HAZARD MITIGATION PLAN UPDATE
ANNEX FOR THE TOWN OF WATERFORD

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

DECEMBER 2017

ADOPTED

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Prepared for:

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ACKNOWLEDGEMENTS

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TABLE OF CONTENTS

Section **Page**

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

Section **Page**

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 Waterford. 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 Waterford 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 Waterford is a coastal community with a significant inland area located in the southeastern portion of Connecticut. Waterford is approximately 34.2 square miles in land area. The Town is bordered by Montville to the north, Groton and Ledyard across the Thames River to the northeast, New London to the southeast, East Lyme to the west, and Long Island Sound to the south. The Town can be accessed via several major transportation arteries including Interstate 95, Interstate 395, Route 1, Route 85, Route 32, Route 156, and the Amtrak Railroad.

The town is relatively rural to suburban in nature. The population of the Town was 19,152 as of the 2000 census and increased slightly to 19,517 as of the 2010 census. However, the population of the town increases 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 on November 23, 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 Assistant Director of Public Works, Director of Utility Commission, the Zoning Enforcement Officer, Planning Department staff including the Environmental Planner, and the Police Lieutenant. The meeting focused on reviewing each section of the existing hazard mitigation plan and annex, critical facilities, and various types of hazards that have affected the town and that should be addressed in the update.

- 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 Waterford will be coordinated by SCCOG and the Planning 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 Planning Director will administer this HMP under the authority of the Board of Selectmen and will be the local coordinator of the HMP. The Emergency Management Director will assist as the deputy local coordinator. The Planning 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 Planning and Zoning Department, Emergency Management Department, and Public Works Department 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 Planning Director 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 Waterford will review the status of plan recommendations each year. 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 Planning 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 Waterford 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 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 Waterford is a large community located on the Connecticut shoreline that also has a significant inland area. Elevations range from sea level to just over 400 feet on hilltops in the northwestern portion of town. The Town of Waterford has approximately 7.3 miles of shorefront along Long Island Sound. Approximately one mile of this shorefront is publicly owned. The total tidal shoreline, including the east bank of the Niantic River and the west bank of the Thames River, is approximately 22 miles. This figure includes the shores of various coves along the shoreline such as Jordan Cove and the western shore of Alewife Cove.

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 Waterford. The town lays above several bedrock types which trend southwest to northeast across the area. These formations include the Potter Hill Granite Gneiss, the Plainfield Formation (including a quartzite unit), the Hope Valley Gneiss, the Mamacoke Formation, the New London Gneiss, the 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 Waterford.

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 along major watercourses are underlain by stratified drift. 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 Plan of Preservation, Conservation and Development, Waterford is a suburban community with a strong economic base. Waterford contains over 630 businesses employing about 11,000 people. The northern section of the community is rural with increasing development density towards the coastline. The largest employer in the community is Millstone power generating facility ("Millstone Station").

The greater New London area was first settled around 1646. Due to the natural harbor, this village soon became a bustling seaport and the growing population pushed out into the surrounding areas. While the economy of New London was primarily focused on maritime trade and whaling, surrounding areas were devoted to subsistence agriculture, fishing, quarrying, and similar occupations. Over time, residents of the outlying areas banded together and submitted petitions to the State legislature to establish a separate town. Several requests were denied

before approval was granted in 1801, and the Town of Waterford became the 109th town in Connecticut.

The arrival of railroads in the mid-1800s helped to transform Waterford. The railroad helped make Waterford a popular shoreline and resort area. Several waterfront estates were built in Waterford during this period and summer hotels and beach cottage colonies were created. Many of these changes were aided and accelerated by the creation of a trolley system followed by the expansion of the road system and the proliferation of the automobile.

After the completion of Interstate 95, suburban expansion followed in the 1960s through the 1980s with many residential homes built during this time period. In the 1960s and 1970s, three nuclear power plants were established at Millstone Point. The property tax benefits of these plants enabled Waterford to undertake significant community improvements and provide substantial tax benefits to residents over the next few decades.

The extensive Waterford shoreline attracts tourists during the summer months. The Eugene O'Neill Theater Center and summer music at Harkness State Park also attract many visitors as well. Major commercial development is located within the Waterford Business Triangle (formed by Route 85 and Interstates 95 and 395), including large retail developments. Industrial development is generally found along Route 85 north of Interstate Route 95, and along Industrial Drive north of I-395. Two of the largest employers in Waterford are the Millstone Nuclear Power Plant and Sonalysts, a sonar/audio studio.

Table 2-1 provides land cover figures from the University of Connecticut Center for Land Use Education and Research (CLEAR).

TABLE 2-1
Land Cover by Area (2006)

Land Cover	Area (acres)	Percent of Town
Developed	4,786	21.8
Turf & Grass	1,795	8.2
Other Grasses	852	3.9
Agricultural Field	181	0.8
Deciduous Forest	10,306	47.0
Coniferous Forest	903	4.1
Water	832	3.8
Non-forested Wetland	179	0.8
Forested Wetland	1,304	6.0
Tidal Wetland	71	0.3
Barren	425	1.9
Utility ROWs (Forest)	274	1.2
Total	**21,908**	**100%**

Source: UCONN Center for Land Use Education and Research (CLEAR)

SCCOG data on land use collected in 2011 indicates that approximately 48% of Town land is developed, 14% has been dedicated to open space, and 37% remains hypothetically open to development. Much of the gap between the CLEAR and SCCOG figures may be due to differences in land use designation criteria. 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.

According to the 2011 SCCOG data, 32% of Waterford's developed area is low and very low density residential land, while 25% is medium and high density residential. 22% is transportation, communications, or utility usage. The remaining approximately 21% of the developed area consists of industrial, commercial, and institutional uses.

According to the 2012 *Plan of Preservation, Conservation and Development*, about 41% of Waterford's land area is developed, built upon, or used for some social or economic purpose (including land preserved as open space). The remainder is land that may be developable in the future. As many housing units predate 1990, 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 performed flood mitigation such as elevating heating and electrical utilities above the base flood elevation and / or wind mitigation measures such as shutters.

Development within the town is ongoing and consists of a combination of residential and commercial projects, including the following possible, approved, or pending projects:

- The 40,000 square-foot cancer center on Parkway South affiliated with Lawrence & Memorial is complete.
- Student housing at O'Neill Theatre has been doubled.
- Construction of 88 rental units at the old drive-in theatre on Route 1 is in progress.
- Charter Oak Bank has completed construction on a 60,000-sf corporate office and bank on Industrial Drive near I-395.
- Construction of ten units at Katherine Court is ongoing.
- The "Waterford Station" mixed-use retail development south of Waterford Commons has not yet begun construction and has renewed its development permits.
- Possible development could occur at the airport.
- Thames Landing condo construction is still ongoing. The development includes a marina and support facilities.
- Proposed construction of 45 units at Miner Lane condominiums has not yet begun, but the development permit is still current.
- Sawyers Cove subdivision at Oswegatchie and Shawandassee Roads has been approved by Planning & Zoning. The cluster development will include 11 houses on 5 acres with 23 acres being transferred to the Waterford Land Trust as Open Space.
- Seaview Estates at MacKenzie Farm has constructed 14 lots on 18 acres off Rope Ferry Road near East Lyme. This subdivision created more than eight acres of dedicated open space.
- A former Family Bowl bowling alley downtown is being demolished and replaced with an ALDIs store.

- ❑ Zoning is being updated in the Mago Point area to encourage commercial and residential development.
- ❑ Gloucester Road Surgery is being constructed.

When necessary, the Town incorporates elements of hazard mitigation into development projects. Special provisions are in place for flood damage prevention by requiring (1) buildings to be setback from the SFHA and (2) only passive recreation being allowed in SFHAs.

2.3 Drainage Basins and Hydrology

Waterford is divided among eight sub-regional watersheds. Five of the drainage basins directly or indirectly drain to Long Island Sound, while the remaining three basins drain to the Thames River, eventually discharging to the Sound as well.

Streams in the western portion of the town drain into the Niantic River, discharging to the Long Island Sound at the border of Waterford and East Lyme. Notable watercourses in this drainage area include Latimer Brook, Oxoboxo Brook, Willys Meadow Brook, Oil Mill Brook, Stony Brook, and Lakes Pond Brook.

Streams in the central section of the town drain into Jordan Brook. Jordan Brook bisects the town, extending from the northern town boundary to its discharge to Long Island Sound in Jordan Cove. Jordan Cove is an estuary composed of a long narrow neck feeding into an inner cove and then an outer cove before flowing into Long Island Sound. The inner cove is separated from the outer cove by a large sandbar. Notable watercourses in this drainage area include Nevins Brook and multiple unnamed intermittent watercourses which drain southward to Jordan Brook.

Streams in the northeast section of the town drain generally eastward towards the Thames River. Notable watercourses in this region include Hunts Brook, Green Swamp Brook, Church Brook, in addition to various intermittent unnamed watercourses.

Streams in the southeast section of the town drain eastward toward Alewife Cove and Long Island Sound. Notable watercourses in this region include Fenger Brook and Ledges Brook, in addition to multiple unnamed tributaries.

2.4 Governmental Structure

Waterford is governed by a Representative Town Meeting and Board of Selectmen form of government. The Representative Town Meeting is the legislative body of the Town and the Board of Selectmen is responsible for the administration of Town policies. The authority of Town officials is granted by Connecticut General Statutes. Various Boards and Commissions are composed of elected or appointed officials who supervise, manage and organize the diverse functions of local government. Many municipal departments, commissions, and boards are involved with natural hazard mitigation. The various town departments, boards and commissions that may play a role in the implementation of this plan include:

- Emergency Management Advisory Council
- Fire Service
- Police Department and the Board of Police Commissioners
- Public Works
- Planning & Zoning Commission & Staff
- Building Department
- Conservation Commission
- Utility 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 Waterford is noted below:

- The Emergency Management Advisory Council was created by a Town Ordinance 2.108.050 and its members are appointed by the First Selectman. Point members include the First Selectman, Chief of Police/Emergency Management Director, Administrator of Fire Services, Director of Public Works, and Superintendent of Schools. The mission of the Emergency Management Office is to maximize survival of people, prevent and/or minimize injuries, and preserve property and resources in the Town by making use of all available manpower, equipment, and other resources in the event of natural or technological disasters or national security threats. In addition to coordinating activities during disasters, the Council coordinates all early warning activities and is involved in educating the public on how to react during emergency situations. The information available to the public on the Town's website is primarily concerned with evacuation due to an incident at the Millstone Nuclear Power Station, and includes pertinent information regarding alert signals and evacuation routes.

- The Fire Service is the primary agency involved with hazard mitigation through emergency services and public education. The Town currently has five neighborhood fire stations including Cohanzie Fire Company, Goshen Fire Department, Jordan Fire Company, Oswegatchie Fire Company, and Quaker Hill Fire Company.

- The Board of Police Commissioners has jurisdiction and general control of the Police Department. Day-to-day duties of the Police Department include crime prevention, criminal investigations, traffic enforcement, motor vehicle accident investigations, and patrols. Duties related to natural hazard mitigation include planning and coordination of personnel, equipment, shelters, and other resources necessary during an emergency. The types of mitigation that are directly administered by the Police Department include mainly emergency services and public education. Communication and coordination with the Fire Service and individual companies is critical before, during, and after natural hazard emergencies.

