HAZARD MITIGATION PLAN UPDATE
ANNEX FOR THE TOWN OF EAST LYME

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

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TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

Tables

Figures

Appendices

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 Town of East Lyme. 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 Town of East Lyme and is not to be considered a standalone document.

The primary goal of this hazard mitigation plan annex is to identify risks 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 Town of East Lyme is a coastal community with a significant inland area located in the southeastern portion of Connecticut. The area was first settled in the 1640s and the Town was incorporated in 1839. East Lyme is approximately 34.8 square miles in land area and includes several historical villages including Niantic and Flanders. The Town is bordered by the Salem to the north, Montville to the northeast, Waterford to the east, Niantic Bay and Long Island Sound to the south, and Old Lyme and Lyme to the west. The Town can be accessed via several major transportation arteries including Interstate 95, Route 1, Route 156, Route 161, and the Amtrak-Metro North Railroad. Railroad stations are located nearby in New London and Old Saybrook.

While the northern area of town is relatively rural to suburban in nature, the shoreline area is more densely developed. The Town includes several beach communities in the Niantic area, including Attawan Beach, Black Point, Crescent Beach, Giants Neck Beach, Giants Neck Heights, Oak Grove Beach, Old Black Point, Pine Grove, and Saunders Point. Some of these communities have their own Zoning regulations. The population of the Town was 18,118 as of the 2000 census and increased slightly to 19,159 as of the 2010 census. However, the population of the town increases to around 30,000 each summer due to the influx of seasonal residents to the beach communities and tourists to the area.

1.3 Plan Development

The 2012 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 Public Safety Director 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 2012, SCCOG determined that the following data collection program would be sufficient to collect data to update the Multi-Jurisdictional plan and each annex.

- A survey soliciting public input was hosted at www.surveymonkey.com/r/SCCOGHazard from October 17, 2016 through March 17, 2017. Topics addressed by the survey included the types of natural hazards that concern participants, the assets, infrastructure, and government services they feel are most at risk, and the types of mitigation measures they support. The survey link was publicized along with the public meetings in The Day, The Norwich Bulletin, and local Patch websites, and at all public meetings.

- The SCCOG issued a press release on November 4th, 2016 announcing two public information meetings on the multi-jurisdictional HMP update. This press release was published in the Norwich Bulletin and The Day, as well as in relevant local "Patch" news websites. This notice was also posted on the SCCOG Facebook page and website. The public information meetings were held on November 28 and December 1, 2016, at the Town of Groton Library and the SCCOG office, respectively.

- A data collection meeting was held with the Town on November 21, 2016 to discuss the scope and process for updating the plan and to collect information. The Planning Director coordinated the local planning team which included the Director and Deputy Director of Public Works, Director of Public Health, the Town Engineer, the Utility Engineer, and the Board of Education Facilities Supervisor. At this meeting, the scope and process for updating the plan was discussed and some initial information was collected. Town staff decided that they would continue to continue to collect data necessary for the plan update internally and provide it to the consultant at a later date.

- The draft that is sent for State review will be posted on the Town website (http://www.eltownhall.com/) 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 Town of East Lyme will be coordinated by SCCOG, the Planning Director, and the Public Safety Director. The HMP update must be adopted within one year of conditional approval by FEMA, or the Town 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 Public Safety Director will administer this HMP under the authority of the Board of Selectmen and will be the local coordinator of the HMP. The Planning Director will assist the Public Safety Director as the deputy local coordinator. The Public Safety Director 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 Selectmen.

The HMP will be on file with the Public Safety Director, the Planning Department, the Town Engineer, and the Land Use Departments to assist in guiding growth decisions. See Section 2.5 for recommendations related to integrating the findings of this HMP into other Town planning documents. The Town will continue to encourage residents to contact the Public Safety Director and the Planning Department, with concerns related to natural hazards or emergency response via the Town's website. Such announcements will also state that the HMP is available for public review at the Town Hall as well as available on the Town's and the SCCOG's website.

The Town of East Lyme will review the status of plan recommendations each year. The Public Safety Director and the Planning Director 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 Public Safety Director 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 Town of East Lyme 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 Town. The Public Safety Director and the Planning Director will coordinate with SCCOG for the next HMP update which is expected to occur in 2022.

2.0 COMMUNITY PROFILE

2.1 Physical Setting

The Town of East Lyme is a geographically large community located on the Connecticut shoreline that also has a significant inland area. Elevations range from sea level to just over 460 feet on hilltops in the Nehantic State Forest in the northwestern portion of town. Several inhabited islands are located along the East Lyme shoreline, including Griswold Island and Brainard Island.

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 Town of East Lyme. The town lays above several bedrock types which trend southwest to northeast across the area. These formations include the Hope Valley Alaskite Gneiss, Mamacoke Formation, New London Gneiss, Plainfield Formation (including a quartzite unit), Potter Hill Granite Gneiss, Rope Ferry Gneiss, Tatnic Hill Formation, and Westerly Granite. Each of these formations consists primarily of gneiss which is a relatively hard metamorphic rock with the exception of the Westerly Granite which is a hard igneous rock. Bedrock fault lines are not known to be mapped in East Lyme.

The surficial geologic formations in the town 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 town is underlain by glacial till. Till contains an unsorted mixture of clay, silt, sand, gravel, and boulders deposited by glaciers as a ground moraine. Areas in the vicinity of the Four Mile River, Bride Brook, the Pattagansett River, Latimer Brook, and Oil Mill Brook are underlain by stratified drift, as is the majority of Niantic, Golden Spur, and the area between the State Department of Correction and Indian Woods. 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

As noted in the 2009 *Plan of Conservation and Development*, East Lyme is a suburban community which relies on diversified industries and commercial businesses rather than large industries to support its tax base. The northern section of the community is rural with increasing development density towards the coastline. Businesses are concentrated in the village centers of Flanders and Niantic, and extend west from Niantic along Route 154, with nine marinas located on the Niantic River. The largest employer in the community is the State Department of Corrections which operates several rehabilitation facilities for men and women.

Historically, East Lyme was an agricultural community supported by a modest textile industry in Golden Spur (a small village at the headwaters of the Niantic River), and maritime industries in Niantic. After the completion of Interstate 95, suburban expansion followed in the 1960's through the 1980's with many residential homes built outside of the major villages during this

time period. Recent development has included additional single-family homes as well as infill development in Niantic and Flanders.

According to the 2009 *Plan of Conservation and Development*, approximately 12% of the housing units in the town are seasonal units located in the Town's beach communities. As many housing units predate 1990 particularly in the historic villages, it is believed that many 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.

According to the 2009 *Plan of Conservation and Development,* land in the town is approximately 25% residential, 5% commercial and industrial, 9% agricultural, 23% institutional or transportation related, and 18% recreational or open space. East Lyme has a significant area of land that is public property. Rocky Neck State Park occupies approximately one-third of East Lyme's Long Island Sound shoreline and is a popular tourist attraction for camping and swimming during the summer. The Nehantic State Forest is another large tract of public land located in the northwestern portion of town. In addition, the Town of East Lyme recently purchased 300 acres surrounding Darrow Pond to be used as permanent open space. Institutional properties include Stone Ranch Military Camp utilized by the United States Coast Guard, and the State Correctional Center for Women. Approximately 20% of the total land area is considered to be undeveloped and therefore have the potential for development. This area is located in Flanders and in the north-central section of town.

SCCOG data on land use collected in 2011 indicates that approximately 51% of town land is developed, 17% has been dedicated to open space, and 31% remains hypothetically open to development. Some of the difference between these figures and those provided in the 2009 POCD may be due to differences in data collection and land use designation between the POCD data source and that of the SCCOG. For example, very low density residential is considered developed land by SCCOG, despite the fact that a large portion of each parcel may be open space.

The number of housing units in the community grew by 468 between 2005 and 2010. Several developments have been recently completed, are underway, or are likely to be completed in the future:

- The Exit 74 Gateway in Flanders, a mixed-use project off Interstate 95, is underway; 280 units have been built so far, with water, sewer, and gas utilities connected via Route 161. Construction of a Costco has been approved by the Town but has not yet begun.
- A streetscape project on Main Street in Niantic has been completed.
- Village Crossing off Park Place will have 150 residential units. Two of six buildings, with a total of 60 units, have been completed so far.
- The Orchards is a partly constructed residential development on Plum Hill Road. Approximately half of the 120 expected lots have been completed, and the project is expected to finish in 2018.
- A residential development at 38 Hope Street has been completed with more than 100 units.
- A subdivision on Sleepy Hollow Road continues to be under construction.

- An affordable housing development will be constructed between Capital Drive and West Main Street by JAG Capital Drive, LLC. The proposal as of 2014 was for 60 units to be constructed on 24 acres, to be an active adult community. The Town initially denied this development because that area is zoned for industrial usage, but that decision was overturned in court.
- The Crescent Beach Association is rebuilding the beach and improving public access using Hurricane Sandy disaster relief funding from FEMA. This project includes a one-thousand-foot walkway.
- A 1.1-mile boardwalk along the water has recently been constructed in Niantic.

2.3 Drainage Basins and Hydrology

The town lies within three regional drainage basins that eventually drain to Long Island Sound. These include the Eight Mile River, Southeast Western Complex, and the Southeast Shoreline regional basins as delineated by the Connecticut DEEP. Sub-regional drainage basins include those associated with Latimer Brook in the northeastern part of town, the Niantic River in the southeastern part of town, the Pattagansett River and Bride Brook in the central to southern part of town, and the Fourmile River on the western edge of the town. In addition, small areas of town drain to Harris Brook and the East Branch Eightmile River in Salem, Beaver Brook in Lyme, and the Lieutenant River in Old Lyme. One minor drainage basin also exists that drains an unnamed stream in the Giants Neck area to Long Island Sound.

There are many impoundments throughout the town including Bride Lake on Bride Brook, Dodge Pond in Niantic, Gorton Pond, Pattagansett Lake, and Powers Lake on the Pattagansett River, and Darrow Pond above Latimer Brook. Along the shoreline, recreational boaters enjoy protected harbors and coves such as the Niantic River, Smith Cove, and the Pattagansett River estuary. These areas are protected by from wave action by islands in Long Island Sound and the spit of land known as "The Bar" across the mouth of the Niantic River. Niantic Bay is located to the southeast of Niantic but does not have any protection from wave action on Long Island Sound.

2.4 Governmental Structure

The Town of East Lyme is governed by a Board of Selectman – Town Meeting form of government as authorized by the Town Charter most recently revised in December 2009. The First Selectman is the chief executive officer of the Town and is directly responsible for the administration of all departments, agencies, and offices. The Board of Selectman reviews and approves all Town business.

The Town has several departments that provide municipal services. Departments pertinent to natural hazard mitigation include the Building Official, Engineering, Fire, Land Use, Police, Public Safety, and Public Works. In addition, there are several boards and commissions that can take an active role in hazard mitigation, including the Commission for the Conservation of Natural Resources, Inland Wetland Agency, the Harbor Management-Shellfish Commission, the Planning Commission, the Water & Sewer Commission, the Zoning Board of Appeals, and the Zoning Commission. 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 Town of East Lyme is noted below:

- The Building Official inspects new development and substantial redevelopment for compliance with current building codes. The Building Official is authorized by ordinance to review all applications and building permits for consistency with flood hazard regulations. The Town of East Lyme utilizes the Connecticut Building Code.

- The Commission for the Conservation of Natural Resources supervises the Town's open space and manages farmland preservation programs.

- The Public Safety Department oversees Police, Fire, and Ambulance services in the Town. It also maintains a comprehensive set of web links on the Town's website regarding how to prepare for natural hazards such as hurricanes and lightning strikes, how to sign up for the CT Alerts "Everbridge" notification system, as well as general safety tips. It also has a Facebook page that it uses to broadcast safety tips and reminders to residents.

- The Town Engineer, with the assistance of the Engineering staff, supports the Town's Land Use Commissions and Public Works, oversees certain construction projects, provides flood awareness information, and manages the Town's Community Rating System compliance including maintaining elevation certificates, distributing an annual awareness newsletter regarding the availability of flood mapping, and maintaining documents regarding flooding and mitigation in the local library.

- The Town of East Lyme has three volunteer fire departments that provide emergency medical, fire suppression, fire/ disaster prevention, rescue, hazardous materials, and disaster mitigation services to the town. Public Water Service for fire protection is provided by the East Lyme Water Department in certain areas. The Public Safety Director is also the Town's Fire Marshall. Patients are transported to Lawrence & Memorial Hospital in New London.

- The Harbor Management - Shellfish Commission maintains and enforces a Harbor Management Plan and ordinance.

- The Inland Wetland Agency reviews plans for compliance with the Town's Inland Wetland and Watercourse Regulations.

