "emergency-use-only" at-grade crossing of the railroad tracks. In the meantime, a pedestrian footbridge provides a second mode of egress over the railroad tracks at Elm Street. The concern regarding having only one egress out of the borough is heightened since the residents of Fishers Island, NY utilize the Town Dock in the borough to evacuate.

2.7 Status of 2005 Plan Recommendations

The previous HMP included several general recommendations related to mitigating natural hazards. The recommendations and a summary of actions taken over the past several years towards those actions are listed below. Where progress was indicated, the progress was paid for out of the Borough's operating budget. Recommendations that are carried forward appear in Section 11 of this annex.

- Evaluate and Retrofit Viaduct & Provide an Alternate Access to the Borough – The Town is planning a second mode of egress for borough residents. *This recommendation continues to be valid.*

- Rebuild Outer Harbor Breakwater – This breakwater is located in Fishers Island Sound and is not within the Borough limits. *This recommendation remains valid but the Borough cannot directly perform the work. Instead, the Borough must work with the State of Connecticut to achieve this goal.*

- Purchase a Fire Boat & Consider Installation of Dry Hydrants – The Borough has not had the funding to purchase such emergency equipment. *This recommendation remains valid.*

- Evaluate the Hazard Resistant Nature of Critical Facilities – This is ongoing as part of the Borough's annual EOP update. Critical facilities in the borough are located within the 1% annual chance floodplain and storm surge zones. It is believed that the Stonington Borough Fire Station is the most protected building as it has floodproofing measures installed. *This recommendation remains valid but has been subsumed into the EOP update.*

- Comprehensive Evaluation of Emergency Communication Capabilities Throughout the Borough – This is ongoing along with the annual EOP update. The Borough has communication capability with surrounding communities and a Borough-wide alert system in addition to access to the Statewide CT Alerts "Everbridge" Reverse 9-1-1 system. *This recommendation remains valid.*

- Obtain Communications Equipment and Develop Emergency Protocols for Better Communications with Utility Companies – The Borough has limited funding and has not performed significant upgrades to its communications equipment since the time of the previous HMP. The Borough has an Emergency Operations Plan that calls for coordination with surrounding communities (particularly the Town of Stonington) and Connecticut Light & Power. *The first part of this recommendation remains valid but has been subsumed into other recommendations; the latter part of this recommendation has been completed.*

- Develop a Flood Audit Program –The majority of the borough is floodprone and a formal flood audit program is not proposed due to the expense involved. *This recommendation will not be pursued further and is replaced in favor of monitoring damage to floodprone properties.*

- Identify Appropriate Improvements to Traffic Infrastructure and Emergency Response Training and Equipment – This is ongoing annual as part of the Emergency Operations Plan update. Emergency Response Training occurs regularly with equipment upgrades as funding allows. *This recommendation remains valid but has been subsumed into other recommendations as shown in Section 11.*

- Implement a Reverse 9-1-1 System to Automatically Call Telephones Throughout the Borough, Relaying Important Information During an Emergency – The Borough has access to the Statewide CT Alerts "Everbridge" Reverse 9-1-1 system. *This recommendation is completed and the Borough will continue to utilize this system when appropriate.*

- Distribute or Post Public Information Regarding Hazards in the Town – The Borough has some information available for residents online and at the Borough Hall. Notifications are also posted on bulletin boards at public locations, town buildings, and the Borough website, although many of the web postings redirect to the Town of Stonington's website. Local media is utilized to pass information during storms, including newspaper, television, and radio. Borough employees made personal contact with residents during recent power outages. *This recommendation continues to be valid with updates as presented in Section 11.*

- Evaluate Emergency Shelters, Update Supplies, and Check Communication Equipment – The Borough no longer has emergency shelters; instead, they utilize shelters in the Town of Stonington. *This recommendation is no longer valid and is not considered further.*

- Maintain Emergency Personnel Training as Well as Maintaining and Updating Emergency Equipment and Response Protocols – Training is performed monthly, with equipment upgrades occurring to the extent the budget will allow. *This recommendation remains valid.*

- Evaluate and Consider Burying Power Lines Underground and Away from Possible Tree Damage –There are no plans to move existing utilities underground because the utilities are not owned by the Borough, although the Borough would be interested in such a project if funding were available. *This recommendation remains valid for future developments and should be placed into an ordinance for new development or substantial redevelopment regardless of zoning.*

- Complete an Earthquake Survey of all Critical Facilities and Infrastructures –A formal survey is not proposed. *This recommendation will not be pursued further due to the low occurrence of this hazard type.*

- Complete Catch Basin and Culvert Surveys to Identify Structures in Need of Maintenance or Replacement – Inspections are performed annually by Public Works. Public Works also inspects catch basins in floodprone areas for blockages prior to major storms. *This recommendation remains valid.*

- Complete a Survey of Fire Hydrants to Assess Vulnerabilities and Capabilities for Fire Protection – Fire protection capabilities are reviewed with the Aquarion Water Company each year. The majority of the Borough has water service except for Salt Acres Road. The Borough believes that its fire protection level adequate. *This recommendation remains valid.*

- Improve Property Protection with Storm Shutters and When Possible Elevate Properties above the Base Flood Elevation and Consider Acquisition of Properties that are Repeatedly Flooded – The Borough cannot directly improve private property but encourages the use of storm shutters. The Borough does not have funding available to acquire or elevate floodprone property at this time and residents are not currently interested. *The use of storm shutters by private property owners continues to be a valid recommendation. The remainder of this recommendation is not immediately achievable and is therefore not carried forward at this time, but will be reconsidered in the future.*

3.0 INLAND FLOODING

3.1 Setting / Historic Record

There are no notable inland flooding issues due to watercourses in the borough. The primary inland flooding problem is due to drainage issues or nuisance basement flooding. Such flooding occurs at several times per year and is associated with heavy rainfall overwhelming drainage systems. Such types of flooding occurred during the April 2007 nor'easter and March 2010 heavy rains.

3.2 Existing Programs, Policies, and Regulations

The Borough attempts to mitigate inland flood damage and flood hazards by utilizing a wide range of measures including restricting activities in floodprone areas, replacing bridges and culverts, promoting flood insurance, maintaining drainage systems, through education and outreach, and by utilizing warning systems.

As noted in Section 2.5, the Zoning Regulations of the Borough restrict development and require mitigation for projects constructed within the 1% annual chance floodplains as defined by FEMA. Such Special Flood Hazard Areas are delineated on the DFIRM published with the Flood Insurance Study for New London County that was released on July 18, 2011. Most of the SFHAs mapped by FEMA in the Borough do not appear to be associated with a watercourse and thus are more closely related to coastal flooding (Section 4).

The Highway Department cleans and inspects catch basins and culverts at least annually or more often if problems are noted. The Fire Department accesses weather reports through the National Weather Service, but personnel are not typically concerned about the effects of inland flooding except for the largest of storm events. When inland flooding occurs, the Highway Department or the Fire Department would handle the complaints depending on the location. For example, the Highway Department would close roads, while the Fire Department responds to basement flooding issues.

As noted in the Multi-Jurisdictional HMP, the Borough of Stonington participates in the Community Rating System and has since 2004. The Community is currently rated a Class 9 which provides borough residents with a 5% discount on flood insurance. The Borough posted a Flood Awareness Newsletter on its website announcing the Borough's intention to join the Community Rating System and this newsletter provides additional information on how residents can protect their homes and families, why drainage system maintenance is important, and encourages residents to purchase flood insurance.

The Borough has reportedly been working with the Connecticut DEEP regarding flood mitigation and drainage problems in the borough, but funding is limited to address the problems. Many of the inland flooding problems appear isolated such that mitigation measures may not be cost-effective.

As explained elsewhere in this HMP, the National Weather Service issues a flood watch or a flash flood watch for an area when conditions in or near the area are favorable for a flood or flash flood, respectively. A flash flood watch or flood watch does not necessarily mean that flooding will occur. The National Weather Service issues a flood warning or a flash flood warning for an

area when parts of the area are either currently flooding, highly likely to flood, or when flooding is imminent. The Borough utilizes these warnings and forecasts to prepare emergency responders for flooding events.

3.3 Vulnerabilities and Risk Assessment

This section discusses specific areas at risk to inland flooding within the borough. Areas at risk from coastal flooding are discussed in Section 4 of this annex. Inland flooding due to poor drainage and basement flooding in residential areas is the most common type of flooding experienced in the borough.

Note that *HAZUS-MH*, FEMA's hazard loss estimation software, was utilized to calculate the potential damages to the Borough of Stonington from a combined 1% annual chance riverine and coastal flood. Results were presented in Section 3.5.2 of the Multi-Jurisdictional HMP.

3.3.1 Vulnerability Analysis of Areas along Watercourses

There are no watercourses located within the Borough that are subject to inland flooding.

3.3.2 Vulnerability Analysis of Private Properties

Nuisance flooding occurs several times per year as basements flood. Basement flooding is widespread throughout the Borough. In addition, drainage systems are undersized in several areas causing ponding during severe rain events. This can occasionally cause flooding of nearby yards, but only a few structures are directly affected by poor drainage flooding.

3.3.3 Vulnerability Analysis of Critical Facilities

As noted in Section 2.6, all three Borough-owned critical facilities located within the 1% annual chance floodplain. These facilities are affected by coastal flooding. Critical facilities in the borough do not normally have issues with inland flooding. The risk of inland flooding to critical facilities is therefore considered to be low.