- The Public Works Department responsibilities include solid waste collection, recycling and disposal; and maintenance of safe and efficient infrastructure of roads, bridges and stormwater systems. As is common throughout Connecticut, the Public Works Department

is often charged with implementing numerous structural projects that are related to hazard mitigation. Specifically, roadway/infrastructure maintenance and complaint logging/tracking are the two primary duties of the Public Work Department. 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. Because of the duties described above, the Public Works Department is often the de facto first responder during emergencies. The Public Works Department must maintain access for the Police and Fire Departments to respond to emergencies.

- The Planning and Zoning Commission administers the local Zoning Regulations and is responsible completing and updating the Town's Plan of Preservation, Conservation, and Development. The staff of the Planning and Zoning Department assist the Planning and Zoning Commission, the Conservation Commission, Zoning Board of Appeals, and Economic Development Commission as well as perform long-term planning activities related to land use and community development. The Zoning Enforcement Officer maintains elevation certificates and enforces the Town's Zoning Regulations including flood zone regulations and enforcement and coastal site plan decisions on issues of zoning compliance.

- The Building Official is within the Permitting Office and administers the Town's building inspection program adhering to and enforcing all code requirements of the State of Connecticut relating to building construction. Additional responsibilities include administering and enforcing all related state codes for the safety, health, and welfare of persons and properties in Town, supervising departmental policies and procedures, and providing technical assistance to Town officials. The Building Official has a unique responsibility when it comes to hazard mitigation as he or she is responsible for overseeing a number of codes such as those related to wind damage prevention as well as those related to inland and coastal flood damage prevention. Although other departments and commissions may review development plans and develop or revise regulations, many important types of pre-disaster mitigation are funneled through and enforced by the Building Department. For example, the Building Department works with the Zoning Enforcement officer to enforce A- and V-zone standards for floodproof construction and building elevations, and enforces building codes that protect against wind and fire damage.

- The Conservation Commission serves as the agency that administers the Inland Wetland Regulations. The Environmental Planner assists the commission in administering the Inland Wetlands Regulations.

- The Flood and Erosion Control Board is comprised of seven members who are electors of the town and are appointed by the Board of Selectmen. The Flood & Erosion Board's role in hazard mitigation is very important. Wetlands preservation is one of the purest forms of hazard mitigation due to the natural functions and values of wetlands, including stream bank and shoreline stabilization, and flood water storage.

- The Waterford Utility Commission oversees the orderly development and maintenance of sanitary sewer and public water service in the town. The Utility Commission staff are

considered key officials in the context of hazard mitigation due to the important functions of the water and sewer systems.

The roles of Town departments have not changed since the time of the previous HMP. Thus, the Town of Waterford 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 Preservation, Conservation and Development, Inland Wetland and Watercourse Regulations, Subdivision Regulations, and Zoning Regulations.

Emergency Operations Plan

The Town has an Emergency Operations Plan (EOP) that is updated annually. This document provides general procedures to be instituted by the First Selectman, Emergency Management 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 Preservation, Conservation and Development (2012)

The POCD was most recently updated in 2012 with contributions from local boards, commissions, committees, citizens and citizen groups. An amendment was added in 2015. 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 Coastal Resources section of the plan notes *"In coastal areas, flooding potential is influenced by a number of factors including land elevation, wind intensity, wind direction, storm surge, tidal fluctuation, and shore configuration. Several studies (www.coastalresilience.org and other studies by the federal government) have evaluated the potential for coastal flooding and identified areas most at risk due to possible sea level rise the confluence of these different factors affecting flooding potential. Waterford will continue to manage activities in shoreline areas in recognition of the potential for coastal flooding."*

The Sustainability/Resiliency section of the plan includes the following (with underlines added for emphasis):

- *Continue Hazard Mitigation Planning – One of the ways that Waterford can enhance its preparedness and resiliency is through hazard mitigation planning. This process, undertaken*

at the regional level, involves identifying potential hazards, understanding their potential impact, assessing the overall risk, and preparing avoidance and mitigation strategies. Hazard mitigation planning can help reduce losses from a potential hazard and develop strategies to help avoid repetitive damage associated from recurring events. The overall goal is to reduce or eliminate long-term risk to people, property, the economy, and the region from recognized hazards. This can occur from natural hazards (such as hurricanes or flooding) or from other events (hazardous material spills, rail accidents, events at Millstone, etc.). While Waterford has historically focused on man-made hazards, recent flooding events have indicated that equal or greater attention needs to be focused on natural events, especially if storm events become more severe or more frequent.

- *The most recent Hazard Mitigation Plan for Southeast Connecticut was adopted in June 2005. Waterford participated in that effort and will continue to participate in such efforts in the future. <u>The strategies from such hazard mitigation planning efforts (both current and future) are hereby incorporated into this Plan.</u> As part of this, Waterford intends to participate in the "Community Rating System" whereby Waterford residents will be able to pay lower flood insurance premiums if the Town increases flood protections efforts.*

Thus, the initial HMP annex from 2005, the annex from 2012, and this annex are incorporated into the Plan of Preservation, Conservation and Development.

The Sustainability/Resiliency section of the plan continues with the following (with underlines added for emphasis):

- *Prepare for Possible Sea Level Rise / Climate Change – There are some indications of a possible long-term increase in sea levels. While the rate of this increase cannot be forecast, the possible implications for Waterford and other coastal communities mean that this trend should not be ignored. <u>Certain areas of Waterford may be more at risk than other areas due to low-lying elevations. Waterford should monitor sea level trends and consider the need for a gradual phasing in of new policies related to sea level rise.</u>*

- *In addition, there are indications of other impacts (such as flooding) which may result from climate changes. <u>If there is an increase in the frequency or severity of flooding, Waterford should be prepared to address the possible implications including preventing or minimizing losses in flood-prone areas, preparing for flooding events, and responding to flooding events.</u>*

In the context of drainage systems, the plan states *"Waterford has experienced some significant flooding events in recent years. Whether caused by climatic changes, evolving storm frequency or intensity, or increasing development activity, <u>it has brought new attention to the need to evaluate existing drainage structures and approaches to help prevent flooding which threatens life or property. It also supports the strategy of continuing the hazard mitigation planning process</u>."*

The following recommendations from the POCD also pertain to hazards:

- ❑ Continue to manage activities in coastal areas in recognition of the potential for coastal flooding.
- ❑ Continue to participate in hazard mitigation efforts in the future.
- ❑ Seek to become part of the FEMA "Community Rating System" in order to reduce flood plain insurance premiums in the community.
- ❑ Consider the potential need for a gradual phasing in of new policies related to sea level rise.
- ❑ Evaluate and address the susceptibility of key roads to be affected by flooding.
- ❑ Evaluate existing drainage structures and approaches to help prevent flooding which threatens life or property.

Therefore, the Waterford POCD is considered consistent with the current goals and actions of the hazard mitigation plan, as it directly references the HMP. The next update to the POCD (scheduled for 2025, beyond the life of the current hazard mitigation plan) will continue to incorporate the elements of the hazard mitigation plan.

Zoning Regulations

In Waterford, the Planning and Zoning Commission is charged with administering the Zoning Regulations. Current Zoning Regulations were amended through May 1, 2017 and include the required amendments coincident with the DFIRM adopted in August 2013. Section 25, "Environmental Protection" addresses 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. The Town's local articulation of the NFIP regulations is included in Section 25.3, although Waterford is more stringent because the town requires one foot of freeboard above the base flood elevation for construction of new structures in the AE and VE zones. Stormwater regulations have also been updated since the previous HMP.

Inland Wetland and Watercourses Regulations

The Inland Wetlands and Watercourses Regulations in the Town of Waterford have been revised through June 1, 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.

Subdivision Regulations

The Waterford Subdivision Regulations were first effective in 1948. The current version is currently under review, with adoption of updates expected in 2017. In Waterford, the Planning and Zoning Commission is charged with administering Subdivision Regulations. Components of the regulations that directly or indirectly address hazard mitigation (flooding, public safety, etc.) are listed below:

- Section 3.2, Plans Including Regulated Wetlands/Watercourses: Requires review by Waterford Conservation Commission and an inland wetlands permit.

- Section 5.2, Land Subject to Flooding: Requires proper provisions for protective flood control measures, dealing specifically with water supply, sewage disposal systems, gas and electrical equipment, transmission lines and drainage systems.

- The regulations require installation of fire hydrants for fire suppression.

Stormwater management regulations will be updated in the new version to be consistent with new State MS4 requirements.

2.6 Critical Facilities, Sheltering Capacity, and Evacuation

The Town of Waterford 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 2-2. As shown in Table 2-2, few critical structures in Waterford are located within SFHAs or hurricane surge zones. Note that several sewer pumping stations are partially located in the floodplain and could also be impacted by hurricane storm surge. These facilities are described in more detail below.

Fire Department, Public Safety, and Police Services

The Police and Public Safety Complex are in two buildings. The Police Department Headquarters is located at 41 Avery Lane. The Public Safety Complex is located at 204 Boston Post Road and is the headquarters for the 911 Center, Fire Marshal, and Emergency Management. Waterford utilizes the "regional task force model" for its local EOC. The Town has five task forces addressing different aspects of emergency management during an event.

The five fire stations are located at 53 Dayton Road (Cohanzie Fire Company), 63 Goshen Road (Goshen Fire Department), 89 Rope Ferry Road (Jordan Fire Company), 441 Boston Post Road (Oswegatchie Fire Company), and 17 Old Colchester Road (Quaker Hill Fire Company). None of the fire stations are located in flood zones. The Quaker Hill Fire Company is located in a Category 3 hurricane surge zone.

SCCOG completed an assessment of critical facilities in the region in 2017, fulfilling an action listed in the 2012 edition of the multi-jurisdiction hazard mitigation plan. The Quaker Hill Fire Company facility was addressed in this study. The assessment determined that the site is at risk of both riverine and coastal flooding. Recommendations are incorporated into the list of actions in Chapter 11 of this annex.

Municipal Complex (Public Works)

The Public Works Department, Utility Commission, and a bus lot are located at 1000 Hartford Road (Route 85) outside of any hurricane surge or flood zones. A portion of Hartford Road at the entrance driveway to the facility is located within the 1% annual chance floodplain of Jordan Brook. Flooding of the roadway could lead to difficulties in accessing the facility during or after a disaster.

A Regional Distribution Center at this site is considered a critical facility because it serves the entire region (including East Lyme, Montville, and New London). Water and blankets are available at this site for use in emergencies. The Town has a plan in place to utilize the Community Center if it feels this site will be difficult to access.

A new salt shed has been constructed at the Public Works.

Town Hall

The Waterford Town Hall houses records, plans, the IT systems, and other documents important for administering the Town. A generator is desired for this facility.

Water and Sewer Utilities

The Town of Waterford provides public water throughout the town from New London's Lake Konomoc water treatment plant and distribution system. All six water storage tanks for the combined Waterford/New London system are located in Waterford, with three owned by New London and three owned by Waterford. Even though New London owns the water treatment plant and three tanks, the Town of Waterford must respond to emergencies at these facilities. Three new water towers have been constructed in the last five years.

The Town of Waterford has 28 sewer pumping stations and associated infrastructure that they consider to be critical facilities. A new pumping station was built at Harrison's Landing in the last five years. 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.

Health Care and Senior Living Facilities

Town officials noted a number of critical facilities providing health care, ongoing care and special needs to care to Waterford citizens. Three rental senior housing complexes are located within the town (Ahepa, Twin Havens, and Yorkshire). Camp Harkness is a critical facility because of its vulnerable population and limited egress. Seaside (a group home) is considered a critical facility for the same reasons as Camp Harkness. Assisted living is provided at "Bridges at Crossroads" on Park Lane, which has 150 beds in one building and 40 homes. There are also three nursing homes: New London Convalescent on Clark Lane, Greentree, and Bayview. Of all these facilities, only one (Seaside) is partially located in a hurricane surge zone.