- The Planning Commission and the Zoning Commission oversee 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 town is consistent with existing land use, environmental policy, regulations, and the objectives of the *Plan of Conservation and Development*. They are assisted by the professional staff of the Land Use Department who administer the Town's Zoning Regulations, Subdivision Regulations, administer the Coastal

Management Program, perform planning studies, and provide technical assistance to developers. The Zoning Enforcement Officer is authorized by ordinance to review all applications and building permits for consistency with flood hazard regulations.

- Police services are provided by a Resident State Trooper of the Connecticut State Police and the Town of East Lyme Police Department. The Police Department consists of 21 full-time, paid personnel, one-part time officer, and support staff. The Department provides situation containment and traffic direction services during emergencies.

- The Public Works 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. Public Works also performs drainage system inspections and maintenance to ensure continued credit with the Community Rating System.

The roles of Town departments have not changed since the time of the previous HMP. Thus, the Town of East Lyme 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 Town is densely developed in certain areas and undeveloped in others, presenting particular vulnerabilities to different types of natural hazards in different areas.

2.5 Review of Existing Plans and Regulations

The Town 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 Developmen*t, the *Coastal Area Development Plan* and Harbor Management Ordinance, Inland Wetland and Watercourse Regulations, Subdivision Regulations, and Zoning Regulations.

Emergency Operations Plan

The Town has an Emergency Operations Plan (EOP) that is updated and certified by the Board of Selectmen annually. This document provides general procedures to be instituted by the First Selectman, Public Safety Director, and/or designee 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 (2009)

The POCD was most recently updated in 2009 and amended through 2010 with contributions from local boards, commissions, committees, citizens and citizen groups. The Plan seeks to be a statement of policies, goals and standards for the physical and economic development of the

Town and recommends the most desirable uses types and population densities in various parts of the municipality.

The 2009 Town of East Lyme POCD includes the following actions:

- The town encourages cluster housing in order to reduce impact to sensitive areas such as wetlands, watercourses, flood hazard zones, and steep slopes can be preserved as open space or protected by buffers.
- All applicable provisions of the Flood Damage Prevention ordinance have been incorporated into the zoning and subdivision regulations.
- Encourage agricultural land uses which can reduce flooding by aiding in infiltration as compared to traditional development.
- Town policy is to provide a public water supply system that meets current and future water demands, and provides fire protection. Current public water supply is marginal.
- Town should consider maintenance and emergency vehicle access to the beaches as it re-constructs the Niantic Bay Boardwalk area.
- Town has adopted aquifer protection provisions within the zoning regulations. This prohibits the construction of sites that have a high risk of groundwater pollution.
- Any sewage disposal in the town's aquifer protection district is prohibited, unless a special permit is issued, and certain conditions are met.

The East Lyme POCD is considered somewhat consistent with the current goals and actions of the hazard mitigation plan, although it does not directly address several of the hazards such as winter storm hazards local emergency flood response. The next update to the POCD (scheduled for 2019, during the life of the current hazard mitigation plan) will continue to incorporate the elements of the hazard mitigation plan.

Coastal Area Development Plan and Harbor Management Ordinance

The East Lyme Coastal Area Development Plan was originally adopted by the Planning Commission in 1982 but is now included in the *Plan of Conservation and Development*. The Harbor Management Ordinance authorizes the individual Harbor Masters 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, these ordinances allow the Town to maintain a list of persons who currently have moored boats such that removal or emergency response can be coordinated.

Zoning Regulations

The Zoning Regulations of the Town of East Lyme, Connecticut have been amended through January 27, 2017. They include a variety of preventative regulations pertinent to mitigating natural hazards, including development limitations with regards to slopes, drainage, wetlands, and floodplains. These regulations are applied during the permitting process for new construction and during substantial improvement of existing structures.

Hazard-related regulations include:

- Private driveways must be wide enough and cleared to a sufficient height to ensure passage of fire and emergency vehicles. (S20.23)
- All structures must be more than 25 feet from a tidal wetland or watercourse. (S20.15)
- Conservation Design Development regulations provide more flexible standards to permit residential lots in specified districts to be reduced in dimension and designed to occupy less than the total tract to be subdivided, allowing designation of additional dedicated open space. (S23)
- A certain percentage of developments must be dedicated as open space, depending on the development zone and size (10% minimum).

New construction or substantial improvements are required to be elevated or resistant to flood damage, and utilities must be located to be free of flooding (such as underground) and specifically must be located underground for elderly housing developments in special use districts. Sections pertinent to flood hazard mitigation include:

- Section 14, Coastal Area Management outlines specific site plan requirements for development in areas located fully or partially within the coastal boundary as delineated on the Coastal Boundary Map for the Town of East Lyme. This section requires the applicant to conform to Section 22a-105 through 22a-109 of the Connecticut General Statutes.

- Section 15, Flood Hazard Areas addresses specific requirements for development in Flood Plain Zone, Flood Hazard Areas, and the Coastal Area Boundary; construction adjacent to bodies of water and in wetland areas; and design standards in special flood hazard areas in conformance with NFIP regulations.

- Section 16, Tidal Marsh Districts addresses specific requirements for development in coastal areas and islands characterized by tidal wetlands.

Subdivision Regulations

The Subdivision Regulations in the Town of East Lyme were last amended in February 2011. The regulations require that a Stormwater Management Plan be developed and submitted as part of the application process and that the peak runoff leaving the site under proposed conditions can be no greater than under existing conditions. The regulations further require fire protection water to be available dependent upon subdivision size and require that utilities be located underground whenever feasible.

Inland Wetland and Watercourses Regulations

The Inland Wetlands and Watercourses Regulations in the Town of East Lyme were last amended on April 11, 2011. The regulations require a permit for certain regulated activities which take place within 100 feet of a wetland or watercourse or that may impact a wetland or watercourse. These regulations build on the preventative flood mitigation provided by the Zoning Regulations and Subdivision Regulations by preventing fill and sedimentation that could lead to increased flood stages.

Water Supply Plan

East Lyme is in the process of updating its municipal Water Supply Plan, last updated in 2005. The Water Supply Plan outlines the capital improvements and operations necessary to meet the Town's water needs, and the steps to be taken to ensure a safe adequate source of future water supply. This plan includes the locations and needs of the Town's critical facilities, and addresses firefighting needs; therefore, it is relevant to hazard mitigation. The update is expected to be completed by the end of 2017.

2.6 Critical Facilities, Sheltering Capacity, and Evacuation

The Town of East Lyme considers several facilities to be critical to ensure that emergencies are addressed while day-to-day management of the Town continues. These include both buildings and utility infrastructure. Critical facilities that are buildings are presented on figures throughout this annex and summarized in Table 2-1. As shown in Table 2-1, critical structures in East Lyme are not located within the 1% annual chance floodplain. Note that several sewer pumping stations and Town water supply wellfields are partially located in the floodplain and could also be impacted by hurricane storm surge. These facilities are described in more detail below.

Volunteer Fire Departments and Emergency Services

The Town of East Lyme has a fire station headquarters in downtown Niantic, a station in Flanders, and a third station on Route 156 near Rocky Neck State Park. Equipment includes pump trucks, towers, ambulances, and forestry equipment. The Fire Departments and town staff perform emergency services training with local utilities each year. None of these facilities are susceptible to flooding or storm surge.

Police Department

The Town's Police Department has a generator and is protected from coastal flooding and storm surge by the Amtrak-Metro North railroad embankment located to the rear of the building.

Public Safety Building / Emergency Operations Center

The Town's Public Safety Building houses the Town's Fire Marshall, Emergency Management, and 9-1-1 dispatch services. This building is also the Town's Emergency Operations Center and has a generator and a radio antenna. The Town of East Lyme broadcasts government information and daily announcements on cable channel 22 from this building, and this channel can be used to broadcast emergency messages.

Table 2-1: Critical Facilities

Facility	Address or Location	Emergency Power?	Shelter?	In 1% Annual Chance Floodplain?	In Hurricane Surge Zone?
Emergency Services					
Flanders Fire Department	151 Boston Post Road	✓			
Niantic Fire Headquarters	8 Grand Street	✓			
Niantic Fire Station	227 West Main Street	✓			
Police Department	278 Main Street, Niantic	✓			
Public Safety Building / Emergency Operations Center	171 Boston Post Road	✓			
Public Works Field Services Complex	8 Capitol Drive	✓			
Public Works Sanitation Department	Roxbury Road				
Town Hall	108 Pennsylvania Avenue				
Shelters					
Community Center	41 Society Road	✓	✓		
East Lyme High School	30 Chesterfield Road		✓		
East Lyme Middle School	31 Society Road	✓	✓		
Elderly Housing & Health Services					
Bride Brook Rehab Center	23 Liberty Way, Niantic	✓			
Charter Oak (Medical Clinic)	324 Flanders Road				
Crescent Point	417 Main Street	✓			

Public Works Facilities

East Lyme's primary Public Works facility is the relatively new Field Services Complex at 8 Capitol Drive (on the corner of Colton Road). This is the Town's primary fueling facility and operational center. It is used for vehicle and equipment storage and houses the Town's salt and sand supply. Public Works vehicles need to travel briefly through Old Lyme to leave the facility. This facility has had a generator installed since the previous HMP.

The East Lyme Sanitation Department is located at the Old Public Works garage on Roxbury Road. This site focuses on water and sewer services, and is a backup fueling facility.

Town Hall

The East Lyme Town Hall houses records, plans, and other documents important for administering the Town. It is also the media center during emergencies. A generator is desired for this facility.

Utilities

The Town of East Lyme provides public water service to Niantic, Flanders, and the surrounding areas via water supply wells located along the Pattagansett River and Bride Brook. In general, well heads are elevated above the 100-year floodplain, although buildings may be susceptible to storm surge during a major hurricane event. As the public water supply wells diminish the flow in nearby watercourses, the Town has limitations on the amount of water it can withdraw during the summer months. The Town typically imposes mandatory water conservation measures each summer in order to reduce demand on its water system. This limitation does not apply to emergency situations. In order to increase summertime supply, the Town is performing a $10 million water main extension to Lake Konomoc in Waterford. The Town has formed an agreement with the New London Water Department to pump water into Lake Konomoc in the winter and spring and buy it back during the summer when demand is high.

East Lyme's water resources have improved in the past five years. A new interconnection has been developed with New London, facilitating water exchange between the two municipalities and creating a water system redundancy. A new water tower constructed in Montville provides additional water supply during dry periods, and adds water pressure to East Lyme's distribution system.

The Town of East Lyme has 22 sewer pumping stations and associated infrastructure that they consider to be critical facilities. Sewage is directed to the New London Waste Water Treatment Facility. Many of these pumping stations are also located in the 1% annual chance floodplain and/or coastal surge zones. The Town is currently in the process of mapping the locations of each of these pumping stations and determining vulnerabilities and solutions. They have already identified one station (in the Black Point area) that is at-risk of flooding, and which they wish to relocate to a higher elevation.

Shelters

East Lyme Middle School is the Town's primary shelter and can hold approximately 700 people. The school has a generator and the shelter is American Red Cross certified. The Town's backup shelter is the Community Center which can hold less than 50 people. This building also has a generator but is not American Red Cross Certified. East Lyme High School is also considered a backup shelter and can hold approximately 1,600 people. In addition to Town departments, the local Community Emergency Response Team (CERT), the American Red Cross and the Salvation Army provide services related to mitigation and emergency management. The CERT provides support to emergency personnel during large-scale emergencies and fulfills tasks that do not require a high level of training, leaving trained emergency personnel available to respond to incidents. The American Red Cross and the Salvation Army help provide shelter and vital services during disasters and participate in public education activities. If additional space was needed, the Town would send evacuees to a regional American Red Cross shelter.

Communications

The Town's communication capability is considered adequate for most circumstances. Emergency communications are good except during long power outages. The Town relies on radios, cellular phones and email for much of its communications. The Town is also part of the CT Alerts "Everbridge" Reverse 9-1-1 system for emergency notification of residents. Typically, Town personnel post notifications on bulletin boards and on the Town website prior to major storms and also utilize local media (newspapers, television, and radio) to pass information during and after storms. Residents can also contact the First Selectman or any Town staff directly with comments related to natural hazards or emergency response.

Communication was difficult during the power outages following Hurricane Irene and Winter Storm Alfred due to downed trees and power outages at the nearby cellular towers. Town personnel posted information in public locations made personal contact with many residents by going door-to-door during the outage to pass along necessary information.

Health Care and Senior Living Facilities

The Town has three walk-in medical clinics but only the Charter Oak Walk-In Medical Center is considered to be a critical facility. The Town has 150 units of elderly housing that they do not consider to be critical facilities, but they do consider the Bride Brook Rehabilitation Center and the Crescent Point assisted living facility to be critical facilities since these house patients who almost certainly require additional assistance during an emergency. None of these facilities are susceptible to flooding.

Evacuation Routes

East Lyme has identified evacuation routes for hurricane events. Typically, residents utilize State roads or local roads to exit the town. The highest capacity egress routes from East Lyme include Interstate 95, Route 1, Route 156, or Route 161 into Old Lyme or Waterford.

