Natural Hazard Mitigation Plan
Draft 2016-2021 Update for the South Western Region

Prepared by the Western Connecticut Council of Governments (WCCOG)

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Acronyms

Acronym	Definition
CDD	Cooling Degree Days
CERT	Community Emergency Response Team
CFR	Code of Federal Regulations
CGS	Connecticut General Statutes
COG	Council of Governments
CRS	Community Rating System
CSBC	Connecticut State Building Code
CT	State of Connecticut
CT Alert ENS	Connecticut Alert Emergency Notification System
CTDEEP	Connecticut Department of Energy & Environmental Protection
DEMHS	Connecticut Department of Emergency Management and Homeland Security
DMA	Disaster Mitigation Act
DPW	Department of Public Works
EDT	Eastern Daylight Time
EFS	Enhanced Fujita Scale
EHE	Extreme Heat Event
EJ	Environmental Justice
EMD	Emergency Management Director
EOC	Emergency Operations Center
EOP	Emergency Operations Plan
EPA	Environmental Protection Agency
ESF	Emergency Support Function
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
FMA	Flood Management Assistance
HAZUS-MH	FEMA's Hazard Simulation Software Program
HDD	Heating Degree Days
HMA	Hazard Mitigation Assistance
HMGP	Hazard Mitigation Grant Program

Acronym	Definition
HMP	2016 Hazard Mitigation Plan Update
HSGP	Homeland Security Grant Program
HVCEO	Housatonic Valley Council of Elected Officials
ICS	Incident Command System
IWWA	Inlands Wetlands and Watercourse Agency
LEOP	Local Emergency Operations Plan
LEP	Limited English Proficiency
LEPC	Local Emergency Planning Committee
LID	Low Impact Development
LIS	Long Island Sound
MLLW	Maximum Water Level
MOA	Memorandum of Agreement
mph	Miles Per Hour (wind speed)
MPO	Metropolitan Planning Organization
MRC	Medical Reserve Corps
MTA	Metropolitan Transportation Authority
NCDC	National Climatic Data Center
NDMC	National Drought Mitigation Center
NESIS	Northeast Snowfall Impact Scale
NFIP	National Flood Insurance Program
NIMS	National Incident Management System
NOAA	National Oceanic and Atmospheric Administration
NRCC	Northeast Regional Climate Center
NRCS	Natural Resources Conservation Service
NRWI	Norwalk River Watershed Initiative
NWS	National Weather Service
NY	State of New York
OPM	Connecticut Office of Policy and Management

Acronym	Definition
P&Z	Planning and Zoning
PDM	Pre-disaster Mitigation
PDSI	Palmer Drought Severity Index
PoCD	Plan of Conservation and Development
REPT	Regional Emergency Planning Team
RFC	Repetitive Flood Claims
RPO	Regional Planning Organization
SBA	Connecticut Small Business Association
SFHA	Special Flood Hazard Area
SLOSH	Sea, Lake, and Overland Surges from Hurricanes
SRL	Severe Repetitive Loss
STAPLEE	FEMA's Priority Rating System for Mitigation Strategies
SWR	South Western Region
SWRPA	South Western Regional Planning Agency
TNC	The Nature Conservancy
TTAG	Transportation Technical Advisory Committee
USACOE	United States Army Corps of Engineers
USGS	United States Geological Survey
WCCOG	Western Connecticut Council of Governments
WUI	Wild Urban Interface Area

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Executive Summary

Natural Hazard Mitigation Plan

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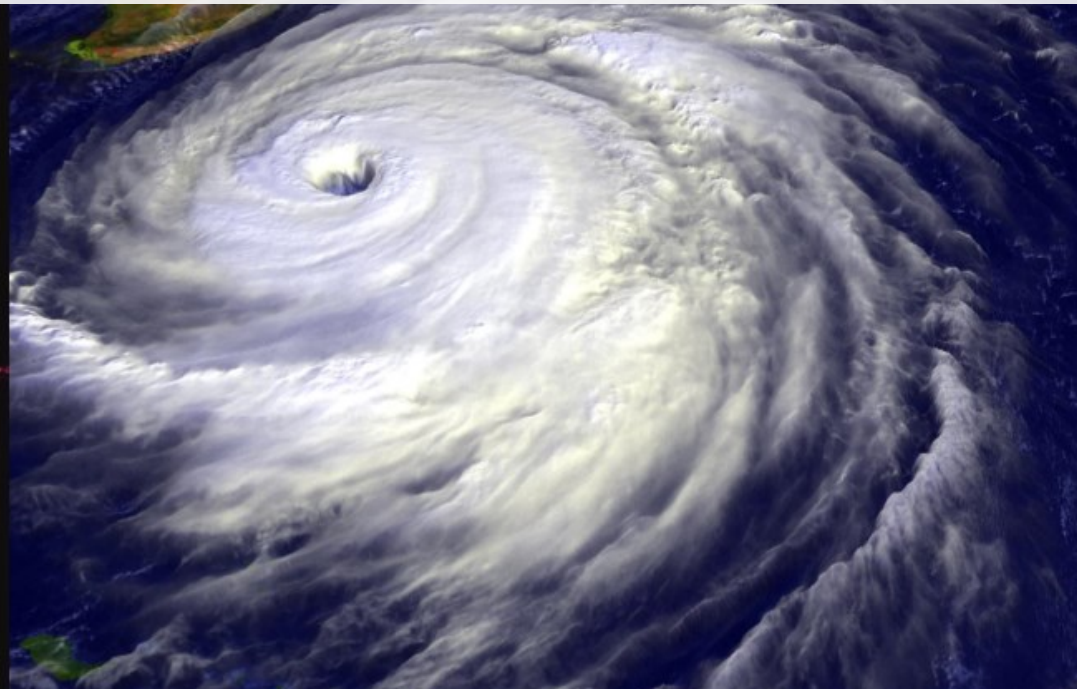


Executive Summary

Natural Hazard Mitigation Plan 2016-2021

ES-1 Introduction

The South Western Region (SWR) is comprised of eight municipalities which form the southwestern panhandle of Connecticut. The region shares its western boundary with New York's Westchester County, is bounded by Long Island Sound (LIS) to the south, and extends inland approximately 13 miles. The Western Connecticut Council of Governments (WCCOG, formerly SWRPA) received Federal Emergency Management Agency (FEMA) funds through the Connecticut Department of Emergency Management and Homeland Security (DEMHS) to develop the 2016 Natural Hazard Mitigation Plan Update (HMP) for the following municipalities listed below:

Town of Darien	City of Stamford
Town of Greenwich	Town of Weston
Town of New Canaan	Town of Westport
City of Norwalk	Town of Wilton

The HMP was prepared in accordance with 44 CFR 201.6 of the Disaster Mitigation Act of 2000 (DMA; Public Law 106-390). The Disaster Mitigation Act of 2000 (DMA) established a national program for pre-disaster mitigation and helps expedite the administration of disaster relief to impacted areas. A key requirement of the DMA is the need for a FEMA-approved HMP, which keeps the region and its municipalities eligible for Hazard Mitigation Assistance (HMA) funding. This plan was approved by FEMA on XXXXXX. Additional Information on municipal adoptions of the regional plan can be found in Appendix C.

WCCOG worked intimately with municipal staff, as well as local and regional stakeholders to identify and incorporate critical project information. This HMP builds on previous iterations in 2005 and more recently in 2011, which currently serves as the existing HMP for the area. A key goal of this plan is to identify the natural hazards likely to affect the SWR, its eight municipalities, and the over 365,000 residents. The plan also identifies areas vulnerable to the aforementioned natural hazards, and incorporates appropriate strategies aimed towards mitigation. Consistent with FEMA and DEMHS goals, the HMP serves to reduce loss of life and property, economic disruptions, and the cost of post-disaster recovery for the region's communities.

Specific goals and objectives of the document include:

- Protecting public safety and preventing loss of life and injury;
- Reducing harm to existing and future development;
- Preventing damage to a community's unique economic, cultural, and environmental assets;
- Minimizing operational downtime and accelerating the recovery of government and business after disasters;
- Reducing the costs of disaster response and recovery, as well as the exposure to risk for first responders; and
- Helping accomplish other community objectives, such as leveraging capital improvements, infrastructure protection, open space preservation, and economic resiliency.

Project benefits include:

- Identifying cost effective actions for risk reduction;
- Directing resources to the greatest risks and vulnerabilities;
- Building partnerships by involving people, organizations, and businesses;
- Increasing education and awareness of hazards and associated risk;
- Aligning risk reduction with other community objectives; and
- Providing eligibility to receive federal hazard mitigation grant funding.

ES-2 Planning Process

Plan development was championed by WCCOG and the eight SWR municipalities. The planning process, including associated outreach and flow of communication, was conducted using a three-tiered format. The first tier consisted of municipal-appointed representatives who served as the HMP's Advisory Committee. The group consisted of staff with expertise in hazard mitigation planning and response, and the aggregation of key expertise served to help steer and provide critical input towards HMP development.

The second tier included key stakeholders, defined by FEMA as those that are affected by a mitigation action or policy. Consistent this definition, key HMP stakeholders included additional municipal staff, state/local agencies, private organizations/institutions, businesses, and members of the general public. Adjacent regions and communities were also invited to participate as stakeholders. Unlike the Advisory Committee, stakeholders did not steer/guide plan development, but rather served to inform the planning team on a specific area of expertise and/or provide input from a different perspective within the community.

Lastly, the third tier consisted of the general public, who were often engaged throughout the planning process. Details regarding the methods and channels of outreach are briefly highlighted below, with additional information located in Chapter 2.

Hazard Mitigation Workshops

WCCOG partnered with The Nature Conservancy (TNC) to bring hazard mitigation workshops to the region. The four workshops covered all eight municipalities, providing critical opportunities to discuss hazard mitigation for a diverse and representative cross-section of each municipality. Participants included municipal staff, key stakeholders, and the general public alike. Such participation provided unique insight with respect to hazard mitigation, while also providing an active forum with which suggestions/feedback for each municipality could be aggregated and incorporated into the HMP in real time.

Greenwich Hazard Mitigation Workshop, December 18, 2014. Photo Credit: WCCOG

Natural Hazard Mitigation Survey

As part of the regions continued and diverse approach to public outreach, a Natural Hazard Mitigation Survey was created and released to the media, for distribution to the mass public. The survey sought to capture the public knowledge and perception of area natural hazards, including associated vulnerability and opportunities for mitigation at both municipal and regional levels. The survey provided an unprecedented opportunity for the SWR to reach an even larger public audience with respect to hazard mitigation input. Rather than solely relying on the public to visit WCCOG's website, the survey itself proactively sought to engage the general public. The results of the survey, by municipality, can be found in Table 2.2.2-2 of Chapter 2.

Media

Media outlets were utilized throughout the development of the HMP, serving as a conduit to the general public. Such outlets will also be utilized during the plan implementation and maintenance portions. Media releases, newspaper, video, and audio interviews were conducted to create an awareness of HMP development and project activities, while simultaneously

conveying the importance of natural hazard mitigation. By utilizing the media, the region and its municipalities were able to tap into an existing communication network and better engage the mass public. The HMP utilized the media at frequencies significantly higher than previous plan iterations. Such efforts, in conjunction with the unparalleled Natural Hazard Mitigation Survey, demonstrate the region's continued commitment to enhanced public involvement.

Municipal Public Information Sessions

A series of four municipal public information sessions were conducted in the SWR following the completion of the Draft HMP. The sessions occurred early in 2015 as part of a 30-day public comment period. The purpose of the meetings were to brief the communities with respect HMP components, area hazards, vulnerabilities, and hazard mitigation, including the connection to existing plans and documents. Presentations were made at the beginning of meetings, with the remaining time serving as an "open house" where residents could review the HMP, ask questions and receive personalized answers. The intimacy between technical experts and the public served as the driver for Public Information Sessions, as opposed to conducting HMP public participation in the form of a meeting agenda item.

ES-3 Natural Hazards

Extensive research and outreach revealed the following natural hazards with the potential to impact the region and its municipalities. An overview of area hazards by municipality can be found below in Table ES-3.1. More detailed information regarding hazard summaries in the region can be found in Chapter 3, including: history, geographic location, extent, probability, and overall significance of each hazard by municipality.

The SWR is vulnerable to a variety of natural hazards, as evidenced by the above table. Hazards with greatest frequency and potential for loss of life and/or property include: Flooding; Extreme Heat and Cold; Hurricane and Tropical Storms; Drought; Severe Wind; Severe Winter Weather; Severe Storms and Tornados. In addition, Storm Surge and Sea Level Rise were key hazards of concern for the five coastal municipalities. The aforementioned hazards are consistent with the most significant hazards identified as part of the State of Connecticut's 2014 Natural Hazard Mitigation Plan.

Table ES-3.1 Hazards by Municipality

	Darien	Greenwich	New Canaan	Norwalk	Stamford	Weston	Westport	Wilton	Region
Avalanche									
Dam Failure	●	●	●	●	●	●	●	●	●
Drought	●	●	●	●	●	●	●	●	●
Earthquake		●	●	●	●	●	●	●	●
Erosion	●	●	●	●	●	●	●	●	●
Expansive Soils									
Extreme Cold	●	●	●	●	●	●	●	●	●
Extreme Heat	●	●	●	●	●	●	●	●	●
Flood	●	●	●	●	●	●	●	●	●
Hail	●	●	●					●	●
Hurricane	●	●	●	●	●	●	●	●	●
Landslide									
Lightning	●	●	●	●	●	●	●	●	●
Sea Level Rise	●	●		●	●		●		●
Severe Wind	●	●	●	●	●	●	●	●	●
Severe Winter Weather	●	●	●	●	●	●	●	●	●
Storm Surge	●	●		●	●		●		●
Subsidence									
Tornado	●	●	●	●	●	●	●	●	●
Tsunami	●								●
Wildfire	●	●			●	●		●	●
Severe Storm	●	●	●	●	●	●	●	●	●

Hurricanes/Tropical Storms

The annual Atlantic hurricane season extends from June 1st through November 30th, although tropical cyclones can occur outside of this timeframe. Tropical cyclones can take form as either hurricanes, tropical storms, or tropical depressions, with hurricanes being the strongest form of cyclone. The National Weather Service's (NWS) National Hurricane Center is responsible for tracking and predicting tropical cyclones in the north Atlantic.

In August 2011 Hurricane Irene made its third landfall in New York City as a tropical storm. Irene brought sustained tropical storm winds, heavy rain, and destructive storm surge to Connecticut on August 28, 2011. Approximately 15,000 people evacuated due to storm surge along the shores of Long Island Sound, where a state voluntary evacuation was in effect. Preliminary damage cost estimates included $150-200 million for Individual Assistance covered by Insurance and $40-50 million for Public Assistance. The number of power outages statewide peaked to around 900,000, and around 3% of the state's trees along state roads were lost. The New Canaan branch of Metro North suffered extensive damage, and AT&T reported 2,000 downed poles, as well as additional damage to numerous cellphone towers.

Utilizing FEMA's HAZUS-MH modeling software, WCCOG estimated the extent of physical damage and economic losses to the SWR and its communities under the 500-year probabilistic Hurricane scenario. This scenario is similar to or slightly stronger than the 1938 Category 3 Hurricane that impacted the state. The model considered storm surge and wind data, predicting regional impacts totaling over $1.8 billion, with nearly 20,000 buildings receiving moderate or greater damage, 42 of which included critical facilities such as hospitals.

Flooding

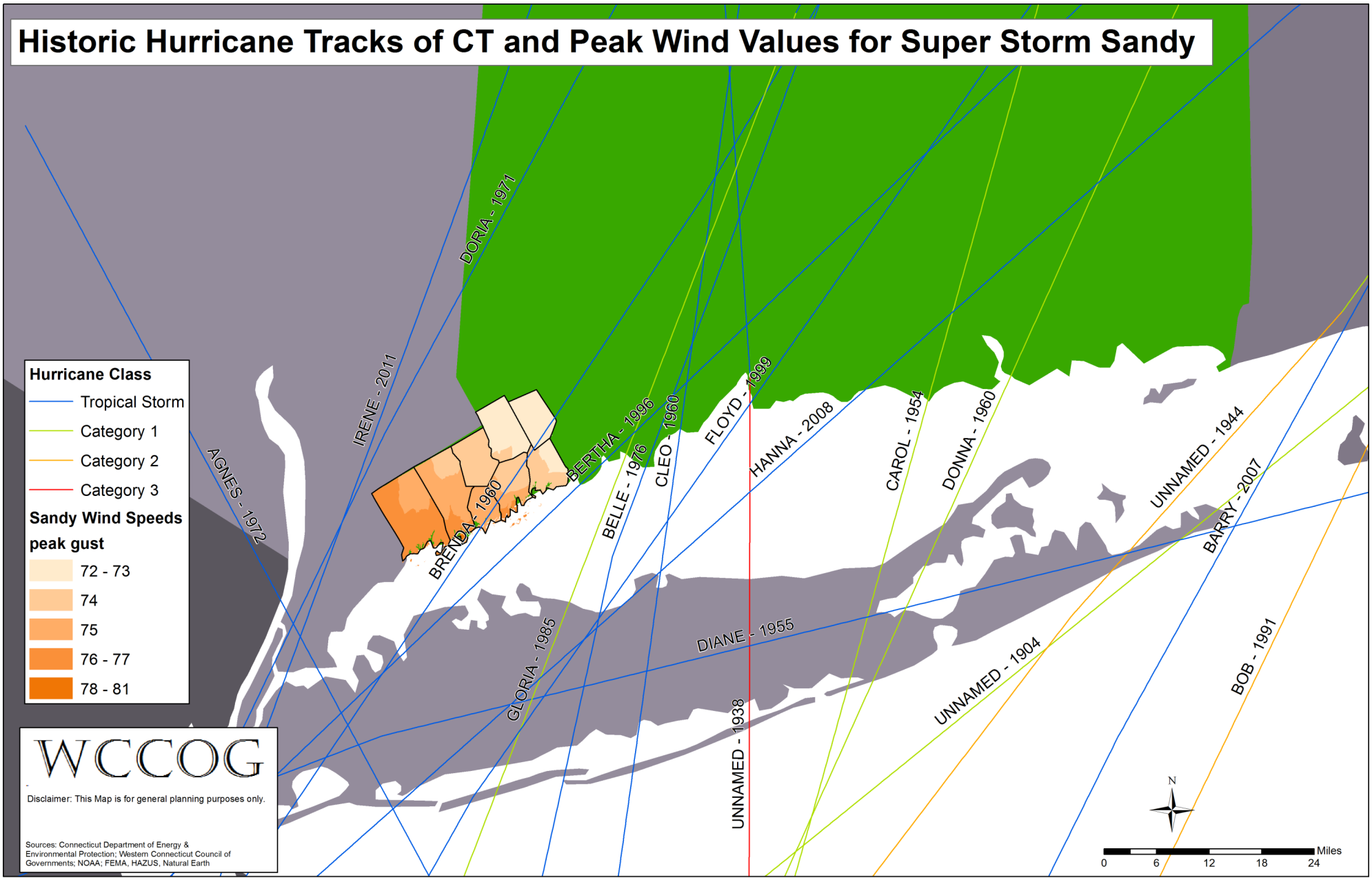
With over 85 miles of coastline and more than 600 miles of waterways, the entire SWR is vulnerable to flooding, although the type varies by geography. The four main types of flooding are coastal, riverine, and shallow flooding. Coastal flooding typically results from coastal storms producing storm surges and erosion of coastal areas; riverine flooding occurs when water channels receive more rain, runoff and/or snowmelt from their watershed than normal, or if the channel is blocked by ice or debris; flash flooding occurs when an area experiences an unusually large amount of rain and/or high velocity of water flow within a very short period of time; lastly, shallow flooding tends to occur in flat areas with poor drainage, resulting in the pooling of water. The coastal municipalities experience all four major flood types, whereas the inland areas can experience riverine, flash, and shallow flooding.

The combination of dense development and highly valuable real estate in close proximity to water create the potential for substantial economic and/or property impacts from flooding. As a result, this hazard remained a significant concern for the region and its municipalities during the HMP development. Flooding can occur at any time of year, but the region experiences a greater risk during the spring as heavier precipitation events may correlate with melting snow and ice. The National Oceanic and Atmospheric Administration (NOAA) has also noted that late summer/early fall and early winter also create favorable conditions for flood events. Significant and widespread flood events have been observed in the region on an annual basis dating back to 2006.

The National Flood Insurance Program (NFIP) provides a means of financial protection for property owners from flooding. NFIP offers flood insurance to homeowners, renters, and businesses in participating municipalities. A December 2014 analysis of NFIP claims revealed 850 Repetitive Loss Properties (RLP) in the SWR, with claims totaling nearly $83.9 million. Not surprisingly and as depicted in Figure ES-3.2 below, claims are generally concentrated along waterways.

To better assess area flood risks, WCCOG modeling the impacts of flooding using FEMA's HAZUS-MH loss estimation program. The results indicate potential municipal damage as a result of a flood with a 1% (100-year flood) and 0.2% (500-year flood) probability of occurring in any given year, along with the impacted acreage. The analysis was conducted for both Coastal and Riverine Flooding, with the output also presented below.

Figure ES-3.1


Historic Hurricane Tracks of CT and Peak Wind Values for Super Storm Sandy
Hurricane Class
Tropical Storm
Category 1
Category 2
Category 3
Sandy Wind Speeds
peak gust
72 - 73
74
75
76 - 77
78 - 81
WCCOG
Disclaimer: This Map is for general planning purposes only.
Sources: Connecticut Department of Energy & Environmental Protection; Western Connecticut Council of Governments; NOAA; FEMA, HAZUS, Natural Earth
DORIA - 1971
IRENE - 2011
AGNES - 1972
BRENDA - 1960
BERTHA - 1996
BELLE - 1976
CLEO - 1960
FLOYD - 1999
HANNA - 2008
CAROL - 1954
DONNA - 1960
UNNAMED - 1944
BARRY - 2007
GLORIA - 1985
DIANE - 1955
UNNAMED - 1938
UNNAMED - 1904
BOB - 1991
N
0
6
12
18
24
Miles

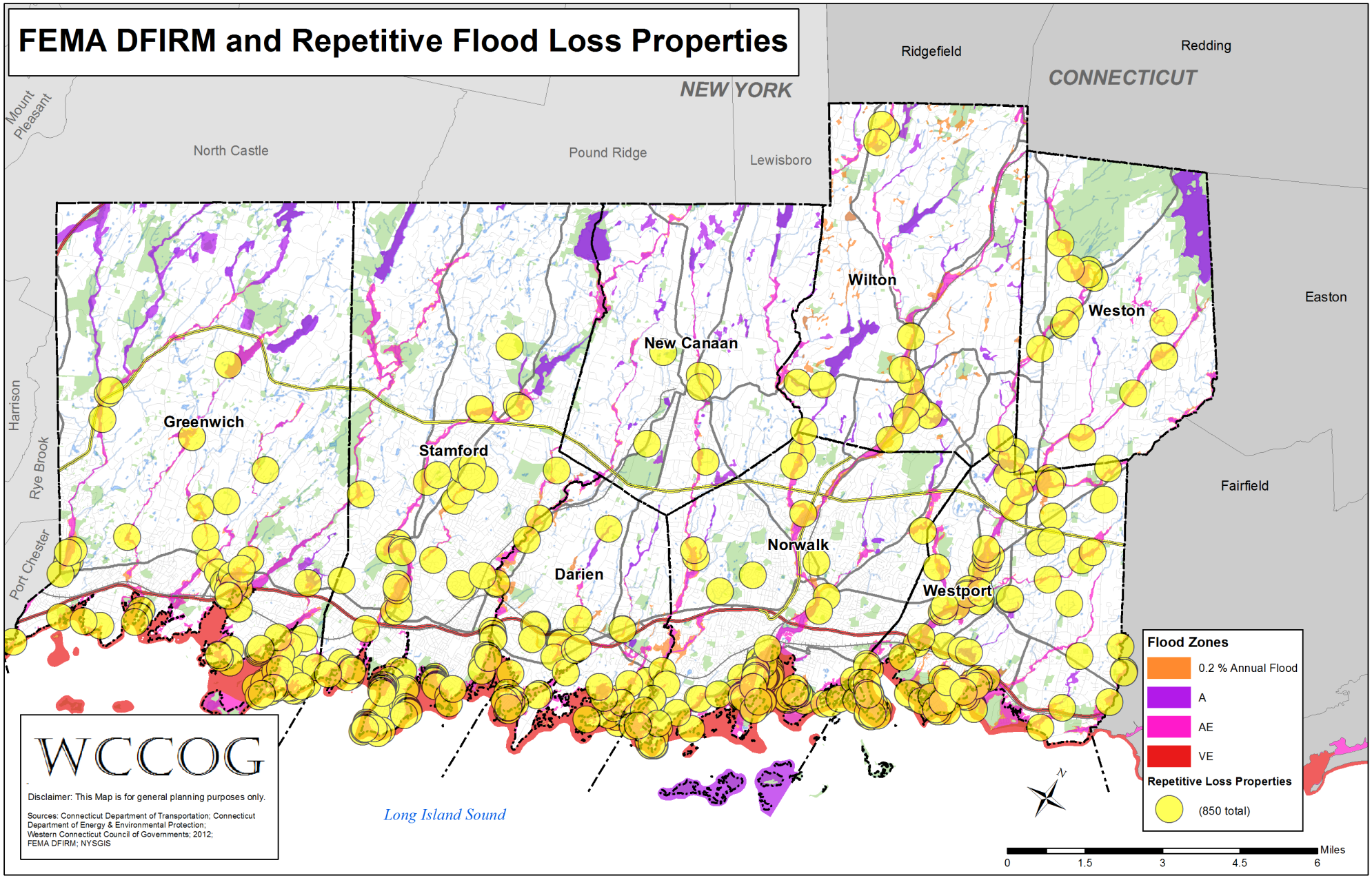

FEMA DFIRM and Repetitive Flood Loss Properties
NEW YORK
CONNECTICUT
Ridgefield
Redding
Mount Pleasant
North Castle
Pound Ridge
Lewisboro
Easton
Wilton
Weston
New Canaan
Greenwich
Stamford
Harrison
Rye Brook
Port Chester
Fairfield
Norwalk
Darien
Westport
Long Island Sound
WCCOG
Disclaimer: This Map is for general planning purposes only.
Sources: Connecticut Department of Transportation; Connecticut Department of Energy & Environmental Protection; Western Connecticut Council of Governments; 2012; FEMA DFIRM; NYSGIS
Flood Zones
0.2 % Annual Flood
A
AE
VE
Repetitive Loss Properties
(850 total)
N
0
1.5
3
4.5
6
Miles

Table ES-3.2: Flood Statistics by Municipality

	Riverine				Coastal			
	Flood Area (Acres)		Damage ($ 1000's)		Flood Area (Acres)		Damage ($ 1000's)	
Town	1% Flood	0.2% Flood	1% Flood	0.2% Flood	1% Flood	0.2% Flood	1% Flood	0.2% Flood
Darien	240.7	302.8	33231.0	50823.7	493.9	596.0	64023.0	92530.0
Greenwich	1368.9	1637.8	71481.0	109323.6	903.7	1152.6	193473.0	288006.0
New Canaan	533.6	618.0	19093.0	29201.0	--	--	--	--
Norwalk	516.5	597.4	107580.0	164533.6	1272.8	1461.8	249371.0	436406.0
Stamford	1421.2	1689.3	209421.0	320290.0	879.0	1070.2	413109.0	643095.0
Weston	1061.9	1167.8	29062.0	44447.6	--	--	--	--
Westport	507.5	1022.1	53293.0	81506.7	1017.2	1252.5	193279.0	352951.0
Wilton	939.9	1059.1	222010.0	339543.7	--	--	--	--
Region	6590.2	8094.3	745171.0	1139670.0	4566.7	5533.0	1113255.0	1812988.0

1. Damage statistics for 0.2% flood event for each municipality were derived from the regional 500yr flood event totals and the damage proportions observed in the 1% flood event. Source: FEMA HAZUS-MH, WCCOG

Drought

The potential for and impacts from drought have increasingly grown of concern in the region. Severe droughts have the potential to adversely impact the watery supply and increase chances of wild fires. While the entire SWR is vulnerable to drought impacts, the severity increases towards inland areas of the region that rely on wells for drinking water, in addition to cisterns and/or fire ponds for firefighting.