TABLE 2-2
Critical Facilities

Facility	Address or Location	Emergency Power?	Shelter?	In 1% Annual Chance Floodplain?	In Hurricane Surge Zone?
Emergency Services					
Police Station	41 Avery Lane	✓			
Public Safety Complex	204 Boston Post Rd	✓			
Cohanzie Fire Company	53 Dayton Road	✓			
Goshen Fire Department	63 Goshen Road	✓			
Jordan Fire Company	89 Rope Ferry Road	✓		✠	✠
Oswegatchie Fire Company	441 Boston Post Road	✓			
Quaker Hill Fire Company	17 Old Colchester Road	✓			✓
Other Municipal and Regional Facilities					
Town Hall	15 Rope Ferry Road				
Public Works	1000 Route 85				
Regional Distribution Center	1000 Route 85				
Shelters					
Community Center	24 Rope Ferry Road	✓	✓		
Clark Lane School	105 Clark Lane	✓	✓		
Quaker Hill School	285 Bloomingdale Road	✓	✓		
Oswegatchie Elem. School	470 Boston Post Road	✓	✓		
Waterford High School	20 Rope Ferry Road	✓	✓		
Elderly Housing & Health Services					
Ahepa Sr. Housing	95 Clark Lane				
Twin Havens Sr. Housing	36 Mary Street				
Yorkshire Sr. Housing	55 Yorkshire Drive				
Camp Harkness	301 Great Neck Road				✠
Seaside Sanatorium group home (Closed)	Woodsea Place				✓
Bridges at Crossroads	1 Beechwood Drive				
New London Convalescent	88 Clark Lane				
Greentree nursing home	4 Greentree Drive				
Bayview nursing home	301 Rope Ferry Road				
Other Infrastructure and Facilities					
Lake Konomoc WTP	Route 85	✓		✓	
Water pumping stations (3)	Various	✓			
Water tanks (3 owned by town)	Various				
Water tanks (3 owned by New London)	Various				
Sewer pumping stations (27)	Various	✓		*	*
Communication towers (5)	Various	✓			

✠Part of the property is in the flood or surge zone but not any buildings.
*Some of these utilities are located in flood or surge zones

Shelters

Emergency shelters are considered to be an important subset of critical facilities as they are needed in emergency situations. These are not to be confused with safe rooms or individual storm shelters, such as designated rooms in certain buildings that are meant to provide increased levels of protection from winds. Town officials have designated the Community Center and four public schools as shelters.

Evacuation Routes

The Town's Emergency Management website contains an evacuation route map for residents to use in the event of an alert regarding the Millstone Power Station. The map directs residents to East Harford, the host community to Waterford in the event of a nuclear emergency. This map is somewhat applicable for other hazards in the town as well, although evacuation to East Hartford would not be necessary.

A more locally-based natural hazard evacuation map should be tied to the concept of evacuation routes connected to primary shelters throughout the town, and evacuation routes should not include roads that can become submerged during coastal storms and riverine flooding. Any changes in shelter status or shelter locations will necessarily require modifications to the evacuation map. In addition, any changes in routing will necessarily require modifications to the evacuation map. The town does not have evacuation signs at the present time but would like them placed throughout the coastal neighborhoods.

Waterford has particular vulnerability at Gardiners Wood Road, an evacuation route, because it continually floods along an unnamed brook. Gardiners Wood Road likely needs to be elevated with two culverts replaced. Route 156 at Gardiners Wood Road also floods from the same unnamed brook. Without the ability of residents near Millstone to evacuate through Jordan Cove Road or Gardiners Wood Road during severe flooding, they may be able to evacuate through an old access road on the Millstone land. However, the road is blocked with barriers that would need to be moved, and part of the access to this road lies within the 1% annual chance floodplain. The Town must continue to make evacuation routes in this area more resilient and useable.

Another particular vulnerability is the intersection of Route 156 and Route 213. The roads in this area are susceptible to both the 1% annual chance flood as well as storm surge from a Category Three hurricane. Route 213 is the primary mode of egress from most of this section of Waterford and residents would be stranded if this area floods. This is because the other potential mode of egress, Niles Hill Road (Route 213) into New London, is also in the 100-year floodplain and would be overtopped by storm surge from a Category Two hurricane. The Town should encourage the State to make improvements at the intersection of Route 156 and Route 213 to make it less likely to be overtopped by flooding. Additionally, the Town should consider creating an emergency access road through Laurel Crest Drive to the former landfill site or an adjacent property on Miner Lane, as Miner Lane is the only other road in the area that has access across the railroad tracks.

Communication

Waterford's emergency services communicate internally over radio. There are five radio towers in Town that provide adequate radio coverage. Five new generators (enough for all five towers) to maintain service at these towers during a power outage have been purchased through the National Defense Authorization Act of Fiscal Year 1997's 1033 program.

Residents can sign up for the Connecticut Alerts "Everbridge" Reverse 9-1-1 system to receive warnings when hazards are imminent. The Town can telephone warnings into potentially affected areas using this system.

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. For example, the June 1982 rainfall damaged many roads in Waterford and Town personnel report that flooding damage was as severe as that experienced in East Lyme and Montville

Sustained heavy rainfall in late March 2010 caused a 1% annual chance flood throughout southeastern Connecticut. This is now considered the flood of record for Waterford. Many roads throughout the community were closed, and sewer trenches were flooded leading to collapsed roads and sewer lines. The sewer issue involved increase in ground water elevations that drew fines away from the bedding and caused the trenches to fail. The following flooding issues were observed throughout the town:

- Two key roads for evacuation were flooded. These included Route 156 (Rope Ferry Road) at Jordan Brook where two to three feet of water covered the road at Jordan Brook and back to the intersection of Route 156 and Route 213 (Great Neck Road); and Gardiners Wood Road along an unnamed brook.
- Route 156 at Gardiners Wood Road flooded from the same unnamed brook.
- The southern part of Route 213 had many crossings closed during the March 2010 flooding that were coincidental with mapped 1% annual chance floodplains.
- Braman Road flooded at the headwaters of one of the streams that flows into Goshen Cove.
- An unnamed brook near Niantic River Road flooded, affecting the numbered streets (First Avenue through Seventh Avenue).
- Oil Mill Road at Oil Mill Brook flooded at two locations.
- Way Hill Road at Oil Mill Brook flooded.
- Niles Hill Road at Fenger Brook (head of Alewife Cove) flooded.
- The Boston Post Road at Jordan Brook flooded.
- Hunts Brook flooded at Bloomingdale Road and Old Norwich Road (see below for more about Hunts Brook).

Heavy rainfall events continue to affect Waterford. 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 Programs, Policies, and Regulations

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 Waterford.

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.

Many old culverts throughout the town are corrugated pipes. Those that have been replaced now have box culverts, with positive results relative to reduced frequency of flooding. For example, Way Hill Road reportedly does not experience flooding anymore from Oil Mill Brook since its culvert was replaced.

An unnamed brook near Niantic River Road previously flooded the numbered streets (First Avenue through Seventh Avenue). The culverts along the entire length of this brook were recently replaced as part of the Cooperative Road Reconstruction Project with proper sizing regarding adjacent restrictions (houses and other structures).

Regulations, Codes, and Ordinances

The Town of Waterford has planning and zoning tools in place that incorporate floodplain management. The Town has recently updated its flood protection regulations in its Zoning and Regulations as noted in Section 2.5. The most recent update to the flood protection regulations was completed September 26, 2016. The Town utilizes the 1% annual chance floodplain as defined by FEMA (with the recent maps published in July 2011 and August 2013 specifically referenced) to regulate floodplain and floodway activities and 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 one foot above the base flood elevation (freeboard). The Town defines substantial improvement cumulatively over the lifetime of a structure, which is an aggressive approach that helps drive mitigation and resilience.

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 are enforced by the Town's Conservation Commission.

Acquisitions, Elevations, and Property Protection

To date, the Town of Waterford has not performed elevations of floodprone property. The Town has performed acquisition of property located within the 1% annual chance floodplain but

not to reduce future flooding damages (although floodplains are a consideration when the Town is purchasing open space). 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 is hoping to acquire and remove a home on Bloomingdale Road as noted below in Section 3.3.2.

The West Farms Land Trust was founded in 1974 by local residents striving to preserve the natural charm of the undeveloped lands and irreplaceable resources of Waterford and Montville. State law also enables this trust to accept donations of land, easements and other grants in furtherance of these purposes. Over the past 26 years, the Trust has conserved and managed 17 properties, ranging in size from 1/4 acre to 338 acres. This is believed to have included properties with potential flood hazards.

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 Waterford does not participate in the Community Rating System (CRS) , nor is there much public support for joining the program. Waterford has the technical and administrative capacities to conduct many of the actions required to join the program, but would need the support of residents first.

Summary

In general, municipal capabilities to mitigate flood damage have increased since the 2012 edition of the hazard mitigation plan was adopted. This is likely because the Town increased its capabilities in response to continued roadway flooding; and the flooding of 2011 and 2012 associated with Tropical Storm Irene and Hurricane Sandy, which are discussed in later chapters. Town personnel have participated in events of the Connecticut Association of Flood Managers in recent years, and should continue to do so when time allows.

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 Waterford, although poor drainage and nuisance flooding also occur.

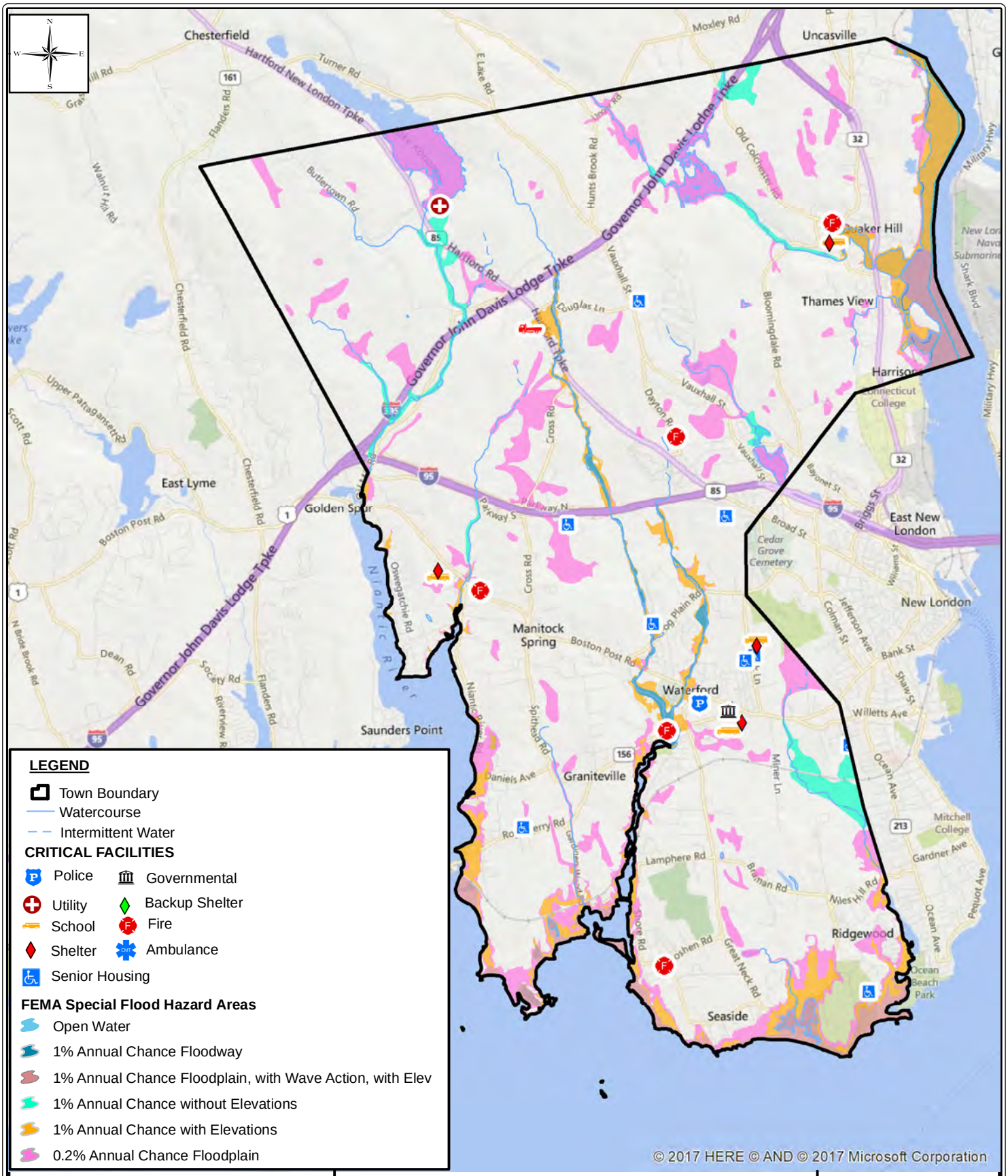
3.3.1 Vulnerability Analysis of Areas along Watercourses