3.4 Potential Mitigation Measures, Strategies, and Alternatives

Potential mitigation measures for reducing or eliminating the impact of inland flooding fall into the categories of prevention, property protection, emergency services, public education and awareness, natural resource protection, and structural projects. General potential mitigation measures that can be taken to reduce the effects of inland flooding were discussed in Section 3.7 and in Section 11.2.2 of the Multi-Jurisdictional HMP. General recommendations pertinent to all natural hazards that could affect the borough are listed in Section 11 of this annex, as are specific measures pertinent to reducing inland flooding in the Borough of Stonington.

4.0 COASTAL FLOODING & SHORELINE CHANGE

4.1 Setting / Historic Record

The shorefront of the Borough of Stonington contains modified bluffs and escarpments and developed shorefront along the western edge of the borough facing Stonington Harbor, beach resources at Stonington Point, and modified bluffs and escarpments, rocky shorefront, and beaches along the remainder of the borough. Stonington Harbor and the portion of Fishers Island Sound located adjacent to the eastern portion of the borough are considered to be estuarine embayments (defined as a protected coastal water body with a direct connection to Fishers Island Sound). The coastal resources found in Connecticut and described by DEEP can be found in the Multi-Jurisdictional HMP.

Homes, businesses, and industry are located in close proximity to the coastline along Fishers Island Sound. Structures and infrastructure in the southern section of the borough are closer to sea level than in northern areas and are therefore more susceptible to coastal flooding. Hurricanes and tropical storms have the potential to induce coastal flooding and storm surge that can flood the majority of the borough and impact structures. Primarily, only roadway closures have occurred due to coastal flooding since 2005.

Only a few structures are known to have received damage by coastal floodwaters in recent years although much of the borough is located in the flood hazard area. For example, during Tropical Storm Irene, a walkway was eroded and waves crashed into seawalls that were near homes but only a few were directly damaged by coastal flooding. However, the Borough is also concerned with the potential long-term effects of sea level rise and its potential to exacerbate flooding conditions in the future.

4.2 Existing Programs, Policies, and Regulations

The Borough primarily attempts to mitigate coastal flood damage and flood hazards by controlling and restricting activities in floodprone areas, encouraging the elevation of homes and roadways, maintaining hard structures in good condition, and providing signage and warning systems. Many of the existing programs, policies, and mitigation measures utilized in the Borough for inland flood mitigation (Section 3.2) are also applicable to coastal flood mitigation.

As noted in Section 3.2 and Section 2.5, the Borough utilizes the 1% annual chance floodplains delineated by FEMA. These consist of the 1% annual chance floodplain with elevations (Zone AE), and the 1% annual chance floodplain subject to wave velocity (Zone VE). As noted by the Zoning Regulations, building activities in these areas are restricted and new construction or substantial redevelopment must prove that the lowest horizontal member of the new construction will be above the base flood elevation. The Planning and Zoning Commission and the Planning Department are required to review and approve portions of applications that involve structures within FEMA Special Flood Hazard Areas.

The Borough has conducted outreach to residents about flood mitigation but residents are generally not interested in acquisitions or elevations. Instead, residents are typically more interested in the creation of hard structures such as floodwalls. As such, the Borough has further attempted to streamline restrictions to its regulations through its recent amendments to the Zoning

Regulations, and through planning guidelines in the 2012 *Plan of Conservation and Development*. The Plan notes that over 62% of the borough is located within the 1% annual chance floodplain.

Although the borough lacks inland flood control structures such as flood control dams and channelized sections of rivers, the shoreline of the borough contains many coastal flood control structures. Small, private seawalls and bulkheads can be found in many of the residentially developed coastal neighborhoods such as on Stonington Point. Most of these structures were designed to retain land as well as protect against wave action, but have the secondary effect of reducing coastal erosion. Larger breakwater structures are in place in Fishers Island Sound to reduce the velocity of waves entering Stonington Harbor. Groins are also located along the beach at Stonington Point.

Like many communities, the Borough lacks existing policies and mitigation measures that are specifically designed to address sea level rise. Although the Borough does not currently have a specific plan to address sea level rise, important pieces are in place in the form of the codes and regulations cited in this HMP that have been enacted to minimize storm, erosion, and flood damage.

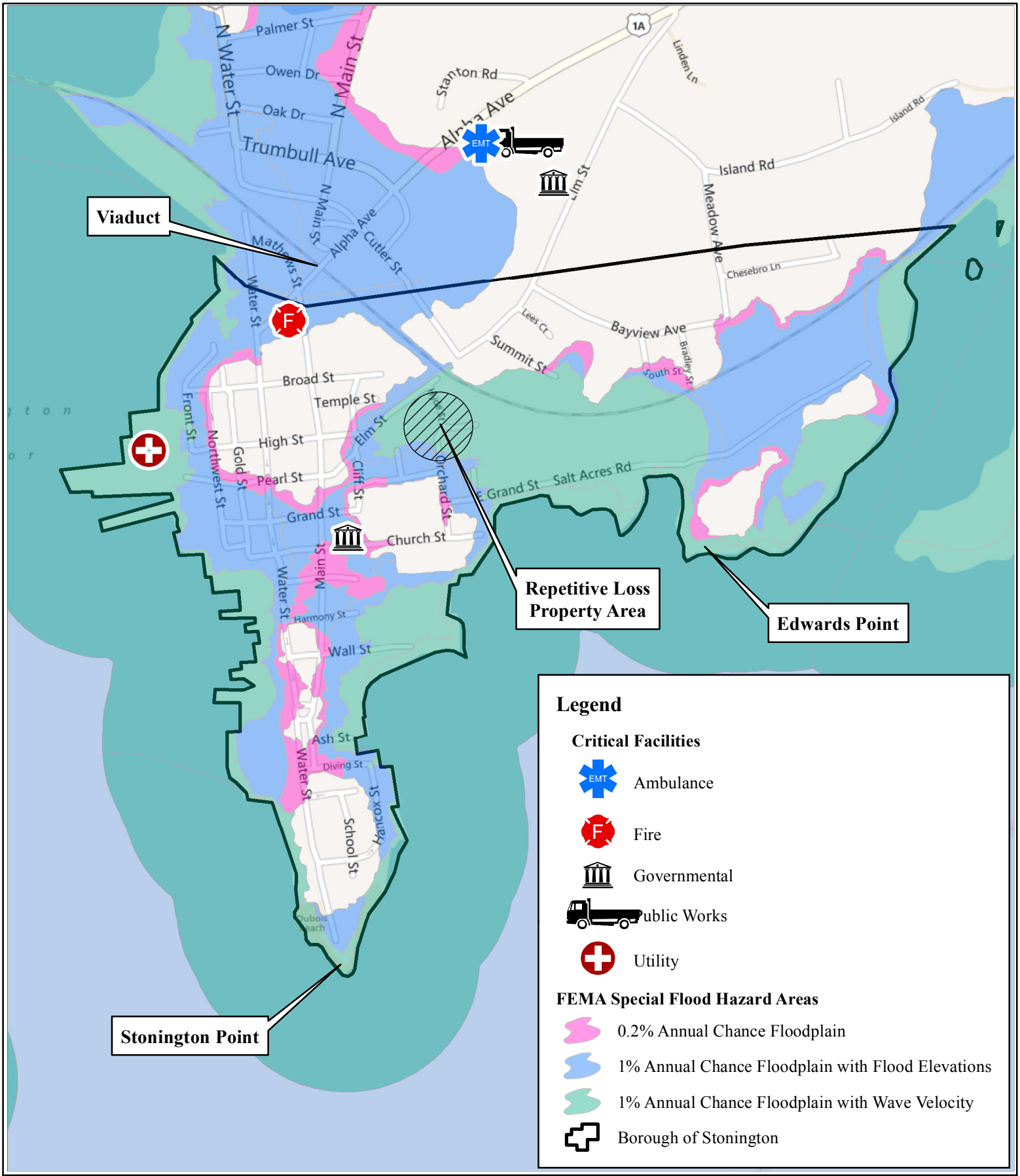
4.3 Vulnerabilities and Risk Assessment

This section discusses specific areas at risk to coastal flooding within the borough. This flooding can be the result of astronomical high tides, hurricanes, nor'easters, or storm surge. As shown by the historic record, coastal flooding can impact roads and neighborhoods, potentially cause severe damage, and impede transportation in the borough. Refer to Figure 4-1 for a depiction of areas susceptible to coastal flooding, and Figure 4-2 for areas susceptible to storm surge from hurricanes.

Note that *HAZUS-MH*, FEMA's hazard loss estimation software, was utilized to calculate the potential damages to the Borough of Stonington from a combined 1% annual chance riverine and coastal flood. Results were presented in Section 3.5.2 of the Multi-Jurisdictional HMP.

4.3.1 Vulnerability Analysis of Areas along Coastal Waters

The low-lying shoreline areas of the borough are subject to periodic flooding. As the borough generally lacks defined watercourses, there are no tidally-influenced watercourses in the borough. FEMA has defined 1% annual chance and 0.2% annual chance floodplains associated with coastal flooding, as well as 1% annual chance floodplains with wave velocity for the borough.