As discussed above, drought has an equal chance of affecting all areas of the region, with a 12% annual chance of occurrence, according to NOAA's National Climatic Data Center (NCDC). The NCDC has recorded five drought events rated moderate or greater from 1901 to 2013. Most recently in October 2013, the SWR experienced moderate drought conditions according to United States Drought Monitor. Bridgeport, just east of the region, experienced a rainfall deficit of -6.76" during this period.

Severe Storms and Winter Weather

For purposes of this section, Severe Storms and Winter Weather include events such as: nor'easters; severe heat and cold events; blizzards, ice storms, and other intense precipitation events; severe winds; thunderstorms; and tornados.

According to the historic data collected from the NCDC during 2000-2014 the SWR can expect, on average, three severe winter storm events a year. All towns in the region are vulnerable to such impacts, which can cause icy and congested roads, power outages, school and work cancelations, as well as property damage. Heavy snow, ice, and high winds from nor'easters increase the potential for downed limbs and power lines. With much of the region's utility infrastructure situated aboveground, downed limbs and utility lines can wreak havoc to area residences, businesses, and emergency responders. Wind impacts from thunderstorms (downbursts) and/or tornados also create similar hazards to utility lines.

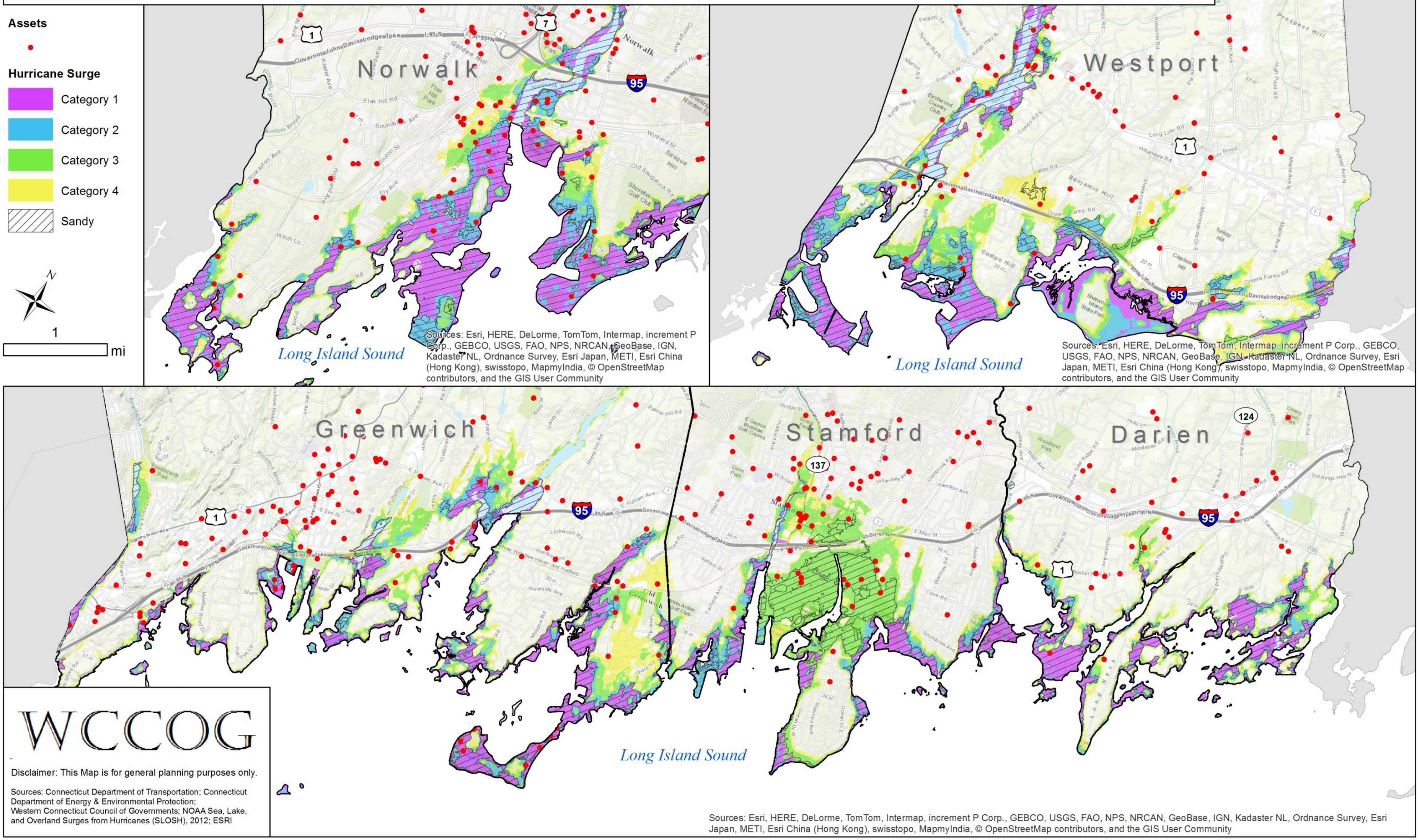
People living in the more rural areas of the SWR are even more vulnerable to potential power losses and property damage from severe storms. In addition, the elderly, poor and homeless populations are also very vulnerable to the impacts created by winter storms due to resource needs (heat/cooling, power loss, safe access to food stores, etc.). There is also an increased risk associated with transportation mobility as roads may become: blocked by downed trees/utilities; slick and treacherous in winter; and lower visibilities; all of which may increase traffic congestion along the area thoroughfares.

Storm Surge and Sea Level Rise

Storm surge is defined by NOAA as an abnormal rise of water generated by a storm, over and above the predicted astronomical tide. The end result is that sea water is pushed onto the coastline, resulting in flooding. The Sea, Lake, and Overland Surges from Hurricanes (SLOSH) model is used to geographically evaluate the potential impact of storm surge, and is delineated

Figure ES-3.3

Category 1-4 Hurricanes and Super Storm Sandy Storm Surges with Assets



by Hurricane Category (1-4 only). Recent storm surge events occurred in late October 2012 during Superstorm Sandy, and on August 28, 2011 as part of the remnants of Hurricane Irene.

Sea level rise (SLR) creates the potential for the flooding of shoreline areas and coastal erosion, including saltwater intrusion from Long Island Sound. Increases in SLR could result in building damage, road and utility impacts, as well as loss of property. Impacts may be further exacerbated by the dense development along the coastline, with corresponding elevated property values. The municipalities of Greenwich, Darien, Norwalk, Stamford, and Westport are all potentially vulnerable to both SLR and Storm Surge.

Vulnerable Assets

WCCOG performed geospatial analyses using Geographic Information Systems (GIS) to identify critical assets (by type) potentially impacted by a variety of hazard scenarios. This was performed by overlaying the assets on top of GIS layers like Superstorm Sandy inundation areas; all assets which lie in the mapped hazard areas were flagged and added into a table. Unlike drought and tornados which have equal chances of occurring anywhere in the region, certain areas are more vulnerable to specific hazard types. For example, the coastal area is naturally more susceptible to sea level rise than its inland counterparts. The results of the geospatial analyses, including type of hazard and corresponding asset impacts, are presented in Table ES-3.3.

Additional information regarding specific asset types by hazard vulnerability can be found in Section 3.21 of Chapter 3.

ES-4 Mitigation Strategies

The identification and development of activities which channel HMP goals of reducing loss of life, property and economic disruptions are paramount. The resulting mitigation strategies are the lynchpin in taking identified hazard risks and vulnerable areas from previous sections, and mitigating potential future impacts. Structurally, mitigation strategies are organized by the overall goal, refined further through objectives, and finally detailed action items. Figure ES-4.1 depicts the flow from goal to ob-

Table ES-3.3 Vulnerable Assets by Hazard Type

Hazard Category	Darien	Greenwich	New Canaan	Norwalk	Stamford	Weston	Westport	Wilton	Region
FEMA 1% Flood Zone (DFIRM)	1	22	0	17	14	0	19	2	75
FEMA 0.2% Flood Zone (DFIRM)	1	22	0	19	15	0	22	4	83
Hurricane Sandy Inundation Zone	1	18	0	17	6	0	12	0	54
Category 1 Hurricane (SLOSH)	0	15	0	9	0	0	5	0	29
Category 2 Hurricane (SLOSH)	1	21	0	22	0	0	12	0	56
Category 3 Hurricane (SLOSH)	1	27	0	34	24	0	16	0	102
Category 4 Hurricane (SLOSH)	3	30	0	42	28	0	22	0	125
Max Snow Depth greater than 24"	0	0	2	140	0	12	79	33	266
WildFire Urban Interface	0	16	12	2	21	0	7	11	69

Source: WCCOG, FEMA, NOAA, SLOSH, USGS, NCDC

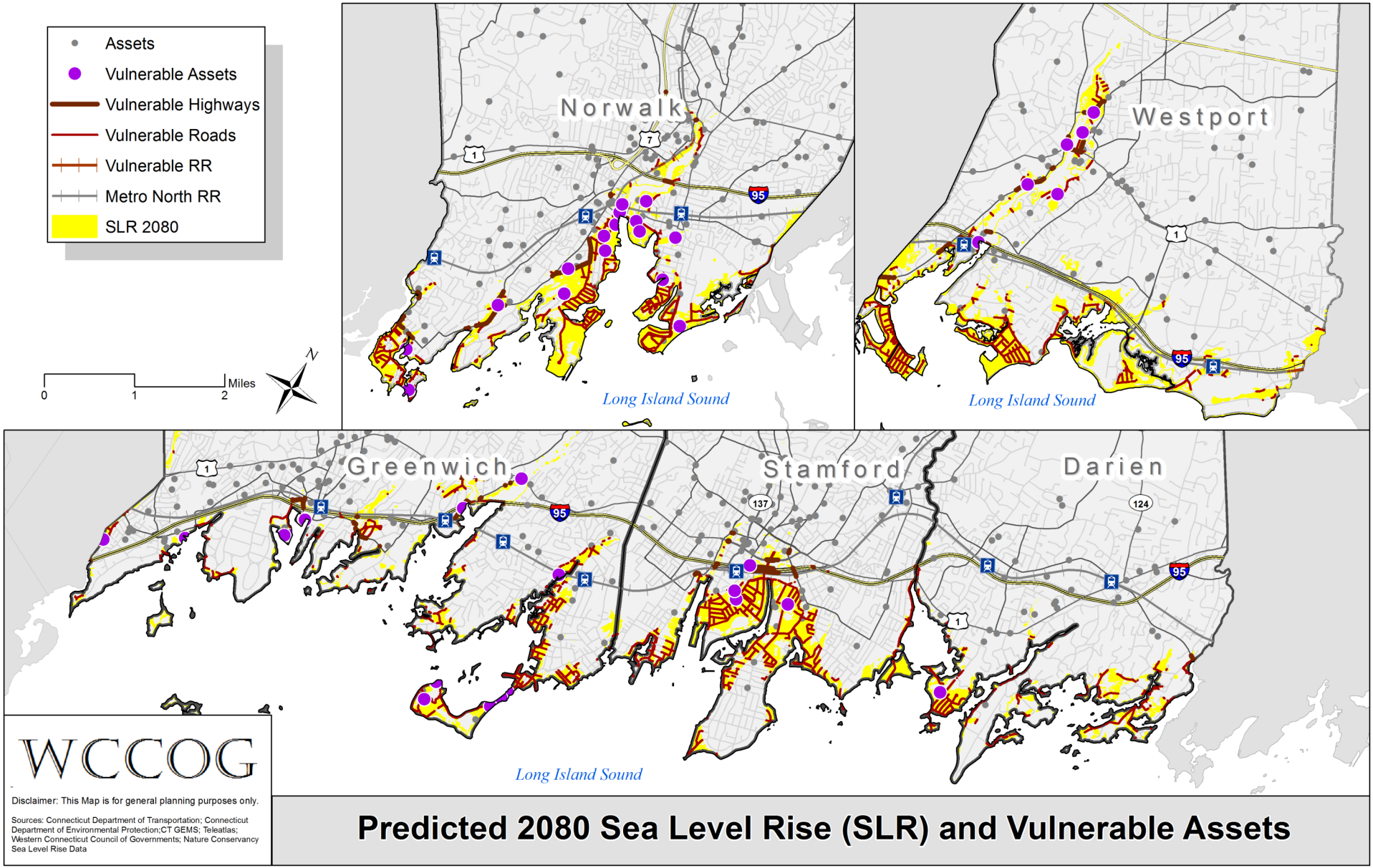
Table ES-3.4: Vulnerable Assets in Region from Sea Level Rise (SLR)

Impacts from SLR	Assets (count)	Railroads (# locations)	Vulnerable Roads (miles)	Vulnerable Arterial Roads / Highways (miles)	SLR Inundation Area (sqml)
2020 SLR	11	17	46.4	1.7	2.7
2050 SLR	20	17	49.2	2.6	3.3
2080 SLR	45	24	81.5	5.1	4.8

Source: WCCOG, CTDOT, TNC

Figure ES-4.1

*Image source: FEMA Location Mitigation Handbook, 2013



Predicted 2080 Sea Level Rise (SLR) and Vulnerable Assets

jective, including examples:

Previous mitigation strategies serve as an integral component to this HMP update. Such efforts are critical and aid in refining each municipality's mitigation strategies, particularly in light recent storm events and experiences gained since the 2011 plan. In addition, priorities can change over a five-year period, thus revisiting previous strategies provides municipal officials the opportunity to reflect on changes in priority. WCCOG met with each municipality and reviewed the 2011 mitigation strategies, revising accordingly. The revised strategies were then rated and prioritized using FEMA's STAPLEE method to determine feasibility and overall effectiveness. Additional and more detailed information on mitigation strategies can be found in Chapter 4.

Regional Mitigation Strategies

Due to the larger geographic impacts of certain hazards in conjunction with shared commonalities among municipalities, many mitigation strategies are better serviced at the regional level. The need for regional mitigation strategies is further bolstered by certain activities requiring coordination with the state and/or federal government, dealings with which WCCOG has expert experience in. Table ES-4.1 illustrates the 2016 South Western Region Hazard Mitigation Strategies.

Municipal Mitigation Strategies

As discussed at the beginning of this section, WCCOG worked intimately with each municipality to reassess their mitigation strategies, which consisted of goals, objectives, and actions. Strategies were revised to reflect current conditions, removing those completed and/or no longer applicable, and adding new strategies, particularly in light of recent event such as Hurricane Irene in 2011 and Superstorm Sandy in 2012. Consistent with federal guidelines, each municipality separately reviewed and revised their own specific mitigation strategies. The revised 2016 municipal strategies chart a course for which municipalities can follow in order to implement appropriate and feasible strategies that will attain the HMP goals and objectives. As with the regional strategies, the municipal counterparts were also rated and prioritized using FEMA's STAPLEE system.

While mitigation strategies vary by municipality and are based on a variety of factors, it is possible to categorize the strategies into more general groupings. Table ES-4.2 provides a snapshot of the strategy types, and the text

below describes the types in more detail. Additional information on specific mitigation strategies and corresponding details can be found in Chapter 4.

Education and Outreach: Projects and actions in this category include measures to inform and educate residents, businesses, elected officials, state/regional/local agencies and institutions, as well as other key stakeholders. Specific types of outreach vary, and include mailings, website postings, public information sessions and workshops, newspaper postings, television/radio interviews, media releases and e-mail correspondence. Additional outreach measures include targeted outreach to specific populations that may be particularly vulnerable and/or at-risk, as well as key neighborhood and community groups. Lastly, actions were also developed to maintain and enhance municipal interdepartmental coordination, helping streamline communication, awareness, and emergency response efforts.

Emergency Preparedness and Response: include actions such as improving coordination with utility companies; maintaining and enhancing communication systems such as severe weather warnings; 911 centers; GIS and emergency mapping applications; trainings and exercises; new facilities and/or equipment such as backup generators, emergency operations center (EOC) improvements, or automated sand baggers.

Prevention: proactive measures conducted in advance of and aimed towards reducing hazard impacts. Prevention actions include regulations and ordinances such as requiring freeboard and other wet/dry flood proofing measures in flood zones; encouraging resiliency efforts such as elevating homes, implementing low impact development (LID) to control stormwater runoff and reduce impervious surface area.

Structural Projects: include activities to strengthen and harden facilities against natural hazards; acquiring property within the flood zone; maintenance activities such catch basin cleaning/dredging; in addition to constructing larger culverts and/or new drainage systems.

Table ES-4.1: Summary of 2016-2021 Mitigation Strategies by Type

	Education and Outreach			Emergency Preparedness and Response					Prevention				Structural and Other Physical Projects				Natural Resource Protection		
Mitigation Strategies	Informational Public Outreach	Targeted Public Outreach	Intra-municipal Coordination and Outreach	Improve Coordination and Working Relationships	Develop/Improve/Maintain Notification/Warning and Communication Systems	Integrate/Expand/Maintain Emergency Software and Mapping Capabilities	Trainings and Exercises	New/Upgraded Facilities/Equipment	Identfy/Assess Risks and Vulnerabilities	Identify/Assess/Protect Vulnerable Populations and Assets	Enhance/Strengthen Planning, Zoning, Building and Development Regulations	Encourage/Require Resiliency Techniques to Properties in Hazare Prone Areas	Property Acquisition/Relocation	Improve Drainage, Culverts, Roads, and Bridges (including Maintenance)	Protect/Improve Utility Infrastructure	Harden/Strengthen Critcial Assets	Encourage/Incorporate Best Management Practices to Reduce Hazard Impacts	Tree Management and Maintenance	Implement/Maintain Natural Mitigation Systems
Darien	✓	✓	✓		✓	✓	✓		✓	✓	✓	✓		✓	✓	✓	✓		✓
Greenwich	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓
New Canaan	✓	✓		✓	✓			✓	✓	✓			✓	✓	✓	✓		✓	
Norwalk	✓	✓		✓	✓		✓	✓	✓	✓				✓	✓	✓	✓	✓	
Stamford	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Weston	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Westport	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Wilton	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
Region	✓	✓	✓	✓	✓	✓	✓		✓	✓							✓	✓	

Table ES-4.2: Synopsis of 2016-2021 Regional Mitigation Strategies

Goal: Reduce the loss of life, property, and economic disruptions as a result of natural hazards.

Objective 1: Provide/Assist with education and outreach efforts to municipalities, stakeholders, and the public

Mitigation Actions:

1.1	Work with Municipalities, DEMHS, and the Red Cross to continue shared/regional sheltering locations.
1.2	Work with local municipalities to identify and coordinate desired training, exercise, and workshop programs that may be beneficial to the region and its municipalities.
1.3	Perform/assist with outreach and other project efforts for the public regarding hazards and emergency preparedness, including vulnerable populations

Table ES-4.2

Objective 2: Provide Planning and Technical Assistance to the Region and its Municipalities	
Mitigation Actions:	
2.1	Work with the State, Region, and local municipalities to enhance the Debris management plan to ensure its usefulness.
2.2	Work with municipalities and DEMHS to develop shelter-specific evacuation routes for a variety of storm scenarios. Document the results in a planning document. Encourage the state to evaluate large-scale evacuation scenarios for CT that includes a
2.3	Work with municipalities to maintain and implement the Regional HMP, conducting updates every five years.
2.4	Initiate Phase 2 of the DEMHS R1 Emergency Evacuation Planning and Needs Assessment. Explore the feasibility of evacuation routes and transportation modes in Region relative to natural hazards, potentially including identification of hazard-prone areas along key routes and associated access issues (i.e. transportation suitability analysis). Assess vulnerable assets from HMP and develop a short-list of feasible mitigation measures to explore for implementation
2.5	Explore and develop a regional communications plan. Includes communications, sharing resources, identifying common strengths, weaknesses, and vulnerabilities. Identify opportunities to mitigate weaknesses and vulnerabilities.
2.6	Conduct a tree damage vulnerability analysis and assess susceptibility of critical assets and infrastructure.
2.7	Peform a watershed health analysis to scan region's watersheds, including area land use types and impervious area. Results will help determine vulnerable areas based on flow regime and storm runoff.
2.8	Support the development and maintenance of the ESF-7 Asset Inventory. Explore opportunities to sustain inventory, and the potential development of an associated plan.
2.9	Assist with projects and efforts that involve two or more participating municipalities, and other regional incentives, where desired. For example: a regional communications/dispatch center; a plan identifying interfaces with WebEOC, Veochi, GIS and other software applications.
2.10	Continue to identify and asses critical assets and region. Work with municipalities and DEMHS to identify opportunities to mitigate critical assets and infrastructure against natural hazard impacts

Objective 3: Support federal, state, and municipal efforts with respect to hazard mitigation	
Mitigation Actions:	
3.1	Continue the development and maintenance of a regional website with emergency management information (i.e. DEMHS site that can be linked to).
3.2	Participate in the development/update of the state emergency preparedness plans.
3.3	Continue to work to have an Army Corps of Engineers Reconnaissance Study conducted of the Region's rivers and streams.
3.4	Explore opportunities to secure technical assistance for Hazard Mitigation Grant Program (HMGP) applications (i.e. home elevation grants)
3.5	Create and maintain a regional stormwater clearinghouse to assist municipalities with stormwater BMPs, appropriate mitigation techniques, and regulatory compliance.

Natural Resource Protection: are noninvasive techniques to mitigation against natural hazards while concurrently retaining and restoring the areas natural functions. Examples include the installation of rain barrels and gardens to reduce flooding; encouraging and educating private property owners on proper stream channel clearing; as well as removing dead and diseased trees.

ES-5 Plan Maintenance

As a living document, the importance of keeping the plan current is crucial. Over time, changes to hazards, available information and data, as well as actions and priorities tend to occur, which may require plan adjustments. Such "real-time" adjustments help aid in keeping the HMP both current and relevant.

The HMP Advisory Committee will coordinate and convene annual plan reviews to assess overall implementation, difficulties/challenges, and any departures from what is currently captured in the HMP. As official HMP liaisons to their respective municipalities, municipal advisory committee members will also concurrently conduct annual outreach to each municipality, while also partaking in the regional discussion. Additional meetings will convene prior to and following an area natural hazard event, as appropriate.

With respect to actual details, the following elements from the plan will be carefully reviewed at the aforementioned meetings:

- Assess overall plan implementation progress;
- Evaluate specific sites and areas vulnerable to natural hazards:
  - Including all critical assets and infrastructure
  - Identify cost-effective mitigation measures to benefit these areas;
- Summarize mitigation strategies that have taken place;
- Monitor plan and effectiveness of remaining mitigation strategies;
- Review and adjust overall goals and mitigation strategies (where applicable)

Table ES-5.1 highlights the proposed schedule from 2016 to 2021.

Additional information on the HMP and natural hazard mitigation planning can be found at WCCOG's website: http://www.swrpa.org/default.aspx?Regional=268 *INSERT NEW WCCOG WEBSITE LINK HERE, ONCE READY*

Table ES-5.1: Schedule for 2016-2021 HMP Update

	2016				2017				2018				2019				2020			
2016-2021 Plan Approval and Adoption																				
FEMA Review & Approval	●	●	●																	
Local & Regional Adoption			●	●	●															
Plan Distribution			●	●	●															
Plan Monitoring and Implementation																				
Annual Reviews & Updates						●				●				●				●		
Public Involvement						●				●				●				●		
HMP Update Process																				
Apply for Grant Funding							●													
Regional Board Approval							●													
Municipal Approval(s)							●													
HMP Development																				
Critical Assets & Infrastructure Update									●	●										
Risk Assessment Update										●	●	●	●	●	●					
Mitigation Strategies Update												●	●	●	●	●	●			
Document Preparation & Revisions														●	●	●	●	●	●	●
Public Involvement										●			●		●	●	●	●	●	●

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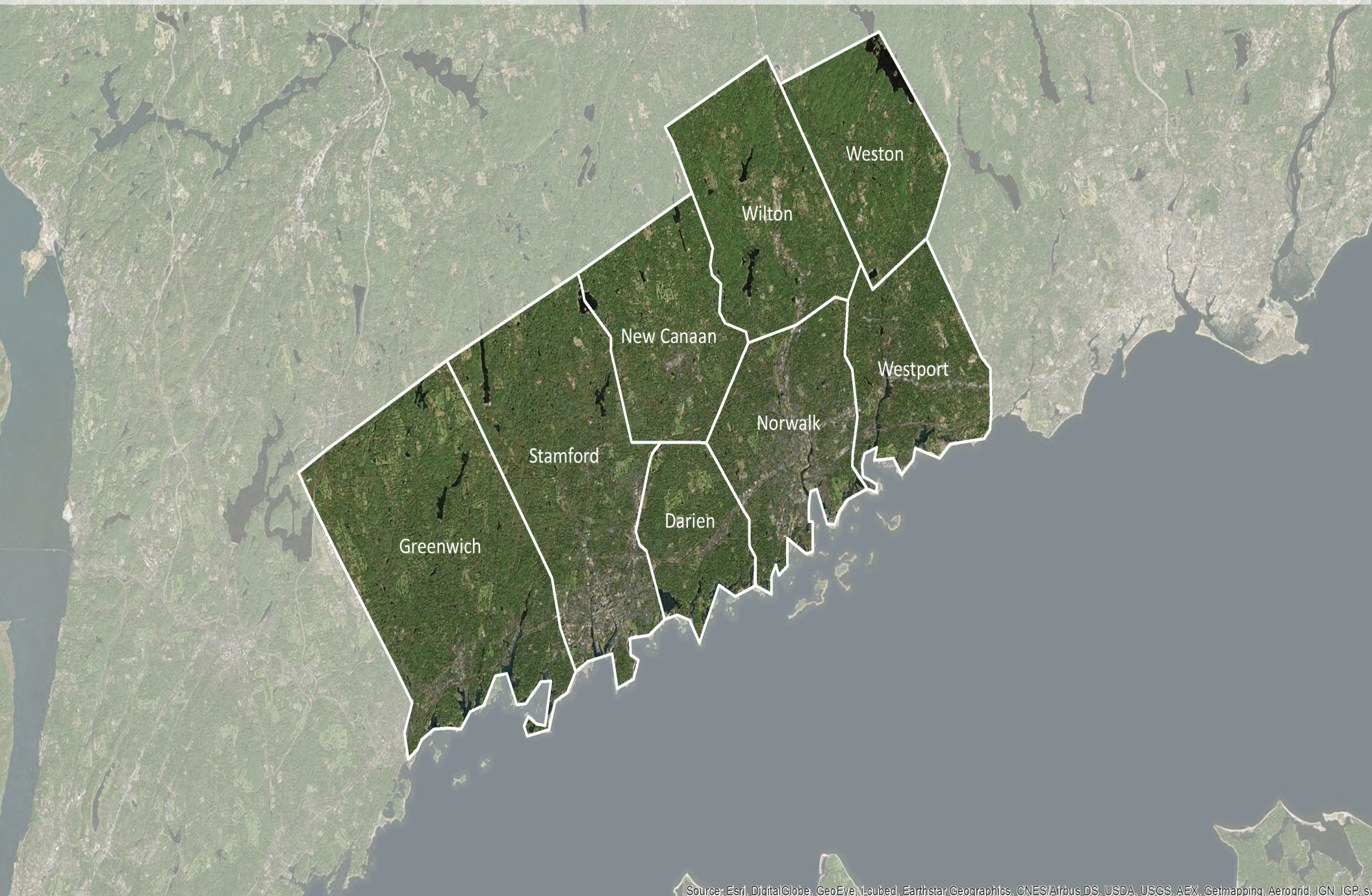
1.0 Introduction & Regional Overview



1.0 Introduction and Regional Overview

The South Western Region (SWR)

1.1 Background and Purpose:

The purpose of the 2016 South Western Region Hazard Mitigation Plan Update (HMP) is to identify natural hazards and associated risks, existing area capabilities, as well as implementation measures that will effectively reduce the loss of life and property. The HMP also serves to limit human suffering, economic disruption, and disaster assistance costs from natural disasters. These efforts directly correlate with the purpose of the Robert T. Stafford Act Disaster Relief and Emergency Assistance Act (Public Law 100-707), as amended by the Disaster Mitigation Act of 2000 (Public Law 106-390). The Disaster Mitigation Act of 2000 (DMA) established a national program for pre-disaster mitigation and helps expedite the administration of disaster relief to impacted areas. A key requirement of the DMA is the need for a FEMA-approved HMP in order to be eligible for Hazard Mitigation Assistance (HMA) funding.