3.0 INLAND FLOODING

3.1 Setting / Historic Record

Flooding is the primary hazard that impacts the town each year as documented in the previous HMP. While riverine flooding is a concern, nuisance flooding and poor drainage have also created flooding issues at several locations in the town. Flooding is typically caused by heavy rainstorms, but can also be caused by relatively light rains falling on frozen ground. Flooding of roadways is more common than damage to structures.

One of the largest inland flood events in recent history occurred in June 1982. According to the 2011 *Flood Insurance Study* for New London County, a heavy rainstorm produced widespread flooding and several dam failures in southern Connecticut. This flood damaged bridges and structures along the Fourmile River and Latimer Brook in East Lyme. The event is the flood of record at the USGS gaging station on the Fourmile River.

Sustained heavy rainfall in late March 2010 caused a 1% annual chance flood throughout southeastern Connecticut. This is now the flood of record for East Lyme replacing the storm of June 1982. Many roads throughout the community were closed, including the Exit 74 and Exit 75 ramps from southbound Interstate 95, and Route 161 was closed in both directions at Route 156. North Bride Brook was closed with deep flooding, Bush Hill Drive was flooded for three days, and flooding was severe enough at the intersection of Route 161 and Walnut Hill Road that water rescues were necessary. The March 2010 storms continue to be considered the event that caused the most widespread inland flooding in East Lyme since the town began participating in the multi-jurisdiction hazard mitigation plan.

At least one additional heavy rain event occurred in East Lyme in 2011. The NCDC reported that heavy rainfall produced flash flooding on North Bride Brook Road in East Lyme on June 23, 2011. The road was closed with four feet of standing water on the road. On September 10, 2015, a wave of low pressure riding along a cold front stalled just south of Long Island. It brought heavy rain and isolated flash flooding to New London County, Connecticut.

3.2 Existing Capabilities

The Town 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, acquiring floodprone structures, maintaining drainage systems, through education and outreach, and by utilizing warning systems. Many mitigation measures are common to all hazards and therefore were listed in Section 2.5 and Section 2.6. No major inland flood control structural projects are in place within or upstream of East Lyme.

Bridge Replacements, Drainage, and Maintenance

The Department of Public Works cleans and inspects catch basins and culverts at least annually or more often if problems are noted. The Town fields phone calls related to drainage complaints. Roadway drainage complaints are directed to the Director of Public Works. When

flooding occurs, the Public Works department or the Fire Department would handle complaints depending on the location. For example, Public Works would inspect bridges and culverts and erect barricades to close roads, while the Fire Department responds to calls requesting help for flooded basements.

Regulations, Codes, and Ordinances

The Town of East Lyme has planning and zoning tools in place that incorporate floodplain management. The Town's flood protection regulations are found in section 15 of its Zoning Regulations as noted in Section 2.5, and were most recently revised on July 11, 2013; this is the Town's articulation of the FEMA NFIP regulations. The Town utilizes the 1% annual chance floodplain as defined by FEMA to regulate floodplain and floodway activities, and the most recent edition of its Zoning Regulations refer specifically to the New London Flood Insurance Study (FIS) and Flood Insurance Rate Map (FIRM) published by FEMA on August 5, 2013 for coastal areas and July 18 , 2011 for inland areas. The Town requires 100 percent compensatory storage for any encroachment in the floodplain. The Town also requires new construction or substantial renovations to be located at an elevation greater than the base flood elevation, and requires the preparation of elevation certificates to verify that a structure has been elevated or built to the proper height. The Zoning Regulations define substantial improvement cumulatively over a ten-year period.

The Town's Building Official was a founding member of the Connecticut Association of Flood Managers (CAFM) and continues to participate in the organization, attending meetings and annual conferences. This ensures that the Town's Building Department is aware of the most up-to-date flood regulations and policies.

The Town's Subdivision Regulations require that adequate drainage be provided to reduce exposure to flood hazards and that buildings and utilities are located to minimize the effects of flood damage. Regulations covering development in or within 100 feet of inland wetland or watercourse areas were last updated in 2011 and are enforced by the Town's Inland Wetlands and Watercourses Commission. The Town has also adopted a map prepared by the Inland Wetland and Watercourse Commission which regulates building in wetland areas.

Acquisitions, Elevations, and Property Protection

The Town of East Lyme has not performed acquisitions or elevations of floodprone property. Property protection has focused instead on preventive measures and maintaining and upgrading drainage systems. The Town is not opposed to performing acquisitions, elevations, or relocations if property owners were willing and grant funding was available. For example, the Town has approached the owners of repetitive loss properties about this level of mitigation for their properties, but homeowners are either unwilling to move at this time or not willing to fund 25% of the cost for an elevation or relocation project.

Flood Watches and Warnings

The Public Safety Director and the Fire Department access weather reports through the National Weather Service and local media. Residents can also sign up for the Connecticut Alerts "Everbridge" Reverse 9-1-1 system to receive warnings when storms are imminent. The Town can telephone warnings into potentially affected areas using this system.

Community Rating System

The Town of East Lyme joined the Community Rating System in 1991 and currently has policies and procedures in place that exceed the minimum standards for an NFIP-compliant community. East Lyme is currently a Class 8 (as of May 2017) Community which qualifies flood insurance policy holders in the town a 10% discount on flood insurance. East Lyme has improved its CRS rating by one point since the previous HMP. The Town performed several accomplishments to earn this rating including: providing and maintaining flood elevation certificates, conventional flood maps, and digital flood data for public information purposes; completing a public information outreach project; preserving open space; improving stormwater management. It is believed that recent improvements such as completion of the previous HMP and this update and the installation of the CT Alerts "Everbridge" Reverse 9-1-1 system will further improve the Town's score with the Community Rating System.

Summary

In general, municipal capabilities to mitigate flood damage have increased slightly since the 2012 edition of the hazard mitigation plan was adopted. This is likely because the Town increased its capabilities in response to flooding of 2011 and 2012 associated with Tropical Storm Irene and Hurricane Sandy, which are discussed in later chapters.

3.3 Vulnerabilities and Risk Assessment

This section discusses specific areas at risk to inland flooding within the Town. Overbank flooding is the most common type of flooding experienced in East Lyme, although poor drainage and nuisance flooding also occur.

3.3.1 Vulnerability Analysis of Areas along Watercourses

Major inland watercourses and water bodies in East Lyme have the 1% annual chance floodplain defined by FEMA. Bride Brook, the Fourmile River, Latimer Brook, and the Pattagansett River, each have inland sections mapped as Zone AE indicating that flood elevations are available. The upper reaches of each of these streams are mapped as Zone A (except for Latimer Brook), and smaller streams such as Beaver Brook and Cranberry Meadow Brook have also have sections mapped as Zone A. Refer to Figure 3-1 for the location of the 1% annual chance floodplains related to inland flooding within East Lyme.

Based on the information in the previous HMP and that provided by Town officials, the following areas along watercourses are vulnerable to flooding damage. This flooding occurs due to

insufficient culvert sizes at crossings or due to overbank flooding from heavy rainfall. Ice jams have not previously been an issue along watercourses in East Lyme.

Beaver Brook

The headwaters of Beaver Brook are located in the northwestern section of East Lyme. The FEMA DFIRM indicates that Beaver Brook could overtop Beaver Brook Road in this area during the 1% annual chance flood.

Bride Brook

Bride Brook is a repeated flooding area and typically floods at least once per year. Bride Brook is conveyed beneath North Bride Brook Road in two places and both crossings can potentially be inundated by the 1% annual chance flood event. The upstream crossing was inundated to a depth of five feet during the March 2010 floods. Flooding becomes tidally influenced downstream of Route 156 when Bride Brook enters Rocky Neck State Park.

Cranberry Meadow Brook

The lower reach of this brook is mapped as Zone A above Chesterfield Road (Route 161). The brook is mapped as Zone AE and impounded by a small dam downstream of Route 161 with the outlet stream quickly reaching its confluence with Latimer Brook. The Route 161 crossing is a repeated flooding area that overtopped several feet during the March 2010 floods.

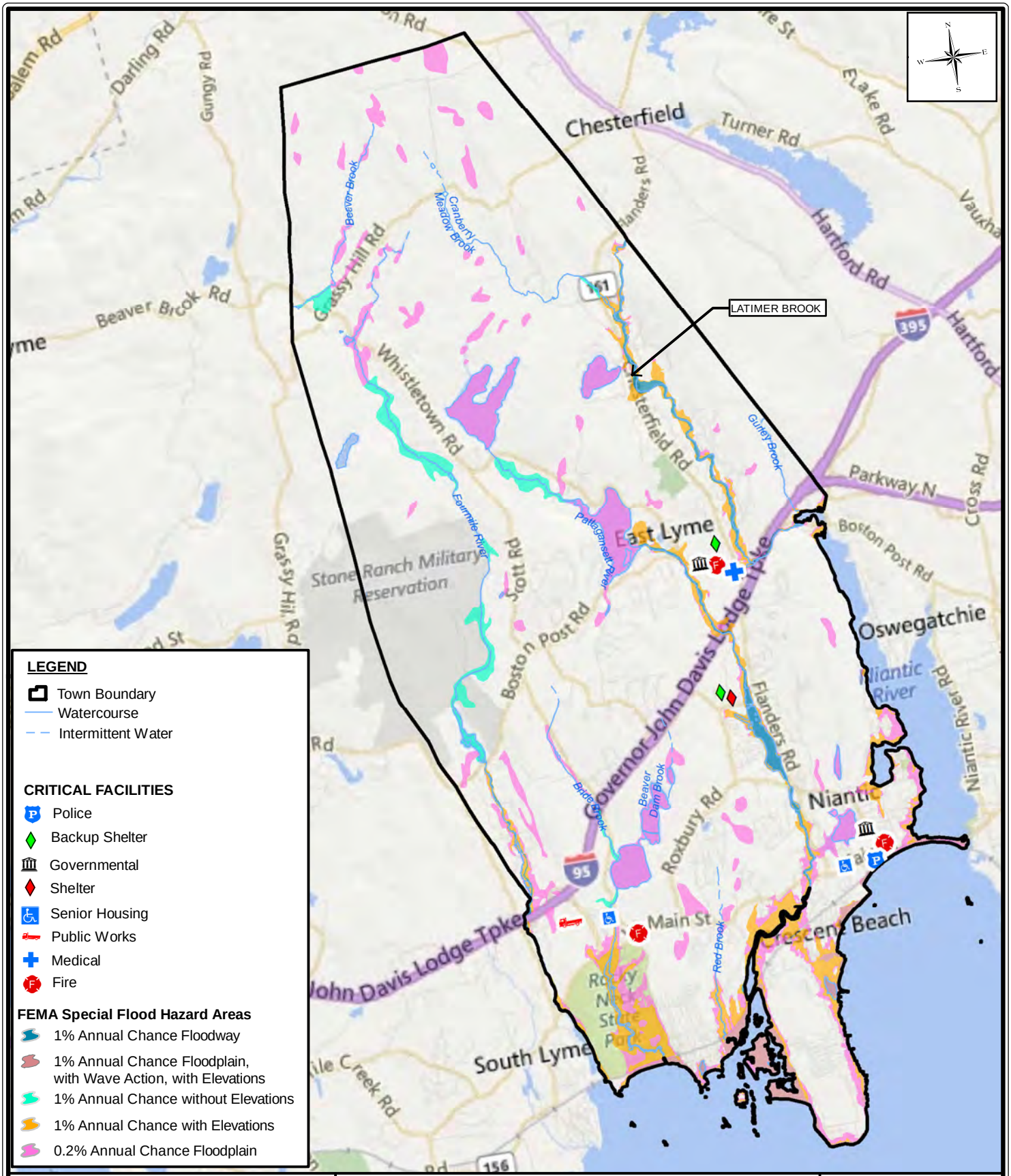
Fourmile River

The Fourmile River has its headwaters in western East Lyme. The headwaters of the river are mapped as Zone A downstream to the Boston Post Road (Route 1). The river could potentially overtop Stone Ranch Road in the Stone Ranch Military Reservation during a 1% annual chance flood event. Downstream of Route 1, the river is mapped as Zone AE and based on the flood profile in the FIS roads would not be overtopped by the 1% annual chance flood event.

Latimer Brook

Latimer Brook has its headwaters in Montville. The brook enters East Lyme just downstream of Silver Falls Road and is mapped as Zone AE throughout its reach. The Town of East Lyme performed many culvert upgrades following the 1982 flood to improve egress to neighborhoods located across the brook. Based on the flood profile in the FIS, roadways that cross Latimer Brook should not overtop during the 1% annual chance flood event. The only road at risk of overtopping is Boston Post Road just upstream of Interstate 95. The removal of a small dam located between Route 1 and Interstate 95 could alleviate this flooding issue. However, many roads adjacent to Latimer Brook could be overtopped by minor flooding from the 1% annual chance flood event, including Latimer Drive, Bob White Lane, the cul-de-sac of Brookfield Drive, Quailcrest Road, and Chesterfield Road (Route 161) near both ends of Mostowy Road. Downstream of Interstate 95, Latimer Brook becomes vulnerable to tidal flooding.