SOURCE(S):
Borough of Stonington, FEMA, Microsoft (basemap)

Figure 4-1: FEMA Special Flood Hazard Areas

LOCATION:
Borough of Stonington, CT

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SCCOG HMP Update
Borough of Stonington Annex

Map By: scottb
MMI#: 3570-05
MXD: H:\3570-05\GIS\Maps\StoningtonBorough\Figure4-1.mxd
1st Version: 7/10/2012
Revision: 7/10/2012
Scale: 1 inch = 750 feet

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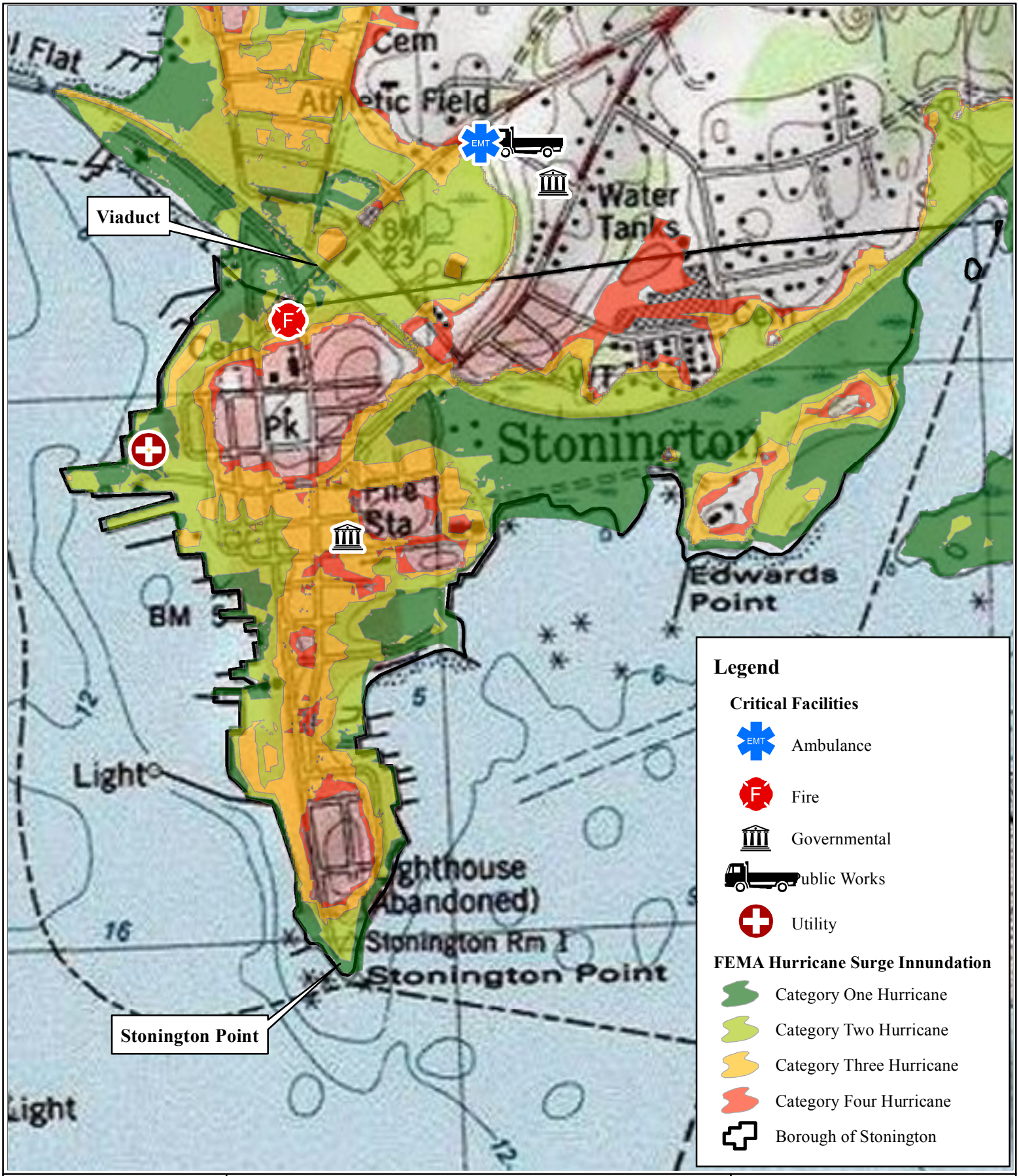

SOURCE(S):
Borough of Stonington, FEMA, USGS Topographic Map (ESRI)

Figure 4-2: FEMA Hurricane Surge Zones

LOCATION:
Borough of Stonington, CT

N

SCCOG HMP Update
Borough of Stonington Annex

Map By: scottb
MMI#: 3570-05
MXD: H:\3570-05\GIS\Maps\StoningtonBorough\Figure4-2.mxd
1st Version: 7/10/2012
Revision: 7/10/2012
Scale: 1 inch = 750 feet

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Nearly the entire shoreline of the borough is exposed to the wave action from Fishers Island Sound. A particular concern is that East Grand Street / Salt Acres Road could be exposed to wave action, isolating several homes on Edwards Point. Salt Acres Road crosses the tidal wetland area separating Edwards Point from the main portion of the borough. Fortunately, these homes are located above the 1% annual chance floodplain. An additional concern for this area of the borough is that the Metro-North railroad is also below the 1% annual chance flood elevation and is vulnerable to overtopping.

The Borough of Stonington has identified several roads that could potentially be partially or fully inundated during the 1% annual chance flood. These roads are listed in Table 3-1. The majority of these roads are fairly interconnected with few extensive dead ends.

TABLE 4-1
Roadways in the 1% Annual Chance Floodplain in the Borough of Stonington

Road	Road	Road
Alpha Avenue	Elihu Street	Miller Street
Ash Street	Elm Street	Northwest Street
Broad Street	Front Street	Orchard Street
Cannon Square	Gold Street	Pearl Street
Church Street	Grand Street	Salt Acres Road
Cliff Street	Hancox Street	South Street
Cross Street	Harmony Street	Summit Street
Cutler Street	High Street	Tanner Court
Denison Avenue	Hyde Street	Union Street
Diving Street	Main Street	Wall Street
East Grand Street	Matthews Street	Water Street

As each of the main roadways in the borough (Water Street, Main Street, and Elm Street) are located in the 1% annual chance floodplain, and with Alpha Avenue leading to the viaduct, Borough officials are interested in identifying an alternate route out of the borough during floods and other emergencies. At this time, only the Elm Street footbridge provides a second mode of egress from the main portion of the borough.

Nearly the entire borough is vulnerable to storm surge, although storm surge from a Category One hurricane would be limited to low-lying coastal areas. The areas affected by storm surge are predicted to be more widespread than the 1% annual chance floodplain for Category Three hurricanes, with Category Four hurricanes pushing storm surge even further inland. The timing of evacuations from the southern part of the borough prior to a hurricane event are therefore very important as the majority of the roads in this area may be flooded or even washed out by a major hurricane.

In general, it is assumed that as sea level rises, the frequency and magnitude of coastal flooding in the borough will increase, with structures and roadways closest to existing sea level being affected more quickly. In addition, tidal marsh areas along Salt Acres Road will likely be eroded by constant inundation since the railroad tracks prevent further inland migration.

Coastal erosion is generally not a problem in the borough since the majority of the shorefront is either developed (particularly along Stonington Harbor) rocky shorefronts consisting of stones and boulders, or modified bluffs and escarpments consisting of seawalls, bulkheads, or revetments. The beach on Stonington Point is susceptible to coastal erosion but is protected by groins such that erosion has not been a major problem. A private beach on Edwards Point is also protected by groins. However, as sea level rises, the effectiveness of these structures may be undermined such that erosion will be able to occur landward of the walls necessitating expansion of the structures.

4.3.2 Vulnerability Analysis of Private Properties

The coastal areas of the Borough of Stonington have properties that are inhabited year-round. This intensifies risk to life and property in coastal areas. Beachfront properties are very susceptible to damage, not only as a result of flooding but also due to the velocity zones located along the shoreline. Shoreline erosion is a relatively minor concern for private property owners at this point in time since most have seawalls or rocky shorefront protecting their structures.

Buildings located in flood hazard areas are primarily residential but also include some commercial and Borough-owned marinas and critical facility structures. Most of the structures that are threatened by flooding are located within the 1% annual chance floodplain, but some are also in the coastal velocity zone. Location in the velocity zone poses an increased threat to structures due to high wind and potential wave damage, as well as inundation by flood waters. Other areas located more inland or behind protective seawalls are only subject to coastal flooding without wave action. However, storm surge can cause damage to structures throughout the borough for even a Category One hurricane such that almost the entire borough is vulnerable to damage from storm surge.

One repetitive loss property is located in the borough. This residential property is located in a low-lying area west of the large tidal wetland located north of Salt Acres Road. Claims were submitted following Tropical Storm Irene, the April 2007 heavy rains, and following "The Perfect Storm" Halloween Nor'easter of 1991. Thus, the property may be affected both by poor drainage and by storm surge. As stated above, coastal flooding is a particular concern in this and similar areas because these areas are low-lying and existing drainage systems do not operate effectively. The Borough recognizes that many private properties may suffer coastal flood damage that is not reported because the structures are not insured under the NFIP, or because they choose to not report the damage. These residents and business owners are likely repairing structures on their own. Coastal flood mitigation as recommended in this HMP could help many of these property owners.

The Borough has no formalized program currently in place to identify the location or the number of structures that are susceptible to flooding. Such information would be valuable in directing hazard mitigation efforts to locations with the greatest risk. Borough planners should use the recently released DFIRM to identify the approximately 291 structures in the borough that are located in the 1% annual chance floodplain (80 of which are susceptible to wave velocity). This could provide a list of areas to inspect following a storm event and allow for the Borough to track building permits from repairs following a natural hazard. This information, in turn, would provide supporting data for future grant applications.