HMA funding is comprised of multiple grant programs, all of which seek to mitigate areas vulnerable to natural hazards. The HMP was prepared in accordance with all applicable guidelines and requirements of the Hazard Mitigation Assistance (HMA) program, including the: Hazard Mitigation Grant Program (HMGP), Pre-disaster Mitigation (PDM), and Flood Management Assistance (FMA) programs. Specific details regarding the aforementioned HMA grant programs are described below and in Table 1.1-1.

Hazard Mitigation Grant Program (HMGP): is authorized under Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act. HMGP provides grants to state and local governments to implement long-term hazard mitigation measures following a major disaster declaration. The purpose of the HMGP is to reduce the loss of life and property due to natural disasters, as well as to enable the implementation of mitigation measures during the immediate recovery from a disaster. A key objective of this program utilizes rebuilding opportunities in order to implement mitigation designs and techniques that will serve to fur-

Table 1.1-1: Eligible Project Activities by Program

Eligible Activities	HMGP	PDM	FMA
Mitigation Projects	✓	✓	✓
Property Acquisition and Structure Demolition	✓	✓	✓
Property Acquisition and Structure Relocation	✓	✓	✓
Structure Elevation	✓	✓	✓
Mitigation Reconstruction			✓
Dry Floodproofing of Historic Residential Structures	✓	✓	✓
Dry Floodproofing of Non-Residential Structures	✓	✓	✓
Minor Localized Flood Protection Projects	✓	✓	✓
Structural Retrofitting of Existing Buildings	✓		
Non-Structural Retrofitting of Existing Buildings and Facilities	✓	✓	
Safe Room Construction	✓	✓	
Infrastructure Retrofit	✓	✓	
Soil Stabilization	✓	✓	
Wildfire Mitigation	✓	✓	
Post-Disaster Code Enforcement	✓		
5% Initiative Projects	✓		
Hazard Mitigation Planning	✓	✓	
Management Costs	✓	✓	✓

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and t

ther HMP goals of protecting life and property in the event of a disaster. Eligible applicants and/or sub-applicants include: State, Local, and Tribal governments, as well as private non-profit organizations[1].

Pre-disaster Mitigation (PDM): Authorized by Part 203 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act. The PDM program provides funding for hazard mitigation planning and the implementation of pre-disaster mitigation projects on an annual basis. The main objective of the program is risk reduction, while concurrently reducing the reliance on federal disaster funding. Eligible applicants include States, Territories, Commonwealths, and Indian Tribal Government; eligible sub-applicants include: State Agencies, Indian Tribal Governments, Local Governments and Communities[2].

Flood Mitigation Assistance (FMA): The FMA program provides funding to projects which reduce or eliminate the risk of flood damage to buildings insured under the National Flood Insurance Program (NFIP), established by congress in 1968. The FMA program was created as part of the National Flood Insurance Reform Act (NFIRA) of 1994, with a long-term goal of reducing/eliminating NFIP claims through the implementation of mitigation measures. The Biggert-Waters Flood Insurance Reform Act of 2012 consolidated the Repetitive Flood Claims (RFC) and Severe Repetitive Loss (SRL) programs into one program. Other changes to the FMA program include: modifications to the definitions of repetitive loss and severe repetitive loss properties; changes in cost-sharing requirements, allowing for additional federal funding towards repetitive flood claims and SLR properties; elimination of in-kind contributions for the non-Federal share. Most recently, changes to the Biggert-Waters Act were implemented via the Homeowner Flood Insurance Affordability Act of 2014, which primarily dealt with flood insurance rates. FMA eligible applicants include: States, Territories, Commonwealths, as well as Indian Tribal Government; eligible sub-applicants include: State Agencies, Indian Tribal Governments, and Local Governments/Communities[3].

1.2 Hazard Mitigation Goals

The origins of the Multi-jurisdictional HMP lie within Section 322 of the Robert T. Stafford Act (Stafford Act), which requires state and local governments to prepare multi-hazard mitigation plans as a precondition for receiving FEMA mitigation project grants. The HMP builds and expands upon previous reports generated in 2005 and 2011, and also helps facilitate inter- and intra-municipal communication with respect to hazard mitigation planning.

Specific goals and objectives of the document include:

- Protecting public safety and preventing loss of life and injury;
- Reducing harm to existing and future development;
- Preventing damage to a community's unique economic, cultural, and environmental assets;
- Minimizing operational downtime and accelerating the recovery of government and business after disasters;
- Reducing the costs of disaster response and recovery, as well as the exposure to risk for first responders; and
- Helping accomplish other community objectives, such as leverging capital improvements, infrastructure protection, open space preservation, and economic resiliency.

Project benefits to Participating Jurisdictions include:

- Identifying cost effective actions for risk reduction;
- Directing resources to the greatest risks and vulnerabilities;
- Building partnerships by involving people, organizations, and businesses;
- Increasing education and awareness of hazards and associated risk;
- Aligning risk reduction with other community objectives; and
- Providing eligibility to receive federal hazard mitigation grant funding.

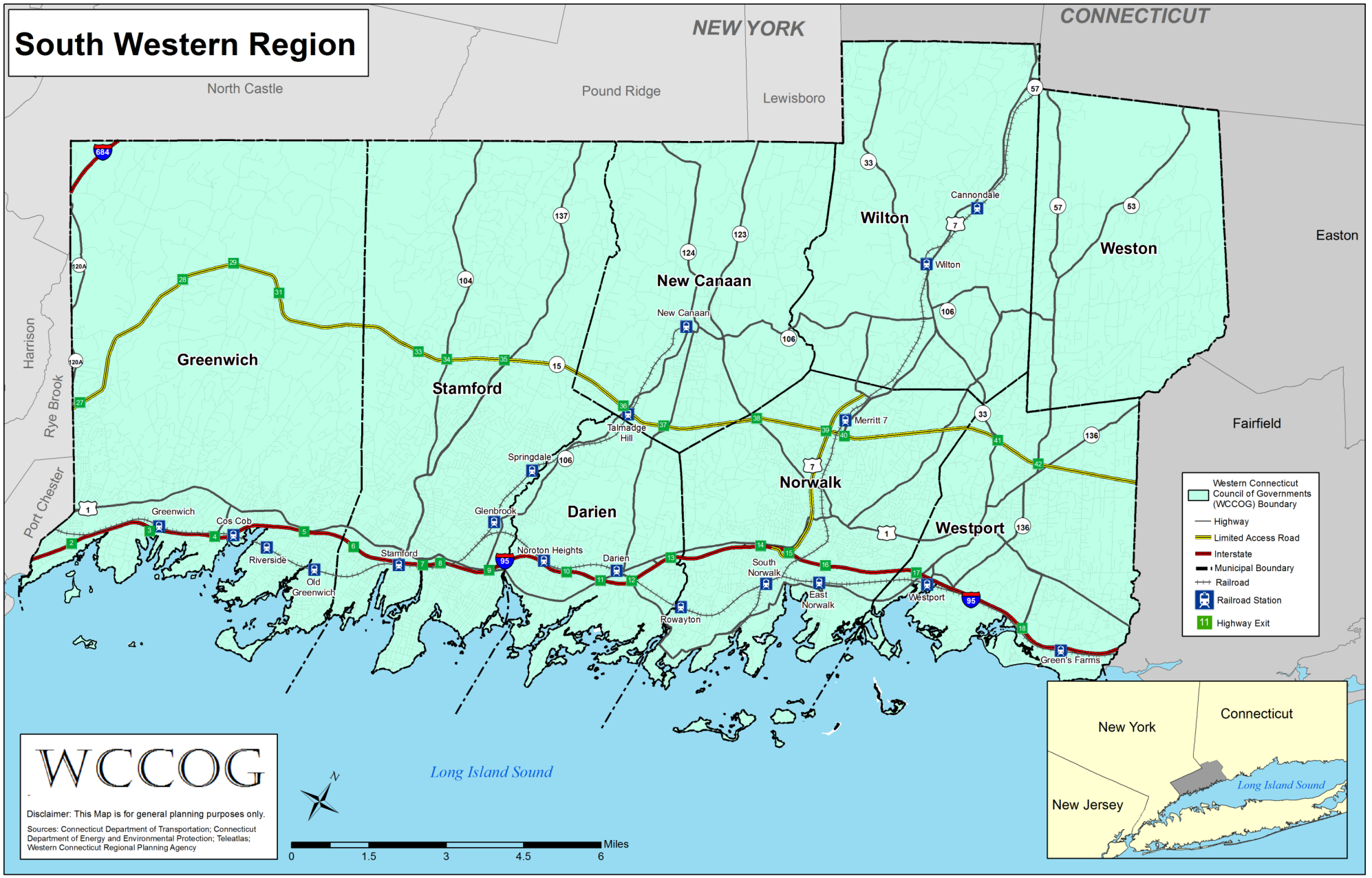
Lastly, the 2016 HMP Update was prepared in accordance with 44 Code of Federal Regulations (CFR) Part 201.6, which provides the regulatory guidelines for preparing local and multi-jurisdictional (more than one municipality) HMP plans.

1.3 Regional Overview

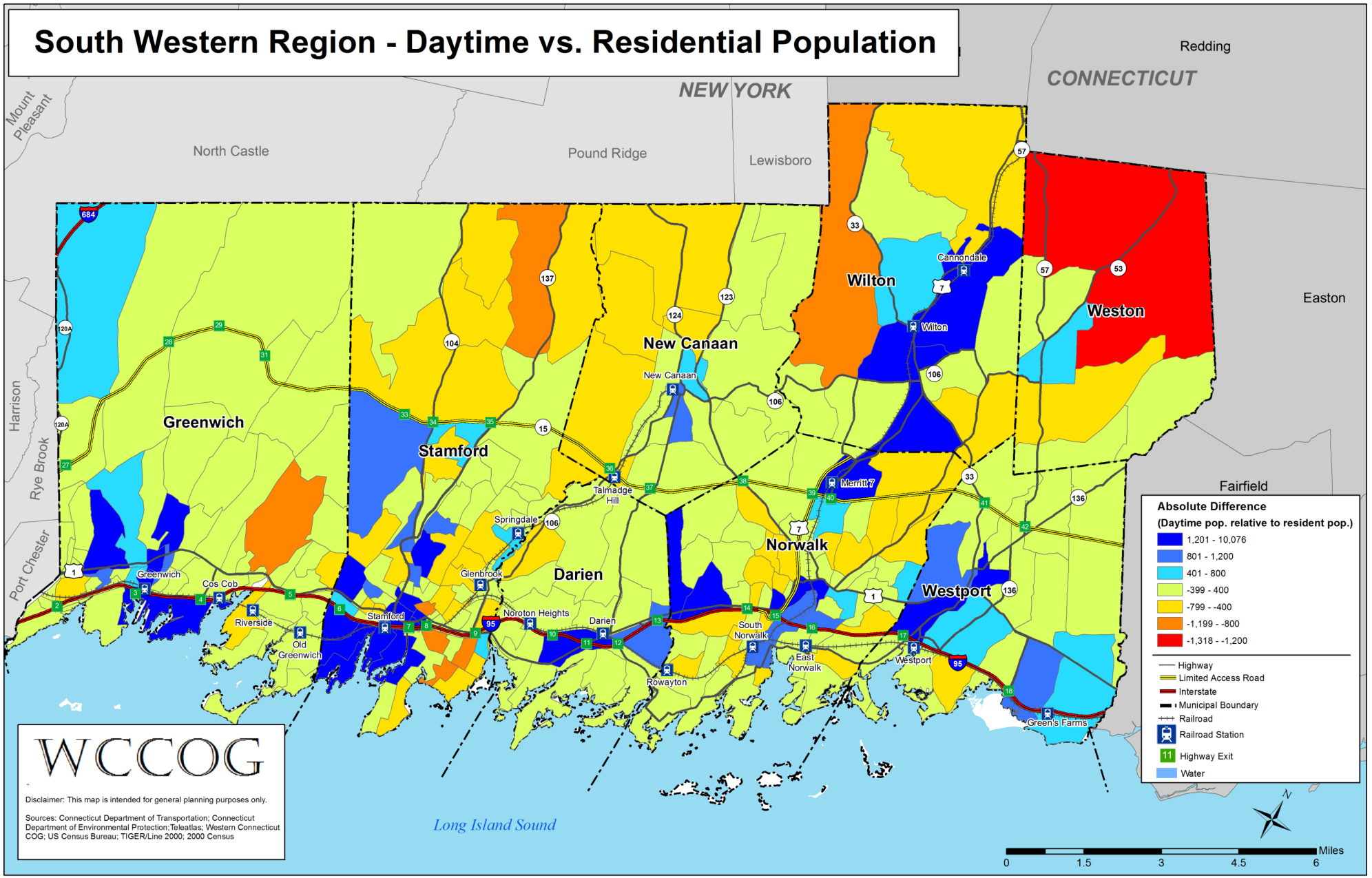
The South Western Region (SWR) is comprised of eight municipalities which form the southwest "panhandle" of Fairfield County, within the State of Connecticut. The municipalities include the: Town of Darien, Town of Green-

Source: Esri, DigitalGlobe, GeoEye, Loubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and t

Figure 1.3-1



Source: Esri, DigitalGlobe, GeoEye, Loubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and t



Source: Esri, DigitalGlobe, GeoEye, Loubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and t

wich, Town of New Canaan, City of Norwalk, City of Stamford, Town of Weston, Town of Westport, and the Town of Wilton. Five of the aforementioned municipalities have direct coastal frontage on Long Island Sound and with the northernmost municipalities less than ten miles inland from the coast, all areas experience a coastal influence. Figure 1.3-1 depicts the geographical extent of the region.

Regional Planning

The eight municipalities lie within the southern portion of the Western Connecticut Council of Governments (WCCOG), the area planning entity that carries out much of the necessary functions at the regional level, including transportation matters. Together the eight municipalities delineate the former boundary of the South Western Regional Planning Agency (SWRPA). The merger of SWRPA with its sister Regional Planning Organization (RPO), the Housatonic Valley Council of Elected Officials (HVCEO), was spurred by Bill Number 6629, "An Act Concerning Regionalism in Connecticut." The state bill mandated the consolidation and geographic re-designation of RPO's, including adopting the Council of Governments (COG) organizational structure. The merger formally took effect on September 10, 2014, when the Secretary Barnes, of the State's Office of Policy and Management (OPM) sent SWRPA and HVCEO formal acknowledgement of the merger.

Population and Housing

The region is one of the most densely populated and heavily developed areas in the State of Connecticut, as evidenced by Table 1.3-1. According to 5-year estimates from the 2012 United States Census American Community Survey, the total regional population is 365,631 persons or approximately 10.4% of the state's total population. Consequently, total land area within the region is 210 square miles, or approximately 4% of the total land area within the state, highlighting the higher population densities found within the SWR.

Table 1.3-1: Population Density by Municipality, Region and State, 2012

Geographic Area	Total Population	Area (Sq. Miles)	Population Density
Darien	20,758	12.9	1609.1
Greenwich	61,428	47.8	1285.1
New Canaan	19,794	22.1	895.7
Norwalk	85,853	22.8	3765.5
Stamford	122,878	37.7	3259.4
Weston	10,203	19.8	515.3
Westport	26,516	20.0	1325.8
Wilton	18,201	26.9	676.6
Region	**365,631**	**210.0**	**1741.1**
Connecticut	3,572,213	4845.1	737.3

Source: U.S Census Bureau, 2008-2012 American Community Survey

The SWR experience a net increase of nearly 6% in total housing units, as depicting in Table 1.3-2. All municipalities mimicked this trend with the exception of Westport, which saw a slight decrease of 24 total units. The area

Table 1.3-2: South Western Region Housing Units - 1990 to 2010

	Total Housing Units				Units in Structure as of 2010				
	1990	2000	2010	1990-2010 % Change	1-unit detached	1-unit attached	2-4 units	5 or more units	% single-family detached
Darien	6,723	6,852	7,032	4.60%	6,284	189	291	275	89.27%
Greenwich	24,195	24,200	24,986	3.27%	15,807	1,551	3950	3212	64.47%
New Canaan	6,953	7,212	7,172	3.15%	5,530	623	603	447	76.77%
Norwalk	33,117	33,186	35,600	7.50%	18,904	1,759	7201	10125	49.76%
Stamford	45,712	47,272	49,518	8.33%	18,909	2,978	9914	17177	38.61%
Weston	3,296	3,488	3,636	10.32%	3,359	30	107	0	96.08%
Westport	10,114	9,989	10,090	-0.24%	9,087	372	411	290	89.44%
Wilton	6,042	6,312	6,247	3.39%	5,361	262	184	364	86.87%
Region	136,152	138,511	144,281	5.97%	83241	7764	22661	31890	57.19%

Source: U.S. 1990, 2000, 2010 Census Bureau

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and t

is largely comprised of single-family, detached housing structures, except in the more urban areas which make up the cities of Norwalk and Stamford. Not surprisingly, these two cities had the lowest percentages of single-family, detached houses. Consequently, both cities experienced the highest concentrations of structures containing five or more units. Additional details on housing characteristics, including median value are provided in Table 1.3-3.

According to the 2006-2010 Census data, 25,794 and 48,366 residents of the SWR worked in Norwalk and Stamford respectively. The remaining municipalities are primarily residential in nature, although all experience an influx of daytime population along the key transportation nodes and corridors, at illustrated in Figure 1.3-2 below. An additional 19,632 commuted to Manhattan for employment, while another 9,587 residents worked in Westchester County. Such work flows into Westchester County, New York City, and the City of Stamford are in part facilitated by the presence of key transportation infrastructure. Such infrastructure includes the MTA Metro-North Railroad, the Merritt/Hutchinson Parkway, as well as Interstates 95 and 287, the latter of which also serves as an artery connecting the cities of White Plains and Stamford, including express bus service provided by CT Transit.

The median value of owner-occupied housing in the Region was $838,688*, nearly three times higher than the statewide median of $285,900. The municipalities of Darien, Greenwich, New Canaan, and Westport all possessed median home values in excess of $1,000,000, although the Census does not provide specific values beyond the $1,000,000 threshold. The five coastal communities all contain property developing directly along the shoreline, with property values here tending to be of greater value than certain inland areas. The results of such high property values, both along the coast and inland, create probabilities of significantly higher monetary losses stemming from natural hazards and as compared with other geographic areas across the state. The proximity of critical transportation infrastructure to coast, including the I-95 and Northeast Rail Corridors – critical to the economies of the Mid-Atlantic and New England Regions, exposes the infrastructure to many coastal hazards and subsequently creates the potential for severe economic impacts within the Mid-Atlantic and New England Regions.

Future projections indicate a continued population growth within the SWR, although at slower rates than in previous decades. The calming of growth within the region can be partially attributed to the highly developed, fairly built out character of the region. Previous development in conjunction with conservation efforts to preserve open space, create limited opportunities for large-scale future development. The economics of limited development opportunities and above average real estate prices has pushed developers to pursue land with steep slopes, wetlands, and other unfavorable conditions which make such developments more susceptible to natural hazards. Commercial developments have also gravitated towards brownfields, abandoned sites, and in-fill properties.

Table 1.3-3: South Western Region Housing Characteristics

Geographic Area	Occupied Housing Units	Owner-Occupied Housing Units	Median Value
Darien	6,627	5,866	$1,000,000+
Greenwich	22,209	15,801	$1,000,000+
New Canaan	6,770	5,485	$1,000,000+
Norwalk	36,717	23,813	$440,700
Stamford	45,196	25,012	$537,300
Weston	3,213	2,996	$906,900
Westport	9,382	8,086	$1,000,000+
Wilton	6,005	5,421	$824,600
Region	**136,119**	**92,480**	**$838,688***
Connecticut	1,360,184	929,560	$285,900

Source: 2008-2012 U.S. Census American Community Survey

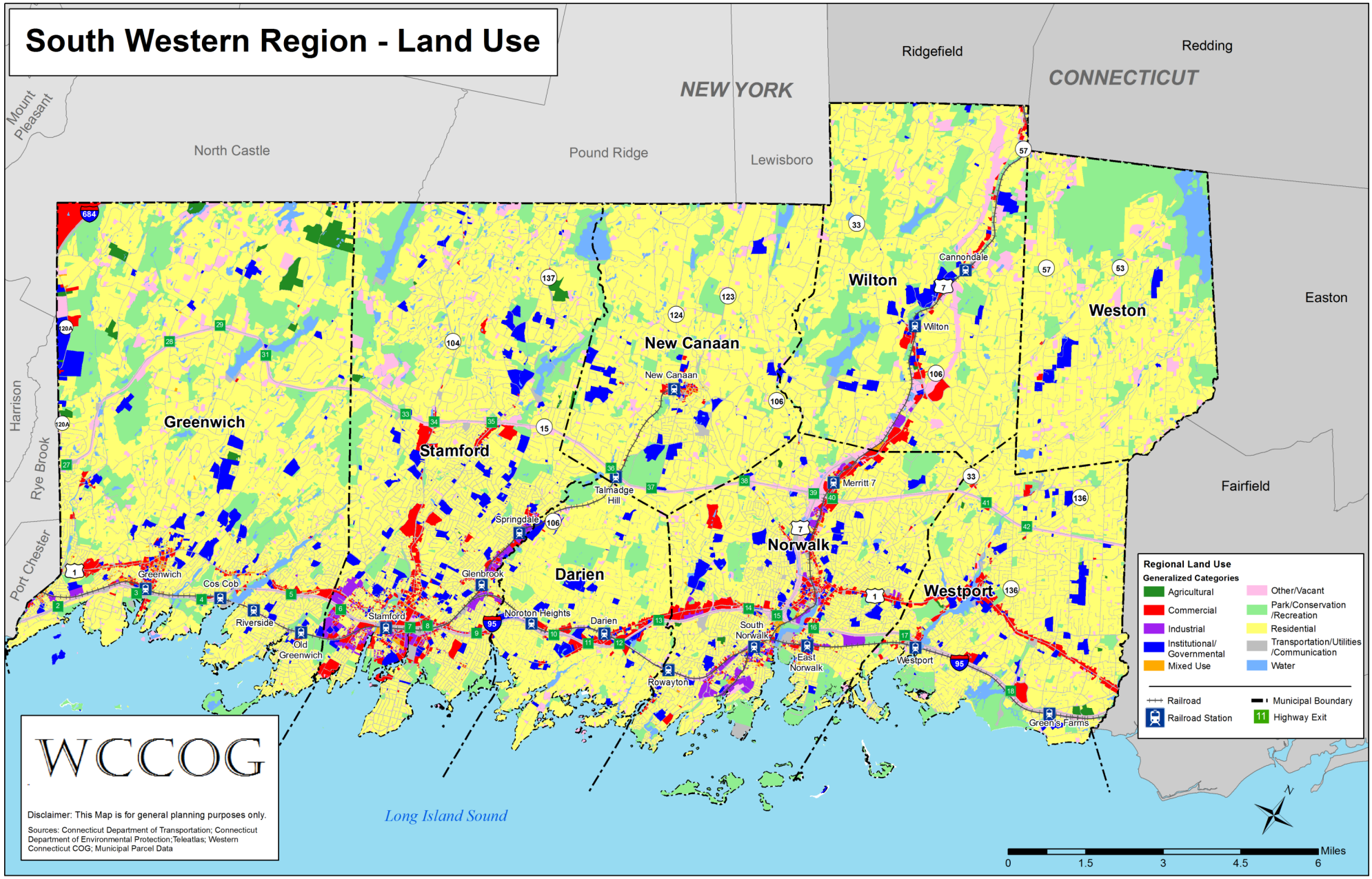
*Since specific median values greater than $1,000,000 were not provided by the Census, $1,000,000 was assumed for Darien, Greenwich, New Canaan and Westport when calculating Regional Median Value

Land Use

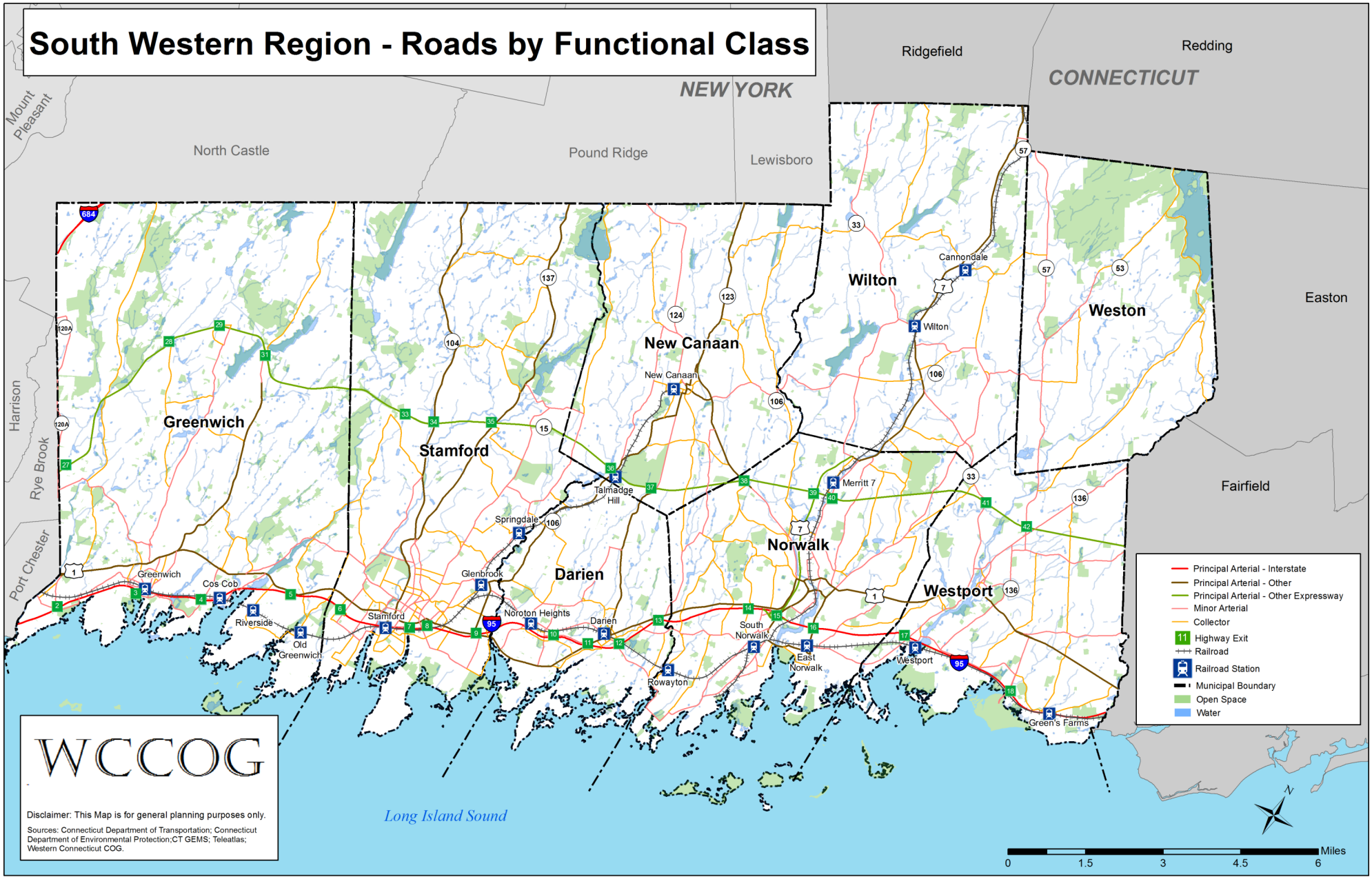
Navigable rivers, miles of coastline and fertile lands influenced both the early growth of the Region's economy and its settlement patterns. Like many other New England cities and towns, the early economy in the SWR was rooted in agriculture. Overtime, port sand commercial hubs developed along the shores of navigable rivers, created opportunities for the export of agricultural goods and the import of other key commodities. Construction of the rail-

Source: Esri, DigitalGlobe, GeoEye, Loubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and t

Figure 1.3-3



Source: Esri, DigitalGlobe, GeoEye, Loubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and t



Source: Esri, DigitalGlobe, GeoEye, Loubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and t

road and roadways connected these ports with inland settlements, further fueling development growth in the SWR. Following World War II, the need for manufacturing promoting population migrations to the cities. After the war, returning veterans created a market for housing and cars. Such advances, in conjunction with the Connecticut Turnpike (I-95) and the Interstate Highway System, resulting in a shift away from the historical emphasis on centralized development and ushered in the dawn of the suburb.