MXD: Y:\3570-09\Maps\annex_maps\East Lyme\Figure 3-1.mxd



LEGEND

- Town Boundary
- Watercourse
- Intermittent Water

CRITICAL FACILITIES

- Police
- Backup Shelter
- Governmental
- Shelter
- Senior Housing
- Public Works
- Medical
- Fire

FEMA Special Flood Hazard Areas

- 1% Annual Chance Floodway
- 1% Annual Chance Floodplain, with Wave Action, with Elevations
- 1% Annual Chance without Elevations
- 1% Annual Chance with Elevations
- 0.2% Annual Chance Floodplain

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FEMA SPECIAL FLOOD HAZARD AREAS

SCCOG HAZARD MITIGATION UPDATE
TOWN OF EAST LYME ANNEX

EAST LYME, CONNECTICUT

SOURCE: NATIONAL FLOOD HAZARD LAYER, FEMA, 2017

DATE: **JULY 26, 2017**		
SCALE: **1"=6,500 '**		
PROJ. NO.: **3570-09**		
DESIGNED **SB**	DRAWN **PS**	CHECKED **DM**

DRAWING NAME:

FIG. 3-1

Pattagansett River

The Pattagansett River is formed at the outlet of Powers Lake located near the Yale Engineering Camp. The river is mapped as Zone AE downstream of Upper Pattagansett Road and could potentially overtop that road and Hathaway Road during a 1% annual chance flood event. The river is impounded by a significant dam downstream forming Pattagansett Lake. The section of river downstream from this lake is mapped as Zone AE. A 1% annual chance flood event would overtop the Boston Post Road (Route 1), Industrial Park Road, Roxbury Road, and Bush Hill Drive. Bush Hill Drive floods annually and was flooded for three days during March 2010. Roxbury Road would overtop during more frequent floods than the 1% annual chance flood event, and Brook Road would be close to overtopping. The Pattagansett River is tidally influenced downstream of Brook Road, but 1% annual chance inland flooding event should not overtop West Main Street (Route 156).

Poor Drainage Flooding

Flooding due to poor drainage occurs throughout East Lyme including in coastal areas. Recently, a nuisance flooding problem has developed on Flanders Road (Route 161) near Industrial Park Road. There has been a lot of development nearby (for example, on Chapman Woods Road) and the older sections of the drainage system on Flanders Road are being overwhelmed since they are likely undersized. This section of roadway typically needs to be closed for several hours during heavy rainfall, and Town personnel have observed manholes overflowing. Drainage improvements along Route 161 may alleviate the flooding issue.

3.3.2 Vulnerability Analysis of Private Properties

As noted in Table 3-4 of the Multi-Jurisdictional HMP, a total of 358 structures in East Lyme appear to be located in the 1% annual chance floodplain. A total of 8 are located in Zone A, 12 appear to be located in the Zone AE floodway, and 314 are located within Zone AE. Approximately 109 of the structures located in Zone AE are vulnerable to inland flooding, with the remainder being vulnerable to coastal flooding (although some may be susceptible to both types of flooding). The vast majority of these structures are residential but a few commercial and industrial structures are also located within inland floodplains. Table 3-1 presents structures susceptible to inland flooding damage from nearby watercourses.

Table 3-1: Structures Susceptible to Inland Flooding in the Town of East Lyme

Flooding Source	Zone A	Zone AE	Floodway	Total
Beaver Brook	1	-	-	1
Bride Brook	2	0	0	2
Pattagansett River	2	52	9	63
Cranberry Meadow Brook	3	-	-	3
Fourmile River	0	2	0	2
Latimer Brook	-	55	3	58
Total	**8**	**109**	**12**	**129**

Note: A "-" indicates that this type of floodplain is not delineated for that stream.

In many cases, these structures are located near the edge of the mapped floodplain and therefore may actually be elevated above the floodplain. Nevertheless, the Town of East Lyme should make an effort to identify properties within the 1% annual chance floodplain and distribute information regarding floodproofing and home elevation to the owners of these properties.

As of November 2011, ten repetitive loss properties related to inland flooding damage were reported in East Lyme. These properties lay along Latimer Brook (five), the Pattagansett River (four), and Cranberry Meadow Brook (one). Damage events are reported in Table 3-2. Based on the information in Table 3-2, damage at one of the Latimer Brook repetitive loss properties only occurred during winter storms more than 30 years ago. Some mitigation measure must have been performed that has eliminated the immediate vulnerability from this property, as it continues to be located within the 1% annual chance floodplain. The remaining properties are each low-lying near the respective stream.

Table 3-2: Storms Causing Repetitive Loss Damage Claims in East Lyme

Repetitive Loss Property	Jan. 1978	Jan. 1979	June 1982	March 2001	June 2001	Feb. 2003	Oct. 2005	March 2007	March 2010
"Cranberry"								✓	✓
"Latimer #1" (1)	✓	✓							
"Latimer #2"		✓		✓				✓	✓
"Latimer #3"								✓	✓
"Latimer #4"								✓	✓
"Latimer #5"		✓	✓						✓
"Pattagansett #1"							✓		✓
"Pattagansett #2"			✓	✓			✓		✓
"Pattagansett #3"				✓	✓	✓	✓		✓
"Pattagansett #4"				✓					✓

As of 2017, a total of ten repetitive loss properties affected by inland flooding are located in East Lyme; these are the same ten properties listed above. Additional flood claims (since 2010) have not been recorded.

3.3.3 Vulnerability Analysis of Critical Facilities

As noted in Section 2.6, critical facilities in East Lyme are not located within the 1% annual chance floodplain. While the public water supply wellfields and some pump houses appear to be located within the 1% annual chance floodplain, these buildings are not designed for permanent habitation and the associated infrastructure can withstand minor flooding. Other structures, such as sewer pump stations, are not affected by inland flooding but rather by coastal flooding.

The Town of East Lyme is concerned with several roads that are the only egress into large neighborhoods that are also located within the 1% annual chance floodplain. For example, Bush Hill Road floods at the Pattagansett River, and this bridge is the only mode of egress for more

than 80 properties. An emergency egress should be considered between either Bush Hill Road and Romangna Road or between Highwood Road and Whiting Farms Lane. Homes on North Bride Brook Road can also become isolated if Bride Brook overtops the road at both locations. Furthermore, if Brook Road over the Pattagansett River was washed out, residents would not be able to leave the neighborhood although they could walk to Park Place for assistance.

3.4 Potential Mitigation Strategies and Actions

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 town are listed in Section 11 of this annex, as are specific measures pertinent to reducing inland flooding in the Town of East Lyme.

4.0 COASTAL FLOODING & SHORELINE CHANGE

4.1 Setting / Historic Record

The shorefront of East Lyme primarily contains rocky shorefront, modified bluffs and escarpments, and beaches and dunes. Coastal bluffs and escarpments, islands, developed shorefront, and tidal wetlands are also present but are more limited in area. Developed shorefront is located only in the Niantic area along the Niantic River. Significant areas of tidal wetlands are located in Rocky Neck State Park, in the Pattagansett River estuary, along Niantic Bay, and along the Niantic River. The coastal resources found in Connecticut and described by DEEP are defined in the Multi-Jurisdictional HMP.

Nearby coastal water bodies are defined as estuarine embayments (defined as a protected coastal water body with a direct connection to Long Island Sound), near-shore waters, or offshore waters. Estuarine embayments include the Pattagansett River and areas along the Niantic River. Niantic Bay and areas south of Rocky Neck State Park are designated as near-shore waters. The mapped islands include inhabited areas such as Griswold Island (approximately 10 structures) and Brainard Island (three structures). Other smaller islands also exist but are uninhabited.

Homes, businesses, and industry are located in close proximity to the coastline along the majority of the shoreline of East Lyme. Structures and infrastructure in the southern section of the town are closer to sea level than in northern areas and are therefore more susceptible to coastal flooding. Hurricanes, tropical storms, and nor'easters have the potential to induce coastal flooding and storm surge that can impact structures, and these types of storms have caused the greatest amount of flood damage to the town in the past. Astronomical high tides can also cause coastal flooding of low-lying areas.

Roadway closures are the most common result of coastal flooding although structures are also affected during moderate events. For example, flooding during Tropical Storm Irene in late August 2011 washed out a seawall in front of houses on Atlantic Street and flooded nearby homes. Only a few structures are known to have received damage by coastal floodwaters since 2005. However, as of 2012, the Town was concerned with the potential long-term effects of sea level rise and its potential to exacerbate flooding conditions in the future.

In October 2012, Hurricane Sandy caused significant coastal flooding in East Lyme. The event occurred after the FEMA approval pending adoption (APA) of the hazard mitigation plan and therefore was not described in the document. Areas along Oak Grove Beach saw significant flooding of roads and homes. Crescent Beach was also hard it, with part of a walking path washed out, and significant erosion occurring. East Lyme received over half a million dollars in FEMA federal aid immediately after the event in order to facilitate the cleanup. In addition, the Crescent Beach Association reportedly received three million dollars for beach restoration.

4.2 Existing Capabilities

The Town 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 Capabilities utilized in the Town 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 Town 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) for coastal flooding areas. As noted by the Zoning Regulations and the Subdivision 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 Town requires elevation certificates to certify such work as part of its Community Rating System efforts. The Planning Commission, Zoning Commission, Land Use Department, and the Building Official are all required to review and approve portions of applications that involve structures within FEMA Special Flood Hazard Areas.

The Town has conducted outreach to residents about flood mitigation but most residents are not interested in acquisitions or elevations. As such, the Town has further attempted to streamline restrictions to its regulations through its recent amendments to the Zoning Regulations and by maintaining its activities with the Community Rating System.

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 Town of East Lyme utilizes these warnings and forecasts to prepare emergency responders for flooding events.

The shoreline of East Lyme 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 Giants Neck, Seal Rock, Black Point, Attawan Beach, Crescent Beach, and Atlantic Avenue. The seawall on Atlantic Avenue washed out during Tropical Storm Irene and the property owners are repairing it without the Town's assistance. Larger structures are associated with the breakwaters at Rocky Neck and the Amtrak-Metro North Railroad at Rocky Neck and the Pattagansett River estuary that protects landward areas from wave velocity. Groins and jetties are also common in beach areas. 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.

"The Bar" that carries Route 156 and the Amtrak Railroad is also an important mitigation structure that helps to protect areas along the Niantic River. The National Railroad Passenger Corporation (Amtrak) is currently replacing the bridge leading from The Bar to Waterford. The

replacement includes the construction of a protective wall, a stone scour protection system, and relocation of a beach seaward of its existing location. Approximately 2,500 feet of beach will be restored as part of the project.

Like many communities, the Town lacks existing policies and mitigation measures that are specifically designed to address sea level rise. However, 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. The Town completed the process of identifying its vulnerability to this hazard, including a completed planning effort with The Nature Conservancy (TNC) in 2011-2012[1] and a separate planning initiative with SCCOG and TNC in 2016-2017[2]. However, the Town has not yet embarked on detailed coastal hazard planning to the degree that nearby communities like Waterford and Groton have done.

As explained in Section 2.13 of the regional part of this multi-jurisdiction hazard mitigation plan, the State Historic Preservation Office (SHPO) embarked on a resiliency planning study for historic and cultural resources beginning in 2016. During winter 2016-2017, individual meetings were held with the shoreline SCCOG communities. Reports were issued to these communities in DECEMBER 2017. The East Lyme report outlines eight strategies that can be employed to make historic and cultural resources more resilient:

- Identify Historic Resources
- Revisit Historic District Zoning Regulations
- Strengthen Recovery Planning
- Incorporate Historic Preservation into Planning Documents
- Revisit Floodplain Regulations and Ordinances
- Coordinate Regionally and with the State
- Structural Adaptation Measures
- Educate

Subsequently, a best practices guide for planning techniques to make historic resources more resilient was distributed in September 2017.

Summary

Municipal capabilities to mitigate coastal flood damage have increased significantly since the 2012 edition of the hazard mitigation plan was adopted. This is because the Town continued working with TNC on its resiliency planning, participating in the historic resources resiliency planning, and generally increased its capabilities sharply in response to the flooding associated with storms Irene and Sandy.

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1 https://www.conservationgateway.org/ConservationPractices/Marine/crr/library/Documents/Eastern%20Connecticut%20Risk%20and%20Vulnerability%20Assessment%20Workshop%20Final%20Report.pdf

2 https://tnc.app.box.com/s/8nne60yjk2g3m1mgzkfa86rndxyjiawf

4.3 Vulnerabilities and Risk Assessment

This section discusses specific areas at risk to coastal flooding within the Town. 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 many roads and neighborhoods, potentially cause severe damage, and impede transportation in the Town. Refer to Figure 3-1 for a depiction of areas susceptible to coastal flooding, and Figure 4-1 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 Town of East Lyme 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 town are subject to periodic flooding. The most severe flooding in East Lyme occurs during hurricanes or coastal storms which can occur during any season. Such storms have intense winds and rainfall that can create high tidal surges, wave runoff, and peak runoff to drainage systems where coastal outlets are submerged. Areas along Long Island Sound, Niantic Bay, and the Niantic River are at the highest risk of experiencing damage from coastal flooding, and tidally-influenced flooding also occurs along the lower portion of major watercourses including the Fourmile River, Bride Brook, Pattagansett Brook, and Latimer Brook. 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 Town.