4.3.3 Vulnerability Analysis of Critical Facilities

As shown on Figure 4-1, critical facilities located within the 1% annual chance floodplain include the Borough Hall, the Borough Fire Department, and the waste water treatment facility. The waste water treatment facility is vulnerable to wave velocity but is partially protected by a sea wall. It is understood that if the water level rose high enough the waste water treatment facility would be rendered inoperable.

These critical facilities are also located in the storm surge zones. The waste water treatment facility and the Fire Station are vulnerable to storm surge from a Category Two hurricane or greater storm, while the Borough Hall is susceptible to flooding from a Category Three or greater storm. As noted in Section 2.6, only the fire station is known to have specific mitigation measures installed to resist flooding.

4.4 Potential Mitigation Measures, Strategies, and Alternatives

Potential mitigation measures for reducing or eliminating the impact of coastal flooding and sea level rise fall into the categories of prevention, property protection, emergency services, public education and awareness, natural resource protection, and structural projects. General potential mitigation measures that can be taken to reduce the effects of coastal flooding were discussed in Section 4.7 and in Section 11.2.2 of the Multi-Jurisdictional HMP. General recommendations pertinent to all natural hazards that could affect the borough are listed in Section 11 of this annex, as are specific measures pertinent to reducing inland flooding in the Borough of Stonington.

5.0 HURRICANES AND TROPICAL STORMS

5.1 Setting / Historic Record

Several types of hazards may be associated with tropical storms and hurricanes including heavy or tornado winds, heavy rains, and flooding. Flooding and storm surge hazards are discussed in Section 3 and Section 4 of this annex. Wind hazards are widespread and can affect any part of the borough. However, some buildings in the borough are more susceptible to wind damage than others.

The last major hurricane or tropical storm wind event to affect the borough was associated with Tropical Storm Irene in August 2011. Trees fell throughout the borough and the region, causing power outages that lasted up to six days. Debris removal took a few weeks since a significant amount of trees were damaged.

5.2 Existing Programs, Policies, and Mitigation Measures

Wind loading requirements for new buildings are addressed through the Connecticut Building Code which is utilized by the Borough. Effective December 31, 2005, the design wind speed for the Borough of Stonington is 120 miles per hour. Borough personnel note that recent buildings all meet the building code for wind loading.

Parts of trees (limbs) or entire tall and older trees may fall during heavy wind events, potentially damaging structures, utility lines, and vehicles. The borough receives electrical service from Connecticut Light & Power who has an active tree pruning program. In the case of an extended power outage, residents would be directed to the shelter at Stonington High School in the Town of Stonington.

The Borough does not have any regulations regarding the location of utilities other than that they must be located to be protected from flooding damage. As such, utility lines are located underground in only a few areas of the Borough. Borough officials noted that the Westerly, Rhode Island recently buried many overhead power lines and that they would be interested in doing the same. The Borough would need to work with Connecticut Light & Power and acquire grant funding to complete this work since the project would be very expensive.

The Borough Tree Commissioner can post notification and schedule tree removal for damaged or dangerous trees. The Borough conducted an inventory of public trees in 2008 and plans to conduct this inventory every ten years or so to evaluate the condition of trees and schedule long-term maintenance activities. The Highway Department also monitors trees as part of their normal rounds and has a budget for minor tree maintenance. The Borough hires outside contractors for larger jobs such as tree removal.

Warning is one of the best ways to prevent damage from hurricanes and tropical storms, as these storms often are tracked well in advance of reaching Connecticut. The Borough can access National Weather Service forecasts via the internet as well as listen to local media outlets (television, radio) to receive information about the relative strength of the approaching storm. This information allows the Borough to activate its EOP and encourage

residents to take protective or evacuation measures if appropriate. During Tropical Storm Irene, a voluntary evacuation notice was issued for the borough, and many people heeded the evacuation and moved inland. The Borough also has a "Hurricane Preparation" page on its website. This webpage encourages residents to be prepared for major storms, encourages residents to check the Town of Stonington website which has more comprehensive information about preparedness and sheltering, and to sign up for the Special Needs Registry if additional assistance is necessary during an emergency or during an evacuation.

Prior to severe storm events, the Borough ensures that warning/notification systems and communication equipment are working properly and prepares for the possible evacuation of impacted areas. The statewide CT "Everbridge" Reverse 9-1-1 system can be utilized to warn coastal residents of an impending evacuation. Although hurricanes that have impacted the Borough have historically passed in a day's time, coordination with the Town of Stonington is important since many Borough residents will be utilizing the Town shelter. Additional shelters could be outfitted following a storm with the assistance of the American Red Cross on an as-need basis for long-term evacuees.

5.3 Vulnerabilities and Risk Assessment

The entire borough is vulnerable to hurricane and tropical storm wind damage and from any tornadoes (Section 6) accompanying the storm, as well as inland flooding (Section 3) and coastal flooding and storm surge (Section 4). Of particular concern are the blockage of roads and the damage to the electrical power supply from falling trees and tree limbs. The borough is also susceptible to damage occurring in other areas damaging the electrical supply as occurred following Tropical Storm Irene.

Direct wind damage to newer buildings from hurricane or tropical storm-level winds is rare in the borough since the new buildings were constructed to meet or exceed current building codes. Many buildings in the borough are greater than 50 years old and do not meet current building codes. Older buildings in the borough are particularly susceptible to roof and window damage from high wind events, although this risk will be reduced with time as these buildings are remodeled or replaced with buildings that meet current codes. For example, many homes have been renovated recently and some property owners have installed shutters and other wind mitigation measures.

The strength of a large hurricane could cause a significant economic impact to the borough. The potential economic effect of wind damage to SCCOG was evaluated in the Multi-Jurisdictional HMP. A separate analysis was not performed specifically for the Borough of Stonington.

5.4 Potential Mitigation Measures, Strategies, and Alternatives

Potential mitigation measures for reducing or eliminating the impact of wind damage fall into the categories of prevention, property protection, emergency services, public education and awareness, natural resource protection, and structural projects. General potential mitigation measures that can be taken to reduce the effects of wind damage from hurricanes and tropical storms were discussed in Section 5.7 and in Section 11.2.3 of the Multi-Jurisdictional HMP. General recommendations pertinent to all hazards that could affect the borough are listed in Section 11 of this annex, as are specific measures pertinent to reducing wind damage to the Borough of Stonington.

6.0 SUMMER STORMS AND TORNADOES

6.1 Setting / Historic Record

Similar to hurricanes and winter storms, wind damage associated with summer storms and tornadoes has the potential to affect any area of the borough. Furthermore, because these types of storms and the hazards that result (flash flooding, wind, hail, and lightning) might have limited geographic extent, it is possible for a summer storm to harm one area within the borough without harming another. Such storms occur in the borough each year, although hail and direct lightning strikes to the borough are rarer. No tornadoes have occurred in the borough since the last HMP.

6.2 Existing Programs, Policies, and Mitigation Measures

Warning is the most viable and therefore the primary method of existing mitigation for tornadoes and thunderstorm-related hazards. The NOAA National Weather Service issues watches and warnings when severe weather is likely to develop or has developed, respectively. The Borough can access National Weather Service forecasts via the internet as well as listen to local media outlets (television, radio) to receive information about the relative strength of the approaching storm. This information allows the Borough to activate its EOP and encourage residents to take protective measures if appropriate.

Aside from warnings, several other methods of mitigation for wind damage are employed by the Borough as explained in Section 5.2 within the context of hurricanes and tropical storms. In addition, the Connecticut Building Code includes guidelines for the proper grounding of buildings and electrical boxes to protect against lightning damage.

6.3 Vulnerabilities and Risk Assessment

Summer storms are expected to occur each year and are expected to at times produce heavy winds, heavy rainfall, lightning, and hail. All areas of the borough are equally likely to experience the effects of summer storms. The density of damage is expected to be greater near the more densely populated sections of the borough.

Most thunderstorm damage is caused by straight-line winds exceeding 100 mph. Experience has generally shown that wind in excess of 50 miles per hour (mph) will cause significant tree damage during the summer season as the effects of wind on trees is exacerbated when the trees are in full leaf. The damage to buildings and overhead utilities due to downed trees has historically been the biggest problem associated with wind storms. Heavy winds can take down trees near power lines, leading to the start and spread of fires. Such fires can be extremely dangerous during the summer months during dry and drought conditions. Fortunately, most fires are quickly extinguished due to the Borough's strong fire response.

Lightning and hail are generally associated with severe thunderstorms and can produce damaging effects. All areas of the borough are equally susceptible to damage from lightning and hail, although lightning damage is typically mitigated by warnings and proper grounding of buildings and equipment. Hail is primarily mitigated by warning, although vehicles and watercraft can often not be secured prior to the relatively sudden onset of a hailstorm. Lightning and hail are considered likely events each year, but typically cause limited damage in the borough. Older

buildings are most susceptible to lightning and hail damage since they were constructed prior to current building codes.

Although tornadoes pose a threat to all areas of Connecticut, their occurrence is least frequent in New London County as compared with the rest of the State. Thus, while the possibility of a tornado striking the borough exists, it is considered to be an event with a very low probability of occurrence.

6.4 Potential Mitigation Measures, Strategies, and Alternatives

General potential mitigation measures that can be taken to reduce the effects of wind damage were discussed in Section 5.7 and in Section 11.2.3 of the Multi-Jurisdictional HMP. No additional recommendations are available specific to reducing damage from summer storms and tornadoes. Refer to Section 11 of this annex for recommendations related to wind damage and general recommendations related to emergency services.