The suburban development patterns that emerged in the 1950s continue today. The characteristics of this development include:

- Separation of residential from industrial and commercial land uses;
- Growing demand for housing, primarily for single-family detached homes outside of urban centers;
- Concentration of commercial uses along major roadways, often near limited-access highways;
- A disconnected street pattern in residential areas with a high number of non-through streets and cul-de-sacs; and
- Increased reliance on automobiles.

A scarcity of available land, high development costs, traffic congestion, the preservation of community character, and heightened awareness of the economic, social, and environmental costs associated with sprawling or inconsistent development patterns have led to the following trends:

- Increased support for "smart growth" policies
- Renewed interest in revitalizing neighborhoods
- Surges in development of new housing, including development of residential rental complexes in urban centers, infill development, substantial renovation of existing older and tract homes, and the demolition of existing smaller homes on large lots to create "McMansions."

As discussed above, the SWR houses a diverse array of economic assets, as evidenced in the grand list data (Table 1.3-4). The region represents a portion of the New York Metropolitan Area, with very strong ties to New York City and neighboring Westchester County. Such proximity to employment and cultural activities is one of its greatest assets. The regions close proximity to New York City (NYC) has assisted in making it a leading economic engine for the State of Connecticut. During the fiscal crises of the 1970s and 80s, many large companies chose to leave NYC and relocate corporate facilities in Stamford. The result was the emergence of Stamford as a significant economic engine, hosting a variety of business industries, including the financial sector. While some have migrated back to NYC, there still exists a strong presence in the SWR. Despite its relatively small geographic size, the region contains over $102 billion in taxable real, personal, and motor vehicle properties. Such high values in conjunction with the proximity to a variety of natural hazards emphasize the importance of hazard mitigation efforts.

Transportation remains a substantial issue within the region and in part contributes to developmental pressure. Traffic volumes on I-95, the Merritt Parkway, Routes 1 and 7, as well as other principal arterial routes continue to grow. Ridership on Metro-North Railroad also continues to grow despite its reliance on dated, unreliable equipment. A burgeoning movement to expand freight traffic along the railroad corridor continues, as increases in congestion persist on the major area highways. Proposed highway and transit projects within the region are expected to generate additional commercial and residential development.

Table 1.3-4 Grand List by Municipality

Municipality	Total Net Grand List (2011)	Residential	Commercial/Industrial/ Public Utility	Motor Vehicle	Personal	Other
Darien	$8,857,408,491	85.9%	7.9%	2.6%	1.8%	1.7%
Greenwich	$30,738,211,554	78.5%	15.0%	2.4%	2.1%	2.0%
New Canaan	$8,251,622,181	89.5%	5.1%	3.1%	0.8%	1.6%
Norwalk	$12,883,677,220	67.3%	21.6%	4.6%	5.6%	0.9%
Stamford	$24,598,526,891	58.8%	33.1%	3.4%	4.7%	0.0%
Weston	$2,656,630,718	93.8%	1.1%	4.4%	0.7%	0.0%
Westport	$9,659,949,393	80.4%	12.2%	3.3%	2.7%	1.4%
Wilton	$5,148,453,180	77.5%	13.7%	3.8%	4.1%	1.0%
Region	$102,794,479,628	74.4%	18.1%	3.2%	3.2%	1.2%

Source: CT Office of Policy and Management (OPM)

Source: Esri, DigitalGlobe, GeoEye, Loubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and t

1.4 Climate and Weather

The eight municipalities of the SWR are classified as a "hot summer continental climate" using the Koppen-Trewartha climate classification system. Such climate classifications are characterized by four well-defined seasons, an average temperature in excess of 50° Fahrenheit (F) during the warmer months, and a coldest month average near or below 26.6° F. The state of Connecticut is divided into three climate divisions: Northwest, Central and Coastal. The SWR primarily falls within the Coastal Connecticut climate division, however the northernmost portions of Wilton and Weston also reside in the Central Connecticut division.

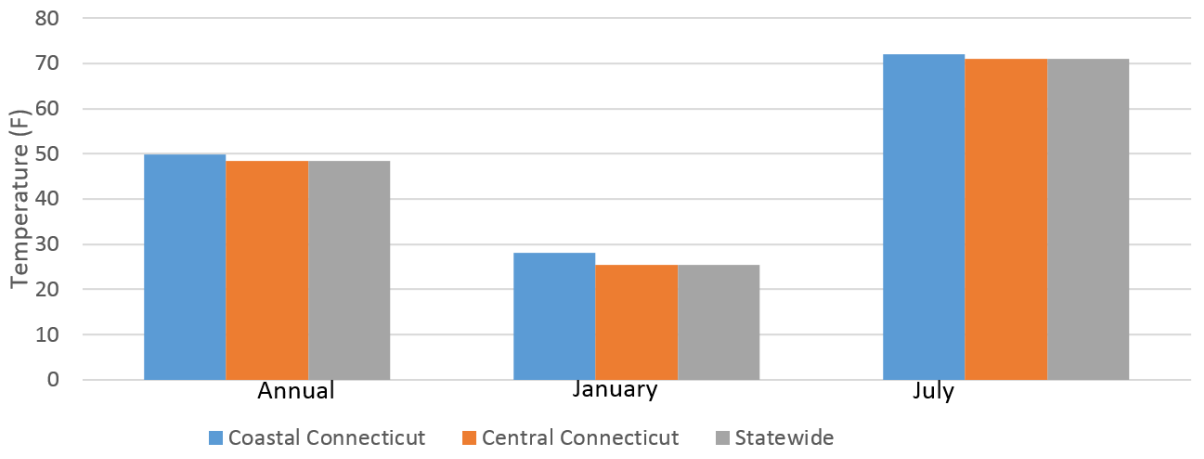
As evidenced by Figures 1.4-1 and 1.4-2, there is little departure between the Coastal and Central climate divisions, when compared against the entire state. Annual temperatures were slightly warmer in the Coastal climate (49.9° F) than the Central (48.4° F) and the state (48.3° F). The slight increase in temperatures within the Coastal climate can likely be partially attributed to the moderating influence of the Long Island Sound, which tends to also keep the area warmer during the winter months. This is consistent with, and likely correlates to warmer January temperatures in the Coastal climate (28.1° F) as compared with Central (25.5° F) and Connecticut (25.5° F).

Average annual temperatures have remained fairly consistent during the 113-year period from 1901 to 2014, with an annual standard deviation of nearly 1.02. It is worth noting that the coldest average annual temperatures occurred consistently prior to 1936. From 1993 until present day, the average annual temperature has consistently been increasing, including a high of 4.4° F above average in 2012. Consequently, the warmest year on record occurred in 2012, with an average annual state temperature of 52.5° F. In contrast, 1904 was the coldest year, with an average temperature of 44.3° F.

Across the state of Connecticut, little to no divergence was experienced with average precipitation values. The driest month occurred in February, with August, conversely, receiving the highest precipitation rates. The results of such data, compiled from 1901-2013 are presented in Figure 1.4-2. The Coastal climate division experienced the lowest average annual precipitation rates (46.65"), with Central (46.91") and Connecticut (47.27") experiencing slightly higher amounts. Unlike the annual averages, the Coastal climate received the highest precipitation amounts during both February and August (3.31", 4.28", followed next by the state (3.26", 4.26") and Central (3.24", 4.22"). The higher monthly averages, in comparison with the lower annual average, indicate that the Coastal Connecticut climate division has more consistent precipitation than Central Connecticut and the state as a whole.

The data indicates precipitation amounts do not vary greatly from month to month, consistent with an annual standard deviation of 2.3038" for the 113 year period from 1901 to 2013. Anomalies do exist, however, for example – a deficit of 16.54" (30.73" total precipitation) was recorded during the year of 1965, while a surplus of 16.42" (63.69" total precipitation) occurred in 2011. Such anomalies in annual precipitation make Connecticut prone to both drought and flood hazards. Flooding is especially of concern when in conjunction with other variables, such as Nor'easters during Fall/Winter months, prolonged coastal rain events in combination with previous icing (rain runoff) or rapid snow melt, as well as in warmer months with intense thunderstorms and/or tropical systems.

Figure 1.4-1: Average Temperature by Climate Division, 1901-2013



Source: National Climatic Data Center

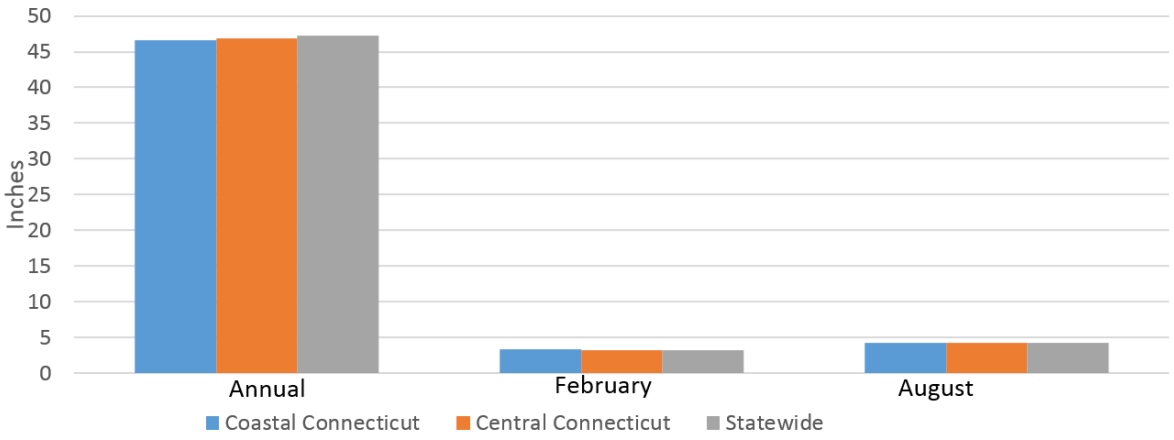
Source: Esri, DigitalGlobe, GeoEye, Loubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and t

Given the four seasons which accompany the area's Koppen-Trewartha climate classification, and the susceptibility of region to a variety of natural hazard events that span the spectrum from: winter snow/ice and extreme cold, to extreme heat, drought and wildfires. Precipitation occurs primarily in the form of rain from April through October, with November through March containing precipitation in the form of rain, freezing rain, sleet and snow. Given the proximity of the area to the warmer, moderating influence of Long Island Sound, it is not uncommon to experience all of the aforementioned precipitation types during singular storm events, depending on storm track.

Freezing rain and wet snow can be particularly disruptive when the weight of accumulated ice and/or can facilitate down tree limbs and/or power lines, in addition to the hazards ice presents to area roads and highways. The dense presence of trees, particularly within inland areas increase changes of adverse impacts/risk to above-ground utilities and the power grid. The region also experiences a wide variety of wind speeds and directions, which are dependent on the diverse weather patterns experienced by the area annually. While infrequent, major hurricanes and tornados have occurred within the area. The most recent hurricane to impact Connecticut was Hurricane Gloria in 1985, although remnants of Hurricane's Irene and Sandy were widely felt within the state.

In summary, the region has four well defined seasons, with hot summers and cold winters. Although the region experiences regular precipitation throughout any given year, anomalies do exist, creating the potential for both drought and flooding, among other hazards. Each natural hazard and its relevance to the eight municipalities within the South Western Region are discussed further .

Figure 1.4-2: Average Precipitation by Climate Division, 1901-2013



Source: National Climatic Data Center

Source: Esri, DigitalGlobe, GeoEye, Loubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and t

2.0 Planning Process

2.0 Planning Process

2.1 Building the Planning Team

2.1.1 Determining the Planning Area and Resources

The planning area for the HMP was defined to include the eight municipalities which comprise the southern portion of WCCOG (formerly SWRPA), which as discussed is Chapter 1, is the regional entity serving as project lead/champion for all efforts. The planning area remains unchanged from the previous reports developed in 2005 and 2011. Rationale for the planning area is highlighted below:

- Capitalizes on existing communication, coordination, and positive working relationships between the municipalities, as well as with WCCOG;
- Promotes inter-municipal coordination, cooperation and assistance for shared hazards, including those that transcend municipal borders. Enables comprehensive mitigation approaches which serve to reduce risks that affect multiple jurisdictions (municipalities);
- Reduces duplication of efforts; and
- Takes advantage of municipal similarities with respect to organizational structures, as well as executive and political processes.

The eight participating municipalities for the HMP Update are as follows:

- Town of Darien
- Town of Greenwich
- Town of New Canaan
- City of Norwalk
- City of Stamford
- Town of Weston
- Town of Westport
- Town of Wilton

2.1.2 The Planning Team

As part of the HMP process, a Memorandum of Agreement (MOA) was executed between the WCCOG/SWRPA and its municipalities (Appendix A-1). In addition to outlining goals, expectations, and responsibilities, each municipal elected official was afforded the opportunity to nominate municipal representatives to serve on the HMP Advisory Committee. The Advisory Committee acts to steer and provide key input regarding plan development, while also serving as municipal liaisons to help obtain crucial information,

Table 2.1.2-1: HMP Advisory Committee Appointees

Municipality	Department	2016 HMP Appointee(s)
Darien	Fire Marshal	Mr. Marc McEwan
	Planning	Mr. Jeremy Ginsberg
Greenwich	Emergency Management	Mr. Daniel Warzoha
	Conservation	Ms. Denise Savageau
	Planning	Ms. Katie DeLuca
New Canaan	Engineering	Mr. Tiger Mann
	Engineering	Mr. Steve Bury
Norwalk	Emergency Management	Chief Denis McCarthy
	Emergency Management	Ms. Michele DeLuca
Stamford	Emergency Management	Captain Thomas Lombardo
	Planning	Ms. Erin McKenna
Weston	Emergency Management	Sergeant Mike Ferullo
Westport	Emergency Management	Chief Andrew Kingsbury
	Planning	Ms. Michelle Perillie
	Conservation	Ms. Alicia Mozian
Wilton	Emergency Management	Deputy Chief Mark Amatrudo
	Emergency Management	Chief Ronald Kanterman
WCCOG	Regional Planning	Mr. Robert Sachnin
	Regional Planning	Mr. Michael Towle

Table 2.1.2-2: HMP Municipal Participants

Municipality	Name	Title	Department
Darien	Mr. Edward Gentile	Director of Public Works	Public Works
	Mr. Jeremy Ginsberg	Director of Planning and Zoning	Planning
	Mr. Marc McEwan	Emergency Management Director/Deputy Fire Marsl	Emergency Management/Fire
	Mr. Darren Oustafine	Assistant Director of Public Works	Public Works
Greenwich	Ms. Katie DeLuca	Director of Planning and Zoning	Planning
	Mr. James Michel	Chief Engineer	Engineering
	Mr. Frank Petise	Senior Engineer	Engineering
	Ms. Denise Savageau	Director of Conservation	Conservation
	Ms. Amy Siebert	Commissioner of Public Works	Public Works
	Mr. David Thompson	Deputy Commissioner of Public Works	Public Works
	Mr. Daniel Warzoha	Emergency Management Director	Emergency Management
New Canaan	Mr. Michael Handler	Emergency Management Director	Emergency Management
	Chief Jack Hennessey	Fire Chief/Deputy Emergency Management Director	Emergency Management/Fire
	Ms. Kathleen Holland	Director of Conservation	Conservation
	Mr. Steven Kleppin	Town Planner/Senior Enforcement Officer	Planning
	Mr. Tiger Mann	Assistant Director of Public Works/Senior Engineer	Public Works/Engineering
Norwalk	Mr. Harold Alvord	Director of Public Works	Public Works
	Ms. Michele DeLuca	Deputy Emergency Management Director	Emergency Management
	Chief Denis McCarthy	Fire Chief/Emergency Management Director	Emergency Management/Fire
	Mr. Mike Yeosock	Senior Engineer	Engineering
Stamford	Ms. Cindy Barber	GIS Coordinator	GIS
	Mr. Louis Casolo	City Engineer	Engineering
	Mr. Ted Jankowski	Director of Public Health, Safety and Welfare	Emergency Management
	Captain Thomas Lombardo	Emergency Management Director/Police Captain	Emergency Management/Police
	Ms. Erin McKenna	Associate Planner	Planning
	Ms. Emily Provonsha	Public Space Planner	Downtown Special Services District
	Ms. Elizabeth Rivera-Rodriguez	Public Health Emergency Response Coordinator	Health Department
	Mr. Richard Talamelli	Environmental Planner	Environmental Protection/Planning
	Ms. Maria Vazquez-Goncalves	Harbor Management Staff	Habor Master
Weston	Mr. John Conte	Town Engineer	Engineering
	Sergeant Mike Ferullo	Police Sergeant/Emergency Management Director	Emergency Management/Police
	Ms. Tracy Kulikowski	Land Use Director	Planning
	Mr. Joseph Lametta	Director of Public Works	Public Works
	Ms. Joan Lewis	Conservation Commission/Planning and Zoning	Conservation/Planning
	Mr. David Pattee	Conservation Planner	Conservation
	Chief John Pokorny	Fire Chief/Marshal	Fire
	Mr. Michael Vincelli	Director of Emergency Response	Health Department
Westport	Mr. Laurence Bradley	Director of Planning and Zoning	Planning
	Deputy Chief Robert Kepchar	Deputy Fire Chief	Fire
	Chief Andrew Kingsbury	Fire Chief/Emergency Management Director	Emergency Management/Fire
	Assistant Chief Michael Kronick	Assistant Fire Chief	Fire
	Ms. Alicia Mozian	Director of Conservation	Conservation
	Ms. Michelle Perillie	Town Planner	Planning
	Mr. Pete Ratkiewich	Town Engineer	Engineering/Public Works
	Mr. Michael Vincelli	Director of Emergency Response	Health Department
Wilton	Deputy Chief Mark Amatrudo	Deputy Fire Chief/Emergency Management Director	Emergency Management/Fire
	Chief Ronald Kanterman	Fire Chief/Deputy Emergency Management Director	Emergency Management/Fire
	Mr. Robert Nerney	Director of Planning and Land Use Management	Planning
	Ms. Patricia Sesto	Director of Environmental Affairs	Conservation
	Mr. Michael Vincelli	Emergency Response Coordinator	Health Department

ensuring all municipal needs/objectives are addressed. Table 2.1.2-1

highlights the formal municipal appointees, the sum of whom comprise HMP Advisory Committee.

In addition to formal appointees and in congruence with HMP goals, other municipal staff were invited to participate in plan development. Their efforts provide additional insight and expertise from their respective subject matters. The results of which created a well-rounded, well thought out project output that considered most, if not all municipal needs and concerns. Table 2.1.2-2 illustrates the additional municipal input received, including corresponding job titles.

2.1.3 Project Meetings

As part of plan development, a series of regional and individual municipal meetings were conducted. Specific details, including meeting dates and participation, are highlight below in Table 2.1.3-1, the corresponding write-up below, and Appendix A-2.

AC-1: On August 14, 2013, the 2011 Advisory Committee met at WCCOG/SWRPA offices to discuss an overview of the 2016 HMP Update, including the importance and roles of the Advisory Committee. The 2011 HMP was reviewed and the group polled for comments regarding: implementation of 2011 strategies; worthwhile additions, enhancements and omissions for the 2016 plan; impacts from recent storm events such as Sandy, Irene and Winter Storm Nemo, including strategies implemented and lessons learned. (Appendix A-2.1)

AC-2: On July 12th, 2014, the updated Advisory Committee was convened at WCCOG/SWRPA offices to discuss the 2016 HMP Update. Agenda items included: 2016 HMP overview; administrative and financial details; local

plan approval; review and updates to the 2011 plan; public outreach strategy, including identification of stakeholders; capability and risk assessment overviews. (Appendix A-2.1)

WPT-1: WCCOG/SWRPA met with Westport municipal representatives on July 1, 2014 to discuss: community capabilities and safe growth audit worksheets; identification of Westport-specific stakeholders and outreach strategy; classifying and ranking natural hazards of concern in town; developing an inventory of critical assets and infrastructure; as well as a status/ implementation update to the Westport portion of the 2011 mitigation strategies. The meeting was held at Westport Fire Headquarters (HQ). (Appendix A-2.8)

GR-1: Greenwich and WCCOG/SWRPA representatives sat down at Greenwich Town Hall on July 11, 2014 to discuss: community capabilities and safe growth audit worksheets; identification of Greenwich-specific stakeholders and outreach strategy; classifying and ranking natural hazards of concern in Greenwich; developing an inventory of critical assets and infrastructure in town; as well as a status/implementation update to the Greenwich portion of the 2011 mitigation strategies. (Appendix A-2.3)

WIL-1: WCCOG/SWRPA and Wilton representatives participated in a Wilton-specific meeting on July 15, 2014, which included: community capabilities and safe growth audit worksheets; identification of Wilton-specific stakeholders and outreach strategy; classifying and ranking natural hazards of concern in town; developing an inventory of critical assets and infrastructure; as well as a status/implementation update to the Wilton portion of the 2011 mitigation strategies. The meeting was held at Wilton Fire HQ. (Appendix A-2.9)

NWK-1: On July 17, 2014 and as part of the City of Norwalk HMP, city representatives and WCCOG/SWRPA organized a meeting at Norwalk Fire Headquarters (HQ) to discuss: community capabilities and safe growth audit worksheets; identification of Norwalk-specific stakeholders and outreach strategy; classifying and ranking natural hazards of concern in town; developing an inventory of critical Norwalk assets and infrastructure; as well as a status/implementation update to the Norwalk portion of the 2011 mitigation strategies. (Appendix A-2.5)

Table 2.1.3-1: HMP Meetings

Date	Municipality/ Jurisdiction	Location	Meeting Code	Appendix
August 14, 2013	Regional	WCCOG	AC-1	A-2.1
June 12, 2014	Regional	WCCOG/Teleconference	AC-2	A-2.1
July 1, 2014	Westport	Westport Fire HQ	WPT-1	A-2.8
July 11, 2014	Greenwich	Greenwich Town Hall	GR-1	A-2.3
July 15, 2014	Wilton	Wilton Fire HQ	WIL-1	A-2.9
July 17, 2014	Norwalk	Norwalk Fire HQ	NWK-1	A-2.5
July 21, 2014	Darien	Darien Town Hall	DAR-1	A-2.2
July 22, 2014	Westport	Westport Town Hall	WPT-2	A-2.8
July 22, 2014	New Canaan	New Canaan Police HQ	NC-1	A-2.4
July 30, 2014	Weston	Weston Town Hall	WTN-1	A-2.7
August 1, 2014	Stamford	WCCOG	STAM-1	A-2.6
August 21, 2014	Westport	Westport Town Hall	WPT-2	A-2.8
August 28, 2014	Greenwich	Greenwich Town Hall	GR-2	A-2.3
September 22, 2014	Regional	WCCOG/Teleconference	AC-3	A-2.1
December 10, 2014	Norwalk	Norwalk City Hall	NWK-2	A-2.5
December 11, 2014	Stamford	WCCOG	STAM-2	A-2.6
December 17, 2014	Weston	Weston Town Hall	WTN-2	A-2.7
December 19, 2014	Darien	Darien Town Hall	DAR-2	A-2.2
December 22, 2014	Regional	DEMHS Region 1 HQ	REG-1	A-2.1
December 24, 2014	Greenwich	Greenwich Town Hall	GR-3	A-2.3

DAR-1: WCCOG/SWRPA met with key Darien municipal representatives on July 21, 2014 to discuss: community capabilities and safe growth audit worksheets; identification of Darien-specific stakeholders and outreach strategy; classifying and ranking natural hazards of concern in Darien; developing an inventory of critical assets and infrastructure; as well as a status/ implementation update to Darien's 2011 mitigation strategies. The meeting was held at Darien Town Hall. (Appendix A-2.2)

WPT-2: On the morning of July 22, 2014, WCCOG/SWRPA and Westport representatives assembled at Westport Town Hall to: finalize 2016 status/ implementation updates to the remaining 2011 mitigation strategies not addressed during the July 1, 2014 meeting; the group next began developing/carrying over, rating, and prioritizing the 2016 mitigation strategies using the STAPLEE priority and feasibility criteria. Additional information on STAPLEE can be found in Chapter 4. Additional information on meeting WPT -2 can be located in (Appendix A-2.8)

NC-1: During the afternoon of July 22, 2014, New Canaan municipal representatives met with WCCOG/SWRPA at New Canaan Police HQ. Meeting topics included: overview of community capabilities and safe growth audit worksheets; identification of New Canaan-specific stakeholders and outreach strategy; classifying and ranking natural hazards of concern in New Canaan; developing an inventory of critical town assets and infrastructure; status/implementation update to the New Canaan portion of the 2011 mitigation strategies, as well as the development and prioritization of 2016 strategies, using the STAPLEE method. (Appendix A-2.4)