Major inland watercourses and water bodies in Waterford have the 1% annual chance floodplain defined by FEMA on a Flood Insurance Rate Map (FIRM) and Flood Insurance Study (FIS). The FIRM delineates areas within Waterford that are vulnerable to flooding and was most recently published on July 18, 2011 with the remainder of New London County. Many of the inland watercourses and water bodies in Waterford are mapped as Zone AE with the exception of Willys Meadow Brook, Oil Mill Brook, Lakes Pond Brook, Hunts Brook, a portion of Green Swamp Brook, and Fenger Brook, which are mapped as Zone A. Refer to Figure 3-1 for the location of the 1% annual chance floodplains related to inland flooding within Waterford.
Based on the information in the 2005 and 2012 HMP annexes and as provided by Town officials, the following areas along watercourses and roads are vulnerable to flooding:

- Gardiners Wood Road (an evacuation route) continually floods along an unnamed brook. The road likely needs to be elevated with two culverts replaced. Route 156 at Gardiners Wood Road floods from the same unnamed brook. This project is scheduled for design in 2015 and construction in 2016.
- The southern part of Route 213 had many crossings closed during the March 2010 flooding. Several unnamed streams flow into Goshen Cove in this area and repeated flooding is a problem.
- Braman Road floods at the headwaters of one of the streams that flow into Goshen Cove. The road likely needs to be elevated concurrent with a culvert upgrade. This project will be added to the Town's Capital Improvement Plan.
- Oil Mill Road at Oil Mill Brook floods in at least two locations. The road likely needs to be elevated in these areas concurrent with a culvert upgrade. This project will be added to the Town's Capital Improvement Plan.
- Niles Hill Road floods at Fenger Brook (head of Alewife Cove). The road likely needs to be elevated concurrent with a culvert upgrade. This project will be added to the Town's Capital Improvement Plan.
- The Boston Post Road floods at Jordan Brook. This is a State Road and the Connecticut Department of Transportation has scheduled a culvert replacement for 2012-2013.

As noted in Section 2.6, without the ability to evacuate through Jordan Cove Road or Gardiners Wood Road during severe flooding, residents near Millstone may be able to evacuate through an old access road on Millstone land. The road is blocked with barriers that would need to be moved. Permission to utilize this access road for emergency evacuation is something the Town would like to address with Millstone. A grant for the replacement of the Jordan Cove Road Bridge from the Federal Local Bridge Program was approved in the summer of 2012 for 80% funding. The design will be initiated in 2012 and construction is scheduled for 2014. This bridge replacement will reduce the potential for residents in this area to be unable to evacuate during a flood.

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



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FEMA SPECIAL FLOOD HAZARD AREAS

SCCOG HAZARD MITIGATION UPDATE
TOWN OF WATERFORD ANNEX

WATERFORD, CONNECTICUT

SOURCE: NATIONAL FLOOD HAZARD LAYER, FEMA, 2017

DATE: JULY 26, 2017		
SCALE: 1"=6,000'		
PROJ. NO.: 3570-09		
DESIGNED SB	DRAWN PS	CHECKED DM
DRAWING NAME: FIG. 3-1		

The Hunts Brook corridor is a significant problem area for the Town of Waterford because it floods but is an A zone – without assigned base flood elevation – rather than AE. The town needs information about flood elevations along Hunts Brook. FEMA is currently working through the RiskMAP process for that corridor, which should help the Town access flood depth information. This will facilitate a benefit-cost analysis (BCA) using the flood module and, in general, would assist with planning and project prioritization in the watershed.

Town staff note that beaver activity has begun to be a problem with regards to inland flooding. There is one location where beavers have been observed constructing a dam inside a double-culvert. The Town does not have the capacity to manage beavers effectively at this time.

A twin box-culvert under Cross Road was recently inspected by the State and found to be only three-feet high and half full of sediment. The Town does not have the equipment to clean this culvert out.

3.3.2 Vulnerability Analysis of Private Properties

As noted in Table 3-4 of the Multi-Jurisdictional HMP, a total of 310 structures in Waterford appear to be located in the 1% annual chance floodplain. A total of five are located in Zone A, five appear to be located in the Zone AE floodway, 269 are located within Zone AE, and 31 are in zone VE. Most 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 Town of Waterford 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 2012, seven repetitive loss properties were reported in Waterford. Four were related to inland flooding damage. These properties lie along Jordan Brook (two), Nevins Brook, and Green Swamp Brook. Each of the structures is located within the 1% annual chance floodplain except for the structure flooded by Green Swamp Brook where there is not a mapped SFHA. The most recent claim-related damage events are listed in Table 3-1.

TABLE 3-1
Recent Inland Repetitive Loss Damage Claims in Waterford

Repetitive Loss Property	Most Recent NFIP Loss
"Jordan Brook 1"	March 2010
"Jordan Brook 2"	October 2005
"Nevins Brook"	March 2010
"Green Swamp"	March 1988

As of 2017, Waterford has ten repetitive loss properties, an increase of three, but the three new listings are at risk to coastal flooding and will be addressed in Chapter 4.

The dates of the recent losses confirm that the March 2010 and October 2005 floods (both presidentially-declared disasters in Connecticut) were likewise damaging in Waterford. These properties are each low-lying near the respective stream and while property owners are not currently interested in acquisitions or elevations, the Town should continue to provide outreach to those property owners regarding floodproofing and other potential mitigation measures.

Two notable structures were damaged in the March 2010 floods. These structures are located on Bloomingdale Road and Old Norwich Road, along Hunts Brook. The house on Bloomingdale Road was the subject of an HMGP application that requested funding for acquisition and conversion to open space. The home was not insured prior to the flood but suffered damage during the flood and is now insured. The house is in the SFHA. The other flooded structure is a store known as the Greens. The owners paid for the necessary repairs, however much of the parking lot for the Greens was washed into the downstream cove.

3.3.3 Vulnerability Analysis of Critical Facilities

Waterford experienced a unique problem during the March 2010 flooding. High groundwater flowing along the gravel around many sewer lines caused collapse of the overlying roads. A few miles of roads and sewer lines were lost, leading to great expenditures for repairs and replacements of sewer sections and roadways. The March 2010 flood caused the following sewer/roadway collapses:

A potential mitigation for preventing future losses to the sewer system and the overlying roadways is to upgrade drainage systems (thus conveying waters elsewhere) and provide engineered controls and different trench materials to prevent future preferential groundwater flows. However, this may not be effective in all cases. Waterford will need to evaluate mitigation solutions on an area-by-area basis. To this end, the Utilities Commission will be reviewing the design of all future sewer installations with specific consideration of this potential flooding issue.

TABLE 3-2
Sewer Collapses during the March 2010 Flood

13 Jodry	Old Colchester Rd., #88- #108	28 Connshire
Quinley Way	Dogwood Drive	10 Farmstead Lane
41 - 44 Beacon Hill Road	Vauxhaull St. Ext. (Grabner to Silva La.)	69-71 Cross Road
Beacon Hill toward end	143 Spithead Rd.	40 Devonshire Drive
Glenvale	146 Spithead Rd.	45 Devonshire Drive
Robin Hill	5, 9, 13, 15 Rogers Hill Rd.	6 Alice Street
Wallace	7 Farmstead La.	378 Glenwood Ave. Ext.
Clark Lane (near #150-#160)	Fairlawn @ Glenvale intersection to next MH	6-8 Quaker Lane
Clark Lane near Miner's & AHEPA	205/207 Old Norwich Rd.	8- 18 Crown Street
Oswegatchie Rd. across from #63	Mullen Hill Rd., #5- #37	26 Lincoln to the Intersection of Wallace

TABLE 3-2 (Continued)
Sewer Collapses during the March 2010 Flood

Oswegatchie Rd. @ intersection of Deborah St.	Briarwood	213 Old Norwich Road
Oswegatchie Rd. @ #62	28 Cross Road	91 Philips St.
Oswegatchie Rd. @ Indian Valley	Old Colchester Rd., #40-#50	834 Vauxhall St. Ext.
92 Oswegatchie	Coolidge Court	14- 18 Whaling Drive
74 Oswegatchie	#10- #16 Rockridge Rd	9 Wallace
71 Oswegatchie	Great Neck Road (Rte 213)	Glenwood Ave. Extension
Indian Valley, #3 to Oswegatchie	621 Vauxhall St.	138 & 163 Niles Hill Road
Raymond La., near #2	16 Mary St.	Trumbull Road @ Seymour Lane
210 Niantic River Road	4 Trumbull Road to Griswold Court	9, 11 Trumbull Road
Albacore Drive	Rockwood	Foote Court
High Ridge @ Croyden Ct.	Diane Drive near intersection of Rockwood to #3	Almond Road
Connshire @ Warwick	8 Maple Terrace	Ridgewood @ Cozy Court
Connshire @ Quinley	56 Kenyon Road	7 Ellen Ward Road

As noted in Section 2.6, critical facilities in Waterford are not located within the 1% annual chance floodplain. While some of the water and wastewater facilities appear to be located within the 1% annual chance floodplain, Town officials note that the pump stations were built above the base flood elevation as required. In addition, these facilities are not designed for permanent habitation. The associated infrastructure can withstand minor flooding or can be floodproofed.

SCCOG completed an assessment of critical facilities in the region in 2017, fulfilling an action listed in the 2012 edition of the multi-jurisdiction hazard mitigation plan. The Quaker Hill Fire Company facility was addressed in this study. The assessment determined that the site is currently at risk of both riverine and coastal flooding. Specifically, the assessment found that the facility has a complex flood risk profile due to the placement of an unnamed stream in a culvert that bisects the site combined with the coastal flood risk from Smith Cove/Hunts Brook; and would be at increased risk to both riverine and coastal flooding due to increasing precipitation intensities and sea level rise, respectively. The assessment recommended:

- In the short term, wet floodproofing should be used for the floor located below the estimated 0.2% annual chance flood elevation
- In the long-term, relocating the facility may eventually be warranted due to the combination of stream/culvert and coastal/storm surge flood risk, coupled with the significant expense associated with replacing the very long culvert.
- Another possible option for reducing risk could be construction of berms along each side of Sunshine Road, which could keep overflowing stream floodwaters from flooding the facilities. However, the berms would affect vehicle access.