7.0 WINTER STORMS AND NOR'EASTERS

7.1 Setting / Historic Record

Similar to hurricanes and summer storms, winter storms have the potential to affect any area of the borough. However, unlike summer storms, winter storms and the hazards that result (wind, snow, and ice) have more widespread geographic extent. In general, winter storms are considered highly likely to occur each year (major storms are less frequent), and the hazards that result (nor'easter winds, snow, and blizzard conditions) can potentially have a significant effect over a large area of the borough. Winter storms and nor'easters have affected the borough since the last HMP, but these storms did not have a significant effect in terms of snowfall.

7.2 Existing Programs, Policies, and Mitigation Measures

Existing programs applicable to winter storm winds are the same as those discussed in Sections 5.2 and 6.2. Programs that are specific to winter storms are generally those related to preparing plows and sand and salt trucks; tree trimming and maintenance to protect power lines, roads, and structures; and other associated snow removal and response preparations.

As it is almost guaranteed that winter storms will occur annually in Connecticut, it is important to locally budget fiscal resources toward snow management. Snow is the most common natural hazard requiring additional overtime effort from Borough staff, as parking lots and roadways need constant maintenance during storms. This is particularly important in the Borough where off-street parking is often unavailable. Water Street, Main Street, and Elm Street are denoted as "Snow Emergency" routes where a parking ban is in effect for the entire street or one side of the street during and following snowfall. After the storm and the clearing of these routes, cars are allowed to park on these streets such that side roads can be cleared.

The Highway Department oversees snow removal in the borough. Salt and sand is stored at the Town of Stonington Public Works facility. The Borough has established plowing routes that prioritize access to and from critical facilities. As no State roads exist in the borough, the Borough is responsible for clearing all roadways.

The Connecticut Building Code specifies that a pressure of 30 pounds per square foot be used as the base "ground snow load" for computing snow loading for roofs. The Borough did not experience snow load problems at its buildings during the winter of 2010-2011, although some residents shoveled roofs.

7.3 Vulnerabilities and Risk Assessment

Severe winter storms can produce an array of hazardous weather conditions, including heavy snow, blizzards, freezing rain and ice pellets, flooding, heavy winds, and extreme cold. Further "flood" damage could be caused by flooding from frozen water pipes. Often, tree limbs on roadways are not suited to withstand high wind and snow or ice loads.

This section focuses on those effects commonly associated with winter storms, including those from blizzards, ice storms, heavy snow, freezing rain, and extreme cold. Warning and education can prevent most injuries from winter storms. This is particularly important as the average age of residents in the borough is increasing. Most deaths from winter storms are indirectly related to

the storm, such as from traffic accidents on icy roads and hypothermia from prolonged exposure to cold. Damage to trees and tree limbs and the resultant downing of utility cables are a common effect of these types of events. Secondary effects can include loss of power and heat.

The majority of buildings in the borough are recently constructed and therefore not susceptible to damage from heavy snow. While some Borough buildings could be susceptible to heavy snow loads, they will be cleared quickly if safety is a concern. Some buildings in the borough have flat roofs which are more susceptible to damage from heavy snow than sloped roofs.

Icing is not a significant issue in the borough. In general, there are few steep slopes such that extra sanding and salting of the roadways in necessary locations alleviates any trouble spots.

7.4 Potential Mitigation Measures, Strategies, and Alternatives

Potential mitigation measures for flooding caused by nor'easters include those appropriate for flooding that were discussed in Section 3.7 and Section 4.7 of the Multi-Jurisdictional HMP and Section 11 of this annex. General potential mitigation measures that can be taken to reduce the effects of wind damage were discussed in Section 5.7 and in Section 11.2.3 of the Multi-Jurisdictional HMP and Section 11 of this annex. However, winter storm mitigation measures must also address blizzards, snow, and ice hazards. These were discussed in Section 7.7 and Section 11.2.4 of the Multi-Jurisdictional HMP and Section 11 of this annex.

8.0 EARTHQUAKES

8.1 Setting / Historic Record

An earthquake is a sudden rapid shaking of the earth caused by the breaking and shifting of rock beneath the earth's surface. Earthquakes can cause buildings and bridges to collapse; disrupt gas, electric, and telephone lines; and often cause landslides, flash floods, fires, avalanches, and tsunamis. Earthquakes can occur at any time and often without warning. Detailed descriptions of earthquakes, scales, and effects can be found in Section 8 of the Multi-Jurisdictional HMP. Despite the low probability of an earthquake occurrence, earthquake damage presents a potentially catastrophic hazard to the borough. However, it is very unlikely that the borough would be at the epicenter of such a damaging earthquake. No major earthquakes have affected the borough since the last HMP.

8.2 Existing Programs, Policies, and Mitigation Measures

The Connecticut Building Codes include design criteria for buildings specific to each region as adopted by Building Officials and Code Administrators (BOCA). These include the seismic coefficients for building design in the Borough of Stonington. The Borough has adopted these codes for new construction, and they are enforced by the Building Inspector.

Due to the infrequent nature of damaging earthquakes, Borough land use policies do not directly address earthquake hazards. However, the potential for an earthquake and emergency response procedures is addressed in the Borough's EOP.

8.3 Vulnerabilities and Risk Assessment

Surficial earth materials behave differently in response to seismic activity. Unconsolidated materials such as sand and artificial fill can amplify the shaking associated with an earthquake. As noted in Section 2.1, a few areas of the borough are underlain by stratified drift. These areas are potentially more at risk for earthquake damage than the areas of the borough underlain by glacial till. The best mitigation for future development in areas of sandy material is the application of the most stringent standards in the Connecticut Building Code, exceeding the building code requirements, or, if the Borough deems necessary, the possible prohibition of new construction. The areas that are not at increased risk during an earthquake due to unstable soils are the areas underlain by glacial till.

Bedrock faults have not been mapped within the borough. Unlike seismic activity in California, earthquakes in Connecticut are not associated with specific known active faults. However, bedrock in Connecticut and New England in general is typically formed from relatively hard metamorphic rock that is highly capable of transmitting seismic energy over great distances. For example, the relatively strong earthquake that occurred recently in Virginia was felt in Connecticut because the energy was transmitted over a great distance through such hard bedrock.

The built environment in the borough primarily includes some more recent construction that is seismically designed. However, most buildings were built before the 1970's and therefore are not built to current building codes. Thus, it is believed that most buildings would be at least moderately damaged by a significant earthquake. Those residents who live or work in older, non-reinforced masonry buildings are at the highest risk for experiencing earthquake damage.

Areas of steep slopes can collapse during an earthquake, creating landslides. The borough is relatively flat such that seawalls at the shoreline represent the steepest slopes. Thus, landslides are not a concern in the borough.

Seismic activity can also break utility lines such as water mains, gas mains, electric and telephone lines, and stormwater management systems. Damage to utility lines can lead to fires, especially in electric and gas mains. Dam failure can also pose a significant threat to developed areas during an earthquake. For this HMP, dam failure has been addressed separately in Section 10.0. As noted previously, most utility infrastructure in the borough is located above ground. A quick and coordinated response with Connecticut Light & Power and other utilities will be necessary to inspect damaged utilities following an earthquake, to isolate damaged areas, and to bring backup systems online. This is covered in the EOPs for these entities.

A *HAZUS-MH* analysis of the potential economic and societal impacts to the SCCOG region from earthquake damage is detailed in the Multi-Jurisdictional HMP. The analysis addresses a range of potential impacts from any earthquake scenario, estimated damage to buildings by building type, potential damage to utilities and infrastructure, predicted sheltering requirements , estimated casualties, and total estimated losses and direct economic impact that may result from various earthquake scenarios.

8.4 Potential Mitigation Measures, Strategies, and Alternatives

Due to the low probability of occurrence, potential mitigation measures related to earthquake damage primarily include adherence to building codes and emergency response services. Both of these are mitigation measures common to all hazards as noted in Section 11 of this annex. The Multi-Jurisdictional HMP also includes additional recommendations for mitigating the effects of earthquakes that are also listed in Section 11.

9.0 WILDFIRES

9.1 Setting / Historic Record

Wildfires are considered to be highly destructive, uncontrollable fires. The most common causes of wildfires are arson, lightning strikes, and fires started from downed trees hitting electrical lines. Thus, wildfires have the potential to occur anywhere and at any time in both undeveloped and lightly developed areas of the borough. However, the borough is small and developed and therefore does not typically experience wildfires. No major wildfires could be recalled in recent history. Structural fires in higher density areas of the borough are larger concern for the Borough, although these are not directly addressed herein.

9.2 Existing Programs, Policies, and Mitigation Measures

Monitoring of potential fire conditions is an important part of mitigation. The Connecticut DEEP Forestry Division uses the rainfall data recorded by the Automated Flood Warning system to compile forest fire probability forecasts. This allows the DEEP to monitor drier areas to be prepared for forest fire conditions. The Borough can access this information over the internet. The Borough also receives "Red Flag" warnings via local media outlets.

Existing mitigation for wildland fire control is typically focused on building codes, public education, Fire Department training, and maintaining an adequate supply of equipment. The Borough's Fire Department has a strong mutual aid relationship with the Town of Stonington and other municipalities to fight wildfires and structure fires. Fire protection water is obtained from the public water systems owned and maintained by the Aquarion Water Company. The Aquarion Water Company tests fire flows regularly and informs the fire department of the pressure available.