WTN-1: On July 30, 2014, WCCOG/SWRPA and Weston officials sat down at Weston Town Hall to discuss the Weston portion of the 2016 HMP, including: community capabilities and safe growth audit worksheets; identification of specific stakeholders and outreach strategy for Weston; classifying and ranking natural hazards of concern in town; developing an inventory of critical Weston assets and infrastructure; as well as a status/implementation update to the Weston portion of the 2011 mitigation strategies. (Appendix A -2.7)

STAM-1: officials from the City and Stamford and WCCOG/SWRPA gathered on August 1, 2014 at WCCOG/SWRPA to discuss hazard mitigation unique to Stamford, as part of the 2016 HMP. Topics discussed at the meeting included: Stamford community capabilities and safe growth audit worksheets; identification of Stamford-specific stakeholders and outreach strategy; classifying and ranking natural hazards of concern within the city; developing an inventory of critical Stamford assets and infrastructure; as well as a status/implementation update to the Stamford portion of the 2011 mitigation strategies. (Appendix A-2.6)

WPT-3: A third meeting on August 21, 2014 was arranged between WCCOG/SWRPA and Westport officials to continue efforts towards the prioritization of 2016 mitigation strategies using STAPLEE. The meeting was held at Westport Town Hall. Following the meeting and with unfinished 2016 strategies, Westport officials were tasked with finalizing the strategies and submitting to WCCOG/SWRPA, which was subsequently completed. (Appendix A-2.8)

GR-2: On August 28, 2014 second meeting between Greenwich and WCCOG/SWRPA officials commenced at Greenwich Town Hall. Topics for discussion included: status update to Greenwich critical assets inventory, as well as capability assessment and safe growth audit worksheets. The participants next initiated the effort of rating and prioritizing 2016 mitigation strategies. Following a significant effort to prioritize strategies using STAPLEE, and with limited results, Greenwich decided to revisit their 2016 strategies, and everyone felt it was best to revisit the 2016 strategies at a later date. (Appendix A-2.3)

AC-3: a well-attended Regional meeting was summoned on September 22, 2014 at WCCOG/SWRPA offices and telephonically. The two primary purposes of the meeting were to: brief the region on the project status, including the results of the individual municipal meetings, completed and remaining tasks, key priorities and associated time lines; as well as to discuss details the proposed Nature Conservancy (TNC) Workshops, which includes a public element, and provided a forum for each municipality to collaboratively assess risk and vulnerabilities within their jurisdictions, as well as identify, develop, and prioritize additional mitigation strategies, while also noting commonalities within the region. (Appendix A-2.1)

NWK-2: City of Norwalk officials and WCCOG/SWRPA convened on Decem-

ber 10, 2014 to finalize 2016 mitigation strategies and prioritize them using FEMA's STAPLEE method. The meeting was held in the Public Works offices, at City Hall. The meeting also included a brief discussion of the city's capabilities with respect to hazard mitigation. (Appendix A-2.5)

STAM-2: On December 11, 2014, City of Stamford representatives and WCCOG met to finalize the city's 2016 mitigation strategies and prioritize them using FEMA's STAPLEE method. The meeting was held at WCCOG offices and also included a brief discussion of Stamford's capabilities with respect to hazard mitigation. (Appendix A-2.6)

WTN-2: representatives gathered at Weston Town Hall on December 17, 2014 to finalize the town's 2016 mitigation strategies using FEMA's STAPLEE method. The meeting also included a brief discussion of Weston capabilities with respect to hazard mitigation. (Appendix A-2.7)

DAR-2: Town of Darien and WCCOG staff worked to finalize Darien's 2016 mitigation strategies and prioritize them using FEMA's STAPLEE method. The meeting was held on December 19, 2014 at Darien Town Hall. (Appendix A-2.2)

REG-1: WCCOG traveled to DEMHS Region 1 headquarters in Bridgeport to discuss important mitigation strategies for inclusion in the multi-jurisdictional HMP, specifically as it pertains to emergency management and associated logistics. Once the 2016 mitigation strategies were identified, they were prioritized using FEMA's STAPLEE rating methodology. The meeting output was shared with the regional Advisory Committee members for proper vetting and any associated edits. The meeting was conducted on December 22, 2014. (Appendix A-2.1)

GR-3: The third and final pre-draft HMP Greenwich meeting was convened at Greenwich Town Hall on December 24, 2014. The purpose of the meeting was to finalize the town's 2016 mitigation strategies, which utilized FEMA's STAPLEE method. The meeting also included a discussion of Greenwich capabilities with respect to hazard mitigation. (Appendix A-2.3)

2.2 Outreach Strategy

Throughout the plan development, effective outreach to municipalities, neighboring communities, local and regional agencies involved in hazard mitigation, all other stakeholders, and the public was utilized whenever and wherever possible. The WCCOG/SWRPA website served as the springboard for all project information, however media releases, newspaper articles, online surveys, and e-mail correspondence were frequently leveraged to provide useful outlets of project information to the masses. The outreach format was comprised of three tiers, classified accordingly based on the appropriate level of involvement, discussed and vetted through the HMP Advisory Committee. Such classifications are detailed more thoroughly in the sections below:

2.2.1 Advisory Committee and Municipalities

The importance of the HMP to serve as a regional and municipal resource helped drive outreach efforts. As discussed above in Section 2.1.2, the HMP Advisory Committee, which consisted of municipally-appointed staff and key stakeholders, served as the frontline for project efforts. The AC leveraged their existing knowledge and experience in hazard mitigation to help drive and steer plan development, while also ensuring all critical information from their jurisdictions were appropriately captured. In addition to regional meetings, separate and distinct individual municipal meetings were held during the summer, fall, and winter of 2014. The purpose of such meetings were to actively involve as many municipal departments as possible, seeking highly localized and detailed information not otherwise possible to capture during regional meetings. Specific participants for each municipality are provided above in Table 2.1.2-2. Frequent briefings, updates and solicitation of input were also conducted for each municipality and the region, utilizing existing forums and outlets. Such outlets included briefings with: elected officials at Metropolitan Planning Organization (MPO) meetings; key municipal staff at Transportation Technical Advisory Group (TTAG) and DEMHS emergency support function (ESF) meetings; area watershed and environmental groups; as part of the four hazard mitigation workshops conducted in the region; and other meetings. Further outreach efforts also involving each municipality are detailed below in the appropriate sections and include stakeholders, as well as the general public.

2.2.2 Stakeholders and Public Involvement

In order to better facilitate mitigation planning in the SWR, key project stakeholders were identified by the Advisory Committee during the June, 2014 project kickoff meeting. Additional stakeholders were identified for each municipality as part of the series of individual, municipal-specific meetings. Specific municipal-identified stakeholders can be found in Appendix A-2. FEMA defines stakeholders as individuals or groups that are affected by a mitigation action or policy and include businesses, private organizations and citizens alike. Unlike advisory committee members, stakeholders may not always be involved in all stages of the planning process, but serve to inform the planning team on a specific topic, or provide input from different points of view in the community[1]. Stakeholders involved in the 2016 HMP Update included, but were not limited to: local and regional agencies involved in hazard mitigation activities; agencies with the authority to regulate development; neighboring jurisdictions; as well as businesses, academia, other private and nonprofit interests.

The participation of area stakeholders was instrumental to the project planning process. Such stakeholders were frequently kept abreast of project activities via regular e-mail notifications of project milestones. They were also provided the project website link and frequently reminded of its location, where project materials and notifications, including meeting summaries, were posted. Stakeholders were also invited to participate in plan development during four hazard mitigation workshops within the region, conducted jointly between WCCOG and The Nature Conservancy (TNC). Furthermore, area stakeholders and the general public were also provided opportunities to comment on the plan during four municipal public information sessions for both draft and final plans, each occurring during the necessary 30-day public review period. Specific details regarding the workshops, public meetings, and other forms of outreach are provided in more detail in Section 2.2.4 “Public Involvement” below.

Lastly, planning process involvement opportunities were extended to neighboring communities, local and regional agencies involved in hazard mitigation activities, agencies with the authority to regulate development, and other interests (Appendix A-3). These additional stakeholders were recruited and briefed on project wherever possible, including DEMHS Region 1 Regional Emergency Planning Team (REPT), DEMHS Emergency Support Functions (ESF) 1-Transportation, 5-Emergency Management Directors, 6-Mass Care, 8-Public Health, 11-Animal Care, and 16-CERT. Stakeholders typically found at the aforementioned meetings include, but are not limited to: Hospital staff, American Red Cross, Public Health officials, Community and Faith-based Organizations, Community Emergency Response Teams (CERT), Transportation and Transit Districts, Emergency Medical Staff, Private Sector/ Business, as well as local and state Emergency Management officials.

WCCOG/TNC Workshops

Throughout the HMP development, the region utilized every opportunity to intersect with and inform stakeholders of project activities and progress. The four workshops with TNC provided critical opportunities for municipal staff, key stakeholders and the public alike to come together and discuss hazard vulnerabilities and resiliency/mitigation efforts in their respective municipalities. In addition to key regional and municipal stakeholders, neighboring communities, local and regional agencies involved in hazard mitigation activities, and others were invited to participate in the workshops. Invitations were also sent to members of the general public, and the media. The workshops served to provide a diverse and representative cross-cut of each municipality, with participants each possessing different backgrounds and roles within the community. Such participation provided unique insight with respect to hazard mitigation. For example, the workshops provided unprecedented opportunities for municipal staff, various commissions and boards, the general public, utility companies, as well as state legislators and agencies to unite in order to identify hazards of concern, vulnerable areas, and opportunities to mitigate such hazards. A table describing workshop participants can be found in the paragraphs below, and sign-in sheets are provided as part of Appendix A-3.2.

The workshops also served to provide an active forum with which suggestions and feedback could be aggregated and incorporated into the HMP in real time. Each municipality will also be provided a summary report prepared by TNC, recapping their specific workshop, helping cast a wider net by informing those who could not attend the workshops. Upon completion and municipal vetting, all summary reports will likely be posted on WCCOG’s website, to further ensure critical information and results are conveyed to

the general public. The structural components of the workshops are provided below:

Introduction: on September 22, 2014 and as part of meeting AC-2, representatives from all municipalities were invited to participate in a discussion regarding the format of the workshops. All details such as workshop location/geographies, invitees/participants, and subject matter were discussed with Dr. Adam Whelchel and Ms. Amanda Ryan, both of TNC. Following the discussion, participant questions and comments were addressed, which were then incorporated into the workshop format, where applicable. Following this, the municipal lists of key staff, stakeholders, and general public were finalized. Meeting invites were prepared and later on distributed. Samples of municipal invites are provided in Appendix A-3.2.

Objectives: the following bullet points represent key objectives sought as part of the WCCOG/TNC workshops:

- *Understand connections between ongoing community issues, hazard, and local planning/mitigation processes in your municipality and region.*
- *Evaluate strengths and vulnerabilities of residents, infrastructure and natural resources to hazards.*
- *Identify and map vulnerabilities and assets and develop infrastructure, societal and natural resource risk profile.*
- *Develop and prioritize actions for your municipality, local organizations, businesses, private citizens, neighborhoods, and community groups.*
- *Identify opportunities to advance actions that further reduce the impact of hazards and increase resilience in your municipality and the region.*

Workshop Components: the bullets below highlight the structural components contained within the WCCOG/TNC Workshops:

- Welcome and Opening Remarks
- Overview and recap of HMP and progress to date, including: remaining objectives, relevance to municipalities and region.
- Overview and Instructions for Workshop objectives
- Small Group Breakouts:
    - Participatory Mapping Exercise: participants markup maps identifying key assets and vulnerable areas
    - Roadmap/Risk Matrix: groups identify hazards of concern, develop infrastructure, societal, ecological profiles and corresponding mitigation strategies
- Top mitigation strategies identified are prioritized using FEMA's STAPLEE method, including responsible part, estimated cost and time line, as well as funding source.
- Small Group Report-Outs: brief presentation on small group dialogue, based on small group breakout and risk matrix
- Open Facilitated Discussion: Commonalities, Plans, Actions
- Wrap-up and Next Steps

Consistent with federal guidance, each municipality was provided a forum to discuss, identify, and capture specific hazard mitigation components for their respective municipalities. Although there were four workshops covering eight municipalities, participating communities at the "cluster" workshops were provided their own table(s) so members could first identifying their individual community hazards of concern, vulnerabilities, and mitigation strategies. Towards the end of the workshop, each community reported their findings to the group, and "regional commonalities" were identified, where applicable.

Workshop #1: November 17, 2014 - New Canaan, Wilton and Weston; Wilton Town Hall

Workshop #2: November 24, 2014 - Darien, Norwalk, Westport; Norwalk City Hall

Workshop #3: December 1, 2014 – Stamford; Stamford Government Center

Workshop #4: December 18, 2014 – Greenwich; Greenwich Town Hall

Results, including listings of participants and workshop outputs can be found in Appendix 3.2.


New Canaan-Wilton-Weston Hazard Mitigation Workshop
November 18, 2014
Wilton, Weston, New Canaan
Hazards and Community Resilience
Workshop
Photo Credits: Dr. Margaret Wirtenberg; WCCOG


Darien-Norwalk-Westport Hazard Mitigation Workshop
November 24, 2014
Photo Credits: WCCOG


Stamford Hazard Mitigation Workshop
December 1, 2014
STAMFORD GOVERNMENT CENTER
Photo Credits: WCCOG


Greenwich Hazard Mitigation Workshop
December 18, 2014
Greenwich
Hazards and Community Resilience
Workshop
TOWN OF GREENWICH CONN
SEAL
Photo Credits: WCCOG

Natural Hazard Mitigation Survey

As part of the regions continued yet varied approach to public outreach. A Natural Hazard Mitigation Survey was created and released to the media, for distribution to the mass public. The survey sought to capture the public knowledge and perception of area natural hazards, including associated vulnerability and opportunities for mitigation by municipality, as well as the region. The survey helped reach an even larger public audience with respect to hazard mitigation input. Rather than solely relying on the public to visit WCCOG's website, the survey itself proactively sought to engage the general public. The results of the survey, by municipality are captured in the series of Tables 2.2.2

Additional information, including a copy of the survey, media release, and the associated media publishing's of survey, can be found in Appendix A-3.3

Table 2.2.2-1 - Question #1: What town/ city do you live in?

Municipality	Total Responses
Darien	4
Greenwich	2
Norwalk	7
Stamford	8
Weston	23
Westport	17
Wilton	3
Other-Architect in area	1
Region	65

Table 2.2.2-2 - Question #2: Have any of the following increased your awareness of natural hazards in the region?

Municipality	Winter Storm Nemo, 2/13	Superstorm Sandy, 10/12	Winter Storm Alfred, 10/11	Hurricane/Tropical Storm Irene, 8/11	Mid-Atlantic Earthquake, 8/11	Other
Darien	2	3	1	2	0	0
Greenwich	0	2	1	0	1	0
Norwalk	2	4	2	3	0	0
Stamford	2	4	2	3	0	0
Weston	6	8	3	6	1	0
Westport	2	4	1	3	0	0
Wilton	1	2	2	2	0	Bridgeport Tornado, 2010
Other	0	1	0	1	0	0
Region	15	28	12	20	2	1

Table 2.2.2-3 - Question #3: What are your greatest hazards of concern

Municipality	Flooding	Hurricane and Tropical Storms	Tornadoes	Severe Thunderstorms (inluding hail and/or downburst)	Winter Storms and Blizzards (includes ice storms)	Earthquakes	Sea Level Rise	Coastal and Inland Erosion	Dam Failure	Other
Darien	4	4	0	1	3	0	2	2	0	0
Greenwich	2	0	0	0	2	1	0	1	0	0
Norwalk	5	4	0	4	7	0	4	2	0	0
Stamford	4	5	0	2	6	0	4	1	1	0
Weston	8	7	2	7	10	0	2	1	2	Radon in Soil
Westport	6	6	0	2	3	0	5	3	0	0
Wilton	2	3	1	1	3	0	1	1	0	Climate Change (GHG Emissions)
Other	1	1		0	1		1		0	0
Region	32	30	3	17	35	1	19	11	3	2

Table 2.2.2-4 - Question #4: Have any of the hazards below personally impacted your home and/or business?

Municipality	Flooding	Hurricane and Tropical Storms	Tornadoes	Severe Thunderstorms (inluding hail and/or downburst)	Winter Storms and Blizzards (includes ice storms)	Earthquakes	Sea Level Rise	Coastal and Inland Erosion	Dam Failure	Other
Darien	3	2	0	1	2	0	0	1	0	0
Greenwich	0	1	0	1	0	0	0	0	0	0
Norwalk	2	4	0	2	3	0	2	2	0	0
Stamford	0	3	0	2	4	0	0	0	0	0
Weston	6	7	1	4	8	0	0	1	0	0
Westport	5	6	1	1	3	0	1	0	0	0
Wilton	2	3	1	3	3	0	1	1	1	Drought
Other	1	1	0	0	1	0	0	0	0	0
Region	19	27	3	14	24	0	4	5	1	1

Table 2.2.2-5- Question #5: Are there any specific areas in your town/city vulnerable to natural hazards? If so, please specify location and hazard vulnerability

Darien
1. The entire coastline. We need to care for the wetlands and trees that absorb water. Don't let people fill and build. Marsh areas are important to helping hold back flood waters. Educate and maintain the natural coast line. We need to stop and get rid of invasive plants in the wooded areas and marshes
2. Five Mile River Road, near the Five Mile River, has a lot of low points that flood often. I think the land near the river needs to be built up to stop it from flooding the street.
Greenwich
No responses to this queston
Norwalk
1. All areas bordering coastal waters in South Norwalk, CT and other communities along Long Island Sound
2. Calf pasture area, Rowayton, Wall st area
3. Harbor View and Village Creek... any area that is on the shore.
4. Harbor View community
5. Public Works Center - on Norwalk harbor. Wastewater treatment plant - on Norwalk harbor. The entire coastline of the City of Norwalk
6. The beach roads and the harbor area near Washington St.
7. Meadow St. flooding
Stamford
1. The South End, Waterside, Shippan neighborhoods are particularly vulnerable to flooding and storms due to their proximity to the Sound
2. We live off of Westover road and see lot of trees falling on power lines. Something should be done about that.
3. Wire Mill Road near intersection with High Ridge Road (where is runs adjacent to the Rippowam River). River levels have been very close to flooding Wire Mill Road, as well the High Ridge Road bridge in some of the major spring storms.
Weston
1. Anywhere the trees can fall on power lines and cause major power outages and difficulty traveling due to downed lines
2. Below the highway overpass on compo road always floods during severe storms and the road is sometimes closed
3. Flooding along the Saugatuck and Aspetuck rivers.
4. Most streets where our service providers are on "poles" and when trees go down it affects people for miles.
5. Old Easton Turnpike(Westport/ Fairfield) is a major road that is prone to falling trees. Lyons Plain is a major road that is prone to falling trees and flooding. I am familiar with a few key roads (besides Old Easton Turnpike and Lyons Plain) that often have problems with trees and/or flooding are River Road, White Birch, Fanton Hill, Old Redding, Cartbridge, Steep Hill, and Davis Hill.
6. Rural aspects of Weston create natural hazards, trees come down often.
7. Valley Forge road is flood prone.
8. Route 53 between Rte 57/53 intersection and Godfrey Road is prone to flooding in heavy rain. West branch of Saugatuck River behind our house on Wedges Field is prone to overflow during heavy rains, flooding portions of our backyard.
9. Road just south of Godfrey road floods often
10. Many roads with trees too close to power lines; inadequate ground cover, trees, and other natural tools such as rain gardens and berms to help prevent run off.
11. Good Hill Road on the Saugatuck River-flooding, hurricane and tropical storms,thunderstorms,winter storms and blizzards,sea level rise,coastal and inland erosion,power outages,tree damage.
Westport
1. All low lying Coastal Areas - Including Saugatuck Shores, Compoi & Compo Mill Cove
2. Canal Road and Harbor Rd
3. Compo beach area
4. Downtown Westport and constant flooding
5. Harbor Road on Saugatuck Shores in Westport
6. Saugatuck Shores
7. The beach and all of the homes along the coast are very vulnerable to flooding and storm surge. Likewise, the homes and businesses along the Saugatuck River are very vulnerable to flooding. Sea level rise and changing weather patterns associated with global climate change have vastly changed our vulnerability, and it only increases with time.
8. Very tall pine trees along power lines such as those in the beginning of cross hwy in Westport south of intersection with north compo. They are top heavy and frail and In strong winds they sway significantly and limbs break. It's a matter of time before they break.
9. Saugatuck Island and Shore - Flooding and hurricane winds. Compo Beach area - Flooding and hurricane winds. Jennings Beach area - Flooding and hurricane winds
10. The Dead Man's Brook, prone to flood and in need of dredging.
11. Saugatuck Island in general, but Canal Road and Cross Way in particular, in regards to flooding as a result of higher tides, and particularly during hurricanes/severe storms.
Wilton
1. All water courses are ever more subject to scour, too-high summer temps; road salt and sand washing into ponds, lakes, streams and rivers with
2. Intersection of Nod Hill and Olmstead Hill Road, culvert with large tree fallen into narrow gully. Other large trees threaten overhead utility lines and will block road if toppled by high winds.
3. Most all of the roads in Wilton are a hazard due to overgrown trees. Yes, crews have worked diligently to prune - but pruning is NOT the answer.
Other
1. Bridge in Westport to Saugatuck Island on harbor Road

Media

Media outlets were utilized throughout the development of the HMP, serving as a conduit to the general public. Such outlets will also be utilized during the plan implementation and maintenance portions. Media releases, as well as newspaper, video and audio interviews were conducted to create an awareness of HMP development, but also to convey the importance of natural hazard mitigation in the SWR. By utilizing the media, the region and its municipalities were able to tap into an existing communication network and engage the mass public to convey information. The 2016 HMP Update utilized the media at frequencies significantly higher than previous plan iterations. Such efforts, in conjunction with unprecedented Natural Hazard Mitigation Survey, demonstrate the region's continued commitment to enhanced public involvement.

Municipal Public Information Sessions

A series of four municipal public information sessions were conducted in the SWR following the completion of the Draft HMP. The sessions occurred during the winter of 2015 and as part of a 30-day public comment period. Much of the associated public involvement activities of the HMP parallel methodology used in the region's Transportation Public Involvement Plan, which can be found here: http://www.swrpa.org/default.aspx?Transport=152 (WILL PROVIDE REVISED LINK ONCE WCCOG WEBSITE IS FINALIZED).

WCCOG issued media releases to notify the public of the information sessions, with references in multiple languages to accommodate those with little or no English proficiency. Languages chosen for translation were derived from the regions Title IV and Limited English Proficiency (LEP), as well as Environmental Justice (EJ) reports, which identify communities of concern and ethnic populations so as to ensure they are adequately accommodated and do not bear adverse or disproportionate impacts . The meeting dates and times were carefully

Table 2.2.2-6- Question #6: What are some helpful measures that can be taken to reduce your city/towns vulnerability to natural hazards?

Municipality	Identify future threats and impacts from natural hazards	Outreach/Education to residents, businesses, and other community entities to help understand area risks and vulnerabilities	Technical assistance to residents, businesses and other community entities to aid in the reduction of damage/losses from natural hazards and disasters	Specific, targeting project efforts that will mitigation hazards and make the community more resilient	Improve warning and response systems with respect to natural hazards and disasters	Develop and enforce regulations, codes, and ordinances.	Other
Darien	3	3	2	3	1	2	0
Greenwich	2	1	1	1	1	2	0
Norwalk	4	4	5	6	1	2	Higher seawalls where possible
Stamford	3	6	4	5	3	2	Reduce development in floodplain. Pursue property acquistions, protect inland/coastal wetlands, extend sewer and water lines, bury utilities
Weston	11	7	8	10	8	4	3 positive comments about warning/notification system. Increase cell phone coverage, public safety/town hall renovation, strengthen utility lines/tree issues
Westport	6	4	4	7	4	2	1 positive comment regarding emergency management efforts in town, continue pursuit of hazard mitigation grants, trees/utility line issues
Wilton	2	1	2	2	1	1	Reduce GHG emissions
Other	0	1	0	0	0	1	0
Region	31	27	26	34	19	16	11

chosen to ensure any potential scheduling conflicts were minimized, and occurred at times that yielded the greatest turnaround.

Additionally, notices were sent to various municipal officials including: chief elected officials, school superintendents, public housing authorities, various board and commission chairs, CERT leaders. Notices were also sent to hospitals, local libraries, universities and colleges, chambers of commerce, utilities, the Red Cross, adjacent towns/regions, federal and state legislators, and community organizations. Meeting notices were also posted on WCCOG/SWRPA's website. Municipalities were also asked to post the meeting notice on their respective websites, as well as to post the Draft HMP, or link to WCCOG/SWRPA's website, which also housed the report.

The purpose of the meetings were to brief the communities with respect HMP components, hazard and hazard mitigation, as well as the connection to existing plans and documents. Presentations were made at the beginning of meetings, with the remaining time serving as an "open house" format, where residents could review the HMP, ask questions and receive personal answers. The intimacy between technical experts and the public served as the driver for Public Information Sessions, as opposed to conducting HMP public participation in the form of a meeting agenda item. All meetings were conducted during the evening and noticed using available informational outlets to maximize potential attendance. A listing of the sessions are provided below, all applicable materials are provided in Appendix A-3.4.