Recommendations are incorporated into the list of actions in Chapter 11 of this annex.

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 Waterford.

4.0 COASTAL FLOODING & SHORELINE CHANGE

4.1 Setting / Historic Record

The shorefront of Waterford primarily contains coastal bluffs and escarpments, rocky shorefront, modified bluffs and escarpments, and beaches and dunes. Developed shorefront and tidal wetlands are also present but are more limited in area. Jordan Cove is an estuarine embayment. The coastal resources found in Connecticut and described by DEEP are defined in the Multi-Jurisdictional HMP.

Homes are located in close proximity to the coastline along much of the shoreline of Waterford. Millstone Station is located on the waterfront, as well. 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, part of Jordan Cove Road was destroyed during Tropical Storm Irene. The Public Works Department oversaw its replacement with a barrier curb that was reimbursed (75%) by FEMA. The total project cost was $110,000. Only a few structures are known to have been damaged by coastal floodwaters since 2005. However, the Town is concerned with the potential long-term effects of sea level rise and its potential to exacerbate flooding conditions in the future.

Hurricane Sandy struck Waterford on October 29, 2012. Coastal communities along Southern New London County experienced two successive tidal cycles with at least moderate coastal flooding. Widespread major coastal flooding occurring along the Southern New London County coast. Peak storm tides surpassed water levels from Hurricane Irene in 2011, only being topped by Hurricane Carol in 1954 and the 1938 Hurricane. The record storm tide levels along Eastern Long Island Sound resulted from a peak storm surge of about 5 to 7 feet that coincided with normal high tides. In Waterford, two barrier beaches were breached by floodwaters, and the seawall at Seaside started to fail (a sewer line is located behind this wall, and is a major concern for Town staff). Flooding occurred at Mago Point and Miner Lane, and many other roads were closed.

4.2 Existing Programs, Policies, and Regulations

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. Waterford recognizes Coastal AE zones, AE zones seaward of the Limit of Moderate Wave Action, as zones of higher hazard than other AE zones. VE zone floodplain construction standards are applied in the Coastal AE zone.

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 more than one foot above the base flood elevation (freeboard). In addition, flood hazard areas are considered non-buildable and therefore cannot be included when subdividing property. The Zoning Enforcement Officer and the Building Official are required to review and approve portions of applications that involve structures within FEMA Special Flood Hazard Areas. In addition, a separate coastal site plan application is required to be submitted to the Planning and Zoning Commission for most development types within the coastal management area defined by the State.

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 Waterford utilizes these warnings and forecasts to prepare emergency responders for flooding events.

The shoreline of Waterford contains many coastal flood control structures. Small, private seawalls and bulkheads can be found in many of the residentially developed coastal neighborhoods. 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 an important mitigation structure that helps to protect areas along the Niantic River. 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.

Climate Change Vulnerability, Risk Assessment, and Adaptation

The Town of Waterford hired Kleinfelder, Inc. to prepare a Climate Change Vulnerability, Risk Assessment, and Adaptation Study. A town-wide vulnerability assessment has been completed. The Town will use this information, and future recommendations that result from this project, to help guide future plans and actions intended to mitigate sea level rise and Climate Change. In addition, the Town participated in a resiliency planning initiative with SCCOG and TNC in 2016-2017[1].

[1] https://tnc.app.box.com/s/8nne60yjk2g3m1mgzkfa86rndxyjiawf

Historic and Cultural Resources Resiliency Planning

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 Town of Waterford 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 sharply since the 2012 edition of the hazard mitigation plan was adopted. This is because the Town developed a Climate Change Vulnerability, Risk Assessment, and Adaptation Study; participated in the historic resources resiliency planning; and generally increased its capabilities in response to the flooding associated with storms Irene and Sandy in 2011 and 2012, respectively.

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 Waterford 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 Waterford 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, Jordan Cove, and the Niantic River are at the highest risk of experiencing damage from coastal flooding. 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.

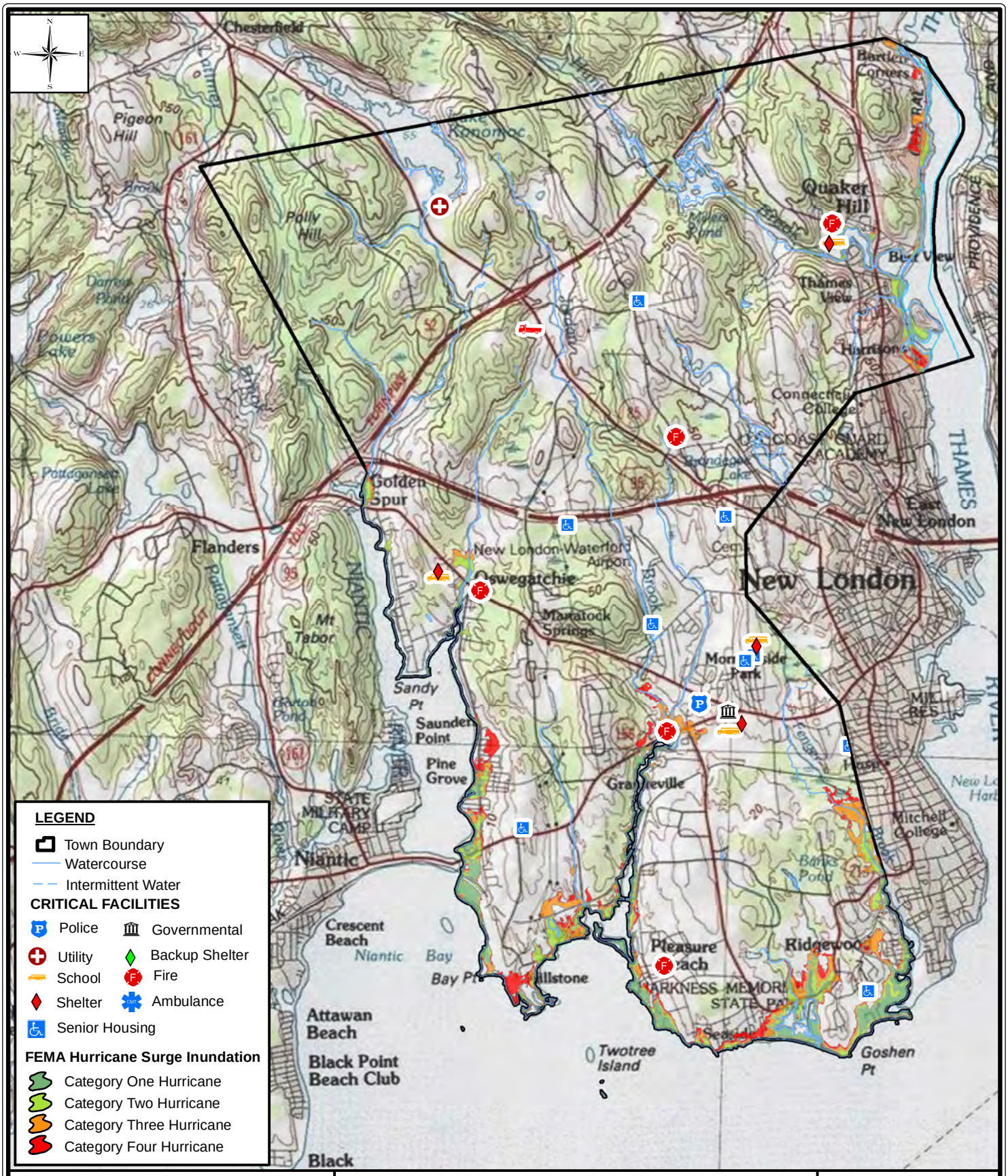
The FEMA mapping implies some level of flooding for areas adjacent to the Route 156 crossing of the Niantic River, and in areas adjacent to Jordan Cove and Goshen Cove during 1% annual chance coastal flood events.

The areas of Waterford that are vulnerable to sea level rise are the same as those vulnerable to coastal flood hazards. In general, a quick view of the coastal floodplain maps reveals the areas that are most vulnerable to sea level rise. These include at-grade roads, certain neighborhoods, and larger areas adjacent to marshes.

As noted in Section 1.3, TNC and several partner agencies have developed a hazard planning tool and a risk assessment process designed to help communities identify and prioritize steps to reduce risks in a community. TNC has been promoting this tool in coastal Connecticut communities, with a focused effort in Waterford. TNC hosted an "Eastern Connecticut Climate Risk Assessment Workshop" in the Waterford Town Hall auditorium on January 11, 2012. This workshop was geared toward assisting with planning and hazard mitigation efforts. During the day-long event, Waterford planners and municipal officials were introduced to the coastal resilience tool and encouraged to complete a vulnerability assessment survey. The results of the survey were later forwarded to aid the development of this plan update and have been incorporated herein.

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 the edges of Jordan Cove, the lower Niantic River, and low-lying areas on either side of Harkness State Park.

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 marshes will either migrate inland or be eroded by constant inundation. Some tidal wetlands could disappear completely.



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POTENTIAL HURRICANE STORM SURGE

SCCOG HAZARD MITIGATION UPDATE
TOWN OF WATERFORD ANNEX

WATERFORD, CONNECTICUT

SOURCE: HURRICANE SURGE INUNDATION LAYER; CTDEEP, 2012

DATE: JULY 26, 2017		
SCALE: 1"=6,000'		
PROJ. NO.: 3570-09		
DESIGNED SB	DRAWN PS	CHECKED DM
DRAWING NAME: FIG. 4-1		

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

Coastal erosion is an important issue in Waterford. Much of the shoreline includes either developed, rocky shorefronts consisting of stones and boulders; or modified bluffs and escarpments consisting of seawalls, bulkheads, or revetments. However, four coastal barrier resource systems are present in Waterford. These coastal barriers and associated beaches are susceptible to coastal erosion. One of them (the Jordan Cove barrier) has eroded significantly. In some places, they may be 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.

4.3.2 Vulnerability Analysis of Private Properties

The coastal areas of the Town of Waterford 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 shoreline. Although shoreline erosion is a relatively minor concern for some private property owners because they have seawalls or rocky shorefront protecting their structures, many property owners suffered damage from Tropical Storm Irene as seawalls overtopped and collapsed.

Buildings located in flood hazard areas are primarily residential. 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.

Floodprone residences are located throughout the coastal areas of Waterford. 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, 31 properties are in zone VE.

As of November 2011, seven repetitive loss properties were reported in Waterford. Three were related to coastal flood zones. These properties are located near Jordan Cove, Goshen Cove, and Alewife Cove. The most recent claim-related damage events are listed in Table 4-1.

TABLE 4-1
Recent Coastal Repetitive Loss Damage Claims in Waterford

Repetitive Loss Property	Most Recent NFIP Loss
"Jordan Cove"	March 2010
"Goshen Cove"	October 2005
"Alewife Cove"	March 2010

These properties are each located at a low elevation close to sea level. The dates of the recent losses confirm that the March 2010 and October 2005 floods (both declared disasters) were

damaging in Waterford. While the property near Jordan Cove could be associated with flooding from a nearby estuary and tidal marsh, the properties near Goshen Cove and Alewife Cove may be affected by nuisance or basement flooding.