The entire borough has water service with the exception of the Salt Acres Road/Eastern Point area. The Borough pump trucks to bring water to areas without public water service and goes to the fires as quickly as possible. The Borough has good access to most areas for fire-fighting. The level of fire protection afforded by the existing hydrants is considered to be good for the development level of the borough. The Fire Department will continue to evaluate the level of risk and the need for additional hydrants in the future.

9.3 Vulnerabilities and Risk Assessment

As the Borough of Stonington is almost fully developed, wildfires can only occur in a few areas. The most vulnerable areas is the Eastern Point/Salt Acres road area since this area does not have public water service and is dominated by marsh grasses. Fortunately, the railroad in this area could act as a firebreak preventing flames from spreading north over the tracks. As such, even a large fire in this area would likely be contained to less than ten acres. The proximity to coastal water also provides a significant backup supply of water to fight the fires although it is not ideal to utilize salt water. This area is considered to be a low to moderate risk for wildfires.

Other undeveloped areas in the borough are generally less than one acre in size and are located adjacent to the public water system. These areas are considered to be a low-risk area for wildfires. Refer to Figure 9-1 in the Multi-Jurisdictional HMP for a general depiction of wildfire risk areas within the Borough of Stonington. The biggest issue related to emergency response in

the borough is that many of the roads are narrow. This can present delays during navigation and access to the fire site.

9.4 Potential Mitigation Measures, Strategies, and Alternatives

The Borough of Stonington is a low- to moderate-risk area for wildfires. Potential mitigation measures for wildfires include a combination of prevention, education, and emergency planning measures as presented in Section 11.

10.0 DAM FAILURE

10.1 Setting / Historic Record

Dam failures can be triggered suddenly with little or no warning and often in connection with natural disasters such as floods and earthquakes. Dam failures can occur during flooding when the dam breaks under the additional force of floodwaters. In addition, a dam failure can cause a chain reaction where the sudden release of floodwaters causes the next dam downstream to fail. While flooding from a dam failure generally has a limited geographic extent, the effects are potentially catastrophic depending on the downstream population. A dam failure affecting the Borough of Stonington is considered a possible event each year although the damage would likely be minimal. No dam failures affected the borough since the time of the last HMP.

10.2 Existing Programs, Policies, and Mitigation Measures

There is only one dam in the borough inventoried with the Connecticut DEEP. The Island Road Pond Dam impounds a small water body north of Bayview Avenue on the northern border of the borough. The pond is located next to an industry and under the jurisdiction of the Connecticut DEEP. The dam safety statutes are codified in Section 22a-401 through 22a-411 inclusive of the Connecticut General Statutes. Sections 22a-409-1 and 22a-409-2 of the Regulations of Connecticut State Agencies have been enacted, which govern the registration, classification, and inspection of dams. Dams must be registered by the owner with the DEEP according to Connecticut Public Act 83-38. Owners of high and significant hazard dams are required to maintain EOPs for such dams.

10.3 Vulnerabilities and Risk Assessment

The Connecticut DEEP administers the Dam Safety Section and designates a classification to each state-registered dam based on its potential hazard as detailed in the regional plan. The Island Road Pond Dam is does not have a hazard classification assigned but it is assumed to be a low hazard dam due to the small size of the pond and the level of the pond below the parking lot of the nearby industry. In addition, there are no dams in adjacent municipalities whose failure would have an effect on the borough.

10.4 Potential Mitigation Measures, Strategies, and Alternatives

Given the fact that the borough is unlikely to be affected by flooding from dam failure, there are no mitigation measures recommended at this time.

11.0 RECOMMENDATIONS

11.1 Summary of Specific Recommendations

The Multi-Jurisdictional HMP provided several region-wide recommendations applicable to all hazards that are also pertinent to the Borough of Stonington. In addition, recommendations throughout the sections of this annex are also applicable as recommendations. These recommendations are listed below:

11.1.1 Recommendations Applicable to All Hazards

Regional Coordination

- Continue to promote inter-jurisdictional coordination efforts for emergency response.
- Continue to promote local and regional planning exercises that increase readiness to respond to disasters.
- Continue to evaluate communication capabilities and pursue upgrades to communication and ensure redundant layers of communication are in place within the borough and with other SCCOG communities, New London County, and the State of Connecticut.
- Work with SCCOG to perform a regional study to identify the vulnerability of critical facilities that may be unable to withstand natural hazard damage. Emphasis should be placed on critical infrastructure, shelters and other sites to ensure structural integrity against various hazards and adequacy of backup supplies.

Local Emergency Response

- Continue to review and update the Borough EOP at least once annually.
- Continue to maintain emergency response training and equipment and upgrade equipment when possible.
- Encourage Borough officials to attend FEMA-sponsored training seminars at the Emergency Management Institute (EMI) in Emmitsburg, Maryland. All of these workshops are free of charge. Tuition, travel and lodging are provided by FEMA for the EMI training. Annual training sessions include emergency management, environmental reviews, the FEMA grant programs, the NFIP and CRS and others related to other hazards.
- Continue to promote dissemination of public information regarding natural hazard effects and mitigation measures into local governmental and community buildings. Specifically,
  - ⇨ Obtain copies of the disaster planning guides and manuals from the "Are You Ready?" series (http://www.ready.gov/are-you-ready-guide).
  - ⇨ Encourage residents and other members to purchase NOAA weather radios with an alarm feature.

- ⇨ Post hazard preparedness information on the Borough's website. Include links to established sources at the State of Connecticut and FEMA.

- ❑ Utilize the CT "Everbridge" Reverse 9-1-1 system to telephone warnings into potentially affected areas.

- ❑ Identify and install an additional means of egress out of the borough across the railroad.

Prevention

- ❑ Integrate additional elements of this HMP into the *Plan of Conservation and Development* during the next update of that plan.

- ❑ Require the underground installation of utilities for all new development and, when opportunities arise, put existing overhead utilities underground.

- ❑ Continue reviewing building plans to ensure proper access for emergency vehicles.

- ❑ Continue to enforce the appropriate building code for new building projects.

- ❑ Encourage residents to install and maintain lightning rods on their buildings.

- ❑ Continue to regulate development in protected and sensitive areas including coastal areas and floodplains.

11.1.2 Recommendations Applicable to Inland and Coastal Flooding

Prevention

- ❑ Continue to regulate new development activities within SFHAs to the greatest extent possible within the local land use regulations.

- ❑ Conduct an annual inspection of floodprone areas that are accessible to Borough officials. Determine if potential flood damage is related to stormwater facilities and make recommendations as appropriate.

- ❑ Work with State and Federal agencies to ensure that flood protection regulations reflect current thinking and standards especially with regard to long-term rise in sea levels.

- ❑ Utilize the recently released DFIRM to compile a list of addresses with structures within the 1% annual chance floodplain. Track the cost of repairs to these properties following major storm events through outreach or building permits to develop a database of information for potential future grant funding.

Property Protection

- ❑ Incorporate information on the availability of flood insurance into all hazard-related public education workshops.

- Make available FEMA-provided flood insurance brochures at public accessible places such as the local government buildings.

- Provide technical assistance to owners of non-residential structures that suffer flood damage regarding floodproofing techniques such as wet and dry floodproofing.

- If property owners become interested, pursue elevation or acquisition of residential properties that suffer flood damage.

- Apply freeboard standards of one foot when requiring structure elevations for renovations and new construction in coastal A and V zones.

- Remind residents that their flood insurance rates will not increase if they make a claim since the insurance is federally subsidized and encourage them to submit claims following damage events.

Emergency Services

- Ensure that the EOP provides up-to-date, detailed instructions regarding the timing of evacuations from the southern part of the borough, since these roads will be significantly flooded or washed out by a major hurricane.

- Pursue mutual aid agreements with such organizations as the American Red Cross and the Boy Scouts of America to provide volunteer labor prior to or during flood events to fill sand bags and assist with other response activities.

Public Education and Awareness

- Expand the annual public outreach projects to include a brochure which will outline the risks of flood prone areas and mitigation and preparedness strategies and contacts. The brochure would be handed out annually.

- Encourage builders, developers, and architects to become familiar with the NFIP land use and building standards by attending annual workshops.

Structural Projects

- Encourage the use of berms and seawalls at existing properties where appropriate.

- Utilize recently available extreme rainfall data to determine existing sizing of culverts. Encourage drainage system upgrades in areas found to be undersized.

- Continue to perform catch basin and culvert surveys to perform maintenance and cleaning and to identify and prioritize structures in need of replacement.

- Upgrade stormwater collection and discharge systems to keep up with rising sea level.

- Maintain existing hard structures along the coast in good condition.

- ❑ Ensure that the Borough's waste water treatment facility is adequately protected from coastal flooding and storm surge, and perform improvements if necessary.

- ❑ Work with the State to ensure that the breakwaters to Stonington Harbor are maintained in good condition.

11.1.3 Recommendations Applicable to Wind Damage from Hurricanes, Tropical Storms, Summer Storms, Tornados, and Winter Storms

Prevention

- ❑ Work with the Borough marinas to ensure that personal watercraft can be removed in a timely manner or brought out to sea prior to a hurricane or tropical storm event.

- ❑ Work with the SCCOG to develop a region-wide Marina Management Plan addressing wind damage mitigation. Share the plan with local marinas and yacht clubs and encourage them to develop plans on their own.

Property Protection

- ❑ Promote the use of functional shutters for older buildings in the Borough to guard against window breakage which can result in structural failure. Investigate funding sources to promote this relatively inexpensive type of retrofitting on a large scale.