- February 10, 2015; New Canaan, Wilton, and Weston; Wilton Town Hall (Snow Date 2/11)
- February 12, 2015, Darien, Norwalk, Westport; Darien Town Hall (Snow Date 2/18, in Westport)
- February 19, 2015; Stamford, Stamford Government Center (Snow Date 2/24)
- February 19, 2015; Greenwich, Greenwich Town Hall (Snow Date 2/23)

All public comments were noted, and where relevant, some were incorporated into the HMP itself. Comments are summarized below:

PLACEHOLDER FOR DRAFT HMP PUBLIC COMMENTS RECEIVED (IF ANY)

Following a review by the DEMHS and FEMA, the HMP was edited accordingly, vetted with the municipalities, and reissued to the public for final comments. The format and methodology utilized for the Final HMP, including associated outreach, mirrors the Draft HMP. Below is a listing of Final

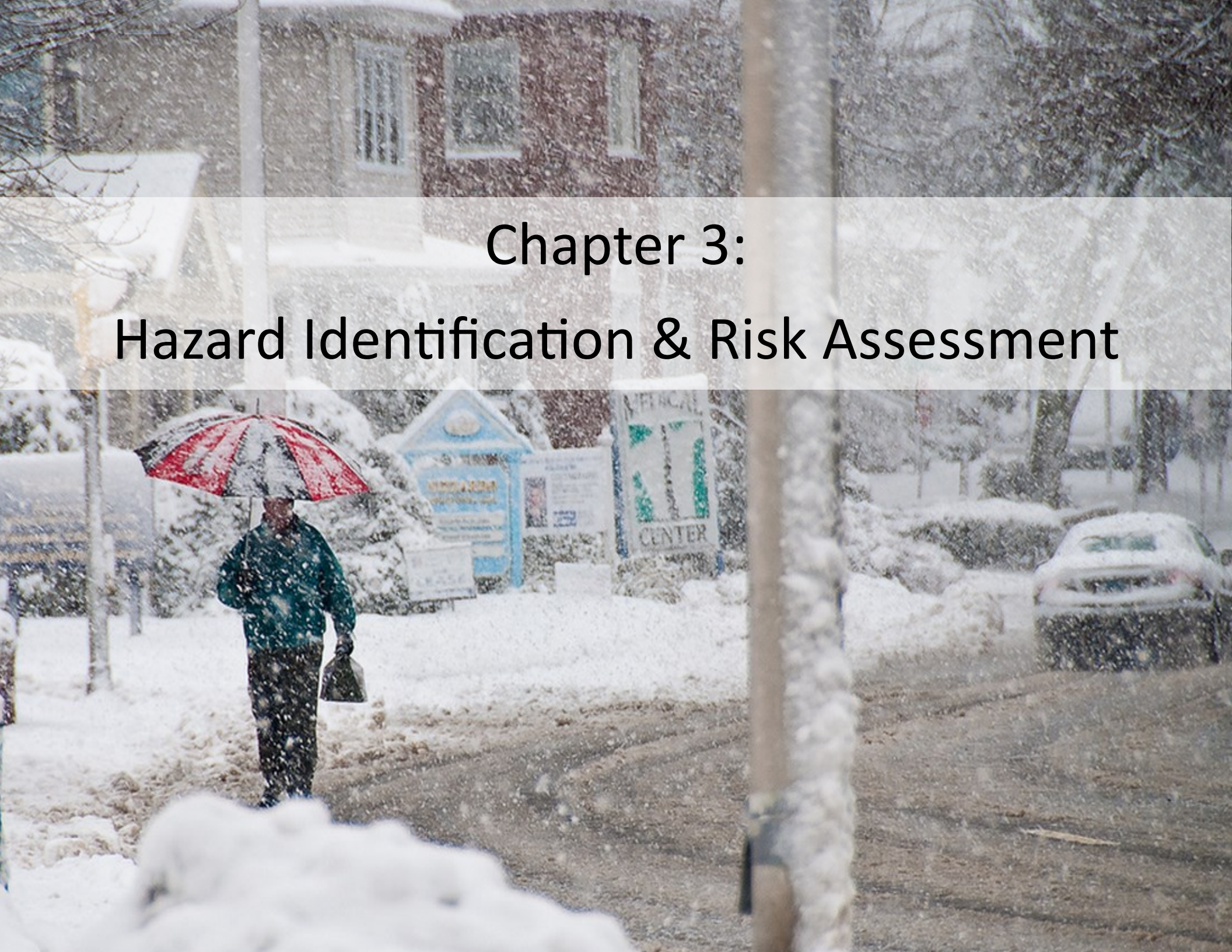
HMP Public Information Sessions:

XXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXX

Public comments received as part of the Final HMP review are summarized below:

PLACEHOLDER FOR FINAL HMP PUBLIC COMMENTS RECEIVED (IF ANY)

Additional information on public outreach, specifically as it relates to plan implementation and continued public participation can be found in Chapter 5 “Plan Maintenance.”



Chapter 3:
Hazard Identification & Risk Assessment

3.0 Hazard Identification & Risk Assessment

Hazard by hazard for all municipalities

Table 3.0-1
Hazards by Municipality

	Darien	Greenwich	New Canaan	Norwalk	Stamford	Weston	Westport	Wilton	Region
Avalanche									
Dam Failure	●	●	●	●	●	●	●	●	●
Drought	●	●	●	●	●	●	●	●	●
Earthquake		●	●	●	●	●	●	●	●
Erosion	●	●	●	●	●	●	●	●	●
Expansive Soils									
Extreme Cold	●	●	●	●	●	●	●	●	●
Extreme Heat	●	●	●	●	●	●	●	●	●
Flood	●	●	●	●	●	●	●	●	●
Hail	●	●	●					●	●
Hurricane	●	●	●	●	●	●	●	●	●
Landslide									
Lightning	●	●	●	●	●	●	●	●	●
Sea Level Rise	●	●		●	●		●		●
Severe Wind	●	●	●	●	●	●	●	●	●
Severe Winter Weather	●	●	●	●	●	●	●	●	●
Storm Surge	●	●		●	●		●		●
Subsidence									
Tornado	●	●	●	●	●	●	●	●	●
Tsunami	●								●
Wildfire	●	●			●	●		●	●
Severe Storm	●	●	●	●	●	●	●	●	●

This chapter addresses the natural hazards identified by the region as shown in table 3.0-1. A summary of regional hazards and their potential impacts is described through tables 3.0-2,3, and 4. The chapter details each of these hazards, including: hazard profile, list of historical events, probability, and corresponding risk assessment. The chapter concludes with an assessment of climate change impacts.

As part of the HMP update process, specific individual municipal and regional meetings were convened. The purpose of the meetings were to reassess the significance of natural hazards since the last update in 2011, particularly in light of significant storm events in recent years. The specific meeting dates, locations, involved municipalities and corresponding information are included as part of Appendix A-2.

FEMA's "Hazard Summary Worksheet 5.1" and corresponding rating system were utilized to identify the location, extent, probability and significance for each hazard for all the towns. Detailed hazard summaries developed during these meetings are presented at the start of each hazard sub section. The actual hazard summary worksheets for each municipality can also be found in Appendix A-2.

Table 3.0-2 Assets impacted by town and hazard type

Hazard Category	Darien	Greenwich	New Canaan	Norwalk	Stamford	Weston	Westport	Wilton	Region
FEMA 1% Flood Zone (DFIRM)	1	22	0	17	14	0	19	2	75
FEMA 0.2% Flood Zone (DFIRM)	1	22	0	19	15	0	22	4	83
Hurricane Sandy Inundation Zone	1	18	0	17	6	0	12	0	54
Category 1 Hurricane (SLOSH)	0	15	0	9	0	0	5	0	29
Category 2 Hurricane (SLOSH)	1	21	0	22	0	0	12	0	56
Category 3 Hurricane (SLOSH)	1	27	0	34	24	0	16	0	102
Category 4 Hurricane (SLOSH)	3	30	0	42	28	0	22	0	125
Max Snow Depth greater than 24"	0	0	2	140	0	12	79	33	266
WildFire Urban Interface	0	16	12	2	21	0	7	11	69

Table 3.0-3 Regional Hazard Summary

Disaster	Frequency:	Potential Impacts:	Vulnerable Locations:	Economic Loss:
Avalanche	-	-	-	-
Dam Failure	No historic records. The chance of dam failure is greatest in conjunction with floods, hurricanes, and earthquakes.	Floods can cause bodily harm, loss of life, and damage property. Dams associated with an active reservoir can cause water shortage.	Areas located downstream of or in a dam inundation zones, particularly for the large class C dams. Areas in Weston and Westport located in the dam inundation zone of the Samuel Senior Dam and areas in New Canaan, Norwalk, and Wilton located in the dam inundation zones of the Browns, John D. Milne and Grupes Reservoir dams.	Property and content damage, power outages, business disruption, and debris removal and cleanup costs.
Drought	21% Annual chance for a Drought to occur.	Water shortages, health issues, and increased risk of wildfires. In addition, drought increases the likelihood of wildfires, especially in low-density, forested areas common north of the Merritt Parkway in Greenwich, New Canaan, Stamford, Weston and Wilton.	Entire Region, Greenwich expressed concern due to the vulnerability of it's reservoirs.	Agricultural and water-dependent businesses may experience economic hardship.
Earthquake	0% Annual chance for a Earthquake to occur.	Collapse of structures and damage roads, pipelines and infrastructure. Depending on magnitude, fires and loss of life can also occur	Entire Region, especially unreinforced masonry buildings	Property and content damage, power outages, business disruption, and debris removal and cleanup costs.
Erosion	Erosion occurs in conjunction with flooding and storm surge events.	Breached dams, street closures, power outages, utility damage, property and content damage, and bodily harm and death.	Land, property and people present along coastal communities and those within flood zones.	Property and content damage
Expansive Soil	-	-	-	-
Extreme Cold	21% Annual chance for a Extreme Cold to occur.	Bodily harm and death.	Entire Region	Increased heating costs.
Extreme Heat	35% Annual chance for a Extreme Heat to occur.	Power outages, drought, bodily harm and death.	Entire Region	Increased cooling costs, and an increase in potential for black outs and brown outs.
Flood	3 flood events per year.	Breached dams, street closures, power outages, utility damage, property and content damage, and bodily harm and death.	Land, property and people present along coastal communities and those within flood zones.	Property and content damage, power outages, business disruption, and debris removal and cleanup costs.
Hail	78% Annual chance for a Hail to occur.	Minimal property damage.	Entire Region	Property and crop damage
Hurricane & Tropical Storms	14% Annual chance for a Hurricane & Tropical Storms to occur.	Street closures, tree damage, power outages, utility damage, property and content damage, car accidents, tree damage, bodily harm and death.	Entire Region	Property and content damage, power outages, business disruption, and debris removal and cleanup costs.
Landslide	-	-	-	-
Severe Storm	~6 severe storm events per year.	Street closures, tree damage, power outages, utility damage, property and content damage, car accidents, tree damage, flooding, bodily harm and death.	Entire Region	Property and content damage, power outages, business disruption, and debris removal and cleanup costs.
Sea Level Rise	Currently occurring. Various rates of SLR have been studied.	Higher sea levels can intensify coastal flood and storm surge events.	Coastal Communities	Intensifies impacts of other hazards
Severe Winter Weather	3 severe winter storm events per year.	Street closures, power outages, school closures, utility damage, property and content damage, car accidents, tree damage, bodily harm and death.	Entire Region	Property and content damage, power outages, business disruption, and debris removal and cleanup costs.
Storm Surge	The chance of storm surge is greatest in conjunction with earthquakes.	Storm surges can cause bodily harm, loss of life, and damage property. Storm surges can also erode coastal land.	Land, property and people present along coastal communities and those within flood zones.	Property and content damage, power outages, business disruption, and debris removal and cleanup costs.
Subsidence	-	-	-	-
Tornado	#REF!	Bodily harm and death, tree damage, utilities damage, property and content damage.	Entire Region	Property and content damage, power outages, business disruption, and debris removal and cleanup costs.
Tsunami	No historic records. The chance of Tsunami is greatest in conjunction with earthquakes.	Impacts are similar to storm surge	-	-
Wildfire	0% Annual chance for a Wildfire to occur.	May cause bodily harm, loss of life, and property damage	Areas of low-density, forest which are common north of the Merritt Parkway in Greenwich, New Canaan, Stamford, Weston and Wilton.	Property and content damage, business disruption,

Table 3.2.1-1: Dam Failure Hazard Summary by Municipality

Municipality	Location (Geographic Area)	Maximum Probable Extent (Magnitude/Strength)	Probability of Future Events	Overall Significance Ranking
Darien	limited	moderate	unlikely	low
Greenwich	limited	extreme	unlikely	medium
New Canaan	limited	severe	occasional	medium
Norwalk	negligible	weak	unlikely	low
Stamford	negligible	weak/moderate	unlikely	low
Weston	limited	extreme	unlikely	low
Westport	significant	weak	unlikely	low
Wilton	limited	moderate	occasional	medium

3.1 Avalanche

Historically, this hazard has not occurred within the region. This hazard has not been identified as a concern by all jurisdictions within the region.

3.2 Dam Failure

Dam Failure – In hydrologic terms, a catastrophic event characterized by the sudden, rapid, and uncontrolled release of impounded water.[1]

Table 3.2.1-2 CTDEEP Dam Safety Classifications

Risk Class	Description
Class AA	Negligible hazard potential dams that upon failure, would result in no measurable damage to roadways, land and structures, with negligible economic loss.
Class A	Low hazard potential dams that upon failure, would result in damage to agricultural land and unimproved roadways with minimal economic loss.
Class BB	Moderate hazard potential dams that upon failure, would result in damage to normally unoccupied storage structures, damage to low volume roadways, and moderate
Class B	Significant hazard potential dams that upon failure, would result in possible loss of life, minor damage to habitable structures, residences, hospitals, convalescent homes, schools, etc, with damage or interruption of service to utilities, damage to primary roadways, and significant eco-
Class C	High hazard potential dams that upon failure, would result in loss of life and major damage to habitable structures, residences, hospitals, convalescent homes, and main

3.2.1 Hazard profile

With 361 dams within the region, 108 of which are classified as moderate hazard or worse, dam failure is has been identified as a low to medium hazard for all towns in the region. Dams in the SWR are typically utilized to impound water for manufacturing, water supply, power generation and fire protection. Dam failures can be triggered suddenly, with little or no warning by other natural disasters such as floods and earthquakes. Dams are classified by the Connecticut Department of Energy and Environmental Protection (CTDEEP) into five hazard categories shown in table 3.2.1-2.

This section primarily deals with potential hazards associated with Class C dam failures, although others are considered as well. The failure of a Class C dam creates the potential for loss of life, as well as damages totaling millions of dollars, if not more, depending on the specific hazard event.

Within CTDEEP, the Dam Safety Section of the Inland Water Resources Division is responsible for the administration and enforcement of Connecticut's dam safety laws. Owners of Class C dams are required to maintain emergency operations plans, as are builders of new Class B dams. Class A or B classifications should not be taken lightly and can pose hazards to the surrounding area, which is of increasing importance when combined with development within the inundation zones. Figure 3.2.1-1 depicts the location of all class C

Table 3.2.1-3 Class C Dams in the South Western Region

CT Dam#	Dam Name	Pond Name	Municipality	Hazard	Regis-	Owner
5704	AMERICAN FELT DAM	AMERICAN FELT	GREENWICH	C	Yes	1881 Limited Liability Company
5702	PUTNAM RESERVOIR DAM	PUTNAM LAKE	GREENWICH	C	Yes	Aquarion Water Company of Connecticut
5726	ROCKWOOD LAKE DAM	ROCKWOOD LAKE	GREENWICH	C	Yes	Aquarion Water Company of Connecticut
5701	MIANUS FILTER PLANT DAM	MIANUS MILL POND	GREENWICH	C	Yes	Aquarion Water Company of Connecticut
5728	AMERICAN CAN COM-	NORTH LAKE	GREENWICH	C	Yes	Bush & Greenwich Inc.
5703	PEMBERWICK DAM	PEMBERWICK POND	GREENWICH	C	Yes	Fairfield Associates Conservation, Greenwich Hills Association, Inc.
9002	JOHN D. MILNE LAKE DAM	JOHN D. MILNE LAKE	NEW CANAAN	C	Yes	City of Norwalk
9003	GRUPES RESERVOIR	GRUPES RESERVOIR	NEW CANAAN	C	Yes	City of Norwalk
9001	NEW CANAAN RESER-VOIR DAM	NEW CANAAN RES-ERVOIR	NEW CANAAN	C	Yes	South Norwalk Electric and Water
10312	CHASMARS POND DAM	CHASMARS POND	NORWALK	C	Yes	Groby, CT DOT Office of Rails
13503	SAMUEL BARGH RESER-VOIR DAM	MIANUS SAMUEL BARGH RES	STAMFORD	C	Yes	Aquarion Water Company of Connecticut
13501	NORTH STAMFORD RESERVOIR DAM	NORTH STAMFORD RESERVOIR	STAMFORD	C	Yes	Aquarion Water Company of Connecticut
15701	SAMUEL P. SENIOR DAM	SAUGATUCK RESER-VOIR	WESTON	C	Yes	Aquarion Water Company of Connecticut
15801	NASH POND DAM	NASH POND	WESTPORT	C	Yes	Brainerd Nash Agents
16109	SPECTACLE SWAMP FLOOD CONTROL DAM	SPECTACLE SWAMP FLOOD CONTROL	WILTON	C	Yes	Connecticut DEEP
16110	SOUTH NORWALK RES-ERVOIR DIKE	SOUTH NORWALK RESERVOIR aka CITY LAKE	WILTON	C	Yes	South Norwalk Electric and Water
16104	POPES POND DAM	POPES POND	WILTON	C	Yes	South Norwalk Electric and Water
16101	SOUTH NORWALK RES-ERVOIR DAM	SOUTH NORWALK RESERVOIR aka CITY LAKE	WILTON	C	Yes	South Norwalk Electric and Water

Source: CTDEEP, November 2014

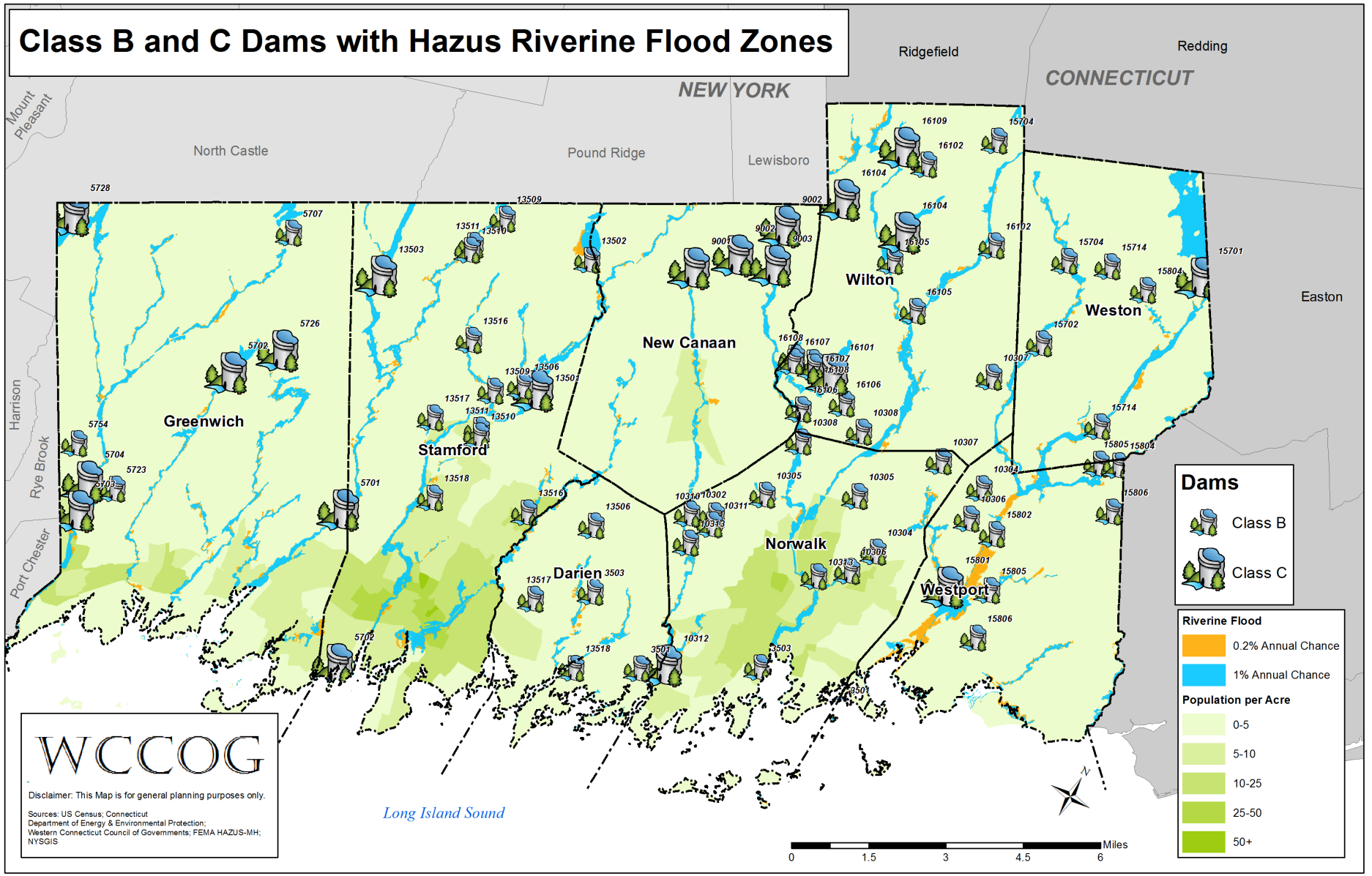
and B dams within the region along with flood zones. Detailed information for the Class C dams can be found in Table 3.2.1-3.

3.2.2 Historical Dam Failure

No historical dam failures have been identified within the SWR. In fact within the entire state of CT, there are no national disaster declarations for dam failure according to FEMA's disaster declaration database. Nonetheless, multiple dam failures have occurred within the State of Connecticut, with two of the most catastrophic events occurring in 1963 and 1982. In 1963, the Spaulding Pond Dam in Norwich failed, resulting in six deaths and $6 million in damages. In 1982, severe flooding resulted in the failure of 17 dams across the state[2]. Associated losses totaled approximately $70 million. Of which, the Town of Deep River suffered the greatest loss ($50 million) when the Bushy Hill Pond Dam failed.

The Samuel P. Senior Dam in Weston, one of the largest dams in the region, is seeing substantial repairs in 2014 and 2015 (The Weston Forum). New Canaan experiences minor flooding along river banks, associated

Figure 3.2.1-1


Class B and C Dams with Hazus Riverine Flood Zones
NEW YORK
CONNECTICUT
Ridgefield
Redding
Mount Pleasant
North Castle
Pound Ridge
Lewisboro
Easton
Harrison
Rye Brook
Port Chester
Greenwich
Stamford
New Canaan
Darien
Norwalk
Wilton
Weston
Westport
Long Island Sound
WCCOG
Disclaimer: This Map is for general planning purposes only.
Sources: US Census; Connecticut Department of Energy & Environmental Protection; Western Connecticut Council of Governments; FEMA HAZUS-MH; NYSGIS
Dams
Class B
Class C
Riverine Flood
0.2% Annual Chance
1% Annual Chance
Population per Acre
0-5
5-10
10-25
25-50
50+
0
1.5
3
4.5
6
Miles

with water releases from upstream dams in New York.

3.2.3 Probability

With scheduled maintenance and monitoring of existing structures dam failure occurs rarely but is most likely to occur in conjunction with floods, hurricanes, and earthquakes which are often the triggering factor for dam failures. Additional information on probability is contained within Table 3.2.0-1 (Town Hazard Profile Table).

3.2.4 Vulnerability and Loss Estimation

While overall an unlikely hazard, there is potential for a chain reaction of floods that could be initiated by dam failure. The Browns Reservoir Dam in Lewisboro, NY is owned by the City of Norwalk, which also owns the downstream John D. Milne and Grupes Reservoir Dams in New Canaan. This reservoir system is vulnerable to the aforementioned chain reaction, where a failure of the Browns Dam could cause the Milne Dam to overtop, and the Grupes dam to fail. A worst case scenario such as this would likely cause catastrophic loss of life and property within the Silvermine River Watershed and downstream portions of the Norwalk River Watershed in New Canaan, Wilton and Norwalk. The associated loss of service, including the potential of long and short term water shortages to First District Water Department customers could further exacerbate an already critical situation.

Several dams outside of the region have the potential to impact the local waterways and dams within the region. Given the high population density of the region, combined with extensive development along many of its waterways, the potential impacts of dam failure could be dire. Three Class C dams are of particular concern, namely the Samuel Senior Dam in Weston, the Browns Reservoir Dam in Lewisboro, NY, and the Grupes Reservoir Dam in New Canaan. A dam failure of the Samuel Senior Dam could potentially cause considerable loss of life and property in downtown Westport, among other areas within the Saugatuck River Watershed.

In addition to Class C dams, neglected and orphan dams can also create hazards of varying size and scale, depending on dam size, storm event type and intensity, strength and duration, frequency, as well as other variables.

The Flood Risk Assessment in Section 3.9.4 provides a preliminary assessment of flood impacts which might be caused by dam failure.

3.3 Drought

Drought - deficiency of precipitation over an extended period of time – usually a season or more – resulting in a water shortage for some activity, group or environmental sector. (The National Drought Mitigation Center [NDMC]).

3.3.1 Hazard Profile

Droughts often occur as large scale climatic events and thus could equally impact all of the towns in the region. The towns rated the significance for drought from low to high as seen in Table 3.3.0-1. The impacts of drought result from the interplay between natural events (less precipitation) and the demand placed on the water supply.

Droughts are measured by the Palmer Drought Severity Index (PDSI),

Table 3.3.1-1: Drought Hazard Summary by Municipality

Municipality	Location (Geographic Area)	Maximum Probable Extent (Magnitude/Strength)	Probability of Future Events	Overall Significance Ranking
Darien	extensive	moderate	occasional	low
Greenwich	extensive	severe	likely	high
New Canaan	extensive	moderate	likely	medium
Norwalk	negligible	weak	unlikely	low
Stamford	extensive	weak	occasional	low
Weston	extensive	extreme	occasional	medium
Westport	negligible	weak	unlikely	low
Wilton	extensive	severe	likely	high

which measures the duration and intensity of a drought event. A PDSI classification key can be found in Table 3.3.1-2. Long-term drought is cumulative, so the intensity of drought during the current month is dependent on current weather patterns, plus the cumulative patterns of previous months. The impacts and severity of drought, as determined by the PDSI scale, can be found in the drought matrix developed by State of Connecticut Drought Work Group in Figure 3.3.1-1.

Figure 3.3.1-1: Drought Matrix

					Palmer Drought Index		
	Precipitation	**Groundwater**	**Streamflow**	**Reservoirs**	**Severity**	**Crop Moisture**	**Fire Danger**
ADVISORY	2 months (cumulative) below %65 of normal	3 consecutive months below normal *	2 out of 3 months below normal *	Average levels less than 80% of normal	-2.0 to -2.99	-1.0 to –1.99 abnormally dry,	Moderate
WATCH	3 months cumulative below 65% of normal	4 consecutive months below normal *	4 out of 5 months below normal *	Average levels less than 70% of normal	-3.0 to -3.99	-2.0 to –2.99 excessively dry	High
WARNING	More than 4months cumulative below 65% of normal,	4 consecutive months below normal *	6 out of 7 months below normal *	Average levels less than 60% of normal.	-4 or less	-3 or less	Very high
EMERGENCY	More than 6 months cumulative below 65% of normal	8 consecutive months below normal *	7 months below normal *	Average levels less than 50% of normal or less than 50 days of supply	-4 or less.	-3 or less, severely dry	Extreme

* Normal levels for Groundwater and Streamflow are defined as the 25th percentile of the period of record.

Source NOAA, NCDC

3.3.2 Historical Droughts

A list of the top historical droughts within the SWR is shown in Table 3.3.2-1 and sorted by severity, which is determined by the PDSI rating. A time line displaying annual PDSI values from 1901 to 2013 is provided in Figure 3.3.2-1.

In response to a drought in 2002 (ranked 26th in severity in the PDSI ranking system), many municipalities within the state implemented education and outreach programs that encouraged residents and business owners alike to conserve water. Many municipalities also imposed water use restrictions, which were enforced through fines. The incident prompted the creation of a statewide Drought Preparedness and Response Plan, developed by the Connecticut Water Planning Council's Interagency Drought Work Group.

The region and its eight municipalities experienced two water supply incidents during the summer of 2010, which prompted the declaration of a water supply emergency by several local water supply companies that July. Following this, the Governor issued a statewide drought advisory on August 18, 2010[3]. The summer months during this year were characterized by high temperatures in conjunction with spotty rainfall, creating abnormally dry conditions which persisted into October. Such dry conditions increased demand for water supply and thus increased demand on the region's water supply, causing stream flows to reach critical levels in many areas.