The southern portion of the town and the lower section of the Niantic River are exposed to the wave action from Long Island Sound. An additional concern for these areas of the Town is that the primary roadways may flood due to drainage issues before structures are affected making subsequent evacuation very difficult. The Town of East Lyme has identified several important roads that could potentially flood during major storms as presented in Table 4-1. Important roads include major roadways or those that are the only mode of egress into a neighborhood.

Table 4-1: Important Roadways at Risk of Overtopping During Coastal Flooding

Road	Road
Boston Post Road (Route 1)	Old Black Point Road
Fairhaven Road	Pine Grove Road
Giants Neck Road	Shore Road
Main Street (Route 156)	West Main Street (Route 156)

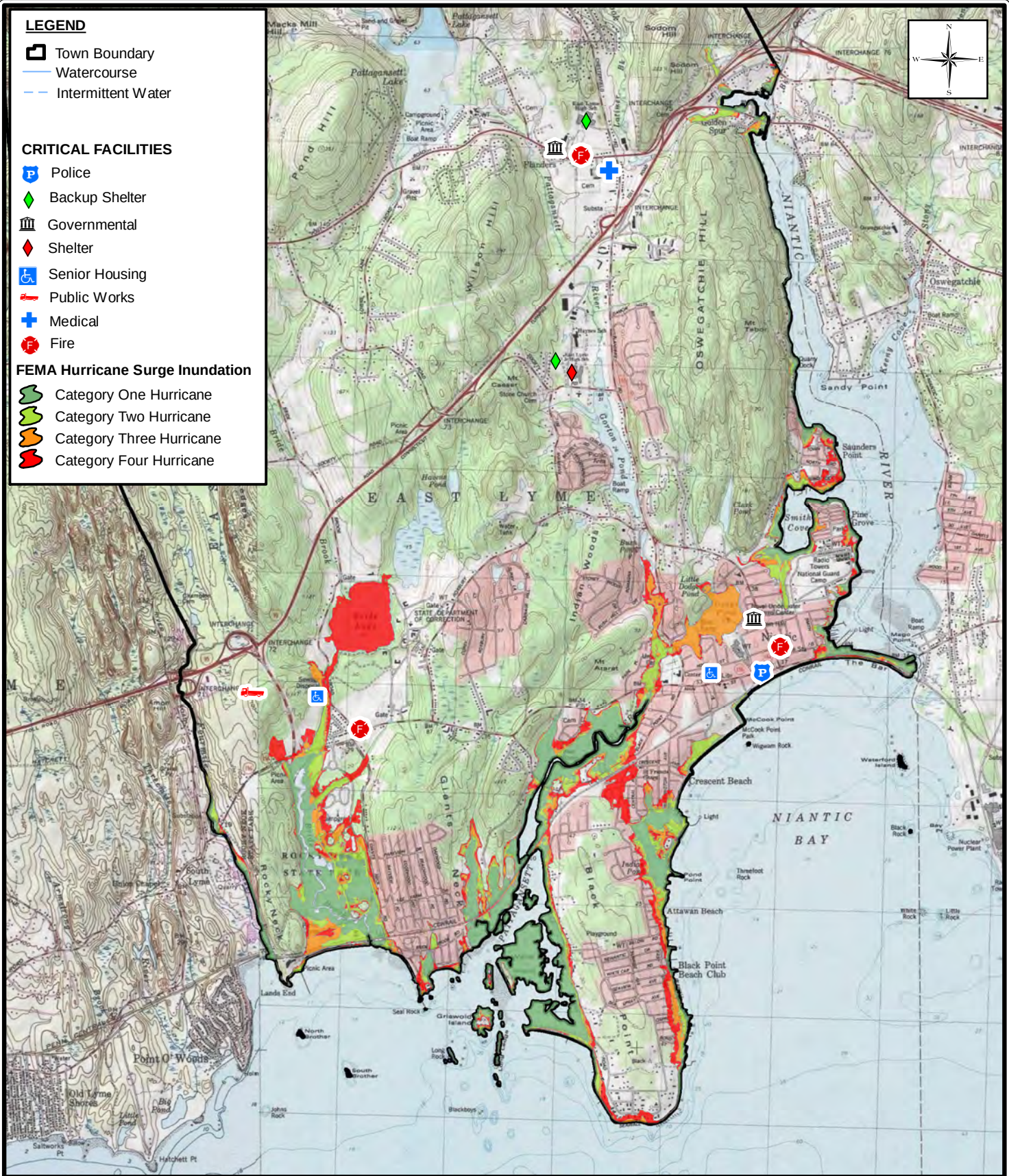
Atlantic Street is a particular area of concern as it can be overtopped by a moderate coastal flood event and the flooding both cuts off access to a small neighborhood and inundates the sanitary and storm sewer systems. When this occurs, the Town has to pump water from the systems into Niantic Bay. Other roads that provide access to coastal structures are also located in the 1% annual chance coastal floodplain as described in Section 4.3.2.

As shown on Figure 4-1, areas of storm surge are generally coincident with the areas of coastal flooding described above. In general, a Category Two Hurricane is expected to produce storm surges that are equivalent to the 1% annual chance flood event, while a Category Three Hurricane is expected to produce storm surges that approximate the 0.2% annual chance flood event. Storm surge from a Category Four Hurricane would affect additional areas, while storm surge from a Category One Hurricane is expected to affect many low-lying coastal areas to a slightly lesser extent than those from a Category Two hurricane. Areas potentially affected by storm surge from a Category One Hurricane include areas of Giants Neck, the Pattagansett River estuary, coastal areas in Black Point, the Indian Pond and Shore Road area, the marina area in Niantic, low-lying roads and properties around Smith Cove, as well as smaller portions of other coastal areas.

In general, it is assumed that as sea level rises, the frequency and magnitude of coastal flooding in the Town will increase with structures and roadways closest to existing sea level being affected more quickly. In addition, tidal marsh areas located in Rocky Neck State Park, the Pattagansett River estuary, the Niantic River, and nearby Indian Pond will either migrate inland or be eroded by constant inundation. Tidal wetland islands such as Watts Island could disappear completely.

Aside from the tidal marshes, coastal erosion is generally not a serious issue in East Lyme since the majority of the shorefront is either developed (particularly along the Niantic River), rocky shorefronts consisting of stones and boulders, or modified bluffs and escarpments consisting of seawalls, bulkheads, or revetments. The beach and some tidal wetland areas are susceptible to coastal erosion but are generally protected from direct wave action by local islands, groins, jetties, and breakwaters. However, as sea level rises, the effectiveness of these structures will be undermined such that erosion will be able to occur more easily during coastal flooding events.

MXD: Y:\3570-09\Maps\annex_maps\East Lyme\Figure 4-1.mxd



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POTENTIAL HURRICANE STORM SURGE

SCCOG HAZARD MITIGATION UPDATE
TOWN OF EAST LYME ANNEX

EAST LYME, CONNECTICUT

SOURCE: HURRICANE SURGE INUNDATION LAYER; CTDEEP, 2012

DATE: **JULY 26, 2017**		
SCALE: **1"=4,000 '**		
PROJ. NO.: **3570-09**		
DESIGNED **SB**	DRAWN **PS**	CHECKED **DM**

DRAWING NAME:

FIG. 4-1

4.3.2 Vulnerability Analysis of Private Properties

The coastal areas of the Town of East Lyme have properties that are inhabited year-round. This intensifies risk to life and property in coastal areas. Waterfront properties are very susceptible to damage, not only as a result of flooding but also due to the velocity zones located along the Eat Lyme's 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, industrial, 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. Drainage systems in low-lying areas can also backup during coastal storms, resulting in flooding along roadways as occurred in Niantic during the March 2010 storms.

Floodprone residences are located throughout the coastal areas of East Lyme. Areas located in the coastal velocity zone are believed to be particularly at risk. As noted in Table 3-4 of the Multi-Jurisdictional HMP, a total of 358 structures appear to be located within the 1% annual chance floodplain in East Lyme. A total of 24 of these properties are located within Zone VE, and approximately 205 properties are located within Zone AE that are vulnerable to coastal flooding. Development in coastal floodplains is not particularly dense in any area; instead, there are structures located in the coastal floodplain throughout East Lyme. Table 4-2 presents located within the 1% annual chance coastal floodplain by flooding source.

Table 4-2: Structures Susceptible to Coastal Flooding in the Town of East Lyme

Flooding Source	Zone AE	Zone VE	Total
Bride Brook	7	-	7
Indian Pond	9	-	9
Long Island Sound	3	8	11
Niantic Bay	71	4	75
Niantic River	32	10	42
Pattagansett River	27	2	29
Smith Cove	31	-	31
Unnamed Tributary from Indian Pond	23	-	23
Unnamed Tributary to Long Island Sound (Giants Neck)	2	-	2
Total	**205**	**24**	**229**

Note: A "-" indicates that this type of floodplain is not delineated for that stream.

Historically, Shore Drive, Shore Road, Atlantic Street, the east and west shores of Black Point, and Giants Neck Road have experienced the most damage from coastal flooding caused by hurricanes in the town. These areas are protected by private seawalls. Town officials have also

expressed an interest in obtaining grant funding to perform structural elevations in these areas but property owners are not interested at this time.

At the time of 2005 HMP, two repetitive loss properties existed in the Town of East Lyme related to coastal areas. As of 2012, two additional repetitive loss properties related to coastal flooding had been identified in the town. As of 2017, 13 repetitive loss properties are located near coastal waters. Each property is a single-family home that was damaged by hurricanes, tropical storms, or nor'easters.

Table 4-3: Repetitive Loss Properties in East Lyme

Location	Number of Properties
Atlantic Street	6
Attawan Ave	1
Bishops Bay Drive	1
Boston Post Road	1
Giants Neck Road	1
Shore Drive	3

As stated previously, coastal flooding is a particular concern in the town because many areas are low-lying and existing drainage systems and the sewage system can become inundated. The Town further 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. The Town of East Lyme is interested in all forms of flood mitigation, including acquisitions, elevations, drainage upgrades, and other structural projects provided property owners are interested and funding is available.

The Town of East Lyme 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. Town planning staff should use the recently released DFIRM to identify the approximately 358 structures in the town that are located in the 1% annual chance floodplain (with or without wave velocity). This could provide a list of areas to inspect following a storm event and allow for the town 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 noted in Section 2.6, critical facilities in East Lyme that are located within the 1% annual chance floodplain include several sewer-pumping stations. These facilities can become inundated during coastal flooding and storm surge events resulting in sewer backups. The Town has to pump water from the systems into Long Island Sound on occasion which can result in beach closures due to the threat of bacteria.

Storm surge flooding can also hinder emergency response, particular in low-lying roads located along the coastline. For example, Route 156 can overtop in several areas during a coastal flood event, and streets such as Giants Neck Road and Pine Grove Road are the only mode of egress into relatively large neighborhoods. The timing of evacuations from these areas of the town prior to a hurricane event is therefore very important as the majority of the roads in this area will be flooded or washed out by a major hurricane.

4.4 Potential Mitigation Strategies and Actions

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 town are listed in Section 11 of this annex, as are specific measures pertinent to reducing inland flooding in East Lyme.

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 town. However, some buildings and areas in the town are more susceptible to wind damage than others.

Tropical Storm Irene impacted the town in August 2011. Trees fell throughout the town and the region, causing power outages that on average lasted several days. Many town facilities were operated with generators. Debris removal took a few weeks to complete because a significant number of trees were damaged.

The last major hurricane or tropical storm wind event to affect the town was associated with Hurricane Sandy in 2012. Although coastal flooding was the primary damage vector from the storm, wind gust of over 60 mph damaged trees and brought down power lines as well. As noted above, East Lyme received over half a million dollars in FEMA federal aid immediately after the event in order to facilitate the cleanup.

5.2 Existing Capabilities

Wind loading requirements are addressed through the state building code. The Connecticut State Building Code was most recently adopted with an effective date of October 1, 2016. The code specifies the design wind speed for construction in all the Connecticut municipalities. The ultimate design wind speed for East Lyme ranges from 125 to 145 miles per hour depending on the building use (for example, hospitals must be designed to the higher wind speed). Note that changes in design wind speed figures since the previous HMP are largely the result of a shift from "nominal" to "ultimate" wind speeds, for compatibility purposes; see the Connecticut Building Code or the American Society of Civil Engineers website for more information. East Lyme has adopted the Connecticut Building Code as its building code. Town personnel note that recent buildings all meet the building code for wind loading.