- ❑ The Planning Department should make information on wind-resistant construction techniques (such as hurricane straps) available to all building permit applicants.

Emergency Services

- ❑ Consider surveying all Borough-owned buildings to determine their ability to withstand wind loading.

- ❑ Develop agreements, if necessary, with land owners and with companies to chop/chip in order to ensure that plans are in place prior to damage and cleanup needs (as is done for snow plow operations).

Public Education and Awareness

- ❑ Post and maintain signs signifying evacuation routes from coastal areas.

11.1.4 Recommendations Applicable to Other Damage from Winter Storms

- ❑ Consider drafting a written plan for inspecting and prioritizing the removal of snow from Borough-owned structures.

- ❑ Continue making funding available to the Highway Department each budget year for clearing snow from roads and parking lots.

- ❑ Provide information for generally protecting borough residents during cold weather and for mitigating icing and insulating pipes at residences.

- Continue to identify areas that are difficult to access during winter storm events and develop contingency plans for emergency personnel.

11.1.5 Recommendations Applicable to Earthquakes

Ensure that Borough departments have adequate backup supplies and facilities for continued functionality in case earthquake damage occurs to these buildings where these critical facilities are housed. This should be part of the regional critical facility study discussed in Section 2.8.

11.1.6 Recommendations Applicable to Wildfires

- Continue to evaluate fire flows, available water supply, and areas at risk of wildfire in the Borough.

- Continue to support public outreach programs to increase awareness of forest fire danger, equipment usage, and protecting homes from wildfires. Educational materials should be made available at Borough Hall.

- Ensure that provisions of Borough regulations regarding fire protection facilities and infrastructure are being enforced.

- Consider the purchase of a fire boat and the installation of dry hydrants near Stonington Harbor.

11.1.7 Recommendations Applicable to Dam Failure

None.

11.2 Prioritization of Specific Recommendations

As explained in Section 11.3 of the Multi-Jurisdictional HMP, the STAPLEE method was utilized in this annex to prioritize recommendations. Table 11-1 presents the STAPLEE matrix for the Borough of Stonington. Each recommendation includes the Borough department responsible for implementing the recommendation, a proposed schedule, and whether or not the recommendation is new or originally from the previous HMP. Refer to Section 2.7 for the list of previous plan recommendations and whether or not each recommendation was carried forward into this HMP.

TABLE 11-1: BOROUGH OF STONINGTON STAPLEE MATRIX FOR PRIORITIZING RECOMMENDATIONS

Implementation of Current Recommendations	Existing or New Recommendation?	Responsible Department [1]	Schedule	Cost [2]	Potential Funding Source [3]	Weighted STAPLEE Criteria [4]															Total STAPLEE Score
						Benefits								*Costs*							
						Social	Technical (x2)	Administrative	Political	Legal	Economic (x2)	Environmental	**STAPLEE Subtotal**	Social	Technical (x2)	Administrative	Political	Legal	Economic (x2)	Environmental	**STAPLEE Subtotal**	
ALL HAZARDS																					
Regional Coordination																					
Continue to promote inter-jurisdictional coordination efforts for emergency response	New	BWB, FD	2012-2017	Minimal	OB	1	1	1	1	1	1	1	**9.0**								**0.0**	***9.0***
Continue to promote local and regional planning exercises that increase readiness to respond to disasters	New	FD	2012-2017	Low	OB	1	1	1	1	1	0.5	1	**8.0**								**0.0**	***8.0***
Continue to evaluate communication capabilities and pursue upgrades to communication and ensure redundant equipment is available	Existing	FC	2012-2017	Low	OB, CI	1	1	1	1	1	1	1	**9.0**								**0.0**	***9.0***
Work with the SCCOG to perform a regional study of the vulnerability of critical facilities to natural hazard damage	New	BWB	2012-2017	Low	OB	0.5	0.5	0.5	0.5	1	0.5		**4.5**		-0.5				-0.5		**-2.0**	***2.5***
Local Emergency Response & Public Information																					
Continue to review and update the Borough EOP at least once annually	Existing	FC	2012-2017	Low	OB	1	1	1	1	1	1	1	**9.0**								**0.0**	***9.0***
Continue to maintain emergency response training and equipment and upgrade equipment when possible	Existing	FD	2012-2017	Moderate	OB, CI	1	1	1	1	1	0.5	1	**8.0**						-0.5		**-1.0**	***7.0***
Encourage Borough officials to attend FEMA-sponsored training seminars at EMI	New	FC	2012-2017	Minimal	OB	0.5	0.5	1	1	1	1	0.5	**7.0**								**0.0**	***7.0***
Continue to promote dissemination of public information regarding natural hazard effects into Government buildings, with additions	Existing	FC	2012-2017	Minimal	OB	1	1	1	1	1	1	1	**9.0**								**0.0**	***9.0***
Utilize the Reverse 9-1-1 system to telephone warnings into potentially affected areas	Existing	FC, FD	2012-2017	Minimal	OB	1	1	1	1	1	0.5	0.5	**7.5**	-0.5							**-0.5**	***7.0***
Identify and install an additional means of egress out of the borough across the railroad	New	BWB	2012-2022	Moderate	CI*	1	0.5	1	1	0.5			**4.5**			-1			-0.5		**-2.0**	***2.5***
Prevention																					
Integrate additional elements of this HMP into the Plan of Conservation and Development during the next update	New	PZC	2017-2022	Low	OB	1	1	1	1	1	1	1	**9.0**				-0.5				**-0.5**	***8.5***
Continue reviewing building plans to ensure proper access for emergency vehicles	New	FD	2012-2017	Minimal	OB	1	1	1	1	1	1		**8.0**								**0.0**	***8.0***
Require the underground installation of utilities for all new development and pursue opportunities to put existing lines underground	Existing	PZC, BWB	2012-2017	Minimal	OB	1	1	1	1	1	0.5		**7.0**				-0.5				**-0.5**	***6.5***
Continue to enforce the appropriate building code for new building projects	New	PZC	2012-2017	Minimal	OB	1	1	1	1	1	1		**8.0**								**0.0**	***8.0***
Encourage residents to install and maintain lightning rods on their structures	New	FD, FC	2012-2017	Minimal	OB	1	0.5	1	1	1	0.5	0.5	**6.5**								**0.0**	***6.5***
Continue to regulate development in protected and sensitive areas including coastal areas and floodplains	New	PZC	2012-2017	Minimal	OB	1	1	1	1	1	1	1	**9.0**								**0.0**	***9.0***
FLOODING RECOMMENDATIONS																					
Prevention																					
Continue to prohibit new development activities within SFHAs to the greatest extent possible within Borough land use regulations	New	PZC	2012-2017	Minimal	OB	1	1	1	1	1	1	1	**9.0**								**0.0**	***9.0***
Conduct an annual inspection of floodprone areas that are publically accessible. Recommend drainage improvements as appropriate.	New	HD	2012-2017	Low	OB	1	1	1	0.5	1	0.5	0.5	**7.0**								**0.0**	***7.0***
Work with State and Federal agencies to ensure that flood protection regulations reflect current standards regarding sea level rise	New	PL	2012-2017	Low	OB	1	1	1	1	1	1		**8.0**								**0.0**	***8.0***
Compile a list of addresses of structures within the 1% annual chance floodplain, and track repair costs following disasters	Existing	PL	2012-2017	Low	OB	0.5	1	0.5	0.5	1	1		**6.5**								**0.0**	***6.5***
Property Protection																					
Incorporate information on the availability of flood insurance into all hazard-related public education workshops	New	PL, FC	2012-2017	Low	OB	1	1	0.5	0.5	1	1		**7.0**								**0.0**	***7.0***
Make available FEMA-provided flood insurance brochures and encourage residents to purchase insurance if they are in a SFHA	New	FC	2012-2017	Minimal	OB	1	1	1	1	1	1		**8.0**								**0.0**	***8.0***
Provide technical assistance to owners of non-residential structures regarding floodproofing techniques	New	PL	2012-2017	Low	OB	1	0.5	0.5	1	1	1	0.5	**7.0**								**0.0**	***7.0***
If property owners become interested, pursue elevation or acquisition of floodprone residential properties	Existing	BWB	2012-2017	High	CI*	0.5	1	1	1	1	0.5	1	**7.5**	-1					-1		**-3.0**	***4.5***
Apply freeboard standards of one foot when requiring structure elevations for renovations and new construction in coastal A and V zones	New	PZC	2012-2017	Minimal	OB	1	1	1	1	1	1		**8.0**								**0.0**	***8.0***
Encourage residents to submit flood insurance claims following damage events	New	All	2012-2017	Minimal	OB	1	1	1	1	1	1		**8.0**								**0.0**	***8.0***