Table 3.3.1-2

PDSI Classification Key	
Rating	PDSI
Near Normal	-1.99 to +1.99
Moderate	-2.00 to -2.99
Severe	-3.00 to -3.99
Extreme	-4.00 and below

Source: National Climatic Data Center (NCDC)

3.3.3 Probability

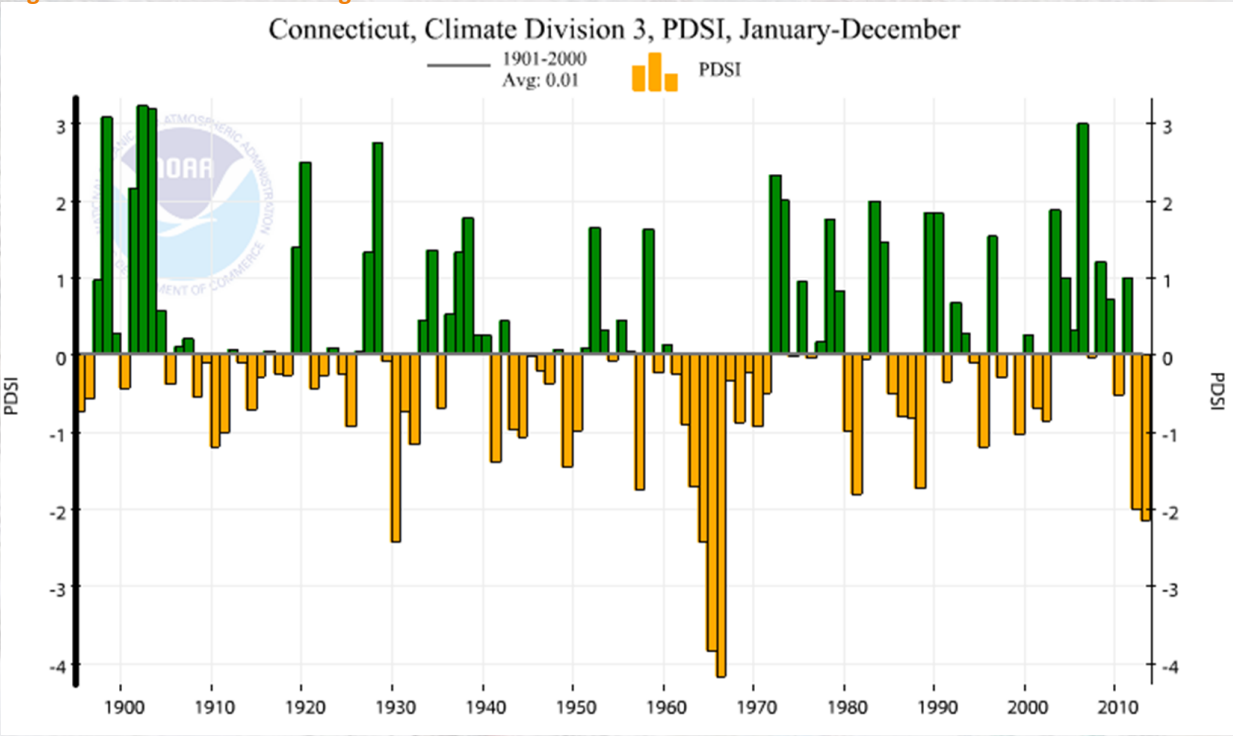
Droughts have become a fairly common occurrence in Connecticut, including the SWR. The extent and severity varies by event. According from data found at the National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center (NCDC), there is a 12% annual chance of a drought event to occur within a given year.

Data from the NCDC which lists PDSI values from 1901 to 2013, there were only five drought events which reached a PDSI of moderate or greater. This is about a 4.4% annual chance. Additional information on probability is contained within Table 3.3.1-1 (Town Hazard Profile Table).

3.3.4 Vulnerability and loss estimation

Unlike floods, hurricanes, and earthquakes, droughts often do not pose immediate threats to life and property. Rather, droughts cause economic hardship through failed crops, loss of livestock, as well as increased expenses and/or lost revenue for water-dependent businesses. Health consequences are often tied to droughts, particularly due to the degradation of water qual-

Figure 3.3.2-1: Historical Droughts in SWR



Source NOAA, NCDC

ity and/or unavailability of water to those businesses and residences using wells. It is estimated that up to 30% of residents in the region are served by groundwater wells, double the estimate of well usage statewide (15%). Well usage is primarily concentrated to the municipalities of New Canaan, Wilton, and Weston, in addition to the northern portions of Stamford and Greenwich. The presence of water-dependent businesses and prevalence of wells for water supply within the region make the region vulnerable to drought conditions, the severity of which varies from municipality to municipality. Greenwich has identified their 1-year reservoirs susceptible to droughts.

Table 3.3.2-1: Top 15 Annual Droughts in South Western Region from 1901-2013

Rank	Year	Palmer Drought Severity Index (PDSI)	PDSI Rating
1	1966	-4.17	Extreme
2	1965	-3.83	Severe
3	1930	-2.43	Moderate
4	1964	-2.43	Moderate
5	2013	-2.13	Moderate
6	2012	-1.99	Weak
7	1981	-1.80	Weak
8	1957	-1.75	Weak
9	1988	-1.73	Weak
10	1963	-1.71	Weak
11	1949	-1.45	Weak
12	1941	-1.39	Weak
13	1910	-1.19	Weak
13	1995	-1.19	Weak
15	1932	-1.16	Weak

Source NOAA, NCDC

3.4 Earthquake

Earthquake - The sudden, cyclic movement of the earth caused by the release of strain inside the earth. This movement causes faulting.[4]

3.4.1 Hazard Profile

While earthquakes do not commonly occur within the SWR, the hazard is relevant due to the presence of existing minor fault lines, sandy soils and historical earthquakes. Within the SWR, earthquakes can be categorized as a low chance but high consequence event. The municipalities in the region have identified earthquakes as a low to medium in hazard significance, as evidenced by Table 3.4.1-1.

The State HMP 2014 Update defines an earthquake, also known as a seismic event, as the shaking of ground caused by the sudden breaking and movement of large sections (tectonic plates) of the earth's rocky outermost crust. The edges of the tectonic plates are marked by faults (or fractures). Most earthquakes occur along the fault lines when the plates slide past each other or collide against each other. The shifting masses send out shock waves that may be powerful enough to:

- Alter the surface of the Earth, thrusting up cliffs and opening great cracks in the ground.
- Damage buildings and other man-made structures, power and gas lines and cause consequent fire, landslides, snow avalanches, tsunamis (giant sea waves) and volcanic eruptions.

Table 3.4.1-1: Earthquake Hazard Summary by Municipality

Municipality	Location (Geographic Area)	Maximum Probable Extent (Magnitude/Strength)	Probability of Future Events	Overall Significance Ranking
Darien	-	-	-	-
Greenwich	extensive	moderate	unlikely	medium
New Canaan	extensive	severe	occasional	medium
Norwalk	negligible	weak	unlikely	low
Stamford	extensive	weak/moderate	unlikely	low
Weston	extensive	extreme	unlikely/occasional	low
Westport	limited	weak	unlikely	low
Wilton	extensive	severe	unlikely	medium

Although other natural hazards account for much greater annual loss in the United States, earthquakes pose the largest risk in terms of sudden loss of life and property.

Earthquakes are measured with the Richter Magnitude Scale, a base-10 logarithmic scale which measures the amplitude of seismic waves. For example, a magnitude 5 earthquake has a shaking amplitude 10 times greater than a magnitude 4.0 earthquake.

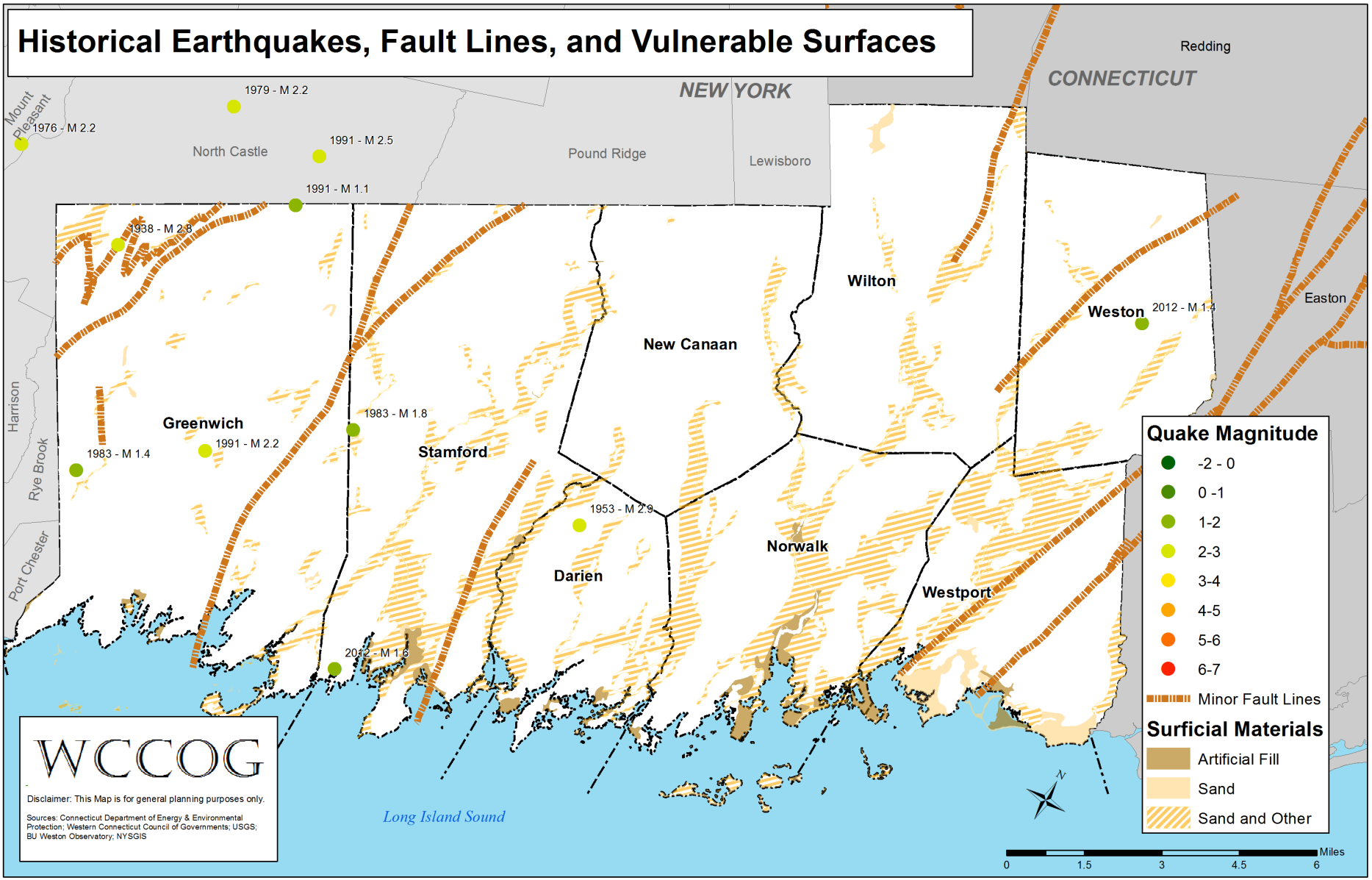
3.4.2 Historical earthquakes

The United States Geological Survey (USGS) National Earthquake Information Center maintains a national database of significant earthquake epicenters from 1568-2010. USGS defines significant earthquakes as those that cause deaths, property damage, geological impacts, or that were experienced by populations in the epicentral area[5]. Boston College's Weston Observatory maintains the history of earthquakes in Northeast. Past earthquakes as well as existing fault lines in the region are presented in Figure 3.4.2-1. Below is a list of historical earthquake events which have impacted the region.

September 7, 2012: "On September 7, 2012, a 2.1 magnitude, 4 km deep earthquake occurred near Stamford. Dozens of residents reported feeling the ground move, but no injuries were reported." [4]

August 23, 2011: "A magnitude 5.8 earthquake occurred 38 miles from Richmond, Virginia on August 23, 2011. The quake was felt from Georgia to Maine and reportedly as far west as Chicago. Many residents of Connecticut experienced the swaying and shaking of buildings and furniture during the earthquake although widespread damage was constrained to an area from central Virginia to southern Maryland. According to Cornell University, the August 23 quake was the largest event to occur in the east central United States

Figure 3.4.2-1


Historical Earthquakes, Fault Lines, and Vulnerable Surfaces
NEW YORK
CONNECTICUT
Redding
Mount Pleasant
1976 - M 2.2
1979 - M 2.2
North Castle
1991 - M 2.5
Pound Ridge
Lewisboro
1991 - M 1.1
1938 - M 2.8
Wilton
Weston
2012 - M 1.4
Easton
New Canaan
Harrison
Rye Brook
Port Chester
Greenwich
1991 - M 2.2
1983 - M 1.4
1983 - M 1.8
Stamford
1953 - M 2.9
Norwalk
Darien
Westport
2012 - M 1.6
Long Island Sound
Quake Magnitude
-2 - 0
0 -1
1-2
2-3
3-4
4-5
5-6
6-7
Minor Fault Lines
Surficial Materials
Artificial Fill
Sand
Sand and Other
WCCOG
Disclaimer: This Map is for general planning purposes only.
Sources: Connecticut Department of Energy & Environmental Protection; Western Connecticut Council of Governments; USGS; BU Weston Observatory; NYSGIS
N
0
1.5
3
4.5
6
Miles

since instrumental recordings have been available to seismologists." [4]

November 30, 2010: "A magnitude 3.9 earthquake occurred 117 miles southeast of Bridgeport, Connecticut on the morning of November 30, 2010. The quake did not cause damage in Connecticut but was felt by residents along Long Island Sound." [4]

April 20, 2002: the region felt an earthquake whose epicenter was over 350 miles away near Plattsburgh, NY. No damage was reported in the region

October 28, 1991: a small earthquake measuring 3.0 on the Richter Scale was felt in Stamford and Greenwich. The epicenter was located near where the Mianus River meets the Stamford-Greenwich town border. No damage was reported in the Region.

October 19, 1985: a small earthquake awakened many in lower Fairfield County (6:08 a.m.). The earthquake measured 4.0 on the Richter Scale and its epicenter was located between Scarsdale, Ardsley, and Greenburgh in Westchester County, New York. The quake caused only minor damage such as cracks in windows.

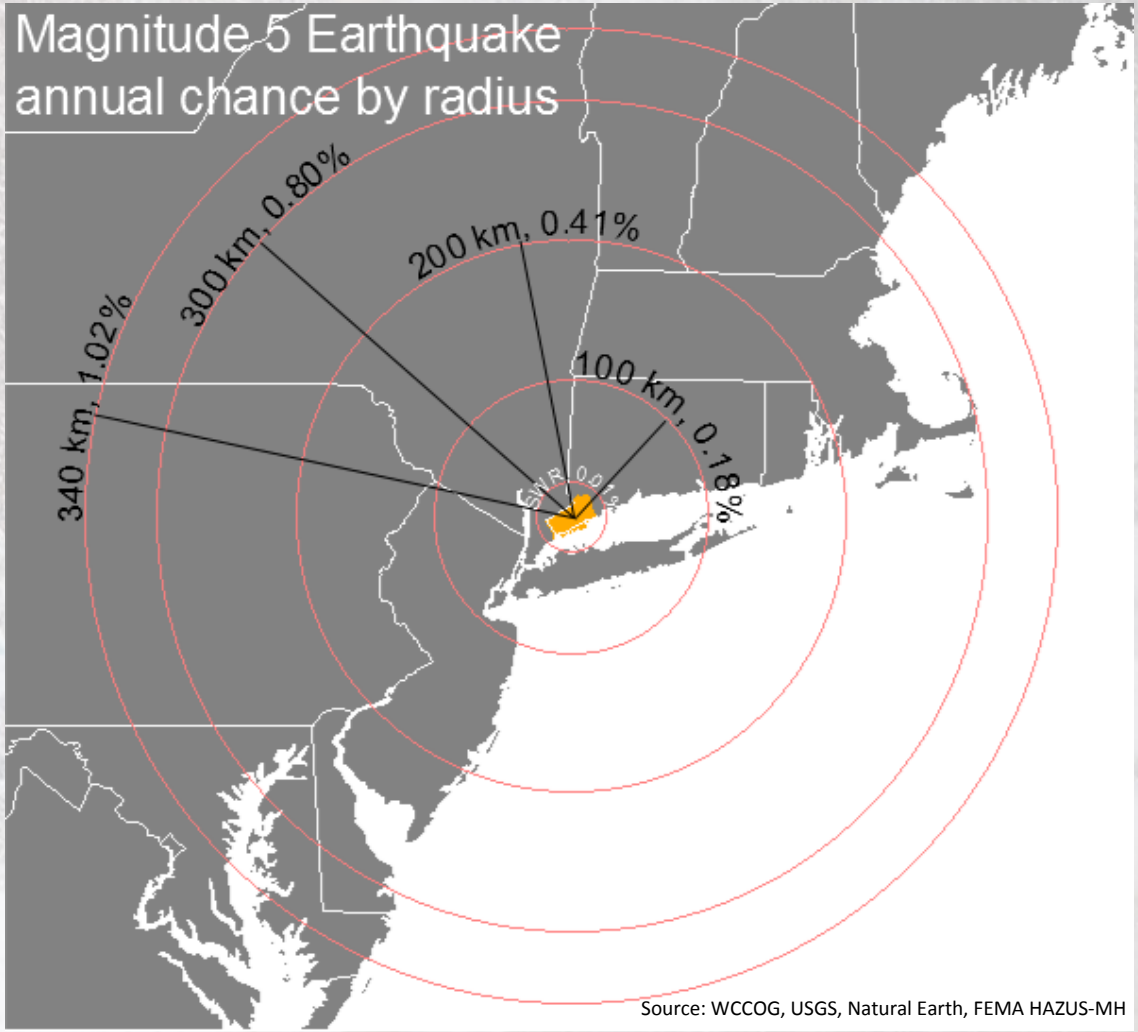
3.4.3 Probability

Substantial earthquakes of magnitude 5 or higher have a low probability of impacting south western Connecticut. There is a 0.012% annual chance a magnitude 5.05 earthquake occurs in close proximity to the SWR, as illustrated in Figure 3.4.3-1. "Close proximity" is defined as a 20km radius around the region's center The USGS provides maps which display the chance of M 5 or higher earthquakes to occur over a 100 year period within a 50km radius as shown in Figure 3.4.3-2 the SWR lands within the percentage of 4-8% range.

Based off of the historic records and data collected for this plan the following conclusions can be made in regards to the risk of future earthquake events in the SWR.

- Earthquakes have occurred within the region in the past.
- Annual chance of a substantial earthquake is 0.012%.

Figure 3.4.3-1:

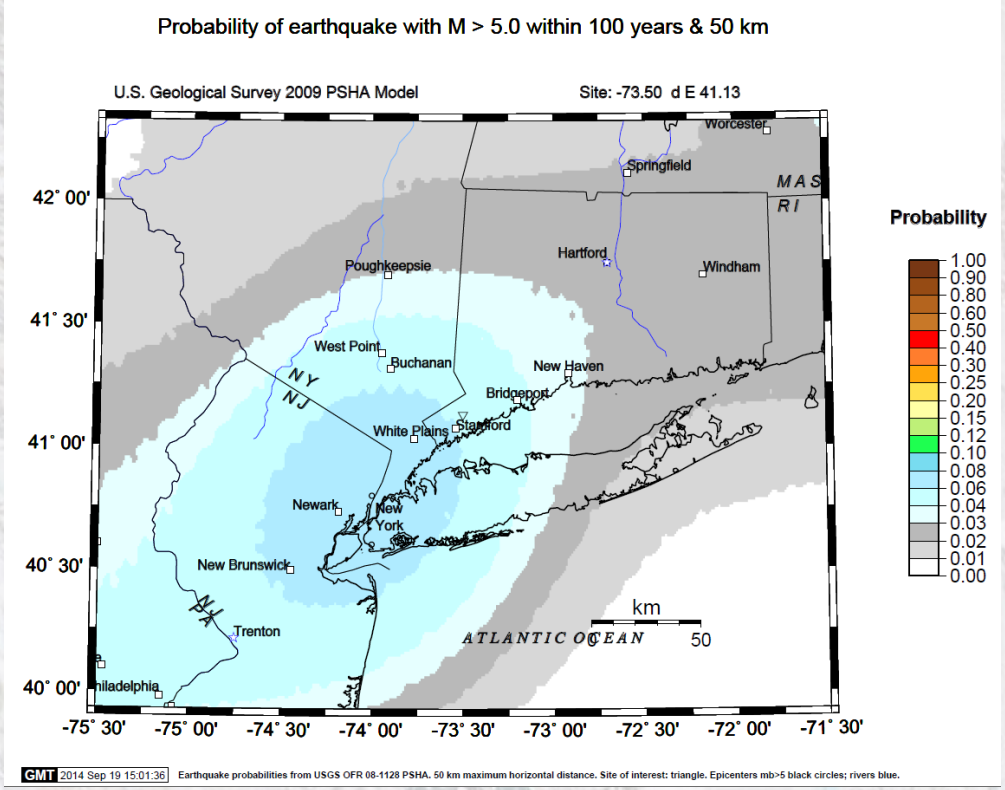


Source: WCCOG, USGS, Natural Earth, FEMA HAZUS-MH

- According to the State 2014 HMP update
- an earthquake of < 3.0 magnitude will occur in the next 100 years and
- The SWR has a higher probability of earthquakes than the rest of Connecticut.

Additional information on probability is contained within Table 3.4.1-1 (Town Hazard Profile Table).

Figure 3.4.3-2:



3.4.4 Vulnerability and loss estimation

Earthquakes are low probability, high-consequence events; ground shaking can cause death, injury, or collapse buildings and bridges as well as disrupt gas, life lines, electric, and phone service. Some secondary hazards caused by earthquakes may include fire, hazardous material release, landslides, flash flooding, avalanches, tsunamis, and dam failure. Destructive earthquake typically are of magnitude five or greater. Moderate and even very large earthquakes are plausible, although very infrequent, in areas of normally low seismic activity. Consequently, buildings in the SWR region are seldom designed to deal with an earthquake threat and are therefore extremely vulnerable.

The State 2014 HMP Update identifies the area from Greenwich to New Haven as one of the most vulnerable to potential earthquakes. "Most at risk are people who work or live in unreinforced masonry buildings built on filled land or unstable soil. Other population groups who may be more vulnerable to the impacts from a potential earthquake with a magnitude greater than 5.0 in both geographic areas include the elderly, the very young (under 18 years of age), people with various special needs." [4]

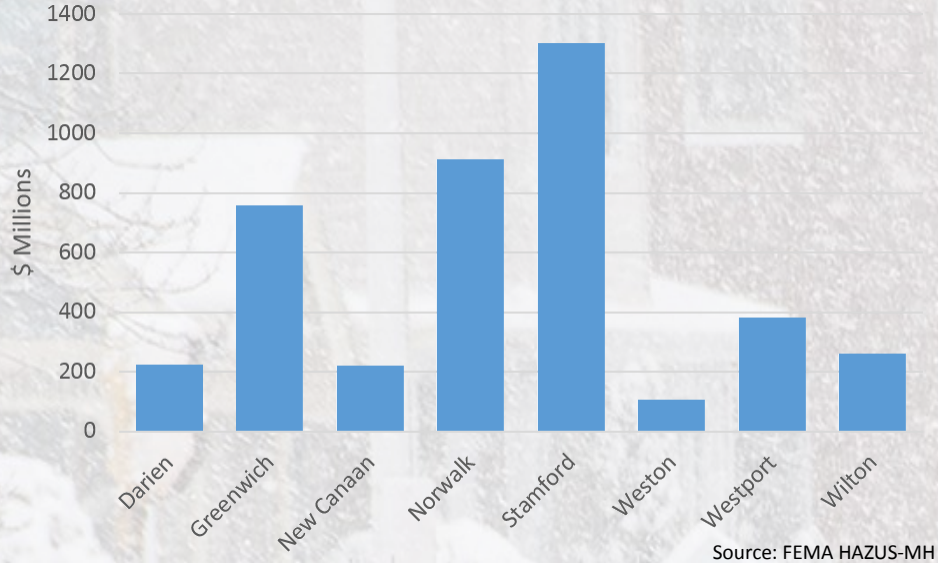
Most property damage and earthquake-related injuries and deaths are caused by the failure and collapse of structures due to ground shaking. The level of damage is dependent upon the amplitude and duration of the shaking, which is directly related to the earthquake size, distance from the fault, site, and regional geology. Other damaging earthquake effects include landslides, the down-slope movement of soil and rock (mountain regions and along hillsides), and liquefaction, where ground soil loses shear strength and ability to support foundation loads. In the case of liquefaction, anything relying on the substrata for support can shift, tilt, rupture, or collapse.

In addition, artificial fill material has the potential for liquefaction. Liquefaction is a phenomenon in which the strength and stiffness of soil are reduced by earthquake shaking or other rapid loading. It occurs in soils at or near saturation, especially the finer textured soils. When liquefaction occurs, the strength of the soil decreases and the ability of soil to support building foundations and bridges is reduced. Increased shaking and liquefaction can cause greater damage to buildings and structures, and a greater loss of life. Artificial fill is often found along the coastal areas of Darien, Greenwich, Norwalk, Stamford and Westport which can be seen in Figure 3.4.2-1

"Areas of fine sand and clay (glacial lake bottom deposits) are also vulnerable, and have been classified as having the highest risk for seismic wave amplification (NEHRP)." [4] Sandy soils are present along many waterways in all municipalities in the study area. Figure 3.4.2-1 displays the location of land fill and sandy soils within the SWR. This map does not include small geographic areas where artificial fill supports individual bridge approaches or buildings, which may also be susceptible. Although less likely, buildings could be damaged in other areas regardless of surficial material since most of the structures in the region are not subject to seismic design standards as they would be in other parts of the country.

"The best mitigation for future development in areas of sandy or filled material may be application of the most stringent building codes, or possibly

Figure 3.4.4-1: Damage Estimates for Municipal Centralized Magnitude 5 Earthquakes



Source: FEMA HAZUS-MH

the prohibition of certain types of new construction."[4]

Using FEMA's HAZUS-MH hazard simulation software, a magnitude 5.05 simulation was conducted for the SWR. HAZUS estimates that over 12% of the buildings in the region or about 13,871 buildings would be at least moderately damaged, and nearly 294 buildings would be damaged beyond repair. 1 hospitals, 38 schools, 1 police stations, 2 fire stations and 1 emergency operations centers would also suffer at least moderate damage although none would be completely destroyed. 6 bridges would be expected to receive damage, 0 bridges are estimated to be completely damaged. Numerous leaks and breaks to water, wastewater and natural gas lines are projected. Widespread power outages would also occur. Four fires are estimated to be ignited due to the earthquake resulting in about $35 million in building losses. Over 1,007 people are likely to seek temporary shelter in public shelters. Depending on the time of day that the earthquake struck, 10 to 23 deaths could be expected. 300 to 550 of people would sustain minor injuries. Total building related losses were estimated at $2.77 billion with 52% of these losses attributed to residential properties.

Due to the fact that the damage potential is largely dependent on the distance from the epicenter, magnitude 5.05 earthquake simulations were performed for each town with a town centered epicenter. These damage totals can be seen in Figure 3.4.4-1. The damage totals reflect the "worst case" scenario for every town. It should also be noted that HAZUS simulations revealed negligible impacts for a magnitude 5.05 earthquake at distances greater than 100 kilometers (km) away from the region's centroid.