The Town has a Tree Warden who can post notification and schedule tree removal for damaged or dangerous trees located in rights-of-way or on Town land. The Highway Department also monitors trees as part of their normal rounds and has a budget for minor tree maintenance. The Town hires outside contractors for larger jobs such as tree removal. The Town also has links regarding hurricane preparedness and disaster preparedness on the Public Safety webpage on its website.

The Tree Warden coordinates tree removal and maintenance with the local power utility. Since the previous HMP, CL&P has been acquired by Eversource. In response to the major

power-outages caused by Tropical Storm Irene and Hurricane Sandy, as well as significant winter storm events, Eversource has taken an aggressive approach to tree maintenance and has improved communication and coordination with municipalities. Municipal staff report that Eversource has enhanced its tree clearing efforts, has updated its facilities, and has been working to strengthen the power grid and build in redundancies. Communication and coordination has improved due to Eversource's liaison program.

Eversource reportedly maintains a list of critical facilities and uses that to prioritize outage prevention and response. The Town also has access to a circuit map, which shows the power distribution grid and includes critical facilities locations.

The Town requires that new subdivisions and new Elderly Housing developments must locate utilities underground and that utilities must be protected from flooding damage. The Town also encourages that utilities be placed underground for all new developments. However, utility lines are located underground in only a few areas of the town. While the Town of East Lyme would be interested in placing utilities underground (particularly along Main Street in Niantic), such activities would need to be localized and combined with private projects since the Town does not own any of the overhead utilities. For example, Town officials noted the estimated cost of burying power lines along Main Street would be $2.5 million. The Town would need to work with Connecticut Light & Power and acquire grant funding to complete any large-scale utility relocation project since the Town could not fund it themselves.

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 Town 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 Town 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 areas of the town, and many people heeded the evacuation and moved inland.

Prior to severe storm events, the Town 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 Town have historically passed in a day's time, power outages can last for several days following a storm. 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.

Summary

In general, municipal capabilities to mitigate hurricane damage have increased significantly since the 2012 edition of the hazard mitigation plan was adopted. This is likely because the Town increased its capabilities sharply in response to the damage from Tropical Storm Irene in 2011 and Hurricane Sandy in 2012.

5.3 Vulnerabilities and Risk Assessment

The entire town 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 town is also susceptible to damage occurring in other communities cutting off 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 town since the new buildings were constructed to meet or exceed current building codes. Many buildings in the town are greater than 50 years old and do not meet current building codes. Older buildings in the town 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.

East Lyme has a diverse housing stock with rental properties and campgrounds. These areas are also at particular risk of damage during a hurricane or tropical storm because rental properties are not owner-occupied and therefore may not be properly maintained, and because campgrounds contain recreational vehicles that are not as structurally sound as permanent buildings. Fortunately, recreational vehicles in such campgrounds can be evacuated relatively easily given the usually long lead time prior to a hurricane or tropical storm event.

The strength of a large hurricane could cause a significant economic impact to the town. 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 Town of East Lyme.

5.4 Potential Mitigation Strategies and Actions

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 town are listed in Section 11 of this annex, as are specific measures pertinent to reducing wind damage to the Town of East Lyme.

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 town. 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 town without harming another. Such storms occur in the town each year, although hail and direct lightning strikes to the town are rarer. No tornadoes have occurred in the town since the last HMP. There have however been multiple severe thunderstorms, although only one caused even moderate damage. On August 11, 2016 a severe thunderstorm impacted East Lyme. The resulting wind and flash flooding left several thousand customers without power.

6.2 Existing Capabilities

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 Town 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 Town 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 Town 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.

Summary

In general, municipal capabilities to mitigate thunderstorm and tornado damage have not increased significantly since the 2012 edition of the hazard mitigation plan was adopted.

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 town 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 town.

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 Town's strong fire response.

Lightning and hail are generally associated with severe thunderstorms and can produce damaging effects. All areas of the town 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 town. 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 town exists, it is considered to be an event with a very low probability of occurrence.

6.4 Potential Mitigation Strategies and Actions

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 town. 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 town.

Winter storms occurring in the winter of 2010-2011 had the most significant effects in the last decade. The Town inspected and ordered many roofs cleared based on visual assessments due to excessive snow accumulations.

Winter storms and nor'easters have affected the town since the last HMP. Specifically, heavy snow from two storms impacted the region in February and March 2013. Several feet of snow fell between the two storms, taxing the town's snow removal abilities. The town received nearly $120,000 to cover expenses related to the storms.

7.2 Existing Capabilities

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. In addition, the Town website seasonally includes information regarding winter safety, including shoveling tips, energy assistance information, and tips to prepare for a winter power outage.

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 Town staff, as parking lots and roadways need constant maintenance during storms. This is particularly important in Niantic where on-street parking is frequently utilized for businesses.

The Public Works Department oversees snow removal in the town. Salt and sand is stored at the Town of East Lyme Public Works facility. The Town has established plowing routes that prioritize access to and from critical facilities. Plows are diverted to address emergency service needs whenever necessary. The Connecticut Department of Transportation plows the four State roads in the town.

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 Town performed visual assessments of many buildings during the winter of 2010-2011 and cleared many town-owned roofs. Many residents also shoveled their own roofs or hired contractors to clear their roofs of excessive snow.

Summary

In general, municipal capabilities to mitigate snowstorm damage have increased slightly since the 2012 edition of the hazard mitigation plan was adopted. This is because the Town continues to experience heavy snow each winter.

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 town includes many residents who are elderly and additional elderly developments are proposed. 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 town are recently constructed and therefore not susceptible to damage from heavy snow. While some Town buildings could be susceptible to heavy snow loads, they will be cleared quickly if safety is a concern. Some buildings in the town have flat roofs which are more susceptible to damage from heavy snow than sloped roofs. Schools were considered particularly vulnerable to heavy snow loads during the winter of 2010-2011. A more detailed response plan is necessary to ensure that town buildings, including schools, are properly inspected and cleared if excessive snow is an issue in the future.

Icing is not a significant issue in the town. 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 Strategies and Actions

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 town. However, it is very unlikely that the town would be at the epicenter of such a damaging earthquake. No major earthquakes have affected the town since the last HMP.

8.2 Existing Capabilities

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 Town of East Lyme. The Town has adopted these codes for new construction, and they are enforced by the Building Official.

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

In general, municipal capabilities to mitigate earthquake damage have not increased since the 2012 edition of the hazard mitigation plan was adopted. This is because the hazard continues to pose a low risk of damage to the Town.

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 several areas of the town (particularly near watercourses) are underlain by stratified drift. These areas are potentially more at risk for earthquake damage than the areas of the town 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 Town 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 fault lines have not been mapped in the vicinity of East Lyme. 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 town primarily includes some more recent construction that is seismically designed. However, most buildings were built before the 1980'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 town has numerous areas with steep slopes greater than 15% located throughout the town and these areas have already prevented significant development. While landslides are not a particular concern in the town, areas beneath steep slopes could be vulnerable to landslide damage during a major earthquake.

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 town 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 Strategies and Actions

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 town. However, the town has strong fire coverage and therefore does not typically experience major wildfires. Town personnel recall that fires occurred more often in the past then they do today. Small wildfires from one to three acres in size occur occasionally but they are quickly contained. Structural fires in higher density areas of the town are a larger concern for the Town, although these are not directly addressed herein.

9.2 Existing Capabilities

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 Town can access this information over the internet. The Town 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 Town Fire Departments have strong inter-municipal cooperation agreements with other municipalities to fight wildfires and structure fires. Fire protection water is obtained from the Town's public water system in the Niantic and Flanders areas. The Water & Sewer Department tests fire flows regularly and informs the fire departments of the pressure available.

A large area of town (primarily the north-central area) is not serviced by public water service. Fire fighters responding to these areas rely on dry hydrants, cisterns, tanker trucks, and drafting of surface water sources to provide fire protection water. New developments are required to install cisterns and/or dry hydrants to provide fire protection water, so most subdivisions have a source of firefighting water available. The Town goes to the fires as quickly as possible and has good access to most areas for fire-fighting, and has gators and brush trucks to access less accessible areas.

A new water tower constructed in Montville provides additional water supply to East Lyme during dry periods, and adds water pressure to East Lyme's distribution system. This has improved the Town's ability to utilize its public water supply for firefighting. The new interconnection with New London also increases East Lyme's water supply and water system redundancy.

The level of fire protection afforded by the existing public water service and other water sources in outlying areas is considered to be good for the development level of the Town. The Fire

Department will continue to evaluate the level of risk and the need for additional public water system hydrants or other water sources in the future.

The Connecticut DEEP has recently changed its Open Burning Program. It now requires individuals to be nominated and designated by the Chief Executive Officer in each municipality that allows open burning and to take an online training course and exam to become certified as an "Open Burning Official." Permit template forms were also revised that provide permit requirements so that the applicant/permittee is made aware of the requirements prior to, during, and after burn activity. The regulated activity is then overseen by the Town.

Summary

In general, municipal capabilities to mitigate wildfire damage have increased since the 2012 edition of the hazard mitigation plan was adopted due to the extensive water system improvements and redundancies created, along with changes in the State's regulation of open burning.

9.3 Vulnerabilities and Risk Assessment

East Lyme has a mix of densely developed areas such as Niantic, Flanders, Giants Neck, and Black Point and rural areas in the north and central areas of the town. The most vulnerable area for a wildfire is the Nehantic State Forest in northwestern East Lyme. This area has relatively limited access for firefighting equipment and limited surface water sources to draft such that firefighting water must be transported. The Stone Ranch Military Reservation in western East Lyme also has limited access and a lack of surface water in many areas. These areas are considered to be at moderate risk for a major wildfire occurrence. Finally, Oswegatchie Hill overlooking the Niantic River is a large undeveloped area that has limited access and steep slopes which could make fire containment difficult although firefighting water is located nearby. The remaining areas of the town that are located nearby water sources 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 East Lyme.

9.4 Potential Mitigation Strategies and Actions

The Town of East Lyme 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 East Lyme is considered a possible event each year with potentially significant effects. No dam failures have impacted the town since the previous HMP.

10.2 Existing Capabilities

The Connecticut DEEP administers the Dam Safety Section and designates a classification to each state-registered dam based on its potential hazard. As noted in the Multi-Jurisdictional HMP, East Lyme is home to four Class B (significant hazard) dams, and one additional Class B (significant hazard) dam is located upstream of East Lyme whose failure could potentially lead to flooding within the town. These dams are listed on Table 10-1.

Table 10-1: High and Significant Hazard Dams Within and Upstream of the Town of East Lyme

Dam	Hazard Class	Location	Owner	River System
Bogue Brook Reservoir	B	Montville	New London Water Dept.	Latimer Brook
Darrow Pond	B	East Lyme	Private / Town of East Lyme	Latimer Brook
Gorton Pond	B	East Lyme	Connecticut DEEP	Pattagansett River
Pattagansett Lake	B	East Lyme	Connecticut DEEP	Pattagansett River
Powers Lake	B	East Lyme	Connecticut DEEP	Pattagansett River

Dams in the region whose failure could impact East Lyme are 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 EAPs for such dams. The Town of East Lyme is part owner of Darrow Pond dam when it acquired half of the pond several years ago. While an evaluation of the dam was performed several years ago, the Town is not sure if an EAP or a dam failure inundation area has been prepared for the dam. The Connecticut DEEP maintains EAPs for the remaining dams in East Lyme, and the New London Water Department operates a dam in Montville that is in the headwaters of Latimer Brook. The Town of East Lyme does not currently possess copies of EAPs for high and significant hazard dams.

Summary

In general, municipal capabilities to mitigate dam failure damage have not increased significantly since the 2012 edition of the hazard mitigation plan was adopted. However, changes in the State's regulation of dams have increased Statewide capabilities sharply.

10.3 Vulnerabilities and Risk Assessment

The potential impacts related to the failure of Class B dams within or upstream of East Lyme are described below. Where information was available, the descriptions below are based on information available at the Connecticut DEEP Dam Safety files.

- *Bogue Brook Reservoir Dam* – This dam is owned by the City of New London Water Department and impounds Bogue Brook for water supply purposes. The dam is believed to be in good condition. Neither an EOP nor a dam failure analysis was found in the Connecticut DEEP Dam Safety files. Failure of this dam would likely impact areas along Bogue Brook and Latimer Brook in Montville and cause minor to moderate flooding along Latimer Brook in East Lyme.

- *Darrow Pond Dam* – Darrow Pond dam is co-owned by a private owner and the Town of East Lyme and the dam is believed to be in good condition. The Town does not believe that an EOP or dam failure analysis has been prepared for this dam. According to records in the Connecticut DEEP Dam Safety files, this dam overtopped during the 1982 floods causing minor damage downstream. Failure of this dam would likely washout Mostowy Road immediately downstream as well as causing damage at Route 161 and one structure downstream. Minor flooding would also likely be experienced by homes located along Latimer Brook.