TABLE 11-1: BOROUGH OF STONINGTON STAPLEE MATRIX FOR PRIORITIZING RECOMMENDATIONS

Implementation of Current Recommendations	Existing or New Recommendation?	Responsible Department [1]	Schedule	Cost [2]	Potential Funding Source [3]	Weighted STAPLEE Criteria [4]															Total STAPLEE Score
						Benefits								*Costs*							
						Social	Technical (x2)	Administrative	Political	Legal	Economic (x2)	Environmental	**STAPLEE Subtotal**	Social	Technical (x2)	Administrative	Political	Legal	Economic (x2)	Environmental	**STAPLEE Subtotal**	
Emergency Services																					
Ensure that the EOP provides current detailed instructions regarding the timing of evacuations from the southern part of the borough	New	FC, FD	2012-2017	Low	OB	1	1	1	1	1	1		**8.0**								**0.0**	***8.0***
Pursue mutual aid agreements with non-profits to provide volunteer labor for filling sand bags and other response activities	New	FD	2012-2017	Low	OB	1	1	1	1	1	1		**8.0**								**0.0**	***8.0***
Public Education and Awareness																					
Annually distribute a brochure outlining the risks of floodprone areas, mitigation strategies, and contacts	New	PL	2012-2017	Low	OB	1	1	1	1	1	1		**8.0**			-0.5					**-0.5**	***7.5***
Encourage builders, developers, and architects to become familiar with NFIP land use and building standards at annual workshops	New	PL	2012-2017	Low	OB	1	1	1	1	1	1		**8.0**			-0.5					**-0.5**	***7.5***
Structural Projects																					
Encourage the use of berms and seawalls at existing properties where appropriate	New	PZC	2012-2017	Minimal	OB	1	1	0.5	1	0.5	1		**7.0**		-0.5					-1	**-2.0**	***5.0***
Utilize the recently available extreme rainfall data to determine existing culvert sizing and encourage upgrades where undersized	New	HD	2012-2017	Moderate	CI	0.5	1	1		1	0.5		**5.5**				-1		-0.5		**-2.0**	***3.5***
Continue to perform catch basin and culvert surveys to prioritize upgrades and perform maintenance and cleaning	Existing	HD	2012-2017	Moderate	OB	1	1	1	1	1	0.5	0.5	**7.5**								**0.0**	***7.5***
Upgrade stormwater collection and discharge systems to keep up with rising sea level	New	HD	2022-2032	High	CI		0.5	1		0.5			**2.5**		-0.5		-1		-1		**-4.0**	***-1.5***
Maintain existing hard structures along the coast in good condition	New	HD	2012-2017	Moderate	CI	1	1	1	1	0.5	1		**7.5**							-1	**-1.0**	***6.5***
Ensure that the Borough's waste water treatment facility is protected from coastal flooding and storm surge and make improvements if needed	New	BWB	2012-2017	Moderate	OB, CI*	1	1	1	1	1	1	1	**9.0**								**0.0**	***9.0***
Work with the State to ensure that the breakwaters to Stonington Harbor are maintained in good condition	Existing	BWB	2012-2017	Moderate	CI*	1	1	1	1	0.5	1	1	**8.5**						-1	-0.5	**-2.5**	***6.0***
WIND DAMAGE RELATED TO HURRICANES, SUMMER STORMS, TORNADOES, AND WINTER STORMS																					
Prevention																					
Work with borough marinas to ensure that personal watercraft can be removed in a timely manner or removed to sea prior to severe winds	New	PL	2012-2017	Low	OB	0.5	0.5			0.5	1		**4.0**				-0.5				**-0.5**	***3.5***
Work with SCCOG to develop a regional marina management plan addressing wind damage, and encourage local marinas to develop plans	New	PL	2012-2017	Low	OB	0.5	1	1	0.5	0.5	0.5	0.5	**6.0**	-0.5			-0.5				**-1.0**	***5.0***
Property Protection																					
Promote the use of functional shutters for older buildings in the borough, and investigate funding sources	Existing	PL	2012-2017	Low	OB, CI	1	0.5	1	1	1	0.5		**6.0**								**0.0**	***6.0***
Make information on wind-resistant construction techniques available to all building permit applicants	New	PL	2012-2017	Low	OB	1	1	1	1	1	1		**8.0**								**0.0**	***8.0***
Emergency Services																					
Consider surveying all Borough-owned buildings, particularly historic buildings to determine their ability to withstand wind loading	New	BWB	2012-2017	Low	OB	1	0.5	1	0.5	1	0.5		**5.5**								**0.0**	***5.5***
Develop agreements with landowners and companies to chop/chip to ensure backup plans are in place for debris removal	New	HD	2012-2017	Low	OB	0.5	0.5	1	0.5	1	0.5		**5.0**								**0.0**	***5.0***
Public Education and Awareness																					
Post and maintain signs signifying evacuation routes from coastal areas	New	HD	2012-2017	Moderate	CI	1	0.5	1	1	1	1		**7.0**								**0.0**	***7.0***
WINTER STORMS																					
Consider drafting a written plan for inspecting and prioritizing the removal of snow from Borough-owned structures	New	HD	2012-2017	Low	OB	0.5	1	1	1	1	0.5		**6.5**								**0.0**	***6.5***
Continue making funding available to the Highway Department each year for clearing snow from roads and parking lots	New	BWB	2012-2017	High	OB	1	1	1	1	1	0.5		**7.0**								**0.0**	***7.0***
Provide information for protecting borough residents during cold weather and for mitigating icing and insulating pipes at residences	New	FC	2012-2017	Low	OB	1	1	1	1	1	1		**8.0**								**0.0**	***8.0***
Continue to identify areas that are difficult to access during winter storm events and develop contingency plans to access such areas	New	FC, FD	2012-2017	Minimal	OB	1	1	1	1	1	1		**8.0**								**0.0**	***8.0***

TABLE 11-1: BOROUGH OF STONINGTON STAPLEE MATRIX FOR PRIORITIZING RECOMMENDATIONS

Implementation of Current Recommendations	Existing or New Recommendation?	Responsible Department [1]	Schedule	Cost [2]	Potential Funding Source [3]	Weighted STAPLEE Criteria [4]															Total STAPLEE Score
						Benefits								*Costs*							
						Social	Technical (x2)	Administrative	Political	Legal	Economic (x2)	Environmental	**STAPLEE Subtotal**	Social	Technical (x2)	Administrative	Political	Legal	Economic (x2)	Environmental	**STAPLEE Subtotal**	
EARTHQUAKES																					
Ensure that Borough departments have adequate backup supplies and facilities for continued functionality following an earthquake	New	BWB	2012-2017	Moderate	OB, CI		0.5	1	0.5	0.5			**3.0**		-0.5		-1				**-2.0**	***1.0***
WILDFIRES																					
Continue to evaluate fire flows, available water supply, and areas at risk of wildfire in the borough	Existing	FC, FD	2012-2017	Minimal	OB	1	1	1	1	1	1	0.5	**8.5**								**0.0**	***8.5***
Continue to support public outreach programs to increase awareness of forest fire danger, equipment usage, and protecting homes	New	FD	2012-2017	Low	OB	1	1	1	1	1	0.5	1	**8.0**								**0.0**	***8.0***
Consider the purchase of a fire boat and the installation of dry hydrants near Stonington Harbor	Existing	BWB, FD	2012-2017	Moderate	CI	1	1	1	1	1	1	1	**9.0**			-0.5			-1		**-2.5**	***6.5***
Ensure that provisions of Borough regulations regarding fire protection facilities and infrastructure are being enforced	New	BWB	2012-2017	Low	OB	0.5	0.5	1	0.5	1	0.5		**5.0**								**0.0**	***5.0***

NOTES

1. Departments:
   BWB = Board of Warden & Burgesses
   FC = Fire & Emergency Management Commissioner
   FD = Fire Department
   HD = Highway Department
   PL = Planning Department
   PZC = Planning & Zoning Commission
2. Minimal = To be completed by staff or volunteers where costs are primarily printing, copying, or meetings; Low = Costs are less than $10,000; Moderate = Costs are less than $100,000; High = Costs are > than $100,000.
3. OB = Operating Budget; CI = Capital Improvement budget; a * indicates that grant funding is needed and will be pursued
4. A beneficial or favorable rating = 1; an unfavorable rating = -1. Technical and Financial benefits and costs are double-weighted (i.e. their values are counted twice in each subtotal)

APPENDIX A

ADOPTION RESOLUTION

BOROUGH OF STONINGTON HAZARD MITIGATION PLAN UPDATE

WHEREAS, the Borough of Stonington has historically experienced severe damage from natural hazards and continues to be vulnerable to the effects of flooding, thunderstorms, high wind, winter storms, wildfires, earthquakes, and dam failure, resulting in loss of property and life, economic hardship, and threats to public health and safety;

WHEREAS, the Southeastern Connecticut Council of Governments, of which the Borough of Stonington is a member, has developed and received conditional approval from the Federal Emergency Management Agency (FEMA) for its Hazard Mitigation Plan Update under the requirements of 44 CFR 201.6;

WHEREAS, the Plan specifically addresses hazard mitigation strategies and Plan maintenance procedures for the Borough of Stonington;

WHEREAS, the Plan recommends several hazard mitigation actions/projects that will provide mitigation for specific natural hazards that impact the Borough of Stonington, with the effect of protecting people and property from loss associated with those hazards;

WHEREAS, adoption of this Plan will make the Borough of Stonington eligible for funding to alleviate the impacts of future hazards;

NOW THEREFORE BE IT RESOLVED by the Board of Warden & Burgesses of the Borough of Stonington that:

1. The Plan is hereby adopted as an official plan of the Borough of Stonington;

2. The respective officials identified in the mitigation strategy of the Plan are hereby directed to pursue implementation of the recommended actions assigned to them;

3. Future revisions and Plan maintenance required by 44 CFR 201.6 and FEMA are hereby adopted as a part of this resolution for a period of five (5) years from the date of this resolution.

4. An annual report on the progress of the implementation elements of the Plan shall be presented to the Board of Warden & Burgesses by October 1 of each calendar year.

PASSED by the Board of Warden & Burgesses this 19th day of November, 2012.

Warden