As of 2017, three additional repetitive loss properties were listed in Waterford, and all three of the new entries are affected by coastal flooding. Two are located near the tidal Niantic River and the third is near Alewife Cove. These likely represent flood claims associated with Tropical Storm Irene and Hurricane Sandy.

Although property owners are not currently interested in acquisitions or elevations, the Town should continue to provide outreach to those property owners regarding elevation, relocation of utilities, and other potential mitigation measures.

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. Coastal flood mitigation as recommended in this HMP will likely assist many of these property owners. The Town of Waterford 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 Waterford 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 269 structures in the town that are located in the AE zone (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 Waterford 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. However, most of the critical facility buildings in Waterford are not located in a hurricane surge zone, the coastal SFHA, or 500-year floodplain. One fire station is believed located in a surge zone.

Storm surge flooding can also hinder emergency response, particular in low-lying roads located along the coastline. For example, streets such as Shore Road, Great Neck Road, Jordan Cove Road, and Gardiner Wood Road are the only modes of egress for coastal 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.

As noted in Chapter 3, SCCOG completed an assessment of critical facilities in the region in 2017. The Quaker Hill Fire Company facility was addressed. The assessment found that the facility has a complex flood risk profile due to the placement of an unnamed stream in a culvert that bisects the site combined with the coastal flood risk from Smith Cove/Hunts Brook; and would be at increased risk to both riverine and coastal flooding due to increasing precipitation intensities and sea level rise, respectively. The assessment recommended:

- In the short term, wet floodproofing should be used for the floor located below the estimated 0.2% annual chance flood elevation
- In the long-term, relocating the facility may eventually be warranted due to the combination of stream/culvert and coastal/storm surge flood risk, coupled with the significant expense associated with replacing the very long culvert.
- Another possible option for reducing risk could be construction of berms along each side of Sunshine Road, which could keep overflowing stream floodwaters from flooding the facilities. However, the berms would affect vehicle access.

Recommendations are incorporated into the list of actions in Chapter 11 of this annex.

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 Waterford.

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 region in August 2011. Trees fell throughout the town and the region, and the power outage lasted two to eight days in Waterford.

In 2012, Sandy, a hybrid storm with both tropical and extra-tropical characteristics, brought high winds and coastal flooding to southern New England. Record breaking high tides and wave action was combined with sustained winds of 40 to 60 mph and wind gusts of 80 to 90 mph. Widespread significant statewide power outages of 667,598 lasted up to 8 days. Power was out in Waterford for 5-8 days. The Town received over $272,000 in disaster relief from FEMA to cover the cost of damages from the storm. The shelter and regional distribution center at the Waterford Municipal Complex were open.

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 Waterford 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. Waterford has adopted the Connecticut Building Code as its building code.

Parts of trees (limbs) or entire tall and older trees may fall during heavy wind events, potentially damaging structures, utility lines, and vehicles. Waterford has a full-time Tree Warden. Tree trimming on municipally-owned property is conducted on an as-needed basis or following complaints by residents. He can post and remove trees in rights of way or town land, but hazards can be removed without notice.

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. The Eversource liaison is stationed at the Waterford EOC during events, helping to identify critical areas and respond to problems. Waterford's Public Works Department and Eversource have a Clear and Make-Safe protocol with regards to downed power lines that has been effective.

Waterford has designated the landfill as the location for its brush-disposal operation. Debris is brought to that site after a storm for storage, disposal, and reuse. Backup locations have also been designated in case the landfill reaches capacity. The Town also participates in the regional Southeastern Connecticut Regional Resources Recovery Authority (SCRRRA) agreement, and will have that organization grind excess debris and return it to the Town as mulch.

All utilities in new subdivisions and developments must be located underground in order to mitigate storm-related wind damages. However, utility lines are located underground in only a few areas of the town. Burial of utilities is not a high priority for the Town.

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 slightly since the 2012 edition of the hazard mitigation plan was adopted. This is likely because the Town increased its capabilities slightly 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.

Waterford has a diverse housing stock including rental properties and two trailer parks. 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 trailer parks contain manufactured homes that are not as structurally sound as permanent buildings. Fortunately, the typical long lead time prior to a hurricane or tropical storm event can provide adequate warning time to evacuate these types of structures.

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 Waterford.

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 Waterford.

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.

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 and nor'easters have affected the town since the last HMP, with the storms occurring in the winter of 2010-2011 having the most significant effect. The town checked town-owned roofs in January 2011 because of snow accumulations, and the Police Department roof was cleared. A Shell gasoline station canopy failed, and Aaron's (located within a shopping center) experienced a partial collapse as well. The roof on the Butler Building on Route 85 almost failed, but removal of the snow after recommendation by the Town prevented a collapse.

- Winter Storm Alfred in October 2011 caused tree damage and power outages due to heavy, wet snow.

- The year 2013 featured exceptional snow events that severely taxed snow removal abilities of towns in the region. The blizzard of 2013 in early February dumped on to two feet of snow on the region. Another snowstorm struck the region in mid-March 2013 dumping upwards of one to two feet of snow in some parts of the county. Although New London County escaped the three feet and higher totals of some areas in the mid-Atlantic, the vast quantity of snow was still a major disruption to the town. Waterford received nearly $150,000 in federal aid from FEMA to cover storm cleanup costs. The Town had to hire contractors with larger vehicles to assist with snow removal

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. The Waterford Community Center/Senior Center maintains a "vulnerable populations list" populated voluntarily by Town residents. The list can be used to perform outreach and to check on vulnerable residents prior, during, or after winter storms. The Town provides emergency heating oil when necessary.

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 areas where on-street parking is frequently utilized for businesses.

The Public Works Department oversees snow removal in the town and along 120 miles of town roads. Salt and sand is stored at the Town of Waterford Public Works facility; a new salt shed has been constructed and increased the Town's salt stockpile. The Town has established plowing routes that prioritize access to and from critical facilities. Main roads are plowed before secondary roads. The Town has one vehicle that can handle very large snow events, and contracts out to private companies for assistance as needed. After Winter-storm Alfred the Town designated specific local contractors as their go-to backup plows. Plows are diverted to address emergency service needs whenever necessary. The Connecticut Department of Transportation plows the 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 as noted above and cleared several 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. 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 Waterford. 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 Waterford. 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.

Stenger Farm Field park was the site of many fires more than 50 years ago. More recent wildfire incidents in the town include a suspicious fire off Douglas Lane near the power lines in 1985. Another fire in the 1980s occurred on town-owned land between Old Barry Road and Quinly Way. The fire lasted many days and was the largest wildfire in Waterford's history. It occurred during a moderate drought.

9.2 Existing Capabilities

Some of the Waterford town parks have intentional fire breaks. An example is Stenger Farm Field, a town park off Clark Lane mentioned above. This unique method of mitigation is not common in Connecticut, but has proven to be effective in many parts of the United States. The State of Connecticut owns 150 acres north of Harkness Park and they conduct controlled burns. This is another method of wildfire mitigation.

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.

Additional mitigation for wildland fire control is typically focused on building codes, public education, Fire Department training, and maintaining an adequate supply of equipment. Fire protection water is obtained from the Town's public water system. Three new water towers have been constructed in the last five years, increasing firefighting capacity. Two booster stations have been retrofitted and rehabilitated, and new mid-pressure zone developed for the Quaker Hill area. The Water & Sewer Department tests fire flows regularly and informs the fire departments of the pressure available.

The town owns ATV fire response vehicles for access to fires in wooded areas where ATV trails are common.

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 remained consistent since the 2012 edition of the hazard mitigation plan was adopted, except that firefighting capacity has increased with the new water tanks.

9.3 Vulnerabilities and Risk Assessment

The town has many wooded areas with ATV trails and therefore believes that it has a moderate risk for wildfires. The most vulnerable areas for wildfires are those described above including park land, State land, and the two regions that experienced large fires in the 1980s. The remaining areas of the town that are located nearby water sources are considered to be at lower risk for wildfires. Refer to Figure 9-1 in the Multi-Jurisdictional HMP for a general depiction of wildfire risk areas within Waterford.

9.4 Potential Mitigation Strategies and Actions

The Town of Waterford is a 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 Waterford 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. According to the "Connecticut Dams" data file that was published in 1996, there were 20 DEEP-registered dams within Waterford, of which eight were Class A, one was Class BB, two were Class B, and one was class C. High and significant hazard dams in Waterford are listed in Table 10-1. This HMP section primarily discusses the possible effects of failure of both high potential hazard (Class C) dams and significant hazard (Class B) dams.

TABLE 10-1
High and Significant Hazard Dams Within the Town of Waterford

Number	Name	Owner	Hazard Class
15201	Lake Konomoc Dams	City of New London	C
15204	Brandagee Lake Dam	City of New London	B
15205	Millers Pond	Schacht, Saunders & Saunders	B

Dams in the region whose failure could impact Waterford 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. EAPs are not on file for the three dams listed in Table 10-1. Despite its hazard class, concerns about the overtopping of the Lake Konomoc Dam are minimal as water does not typically flow over the spillway. The Town requests that the owners of Millers Pond lower the level of the impoundment before rain events, and the owners reportedly comply.

Summary

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

10.3 Vulnerabilities and Risk Assessment

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

- *Lake Konomoc Dam* is a Class C dam located on Lakes Pond Brook at the southern end of the 363-acre impoundment. According to the 1979 USACE inspection, the dam is an earthfill structure with a concrete core, having a length of 540 feet and maximum height of 23 feet. The dam is abutted by an earthfill dike at each end. The Davis Pond Dike at the north end of the lake and the Great Swamp Dike at the northeast end of the lake form the lake closure. A double side channel "U" shaped spillway (reinforced concrete) is located at approximately the mid-point of the dam. It is used a water storage facility for New London and has a surface of 299 acres at the spillway crest.

  The dam is considered a high hazard because a breach could affect several homes, two local roads, two state highways and I-95. The most recent inspection was completed by the CT DEEP in May 2003. The inspection noted that the earthen dam embankments appeared to be in good condition. The Great Swamp Dike also appeared to be in good condition.

- *Brandagee Lake Dam* is a Class B dam located on Great Swamp Brook at the southern end of the impoundment. According to a 2004 Condition Assessment and Repair Recommendations by Karl F. Acimovic, P.E., the dam was originally constructed in the late 1800s as a water supply reservoir. The Phase I Inspection Report notes that the dam is a 450-foot long earth fill structure with a concrete core wall. The dam has a crest width of 12 feet, an upstream slope of 2:1 and a downstream slope of 1.5:1. The spillway is 28 feet long with a trapezoidal weir. The maximum height of the dam is 15 feet. The dam's impoundment capacity is 530 acre-feet at the top of the dam and is used for recreation.

  The dam is classified as small in size but a significant hazard structure in accordance with recommended guidelines established by the USACE. An Inundation Map is on file which indicates the "Limit of Impact Area" from the Drainage Basin & Dam Failure Impact Area.

  Recent inspections of dam in July and September 2004 noted that it was in overall fair condition, but lacking a long-term maintenance program. The dam is heavily vegetated both at the structure and adjacent to it. It is noted that failure to implement a program coupled with access to the public could cause major problems.