- *Gorton Pond Dam* – This dam is owned and maintained by the Connecticut DEEP. Repairs to this dam were completed just prior to the previous HMP and the dam is believed to be in good condition. An EOP for this structure is on file with the DEEP. This dam originally provided water supply for Niantic Mills in the 19th century but currently impounds the Pattagansett River for recreational purposes. A 1981 inspection report prepared by the USACE included a dam failure analysis that suggested inundation would occur downstream to Route 1, that four downstream bridges would be damaged, and that four to five homes could be inundated downstream with moderate flooding. A review of the inundation mapping against current aerial photography suggests that as many as 22 homes could be flooded between the dam and Route 156.

- *Pattagansett Lake Dam* – This dam is owned and maintained by the Connecticut DEEP. An EOP for this structure is on file with the DEEP. This dam originally provided water supply for mills in the 19th century but currently impounds the Pattagansett River for recreational purposes. A 1999 EOP prepared by the USACE is on file at the Connecticut DEEP including a dam breach analysis that suggested inundation would occur downstream at Mill Road, Route 1 (which would overtop by four feet), Pattagansett Road, Church Lane, I-95, Industrial Park Road, Flanders Road, Society Road, Roxbury Road, Romagna Road, East Pattagansett

Road, Bush Hill Drive, Brook Road, Lake Avenue, Herster Drive, Route 156, Whittlesey Place, McElaney Drive, Huntley Court, and Fairhaven Road would be impacted by downstream flooding. A review of the inundation mapping against current aerial photography suggests that upwards of 100 homes, apartment complexes, schools, and businesses could be flooded if the dam failed.

- *Powers Lake Dam* – This dam is owned and maintained by the Connecticut DEEP. An EOP was not found in the Dam Safety files at Connecticut DEEP for this structure. This dam impounds the Pattagansett River for recreational purposes. A 1984 inspection report prepared by Keyes Associates included a dam failure analysis for the dam which suggested that at that time the downstream hazard was minimal. A review of the inundation mapping against current aerial photography suggests that approximately five homes on Upper Pattagansett River, Hathaway Road, and Pepperidge Lane could be flooded if the dam failed.

10.4 Potential Mitigation Strategies and Actions

East Lyme is considered a generally low-risk area for dam failure. Larger dams are publically owned and well-maintained in close coordination with Connecticut DEEP. While EAPs and dam failure inundation mapping was not found for all of the dams in the Connecticut DEEP Dam Safety files, this information could exist elsewhere. Recommendations are presented in this HMP with the goal of reducing East Lyme's long-term risk of experiencing a dam failure. Potential mitigation measures for dam failure include a combination of prevention, education, and emergency planning, as well as dam removal projects as discussed in Section 11.

11.0 MITIGATION STRATEGIES AND ACTIONS

11.1 Status of Mitigation Strategies and Actions

The previous edition of the SCCOG Multi-Jurisdictional HMP and Town of East Lyme annex listed a suite of hazard mitigation actions applicable both locally and region-wide. These actions, along with commentary regarding the status of each, are listed in the tables in this section.

Additionally, new actions were developed in the process of developing this HMP update. These are listed at the end of each hazard section below.

11.1.1 Actions Applicable to All Hazards

Actions Applicable to All Hazards		
Action	**Status**	**Notes**
Regional Coordination		
Continue to promote inter-jurisdictional coordination efforts for emergency response	*Capability*	*Completed through mutual-aid agreements and SCCOG regional hazard management initiatives.*
Continue to promote local and regional planning exercises that increase readiness to respond to disasters	*Capability*	*Completed through local participation in regional and statewide exercises.*
Continue to evaluate communication capabilities and pursue upgrades to communication and ensure redundant equipment is available	*Capability*	*Performed by town personnel. This action is reclassified as a capability.*
Continue to promote regional transportation planning through SCCOG	*Capability*	*This action is the responsibility of, and is being performed by, SCCOG. This action is redefined as a regional capability.*
Work with the SCCOG to perform a regional study of the vulnerability of critical facilities to natural hazard damage	*Complete*	*This action is the responsibility of, and was performed by, SCCOG. None of the facilities in the analysis were located in East Lyme.*
Work with the SCCOG to develop regional evacuation scenarios that build upon the Millstone evacuation plan	*Capability*	*This action is the responsibility of, and is being performed by, SCCOG. This action is redefined as a regional capability.*
Local Emergency Response & Public Information		
Continue to review and update the Town EOP at least once annually	*Capability*	*Performed by town personnel. This action is reclassified as a capability.*
Continue to maintain emergency response training and equipment and upgrade equipment when possible	*Capability*	*This is reclassified as a capability and can be removed from this list of actions.*
Encourage Town officials to attend FEMA-sponsored training seminars at EMI	*Capability*	*The East Lyme Building Official is a founding member and active participant in the Connecticut Association of Flood Managers and participates in conferences and trainings.*
Continue to evaluate emergency shelters, update supplies, and check communication equipment	*Capability*	*This is reclassified as a capability and can be removed from this list of actions.*
Continue to promote dissemination of public information regarding natural hazard effects into Government buildings, with additions	*Capability*	*This is reclassified as a capability and can be removed from this list of actions.*

Actions Applicable to All Hazards		
Action	**Status**	**Notes**
Encourage residents to submit contact information to the CT Alerts Reverse 9-1-1 system and utilize it during emergencies	*Capability*	*Information provided on Town Webpage.*
Prevention		
Develop a checklist for land development applicants that cross-references the specific regulations and codes related to disaster resilience	*Carry Forward*	
Integrate elements of this HMP into the Plan of Conservation and Development during the next update	*Carry Forward*	*The POCD has not been updated since adoption of the previous HMP. This is carried forward through the next POCD update, expected in 2019 or 2020.*
Continue reviewing building plans to ensure proper access for emergency vehicles	*Capability*	*This is reclassified as a capability and can be removed from this list of actions.*
Require the underground installation of utilities for all new development	*Capability*	*Required in Subdivision Regulations*
Continue to enforce the appropriate building code for new building projects	*Capability*	*This is reclassified as a capability and can be removed from this list of actions.*
Encourage residents to install and maintain lightning rods on their structures	*Delisted*	*Town does not feel this will improve hazard mitigation.*
Natural Resource Protection & Open Space		
Continue to regulate development in protected and sensitive areas including steep slopes, wetlands, and floodplains	*Capability*	*This is reclassified as a capability and can be removed from this list of actions.*

11.1.2 Actions Applicable to Inland Flooding, Coastal Flooding, and Shoreline Change

Actions Applicable to Flooding		
Action	**Status**	**Notes**
Prevention		
Continue to regulate new development activities within SFHAs to the greatest extent possible within town land use regulations	*Capability*	*This is reclassified as a capability and can be removed from this list of actions.*
Require developers to demonstrate whether detention or retention of stormwater is the best option for reducing peak flows downstream	*Complete*	*Town requires new developments have a stormwater management plan; these are evaluated on a case-by-case basis.*
Conduct an annual inspection of floodprone areas that are publically accessible. Recommend drainage improvements as appropriate.	*Capability*	*This is reclassified as a capability and can be removed from this list of actions.*
Work with State and Federal agencies to ensure that flood protection regulations reflect current standards regarding sea level rise	*Carry Forward*	*A lack of resources has hindered progress on this action but it is still desired, perhaps as a component of coastal resilience planning when the POCD is next updated in 2019 or 2020.*
Compile a list of addresses of structures within the 1% annual chance floodplain and storm surge areas, and track repair costs	*Carry Forward*	*A lack of resources has hindered progress on this action but it is still desired.*
Continue to maintain good standing with the Community Rating System and consider additional achievements	*Capability*	*Town has improved its CRS rating.*

Actions Applicable to Flooding		
Action	**Status**	**Notes**
Incorporate the results of the Coastal Resilience project into the next HMP update	*Complete*	*The Towns of East Lyme, Old Lyme, Stonington, and Waterford participated in this planning process which was facilitated by The Nature Conservancy in 2012. The vulnerabilities identified in the report are the same as those discussed in this plan annex.*
Property Protection		
Incorporate information on the availability of flood insurance into all hazard-related public education workshops	*Delisted*	
Make available FEMA-provided flood insurance brochures and encourage residents to purchase insurance if they are in a SFHA	*Capability*	
Provide technical assistance to owners of non-residential structures that suffer flood damage regarding flooding measures	*Capability*	
Encourage residents to submit flood insurance claims following damage events	*Capability*	
Pursue elevation of properties that suffer flood damage, prioritizing repetitive loss properties in the Niantic Bay area	*Carry Forward*	
Apply freeboard standards of one foot or more when requiring elevations for renovations or new construction in coastal flood zones	*Carry Forward*	*This has not yet been incorporated into Town regulations, although the State Building Code requires it.*
Ensure that sewer pumping stations have a method for connecting emergency power and are adequately flood proofed	*Complete*	*Town is performing mapping and evaluation of pumping station vulnerabilities, and will perform floodproofing and backup power projects upon completion of evaluation.*
Emergency Services		
Pursue mutual aid agreements with non-profits to provide volunteer labor for response activities	*Carry Forward*	
Include structures within the 1% annual chance floodplain and storm surge areas within the Reverse 9-1-1 contact database	*Carry Forward*	
Consider establishing a second mode of egress for the Bush Hill Drive neighborhood	*Carry Forward*	*This action has not yet been pursued due to lack of popular support and funding.*
Public Education and Awareness		
Visit schools and educate children about the risks of flooding and how to prepare	*Delisted*	
Encourage builders, developers, and architects to become familiar with NFIP land use and building standards at annual workshops	*Delisted*	
Consider an annual "Flood Fair" to familiarize the public with floodplains, flooding, flood insurance, and flood proofing	*Delisted*	
Work with homeowners associations to develop a flood proofing workshop	*Delisted*	
Structural Projects		
Encourage the use of floodplain storage and other flood control methods in new developments and at existing properties where appropriate	*Capability*	*This is encouraged, or sometimes required, through Zoning and Subdivision regulations*

Actions Applicable to Flooding		
Action	**Status**	**Notes**
Utilize the recently available extreme rainfall data to determine existing culvert sizing and encourage upgrades where undersized	*Delisted*	*The methodology has not been formally incorporated into procedures. Has been modified into a new action below this table.*
Continue to perform catch basin and culvert surveys to prioritize upgrades and perform maintenance and cleaning	*Capability*	*This is reclassified as a capability and can be removed from this list of actions.*
Investigate funding sources and the feasibility of elevating locally owned roads with an emphasis on those needed for evacuation	*Carry Forward*	
Upgrade storm water collection and discharge systems to keep up with rising sea level, particularly in Niantic	*Carry forward*	
Maintain existing hard structures along the coast in good condition, particularly near Niantic Bay	*Capability*	*This is reclassified as a capability and can be removed from this list of actions.*
Consider removing a small dam downstream of Route 1 to reduce flooding of Route 1 by Latimer Brook	*Carry Forward*	

New actions developed during the HMP update include:

- Complete mapping and vulnerability analysis of wastewater pumping stations
- Relocate the wastewater pumping station in the Black Point area so that it is outside of the flood risk area, or pursue other flood mitigation alternatives.
- Develop formalized methodology for culvert and bridge construction and replacement that requires utilization of the most up-to-date extreme rainfall data from http://precip.eas.cornell.edu.
- In accordance with the recommendations of the historic and cultural resources resiliency planning effort in 2016-2017, determine if any at-risk structures that are not yet eligible for historic designation will be eligible in the future. This may take the form of a historic resources survey.