- *Millers Pond Dam* is a Class B dam located on Hunts Brook at the southeast end of the 73-acre impoundment, approximately one mile upstream of the discharge to Smith Cove on the

Thames River. The dam was reportedly constructed around 1873 for supplying water to a factory located downstream of the dam. There are no records of alterations of the dam prior to 1983. According to the 1985 Phase II Inspection by Lenard Engineering, Inc., the dam is a masonry and earthfill gravity dam, likely placed on bedrock. The dam is 425 feet long with a dogleg-shaped earthfill section of approximately 335 feet in length, and masonry work on the upstream & downstream faces of the dam. The dam is composed of masonry and concrete walls with earth fill embankments and includes two spillway sections (one stone masonry with a low flow notch/channel and one concrete). The dam was modified in 1999 to provide the 140-foot long emergency spillway constructed with a standard riprap emergency spillway outlet channel near the left abutment. A new gate structure & gate installed and a concrete wall was placed down to bedrock on a substantial portion of the upstream slope of the dam. The dam has a maximum height of 19.5 feet and a top elevation 3.5 feet above the crest of the spillway. The dam section is approximately 14 feet wide near the left end widening to a maximum of 40 feet near the center. The storage capacity of the pond is approximately 410 acre-feet at the spillway elevation.

A 2005 Inspection Report by Karl Acimovic, P.E. noted that the dam was in good condition and had been well maintained. There was small brush growth upstream of the secondary spillway as well as the toe areas and the right abutment area. There was some seepage reported and the riprap downstream of the embankment and stone masonry were in good condition. The primary spillway was in very good condition and the emergency spillway was in generally good condition overall.

The 1985 Phase II Inspection included an EOP, but it did not discuss impacts of dam breach or failure and did not include any mapping of inundation area(s). At least one abutting property owner has cited flooding during high rain events. The position of this property in the floodplain of Hunts Brook may be the cause of this flooding.

There is no EAP available for Millers Pond Dam.

In addition to the Class C and B dams in the town, officials note concern regarding a dam near Route 156 that may be owned by CT DOT. The town will evaluate conditions near this dam if it appears to become a developing hazard. The spillway of this dam was cleared just prior to the data collection meeting held with Waterford staff in 2016, indicating that the dam owner is performing regular maintenance.

The Town reports that the State recently performed a major outreach effort to notify dam owners about resources available. The Town maintains an inventory of minor dams, and provides assistance on a case-by-case basis.

10.4 Potential Mitigation Strategies and Actions

Waterford 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 EOPs 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 Waterford'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 Waterford 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

Action	*Status*	*Notes*
Regional Coordination		
Continue to promote inter-jurisdictional coordination efforts for emergency response	*Capability*	*This is reclassified as a capability and can be removed from this list of actions.*
Continue to promote local and regional planning exercises that increase readiness to respond to disasters	*Capability*	*This is reclassified as a capability and can be removed from this list of actions.*
Continue to evaluate communication capabilities and pursue upgrades to communication and ensure redundant equipment is available	*Capability*	*This is reclassified as a capability and can be removed from this list of actions.*
Continue to promote regional transportation planning through SCCOG	*Capability*	*This is 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 in 2017. The Quaker Hill Fire Station was included in the study due to its positions in riverine and coastal flood zones. Recommendations from the study are incorporated into this HMP.*
Work with the SCCOG to develop regional evacuation scenarios that build upon the Millstone evacuation plan	*Complete*	*Carried out evacuation exercise. SCCOG is assessing exercise results to determine whether evacuation plan is practically feasible*
Local Emergency Response & Public Information		
Acquire and install evacuation signs in coastal flood hazard areas	*Carry Forward*	*Not yet complete due to lack of funding.*
Continue to make evacuation routes in the Gardiners Wood Road area more resilient through elevation, culvert upgrades, etc.	*Carry Forward*	*Funding has been allocated in the Capital Improvement Plan*
Encourage the State to perform improvements to reduce the frequency of flooding at Route 156 (Jordan Brook) and at Route 156 / Route 213	*Delisted*	*This falls within the Jurisdiction of the State.*
Consider installing an emergency egress between Laurel Crest Drive and Miner Lane.	*Carry Forward*	*Waterford believes that constructing a new road for egress is unlikely. They want to continue to review this possibility and evaluate other evacuation options. A modified action is suggested below the table.*
Continue to review and update the Town EOP at least once annually	*Capability / Carry Forward*	*Staff also want to ensure relevant personnel know where the EOP is kept, and are able to access it. A modified action is suggested below the table.*

Action	*Status*	*Notes*
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*	*This is a capability and can be removed from the list of actions. Town personnel attend events and conferences of the Connecticut Association of Flood Managers.*
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.*
Encourage residents to submit contact information to the CT Alerts Reverse 9-1-1 system and utilize it during emergencies	*Capability*	*This is reclassified as a capability and can be removed from this list of actions.*
Prevention		
Develop a checklist for land development applicants that cross-references the specific regulations and codes related to disaster resilience	*Delisted*	*This action is unnecessary, and is covered by Plan Review process.*
Integrate elements of this HMP into the Plan of Conservation and Development during the next update	*Complete*	*Will do this again when next POCD update will fall within HMP planning horizon*
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.*
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.*

New actions developed during this HMP update include:

- In lieu of installing an emergency egress between Laurel Crest Drive and Miner Lane, determine other options for emergency evacuation and egress from southern Miner Lane.
- Ensure relevant personnel know where the EOP is kept, and are able to access it.

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

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.*
Petition FEMA to prepare Zone AE mapping for Hunts Brook	*Complete*	*FEMA is currently working through RiskMAP process. This will address mapping issue.*
Continue managing activities in coastal areas in recognition of potential coastal flooding	*Capability*	*This is reclassified as a capability and can be removed from this list of actions.*
Consider potential need for a gradual phasing in of new policies related to SLR	*Carry Forward*	*Kleinfelder, Inc. has completed a Climate Change Vulnerability Assessment and is developing a set of recommendations to be incorporated into the next HMP.*

Action	Status	Notes
Require developers to demonstrate whether detention or retention of stormwater is the best option for reducing peak flows downstream	*Delisted*	*Town has changed focus to no net increase in runoff, and requires that of new developments.*
Conduct an annual inspection of floodprone areas that are publically accessible. Recommend drainage improvements as appropriate.	*Capability*	*Town is continuously inspecting floodprone areas and improving drainage when possible.*
Work with State and Federal agencies to ensure that flood protection regulations reflect current standards regarding sea level rise	*Complete*	*Addressed by coastal resilience project (Kleinfelder contracted) and new, upgraded zoning.*
Compile a list of addresses of structures within the 1% annual chance floodplain and storm surge areas, and track repair costs	*Complete*	*Town has a list of addresses.* *Repair costs tracked as applications are submitted.*
Incorporate the results of the Coastal Resilience project into the next HMP update	*Complete/ Carry Forward*	*This has been completed with regards to The Nature Conservancy's Coastal Resiliency project in Town prior to 2012. Carry Forward with regards to the new Kleinfelder, Inc., project.*
Review future sewer installation plans specifically for potential flooding issues	*Capability*	*This is reclassified as a capability and can be removed from this list of actions.*
Property Protection		
Incorporate information on the availability of flood insurance into all hazard-related public education workshops	*Delisted*	*Sea Level Rise education workshops have been held. Flood insurance information has not been included. Town does not feel there is a flood insurance knowledge gap.*
Pursue enrollment in the Community Rating System	*Carry Forward*	*Currently there is not popular support for pursuing CRS enrollment, but that may change in the future, and municipal staff are interested*
Make available FEMA-provided flood insurance brochures and encourage residents to purchase insurance if they are in a SFHA	*Capability*	*Online through the website, at kiosk in Town Hall, maps are available.*
Provide technical assistance to owners of structures regarding floodproofing techniques	*Capability*	*Assistance available upon request.*
Encourage residents to submit flood insurance claims following damage events	*Capability*	*Assistance available upon request.*
Pursue elevation of properties that suffer flood damage, prioritizing repetitive loss properties	*Delisted*	*Repetitive Loss has not been a significant problem in Town since the previous HMP, so this action has not been relevant. If RL becomes more significant in the future, the Town will pursue elevations.* *It is also noted that updated substantial improvement definitions will require elevations of RL properties by law, making this action unnecessary to include in this plan update.*
Apply freeboard standards of one foot or more when requiring elevations for renovations or new construction in coastal flood zones	*Complete*	*Incorporated into updated zoning regulations*
Ensure that sewer pumping stations have a method for connecting emergency power and are adequately floodproofed	*Complete/ Carry Forward*	*Wright Pierce was contracted to evaluate pumping stations in October 2016. New FEMA flood maps and Kleinfelder sea-level-rise analysis was incorporated into this evaluation. Action is in progress, carry forward to completion.*

Action	Status	Notes
Emergency Services		
Pursue mutual aid agreements with non-profits to provide volunteer labor for response activities	*Delisted*	*CERT was used in the past, but it was found that volunteers were being trained and taking classes, but wouldn't show up after a disaster. It became a liability. The Town utilizes regional Emergency Support Functions of Region 4 (state initiative). Other volunteers not wanted.*
Include structures within the 1% annual chance floodplain and storm surge areas within the Reverse 9-1-1 contact database	*Carry Forward*	*Exists within institutional memory, but not incorporated into database.*
Public Education and Awareness		
Consider an annual "Flood Fair" to familiarize the public with floodplains, flooding, flood insurance, and floodproofing	*Delisted*	*Municipal staff do not believe this would be effective. Additionally, recent storm events (Hurricane Sandy) served to increase awareness.*
Visit schools and educate children about the risks of flooding and how to prepare	*Delisted*	*Municipal staff do not believe this would be effective. Additionally, recent storm events (Hurricane Sandy) served to increase awareness.*
Work with homeowners associations to develop a floodproofing workshop	*Delisted*	*Municipal staff do not believe this would be effective. Replace with: send out annual flood-hazard mailer to homeowners.*
Encourage builders, developers, engineers, and architects to become familiar with NFIP land use and building standards at annual workshops	*Delisted*	*Town does not hold workshops. Other outreach is considered effective.*
Natural Resource Protection		
Pursue the acquisition and demolition of floodprone properties with conversion to open space, prioritizing repetitive loss properties	*Complete/ Carry Forward*	*This has not occurred at this point, but the Town is interested in this action.* *Town purchased Bingham Beach in 2014 - upper tideland, including beach, dune, and floodplain. $200K, 2.5 acre. No demolition.*
Continue to aggressively pursue wetlands protection and incorporate performance standards into subdivision reviews	*Complete*	*Town purchased Bingham Beach in 2014 - upper tideland, including beach, dune, and floodplain. $200K, 2.5 acre. No demolition.* *More progress is desired, but Town has demonstrated consistent progress on this action.*
Conduct beach nourishment and vegetation replacement along any affected beaches to keep up with erosion	*Capability*	*Performed at Waterford Beach with volunteer labor with matching funds from TNC.*
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 reclassified as a capability and can be removed from this list of actions.*
Utilize the recently available extreme rainfall data to determine existing culvert sizing and encourage upgrades where undersized	*Delisted*	*Town does not require this, but designers utilize this data as they plan projects.* *This is deemed sufficient by the Town, and formally requiring it deemed unnecessary.*
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.*