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

Action	Status	Notes
Prevention		
Work with SCCOG to implement a regional Marina Management Plan for wind damage, and encourage local clubs to develop plans	*Capability*	*Reclassified as a regional Capability.*
Consider working with CL&P to obtain funding to place utilities underground in coastal areas such as Main Street in Niantic	*Complete*	*Utilities were placed underground as part of Main Street streetscaping project.*
Continue to perform appropriate tree maintenance to the greatest extent possible	*Capability*	*This is reclassified as a capability and can be removed from this list of actions.*
Property Protection		
Promote the use of functional shutters for older buildings in the town and investigate funding sources	*Delisted*	*Window blowout has not been an issue in Town and staff due not think this action is necessary.*
Make information on wind-resistant construction techniques available to all building permit applicants	*Capability*	*This is reclassified as a capability and can be removed from this list of actions.*

Action	Status	Notes
Emergency Services		
Identify a location for a brush-disposal operation for dealing with debris following wind storms and determine potential reuse	***Carry Forward***	
Consider surveying all Town-owned buildings to determine their ability to withstand wind loading	***Carry Forward***	
Develop agreements with landowners and companies to chop/chip to ensure backup plans are in place for debris removal	***Carry Forward***	
Public Education and Awareness		
Consider an annual "Wind Fair" to familiarize the public with wind hazards and potential mitigation measures	***Carry Forward***	
Visit schools and educate children about the risks of wind events and how to prepare for them	***Carry Forward***	

11.1.4 Actions Applicable to Other Damage from Winter Storms

Action	Capability	Status
Consider conducting a study to identify buildings vulnerable to roof damage or collapse from heavy snow in the town	***Carry Forward***	
Consider drafting a written plan for inspecting and prioritizing the removal of snow from Town-owned structures	***Carry Forward***	
Continue making funding available to the Public Works Department each year for clearing snow from roads and parking lots	*Capability*	*This is reclassified as a capability and can be removed from this list of actions.*
Provide information for protecting Town residents during cold weather and for mitigating icing and insulating pipes at residences	*Capability*	*Information provided through Town website and Emergency Management Facebook page.*
Consider posting the snow plowing routes in local government buildings and on the Town's website	*Delisted*	*Plow Routes are variable, and Town does not wish to complete this action.*
Continue to identify areas that are difficult to access during winter storm events and develop contingency plans to access such areas	*Capability*	*This is reclassified as a capability and can be removed from this list of actions.*

11.1.5 Actions Applicable to Earthquakes

Action	Capability	Status
Ensure that town departments have adequate backup supplies and facilities for continued functionality following an earthquake	*Capability*	*This is reclassified as a capability and can be removed from this list of actions.*
Consider preventing residential development in areas prone to collapse such as below steep slopes or areas prone to liquefaction	*Capability*	*This is reclassified as a capability and can be removed from this list of actions.*

11.1.6 Actions Applicable to Wildfires

Action	Capability	Status
Continue to evaluate public water supply hydrants and areas at risk of wildfire in the town	*Capability*	*This is reclassified as a capability and can be removed from this list of actions.*

Action	Capability	Status
Encourage the extension of public water supply for fire protection to areas identified as being particularly at-risk	*Complete/ Capability*	*Town has improved its public water supply capabilities in recent years, and will continue to do so.*
Continue pursuing additional sources of firefighting water where adequate supplies do not exist through the use of dry hydrants and cisterns	*Complete/ Capability*	*Town has secured additional firefighting water supplies through New London interconnection and new Montville water tower. Will continue to address this action.*
Continue to support public outreach programs to increase awareness of forest fire danger, equipment usage, and protecting homes	*Capability*	*This is reclassified as a capability and can be removed from this list of actions.*
Ensure that provisions of Town regulations regarding fire protection facilities and infrastructure are being enforced	*Capability*	*This is reclassified as a capability and can be removed from this list of actions.*

11.1.7 Actions Applicable to Dam Failure

Action	Capability	Status
Include dam failure inundation areas in the Reverse 9-1-1 contact database	***Carry Forward***	
Work with CT DEEP to ensure that the owners of high hazard dams have current EOPs and keep local copies	*Capability*	*This is reclassified as a capability and can be removed from this list of actions.*
Prepare an EOP and dam failure analysis for the Darrow Pond Dam	***Carry Forward***	
Provide assistance to the owners of lesser ranked dams regarding resources available for inspections and maintenance	*Capability*	*Assistance is available upon request.*

11.2 Prioritization of Specific Actions

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

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Action or Strategy #	Table 11-1: Mitigation Actions and Strategies for East Lyme 2016 - 2021	Status	Responsible Department[1]	Fiscal Year					Cost	Potential Funding Sources[2]	Weighted STAPLEE Criteria[3]															Total STAPLEE Score	Priority for Community
											Benefits								*Costs*								
				7/2018-6/2019	7/2019-6/2020	7/2020-6/2021	7/2021-6/2022	7/2022-6/2023	Minimal <$1,000 Low < $10,000 Mod. < $100,000 High > $100,000		Social	Technical (x2)	Administrative	Political	Legal	Economic (x2)	Environmental	STAPLEE Subtotal	Social	Technical (x2)	Administrative	Political	Legal	Economic (x2)	Environmental	STAPLEE Subtotal	
1	Develop a checklist for land development applicants that cross-references the specific regulations and codes related to disaster resilience	Carried Forward	LU		x				Low	OB	1	1	1	1	1	0	0	**6.0**	0	0	0	0	0	0	0	**0.0**	**6.0**	Medium
2	Integrate elements of this HMP into the Plan of Conservation and Development during the next update	Carried Forward	LU	x					Minimal	OB	1	1	1	1	1	0	0	**6.0**	0	0	0	0	0	0	0	**0.0**	**6.0**	Medium
3	Work with State and Federal agencies to ensure that flood protection regulations reflect current standards regarding sea level rise	Carried Forward	LU	x					Minimal	OB	1	1	1	1	1	0.5	0.5	**7.5**	0	0	0	0	0	0	0	**0.0**	**7.5**	High
4	Compile a list of addresses of structures within the 1% annual chance floodplain and storm surge areas, and track repair costs	Carried Forward	LU	x					Low	OB	1	1	1	1	1	0.5	0	**7.0**	0	0	0	0	0	0	0	**0.0**	**7.0**	High
5	Pursue elevation of properties that suffer flood damage, prioritizing repetitive loss properties in the Niantic Bay area	Carried Forward	LU	x	x	x	x	x	High	CIB, HMA	0.5	0.5	1	1	1	1	0.5	**7.0**	0	0	0	0	0	-1	0	**-2.0**	**5.0**	Low
6	Apply freeboard standards of one foot or more when requiring elevations for renovations or new construction in coastal flood zones	Carried Forward	LU	x	x	x	x	x	Minimal	OB	1	1	1	1	1	1	0.5	**8.5**	0	0	0	0	0	0	0	**0.0**	**8.5**	High
7	Pursue mutual aid agreements with non-profits to provide volunteer labor for response activities	Carried Forward	EM	x	x	x	x	x	Minimal	OB	1	1	1	1	1	0	0.5	**6.5**	0	0	0	0	-0.5	0	0	**-0.5**	**6.0**	Medium
8	Include structures within the 1% annual chance floodplain and storm surge areas within the Reverse 9-1-1 contact database	Carried Forward	EM		x				Low	OB	1	1	1	1	1	0.5	0	**7.0**	0	0	0	0	0	0	0	**0.0**	**7.0**	High
9	Consider establishing a second mode of egress for the Bush Hill Drive neighborhood	Carried Forward	DPW					x	High	CIB, HMA	0.5	1	1	1	1	0.5	0.5	**7.0**	0	0	0	-1	-0.5	-1	0	**-3.5**	**3.5**	Low
10	Investigate funding sources and the feasibility of elevating locally owned roads with an emphasis on those needed for evacuation	Carried Forward	DPW	x	x	x	x	x	Moderate	CIB, HMA	1	1	1	1	1	0.5	0.5	**7.5**	0	0	0	0	0	-1	0	**-2.0**	**5.5**	Medium
11	Upgrade storm water collection and discharge systems to keep up with rising sea level, particularly in Niantic	Carried Forward	DPW	x	x	x	x	x	High	CIB	1	0.5	1	1	1	0.5	0.5	**6.5**	0	0	0	0	0	-1	0	**-2.0**	**4.5**	Low
12	Consider removing a small dam downstream of Route 1 to reduce flooding of Route 1 by Latimer Brook	Carried Forward	DPW				x		High	CIB	0.5	1	1	1	1	0.5	1	**7.5**	0	0	0	0	0	-1	0	**-2.0**	**5.5**	Medium
13	Complete mapping and vulnerability analysis of wastewater pumping stations	New	DPW	x					Moderate	OB	1	1	1	1	1	0	0	**6.0**	0	0	0	0	0	-0.5	0	**-1.0**	**5.0**	Low
14	Relocate the wastewater pumping station in the Black Point area so that it is outside of the flood risk area, or pursue other flood mitigation alternatives.	New	DPW		x				High	CIB, HMA	1	1	1	1	1	1	1	**9.0**	0	0	0	0	0	-1	0	**-2.0**	**7.0**	High
15	Develop formalized methodology for culvert and bridge construction and replacement that requires utilization of the most up-to-date extreme rainfall data from http://precip.eas.cornell.edu.	New	DPW		x				Low	OB	1	1	1	1	1	0.5	0	**7.0**	0	0	0	0	0	0	0	**0.0**	**7.0**	High
16	In accordance with the recommendations of the historic and cultural resources resiliency planning effort in 2016-2017, determine if any at-risk structures that are not yet eligible for historic designation will be eligible in the future. This may take the form of a historic resources survey.	New	LU			x			Moderate	OB	1	1	1	1	1	0	0	**6.0**	0	0	0	0	0	-0.5	0	**-1.0**	**5.0**	Low
17	Identify a location for a brush-disposal operation for dealing with debris following wind storms and determine potential reuse	Carried Forward	DPW				x		Moderate	OB	1	1	1	1	1	0	0	**6.0**	0	0	0	0	0	-0.5	-0.5	**-1.5**	**4.5**	Low
18	Consider surveying all Town-owned buildings to determine their ability to withstand wind loading	Carried Forward	EM			x			Moderate	OB	1	1	1	1	1	0	0	**6.0**	0	0	0	0	0	-0.5	0	**-1.0**	**5.0**	Low
19	Develop agreements with landowners and companies to chop/chip to ensure backup plans are in place for debris removal	Carried Forward	DPW					x	Low	OB	1	1	1	1	1	0	0	**6.0**	0	0	0	0	0	0	0	**0.0**	**6.0**	Medium
20	Consider an annual "Wind Fair" to familiarize the public with wind hazards and potential mitigation measures	Carried Forward	EM	x	x	x	x	x	Low	OB	1	1	1	1	1	0.5	0	**7.0**	0	0	0	0	0	0	0	**0.0**	**7.0**	High
21	Visit schools and educate children about the risks of wind events and how to prepare for them	Carried Forward	EM	x	x	x	x	x	Minimal	OB	1	1	1	1	1	0.5	0	**7.0**	0	0	0	0	0	0	0	**0.0**	**7.0**	High
22	Consider conducting a study to identify buildings vulnerable to roof damage or collapse from heavy snow in the town	Carried Forward	EM				x		Moderate	OB	1	1	1	1	1	0.5	0	**7.0**	0	0	0	0	0	-0.5	0	**-1.0**	**6.0**	Medium
23	Consider drafting a written plan for inspecting and prioritizing the removal of snow from Town-owned structures	Carried Forward	DPW	x					Low	OB	1	1	1	1	1	0.5	0	**7.0**	0	0	0	0	0	0	0	**0.0**	**7.0**	High
24	Prepare an EOP and dam failure analysis for the Darrow Pond Dam	Carried Forward	EM	x					Low	OB	0.5	1	1	1	1	0.5	0	**6.5**	0	0	0	0	0	0	0	**0.0**	**6.5**	Medium

[1]Notes
DPW = Department of Public Works & Engineering
EM = Emergency Management
LU = Land Use Department

[2]Notes
CIB = Capital Improvement Budget
EOC = EOC Grants
HMA = FEMA Grant Programs
OB = Operating Budget

[3]Notes
Beneficial or favorable ranking = 1
Neutral or Not Applicable ranking = 0
Unfavorable ranking = -1

Technical and Economic Factors have twice the weight of the remaining categories
(i.e. their values are counted twice in each subtotal).

APPENDIX A

ADOPTION RESOLUTION

CERTIFICATE OF ADOPTION
TOWN OF EAST LYME BOARD OF SELECTMEN

A RESOLUTION ADOPTING THE HAZARD MITIGATION PLAN UPDATE, 2017

WHEREAS, the Town of East Lyme has historically experienced severe damage from natural hazards and it continues to be vulnerable to the effects of those natural hazards profiled in the plan (e.g., *flooding, high wind, thunderstorms, winter storms, earthquakes, dam failure, and wildfires)*, resulting in loss of property and life, economic hardship, and threats to public health and safety; and

WHEREAS, the East Lyme Board of Selectmen approved the previous version of the Plan in 2012; and

WHEREAS, the Southeastern Connecticut Council of Governments, of whom the Town of East Lyme is a member, has developed and received conditional approval from the Federal Emergency Management Agency (FEMA) for its Hazard Mitigation Plan Update, 2017 under the requirements of 44 CFR 201.6; and

WHEREAS, committee meetings were held and public input was sought in 2016 and 2017 regarding the development and review of the Hazard Mitigation Plan Update, 2017; and

WHEREAS, the Plan specifically addresses hazard mitigation strategies and Plan maintenance procedures for the Town of East Lyme; and

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

WHEREAS, adoption of this Plan will make the Town of East Lyme eligible for funding to alleviate the impacts of future hazards; now therefore be it

RESOLVED by the Board of Selectmen:

1. The Plan is hereby adopted as an official plan of the Town of East Lyme;
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; and
4. An annual report on the progress of the implementation elements of the Plan shall be presented to the Board of Selectmen.

Adopted this 21st day of February, 2018, by the Board of Selectmen of East Lyme, Connecticut.

Mark C. Nickerson, First Selectman

IN WITNESS WHEREOF, the undersigned has affixed her signature and the corporate seal of the Town of East Lyme this 22nd day of February, 2018.

Karen Galbo, Town Clerk