Action	Status	Notes
Upgrade stormwater collection and discharge systems to keep up with rising sea level	*Carry Forward*	*Part of Coastal Resilience efforts in town have included assessments of the effects of sea level rise. The need to upgrade stormwater infrastructure has been noted in TNC reports and meetings, and was recognized by the Town in the 2012 edition of this HMP annex. Coastal resilience related projects have helped secure public buy-in into stormwater infrastructure improvements, and prioritize locations in need of upgrades.*
Maintain existing hard structures along the coast in good condition	*Capability*	*This is reclassified as a capability and can be removed from this list of actions.*
Replace culverts along Gardiners Wood Road and elevate sections of the road	*Carry Forward*	*Money has been allocated in the Capital Improvement Plan*
Encourage CT DOT to replace a culvert and/or elevate Route 156 at Gardiners Wood Road	*Delisted*	*State Jurisdiction*
Encourage CT DOT to replace culverts and/or elevate Route 213 as needed	*Delisted*	*State Jurisdiction*
Replace culvert and/or elevate a section of Braman Road	*Carry Forward*	*This has not yet been completed due to lack of funding*
Replace culverts and/or elevate sections of Oil Mill Road at Oil Mill Brook	*Complete*	*Completed in 2017*
Replace culvert and/or elevate sections of Niles Hill Road at Fenger Brook	*Carry Forward*	*This has not yet been completed due to lack of funding*
Encourage CT DOT to replace the culvert and/or elevate a section of the Boston Post Road at Jordan Brook	*Complete*	*Under Construction. State Jurisdiction.*
Raise and improve hydraulics of the secondary access to Millstone Station	*Carry Forward*	*Project is on hold until ownership questions are resolved.*
Replace the Jordan Cove Road bridge	*Complete*	*Completed in 2017*

New actions developed during this HMP update include:

- Send out an annual flood-hazard mailer to homeowners.
- 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	*Delisted*	*If SCCOG pursues this action, Town will assist. For now, remove from action items.*
Consider working with CL&P (now Eversource) to obtain funding to place utilities underground	*Delisted*	*Required in new developments.* *Not pursuing in old development - it is not cost effective, and is less expensive to manage trees and power lines..*
Property Protection		

Action	Status	Notes
Promote the use of functional shutters for older buildings	*Capability*	*Promoted during renovation activities*
Make information on wind-resistant construction techniques available to all building permit applicants	*Capability*	*This is a capability and can be removed from this list of actions.*
Emergency Services		
Identify a location for a brush-disposal operation for dealing with debris following wind storms and determine potential reuse	*Complete*	*Location identified: Landfill. SCRRRA is contracted to grind debris, returned to Town as mulch.* *Backup locations are designated in case landfill is at capacity*
Consider surveying all Town-owned buildings to determine their ability to withstand wind loading	*Capability*	*Performed as part of ongoing building maintenance*
Develop agreements with landowners and companies to chop/chip to ensure backup plans are in place for debris removal	*Delisted*	*Town has adequate debris collection capabilities, does not need to develop additional agreements.*
Public Education and Awareness		
Consider an annual "Wind Fair" to familiarize the public with wind hazards and potential mitigation measures	*Delisted*	*Social media is considered to be a more effective and less expensive method for education.*
Visit schools and educate children about the risks of wind events and how to prepare for them	*Delisted*	*Social media is considered to be a more effective and less expensive method for education.*

11.1.4 Actions Applicable to Other Damage from Winter Storms

Action	Status	Notes
Consider conducting a study to identify buildings vulnerable to roof damage or collapse from heavy snow in the town	*Delisted/ Capability*	*Replace with: Prioritize snow removal from municipal buildings*
Consider drafting a written plan for inspecting and prioritizing the removal of snow from Town-owned structures	*Carry Forward*	*Not yet complete due to lack of funding.*
Continue making funding available to the Public Works Department each year for clearing snow from roads and parking lots	*Capability*	*This is 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*	*Water & Sewer can send information through utility bills about protecting pipes.* *Town acts during cold weather - emergency heating oil plan; 211 information on website*
Consider posting the snow plowing routes in local government buildings and on the Town's website	*Delisted*	*Town does not want to publicize static information when things may change.* *Dispatch maintains a list of blocked roads as people call in with that information.*
Continue to identify areas that are difficult to access during winter storm events and develop contingency plans to access such areas Capability	*Capability*	*This is a capability and can be removed from this list of actions.*

New actions developed during this HMP update include:

- ❑ Prioritize snow removal from municipal buildings.

11.1.5 Actions Applicable to Earthquakes

Action	Status	Notes
Ensure that Town departments have adequate backup supplies and facilities for continued functionality following an earthquake	*Capability*	*This is 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 a capability and can be removed from this list of actions.*

11.1.6 Actions Applicable to Wildfires

Action	Status	Notes
Continue to evaluate public water supply hydrants and areas at risk of wildfire in the town	*Capability*	*This is a capability and can be removed from this list of actions.*
Encourage the extension of public water supply for fire protection to areas identified as being particularly at-risk	*Complete*	*Public water supply is considered to be sufficient for firefighting purposes.*
Continue pursuing additional sources of firefighting water where adequate supplies do not exist through the use of dry hydrants and cisterns	*Capability*	*This is a capability and can be removed from this list of actions.*
Continue to support public outreach programs to increase awareness of forest fire danger, equipment usage, and protecting homes	*Capability*	*This is 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 a capability and can be removed from this list of actions.*

11.1.7 Actions Applicable to Dam Failure

Action	Status	Notes
Include dam failure inundation areas in the Reverse 9-1-1 contact database	*Carry Forward*	*This has not yet been completed due to lack of funding.*
Work with CT DEEP to ensure that the owners of high hazard dams have current EOPs and keep local copies	*Carry Forward*	*Town is pursuing the receipt of copies of EAPs. Millers Pond does not have an EAP.*
Monitor conditions of the Route 156 CT DOT dam to determine whether it is a potential hazard	*Capability*	*Town monitors. It noted that the spillway was cleared just recently*
Provide assistance to the owners of lesser ranked dams regarding resources available for inspections and maintenance	*Capability*	*State just performed major outreach effort to notify dam owners about resources available. Town maintains an inventory of minor dams, and provides assistance on a case-by-case basis.*

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 Waterford. 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.

3570-09-n2117-rpt-waterford annex update-adopted.doc

Action or Strategy #	Table 11-1: Mitigation Actions and Strategies for Waterford 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	Acquire and install evacuation signs in coastal flood hazard areas	Carried Forward	EM	x	x	x			Moderate	CIB	1	1	1	1	1	0.5	0	**7.0**	0	0	0	0	0	-0.5	0	**-1.0**	**6.0**	Medium
2	Continue to make evacuation routes in the Gardiners Wood Road area more resilient through elevation, culvert upgrades, etc.	Carried Forward	DPW		x				High	CIB	0.5	1	1	1	1	0	0	**5.5**	0	0	0	0	0	-1	0	**-2.0**	**3.5**	Low
3	Consider installing an emergency egress between Laurel Crest Drive and Miner Lane.	Carried Forward	DPW				x		High	CIB	0.5	1	1	1	1	0	0	**5.5**	0	0	0	0	0	-1	-0.5	**-2.5**	**3.0**	Low
4	In lieu of installing an emergency egress between Laurel Crest Drive and Miner Lane, determine other options for emergency evacuation and egress from southern Miner Lane.	New	EM	x	x	x			Low	OB	0.5	1	1	1	1	0	0	**5.5**	0	0	0	0	0	0	0	**0.0**	**5.5**	Medium
5	Ensure relevant personnel know where the EOP is kept, and are able to access it.	New	EM	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
6	Consider potential need for a gradual phasing in of new policies related to SLR	Carried Forward	PL					x	Minimal	OB	1	1	1	1	0.5	0.5	0.5	**7.0**	0	0	0	0	0	0	0	**0.0**	**7.0**	High
7	Incorporate the results of the Coastal Resilience project into the next HMP update	Carried Forward	PL					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
8	Pursue enrollment in the Community Rating System	Carried Forward	PL	x	x	x	x	x	Low	OB	0.5	1	1	0.5	1	0.5	0	**6.0**	0	0	0	0	0	0	0	**0.0**	**6.0**	Medium
9	Ensure that sewer pumping stations have a method for connecting emergency power and are adequately floodproofed	Carried Forward	DPW	x	x	x	x	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
10	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	0	**6.0**	0	0	0	0	0	0	0	**0.0**	**6.0**	Medium
11	Pursue the acquisition and demolition of floodprone properties with conversion to open space, prioritizing repetitive loss properties	Carried Forward	PL	x	x	x	x	x	High	OB, HMA	0.5	1	1	0.5	1	1	1	**8.0**	0	0	0	0	0	-1	0	**-2.0**	**6.0**	Medium
12	Upgrade stormwater collection and discharge systems to keep up with rising sea level	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
13	Replace culverts along Gardiners Wood Road and elevate sections of the road	Carried Forward	DPW		x				High	CIB	0.5	1	1	1	1	0.5	0	**6.5**	0	0	0	0	0	-1	0	**-2.0**	**4.5**	Low
14	Replace culvert and/or elevate a section of Braman Road	Carried Forward	DPW		x				High	CIB	0.5	1	1	1	1	0.5	0	**6.5**	0	0	0	0	0	-1	0	**-2.0**	**4.5**	Low
15	Replace culverts and/or elevate sections of Niles Hill Road at Fenger Brook	Carried Forward	DPW			x			High	CIB	0.5	1	1	1	1	0.5	0	**6.5**	0	0	0	0	0	-1	0	**-2.0**	**4.5**	Low
16	Raise and improve hydraulics of the secondary access to Millstone Station	Carried Forward	DPW					x	High	CIB	1	1	1	1	0	0	0	**5.0**	0	0	0	0	-1	-1	0	**-3.0**	**2.0**	Low
17	Send out an annual flood-hazard mailer to homeowners.	New	PL	x	x	x	x	x	Low	OB	1	1	1	1	1	0.5	0	**7.0**	0	0	-0.5	0	0	0	0	**-0.5**	**6.5**	Medium
18	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	PL	x					Low	OB	1	1	1	1	1	0	0	**6.0**	0	0	-0.5	0	0	0	0	**-0.5**	**5.5**	Medium
19	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	1	0	**8.0**	0	0	0	0	0	0	0	**0.0**	**8.0**	High
20	Prioritize snow removal from municipal buildings.	New	DPW	x	x	x	x	x	Minimal	OB	0	1	1	1	1	0	0	**5.0**	0	0	0	0	0	0	0	**0.0**	**5.0**	Medium
21	Include dam failure inundation areas in the Reverse 9-1-1 contact database	Carried Forward	EM		x				Low	OB	0.5	1	1	1	1	0	0	**5.5**	0	0	0	0	0	0	0	**0.0**	**5.5**	Medium
22	Work with CT DEEP to ensure that the owners of high hazard dams have current EOPs and keep local copies	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

[1]Notes
DPW = Department of Public Works & Engineering
EM = Emergency Management
PL = Planning 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 WATERFORD BOARD OF SELECTMEN

A RESOLUTION ADOPTING THE HAZARD MITIGATION PLAN UPDATE, 2017

WHEREAS, the Town of Waterford 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 Waterford 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 Waterford 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 Waterford; and

WHEREAS, the Plan recommends several hazard mitigation actions that will provide mitigation for specific natural hazards that impact the Town of Waterford, 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 Waterford 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 Waterford;
2. The respective officials identified in the mitigation strategy of the Plan are hereby directed to pursue implementation of the recommended actions assigned to them;
3. Future revisions and Plan maintenance required by 44 CFR 201.6 and FEMA are hereby adopted as a part of this resolution for a period of five (5) years from the date of this resolution.
4. An annual report on the progress of the implementation elements of the Plan shall be presented to the Board of Selectmen.

Adopted this _____ day of _____, 201_ by the Board of Selectmen of Waterford, Connecticut

_____
First Selectman

IN WITNESS WHEREOF, the undersigned has affixed his/her signature and the corporate seal of the Town of Waterford this _____ day of _____, 201_.

_____
Town Clerk