3.5 Erosion

Erosion: the loss or displacement of land along the coastline due to the action of waves, currents, tides, wind-driven water, waterborne ice, or other impacts of storms or human-caused actions. Erosion can also be caused by the loss or displacement of land due to the runoff of surface waters or groundwater seepage, and is often exacerbated by human-caused actions. The dynamic cycle that can lead to erosion is predominantly a natural phenomenon that occurs over time.

The impacts of erosion occur in conjunction with flooding, as well as storm surges. As such, these impacts are discussed in more detail within sections 3.9 Flood and 3.16 Storm Surge

Table 3.5.1-1: Erosion Hazard Summary by Municipality

Municipality	Location (Geographic Area)	Maximum Probable Extent (Magnitude/Strength)	Probability of Future Events	Overall Significance Ranking
Darien	limited	moderate	occasional	low
Greenwich	limited	moderate	unlikely	low
New Canaan	limited	moderate	occasional	low
Norwalk	negligible	weak	unlikely	low
Stamford	significant	weak/moderate	likely	medium/high
Weston	negligible	moderate	occasional	medium
Westport	limited	weak	occasional	low
Wilton	extensive	moderate	occasional	medium

3.6 Expansive Soils

Historically, this hazard has not occurred within the region. This hazard has not been identified as a concern by all jurisdictions within the region

3.7 Extreme Cold

Extreme Cold Event: Winter weather that is substantially colder than average for a location at that time of year. Extreme cold criteria typically shift by location and time of year.

3.7.1 Hazard profile

Extreme cold events within the north east are usually well below zero, and have historically occurred within the SWR. The towns have identified this hazard ranking from not significant to high significance as seen in Table 3.7.0 -1. Extreme Cold conditions typically accompany winter storm events. NOAA acknowledges that extensive exposure to extreme cold temperatures can cause frostbite or hypothermia and can become life-threatening.

As a large scale climatic event this hazard impacts all municipalities in the SWR.

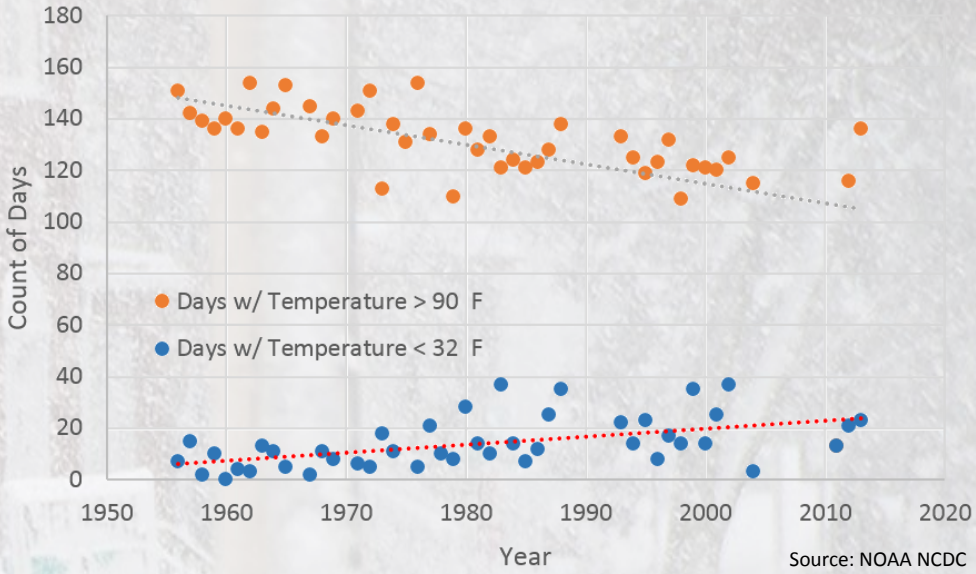
3.7.2 Historical Extreme Cold Events

Cold events observed in the SWR as listed from the NCDC:

January 15-16, 2004 - An arctic cold front swept southeast across the region during Tuesday afternoon, January 13th. The extremely cold air that followed, resulted in a new record low temperature of 1 degree at Sikorsky Airport in Bridgeport on Wednesday, January 14th.

As an Alberta Clipper passed south of Long Island Wednesday night, it rapidly intensified as it moved northeast of Long Island Thursday. The large pressure gradient resulting from a strong low pressure system northeast of New England and a strong arctic high pressure system in Southeast Canada resulted in the combination of extremely low temperatures, high winds, and wind chill index values from sunset Thursday evening through sunrise Friday morning, January 16th. A record low temperature of zero degrees Fahrenheit (degrees) was tied at Sikorsky Airport in Bridgeport on January 16th. Low

Figure 3.7.2-1: Count of Days Below Freezing and Days Over 90 degrees in the South Western Region



Source: NOAA NCDC

Table 3.7.1-1: Extreme Cold Hazard Summary by Municipality

Municipality	Location (Geographic Area)	Maximum Probable Extent (Magnitude/Strength)	Probability of Future Events	Overall Significance Ranking
Darien	extensive	severe	likely	high
Greenwich	extensive	moderate	occasional	medium
New Canaan	extensive	severe	likely	high
Norwalk	limited	moderate	unlikely	low
Stamford	extensive	moderate	likely	medium
Weston	extensive	severe	occasional	medium
Westport	limited	moderate	unlikely	low
Wilton	extensive	severe	likely	medium

temperatures ranged from 0 in Bridgeport to 5 degrees below zero at Meriden. The lowest Wind Chill Index temperature values ranged from 19 degrees below 0 at Groton with a sustained wind speed of 23 mph, to 25 degrees below 0 at Meriden with a sustained wind speed of 14 mph. Peak wind gusts were between 25 and 35 mph.

January 17-18 & 21, 2000 – An arctic cold front swept across the region during Sunday afternoon, January 16th. Strong and gusty northwest winds combined with well below normal temperatures and produced extremely low wind chill values mainly from 2 am to 10 am on January 17th and from 1 am to 1 pm on January 18th.

On January 17th, wind speeds from 15 to 20 mph combined with temperatures from 5 to 10 degrees above 0, produced wind chill values from 15 to around 20 degrees below 0 in urban areas along the coast such as Bridgeport and from 20 to 30 degrees below 0 across suburban and rural areas.

On January 18th, wind speeds averaging 15 mph combined with temperatures from 0 to 5 above zero, produced wind chill values from 20 to 30 degrees below 0 along the coast and from 30 to 35 degrees below zero in rural areas.

The combination of a quickly intensifying low pressure system off the New England Coast and a strong high pressure system west of the Great Lakes caused strong and gusty northwest winds. Northwest winds averaged 25 to 35 mph with gusts from 40 mph at Danbury to 46 mph at Meriden from around 2 pm to 8 pm. As temperatures fell to around 10 degrees, wind chill values plummeted from 20 to 30 degrees below zero along the coast and to 25 to 35 degrees below zero inland.

3.7.3 Probability

For purposes of this report, probability is quantified using the number of freezing days. Freezing days are defined as days where the temperature drops below 32^{o}F. According to NCDC data , the region is likely to experience 110-150 days of the year where the temperature drops below freezing. Trends show that the number of days below freezing is decreasing at a rate of 0.75 days a year, this correlates with historical trends of warming winters. In the case of severe cold, temperatures below 0F, on average the region experiences around 3 days a year. Temperature trends can be observed in the previous section in Figure 3.7.3-1.

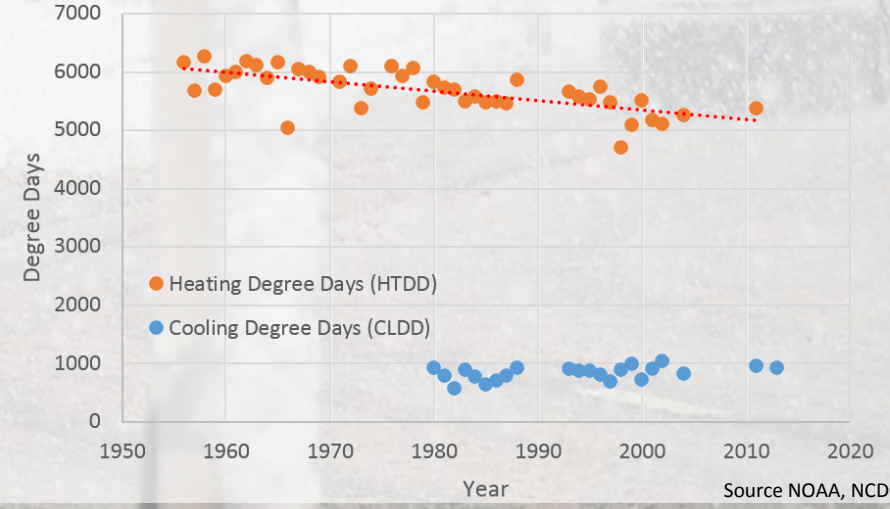
There is some variation in temperature within the region, which partially correlates to the moderating influence of the Long Island Sound in the coastal communities, but overall the probability to extreme cold events is largely equal. The inland areas of Greenwich, Stamford, New Canaan, Wilton and Weston tend to get colder. Additional information on probability is contained within Table 3.7.1-1 (Town Hazard Profile Table).

3.7.4 Vulnerability and loss estimation

All of the municipalities in the region are equally vulnerable to the effects of extreme cold, as discussed above in Section 3.7.3. The impacts affect those on an individual basis and are tied to exposure. Infants and elderly people are most susceptible to the effects of the extreme changes in temperature. As for building vulnerabilities, pipes may freeze and burst in homes that are poorly insulated or without heat.

There is also economic impact tied to the energy cost in heating buildings during cold weather events and is measured in units of Heating Degree Days (HDD). The SWR is observing a decreasing trend in HDD dropping from ~6000 HDD in 1960 to ~ 5000 HDD in 2011. This equates to a cost reduction of around 5/6 for the energy needed to heat buildings. The trend is visible in Figure 3.7.4-1.

Figure 3.7.4-1: Heating & Cooling Degree Days in the South Western Region



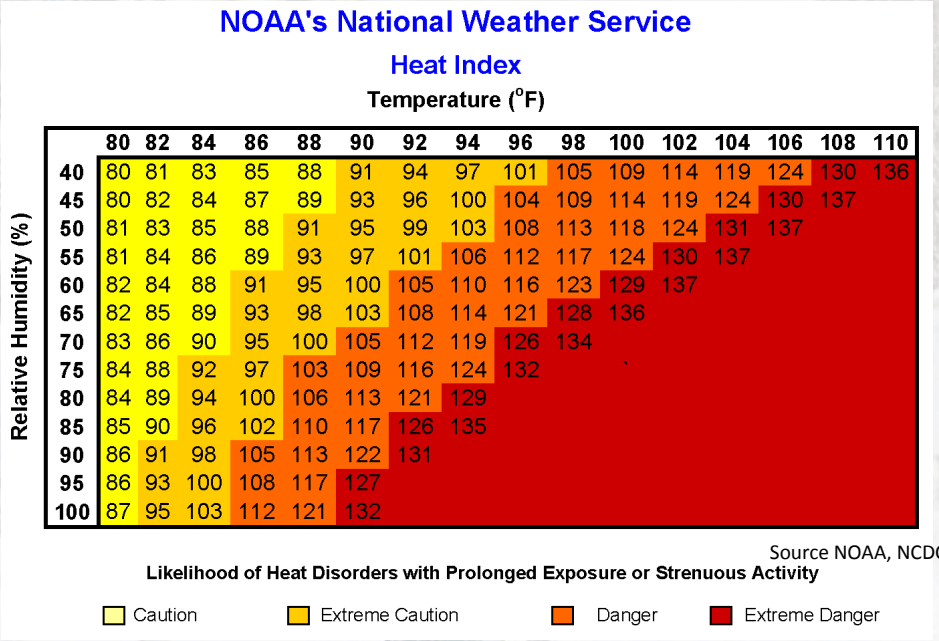
Source NOAA, NCDC

3.8 Extreme Heat

Extreme Heat Event (EHE): Summertime weather that is substantially hotter and/or more humid than average for a location at that time of year. EHE criteria typically shift by location and time of year.

Heat Wave: Heat waves are periods of abnormally hot weather lasting days to weeks. (NCA 2014)

Figure 3.8.1-1:



3.8.1 Hazard profile

Extreme heat is identified as a highly significant in three out of eight towns as seen in Table 3.8.1-1. Extreme heat typically occurs as large climatic events and thus impact all municipalities in the SWR equally. Exposure to extreme heat can cause a number of medical conditions such as heat cramps, heat exhaustion and heat stroke.

A heat index is used to identify relative heat in relation to humidity as seen in Figure 3.8.1-1. Results are usually taken in a shaded areas. When considering direct sunlight, the heat index can increase by another 15 degrees. Health risks will also increase depending on the number of consecutive extreme heat days. These events can also lead to droughts.

3.8.2 Historical Extreme Heat

Heat events observed in the SWR as listed from the NCDC:

July 7, 2013 - A large area of high pressure remained nearly stationary to the south, resulting in excessive heat across the area. The combination of high heat and humidity resulted in a heat index of 106 degrees at Bridgeport Airport.

July 22, 2011 - An oppressive hot and humid air mass produced excessive heat that resulted in day time temperatures 95 to 105 degrees with night time lows in the 70s and 80s. Excessive heat between 95 and 105 degrees, along with heat indices in excess of 105 degrees occurred for a couple of days. The heat index was as high as 109 degrees at 3:00 pm at Sikorsky Airport in Bridgeport (KBDR) on July 22nd.

Table 3.8.1-1: Extreme Heat Hazard Summary by Municipality

Municipality	Location (Geographic Area)	Maximum Probable Extent (Magnitude/Strength)	Probability of Future Events	Overall Significance Ranking
Darien	extensive	severe	likely	high
Greenwich	extensive	moderate	likely	high
New Canaan	limited	severe	likely	high
Norwalk	limited	moderate	unlikely	low
Stamford	extensive	moderate	likely	medium
Weston	extensive	weak	occasional	low
Westport	limited	moderate	unlikely	low
Wilton	extensive	severe	likely	medium

August 1-3, 2006 - An oppressive air mass moved slowly east across the region. Excessive heat occurred mainly from noon to midnight each day for three consecutive days. High temperatures ranged from the mid to upper 90s. With surface dew point temperatures in the lower to

mid-70s, heat indices ranged from 100 to 110 degrees. Excessive heat caused scattered power outages that resulted in business losses. Radio station 1010 WINS reported that extreme heat damaged underground power lines in downtown Stamford. "Flames shot five feet into the air from a manhole cover after a transformer exploded and started smoking. Some commercial buildings were evacuated."

July 2-4, 2002 - Temperatures rose into the mid and upper 90s across interior Southern Connecticut and into the lower and mid 90s along the shores of Long Island Sound. High temperatures and humidity combined to produce heat indices from 100 to 105 degrees across the region, but especially across interior Southern Connecticut. In Greenwich, News Radio 88 (WCBS) reported that a 92 year old man died in his apartment, which was not air conditioned.

August 8-10, 2001 - A Bermuda high pressure system "pumped" hot temperatures and high humidity across the region. Daytime temperatures broke records in a few locations. Maximum temperatures ranged from the mid-90s to 100 degrees in urban areas, which produced heat indices from 105 to 110 degrees. Scattered power outages in urban areas began Tuesday, August 7th, and became more widespread by Friday, August 10th. Record high temperatures were broken at Sikorsky Airport in Bridgeport, when the temperature reached 94 degrees on Tuesday, August 7th, and 93 degrees on Wednesday, August 8th. On Thursday, August 9th, temperatures ranged from 94 at New Haven to 104 at Stamford. High heat indices of 105 to 110 degrees persisted into the early afternoon hours of Friday, August 10th, over inland and urban areas.

July 4-6, 1999 - An extremely hot and humid air mass covered the region from July 4th through July 6th.

3.8.3 Probability

According to NOAA's NCDC the SWR has a 12% annual chance for either a heat or excessive heat event to occur. With warming climate trends, observed in Figure 3.8.3-1, it is likely we'll see an increased likelihood of extreme heat events.

"Analyses show that human-induced climate change has generally increased the probability of heat waves." (NCA 2014)

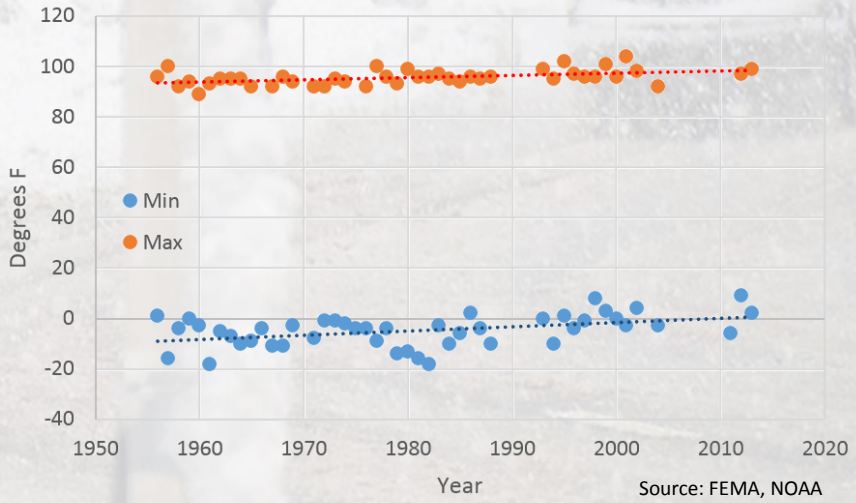
Probability can also be quantified using the number of days >90F, a statistic provided within the NCDC climate data archives for Stamford centered weather station. In a collection of data samples since 1980, the region experiences an average of 17 days ≥90F. Trends show that the number of >90F days is increasing at roughly 0.3F per year. The temperature trends can be found in Extreme Cold section above in Figure 3.8.3-1 .

There is some variation in temperature within the region, which partially correlates to the moderating influence of the Long Island Sound in the coastal communities, but overall the probability to extreme heat events is largely equal. Additional information on probability is contained within Table 3.8.1-1 (Town Hazard Profile Table).

3.8.4 Vulnerability and loss estimation

According to the Environmental Protection Agency's (EPA) 2006 Excessive Heat Event (EHE) Guide EHE events are a public health threat because they often increase the number of daily deaths (mortality) and other nonfatal adverse health outcomes (morbidity) in affected populations. Distinct groups within the population are at elevated risk for experiencing EHE-attributable health problems. The populations that have physical, social, and

Figure 3.8.3-1: Annual Temperature Minimums and Maximums in the South Western Region



Source: FEMA, NOAA

economic factors and the specific actions that make them at high risk include:

- Older persons (age > 65)
- Infants (age < 1)
- The homeless
- The poor
- People who are socially isolated
- People with mobility restrictions or mental impairments
- People taking certain medications (e.g., for high blood pressure, depression, insomnia)
- People engaged in vigorous outdoor exercise or work or those under the influence of drugs or alcohol" (EPA 2006)

Cooling Degree Days (CDD) is a metric used to measure the energy required to cool a building to a comfortable temperature. Increases in CDD generally correspond to warm temperatures. As observed in Figure 3.8.4-1 there is a steady increase in CDD over time resulting in higher costs to cool buildings. Based on this trend, one can deduce that increases in CDD directly correlates to steady increases in ambient temperature.

3.9 Flood

Flood - Any high flow, overflow, or inundation by water which causes or threatens damage. There are several different types of flooding including:

Riverine Flooding - (also considered Overbank Flooding), occurs when water channels receive more rain or snowmelt from their watershed than normal, or the channel becomes blocked by an ice jam or debris. Excess water overloads the channel and flows out into the channel's floodplain area.

Coastal Flooding - can occur as a result of coastal storms which produce storm surges, destructive waters, and erosion of coastal areas.

Flash Flooding – a rapid rise of water along a water channel or low-lying urban area. Usually a result of an unusually large amount of rain and/or high velocity of water flow (especially in hilly areas) within a very short period of time. Flash floods can occur with very little warning.[7, 8]

Shallow Flooding - occurs in flat areas where a lack of a water channel results in water which cannot easily drain away. There are three types of shallow flooding:

Sheet Flow - water spreads out over a large area at a uniform depth;
Ponding - runoff collects in depressions and cannot drain out; and
Urban Flooding - when a drainage system, consisting of manmade features, is overloaded by a larger amount of water than the system was designed to accommodate." [4]

3.9.1 Hazard profile

Flooding is a reoccurring problem in the SWR and poses a serious threat to residents, infrastructure and property. With over 85 miles of coastline fronting the Long Island Sound (LIS) and more than 600 miles of rivers and streams, flooding has been identified as one the biggest challenges for all eight of the Region's municipalities. Flood events result from hurricanes, coastal storms, severe rains, snow melt, occurrence of ice jams and dam failures. Flooding can cause extensive damage to property and risk of injury and loss of life. FEMA identifies five forces of flooding which can cause extensive damage:[7]

1. Hydrodynamic forces - damage created by moving waters. There are three ways in which hydrodynamic forces can damage a structure's walls: by frontal impact to the walls (water striking the walls of a structure); drag effect (water running alongside of a structure's walls); and, eddies or negative pressure (water passing the downstream side of a structure).
2. Debris Impact - includes damage by direct impact of any object that flood waters can pick up and move to another location.
3. Hydrostatic Forces – the pressure, both downward and sideways which standing water exerts on a structure's floor and walls. Hydrostatic pressure can also cause damage to structures due to buoyancy and flotation which can occur in flood waters.
4. Soaking – the warping, swelling and changes in a material's form and structure resulting from being submerged in flood waters.
5. Sediments and Contaminants – the sand, sediments, chemicals, and biological contaminants (such as untreated sewage) that flood waters can move and leave behind after the flood waters subside." [4]

Table 3.9.1-1: Flood Hazard Summary by Municipality

Municipality	Location (Geographic Area)	Maximum Probable Extent (Magnitude/Strength)	Probability of Future Events	Overall Significance Ranking
Darien	extensive	extreme	highly likely	high
Greenwich	significant	severe	occasional	high
New Canaan	limited	moderate	occasional	low
Norwalk	limited	moderate	occasional	low
Stamford	significant	moderate/severe	likely	medium/high
Weston	limited	moderate/severe	likely	medium
Westport	significant	sever	highly likely	high
Wilton	extensive	severe	occasional	medium

3.9.2 Historical floods

The SWR has observed a number of historical flood events, and NOAA's Storm Events Database provides

examples of the impacts of floods in the Region. There were a total of 70 floods included in the database which impacted the SWR dating back to 1996. The following list is a selection of the most recent flood events which have impacted the region:

July 14, 2014 - A very moist and unstable air mass triggered showers and thunderstorms on multiple surface boundaries. Several rounds of storms produced heavy rain that resulted in flash flooding in portions of Fairfield County. A vehicle was floating in flood waters on Elm St. at the I-95 overpass in Stamford. Widespread street flooding with several roads were impassable in Westport. One car was stranded in high water on Myrtle Avenue.

November 27, 2013 - An area of low pressure tracked from the Gulf Coast through New England bringing several inches of rain to the Tri-State Area. This resulted in isolated flash flooding in Fairfield County. South Compo Rd. was closed in Westport due to flooding. Total reported rainfall amounts in Fairfield County ranged from 1.81 inches at Sikorsky Airport in Bridgeport to 3.77 inches in Danbury.

October 28, 2012 - Super Storm Sandy: "Sandy began as a tropical wave in the Caribbean on October 19th, quickly developed into a tropical storm in just six hours, and ultimately upgraded to a hurricane on October 24th as maximum winds reached 74 mph. Although more widespread damage was seen in coastal areas of New Jersey and New York, Connecticut still experienced devastating damage due to the storm. As it reached Connecticut, it caused the Long Island Sound to flood basements and roads along the coast, and coupled with fallen trees many roads were impassable. Streets closest to the water in towns such as Fairfield, Westport and Norwalk remained submerged immediately after the storm. Millions of gallons of raw and partly untreated sewage were discharged into the Long Island Sound. As of May 2013, more than $367 million in federal assistance had been approved to help Connecticut with disaster expenses." -NOAA Storm DB

In Greenwich, "surging floodwaters from the Long Island Sound and downed power lines and trees trapped firefighters as they tried to battle a fire that destroyed three homes during the height of the storm Monday night." – NY Times

In Westport, "city officials say the surge reached as high as 12 feet, sending walls of water down Main Street, causing flood damage in many of the high-end retail shops along the street. In shoreline areas along Compo Beach and Saugatuck Island, many roads remained flooded or were blocked by downed trees and power lines, impeding efforts to assess the full damage." – NY Times

"In the waterfront community of Harbor View, a small peninsula with about 100 homes at the southern tip of Norwalk, menacing winds and 12-foot waves shredded the sea wall and ripped facades and decks off homes." – NY Times

August 28, 2011 - Tropical Storm Irene: "Swept across the east coast on August 28, 2011 with Connecticut being the hardest hit state. Maximum wind gusts were 66 mph, while average wind gusts for the entire state were 52.3 mph. The storm killed two Connecticut residents and left hundreds of thousands of people without power. The storm hit the coast at high tide, which caused a storm surge that flooded roads and homes from Fairfield to New London" [4]

In Greenwich, "Parts of town experienced major flooding, including Route 1 and the eastern sections. In Old Greenwich, nearly every street on the north side of Shore Road was flooded following a morning storm surge, and Binney Park was completely submerged even after the rain cleared." Greenwich Times

In Wilton the "Norwalk River overflowed, flooding office building parking at 370 Danbury Rd, and completely burying the Wilton YMCA parking lot." Fairfield County Food Examiner

March 13, 2010: An unnamed nor'easter hit New England. Although the Region did not experience the same extent of flooding seen in the eastern part of the state, rain and strong gusts of wind caused localized flooding; and numerous trees were destroyed leaving many homes and businesses without power.

October 18, 2009: In Westport flooding was reported at Compo Beach Road and Soundview Drive during high tide. Water Street in Norwalk was closed for 5 hours due to coastal flooding, with at least one vehicle being stranded. Moderate tidal flooding was caused by a strong pressure gradient between high pressure to the north and a coastal storm passing south of

Long Island October 17th and 18th. A prolonged period of strong northeast winds across coastal waters coupled with astronomically high tides caused water to build along the coast followed by tidal piling.

September 6, 2008: Two feet of water was reported on portions of Sound Beach Ave. and Arcadia Rd. in Greenwich. Tropical Storm Hanna impacted Southern Connecticut, making landfall near the Nassau/Suffolk County border in New York around 10:35 pm on the 6th. Storm total rainfall ranged from 2.76 inches at Groton Airport to 6.45 inches at New Canaan. Periods of torrential rain from heavy showers and thunderstorms caused flash flooding in urban areas, small streams, and rivers. One person was killed due to flash flooding.

October 11, 2007: Localized flooding occurred in the Darien-Stamford area, when five inches of rain fell in a short period of time. Disaster assistance was requested from FEMA and the Connecticut Small Business Administration (SBA). Although the damage was extensive, only a small area was affected and did not meet the criteria for a FEMA declaration.

April 2007: A nor'easter on April 15 and a second storm on April 18 hit the Region. Both storms closed dozens of state and local roads, interrupted rail service on Metro-north and left many residents without power. In addition, numerous homes inland and along the coast experienced damage due to flooding, and the Cartbridge Bridge in Weston was washed out. This brought a burden to area homes and businesses that were still recovering from a major rain storm event on March 2, which flooded numerous area roadways and several area homes and businesses. Many of the same people suffered a loss again. A disaster declaration was made from this event.

In May of 2007, the President signed a declaration of a "major disaster" in Connecticut following the April 15 nor'easter. The signed declaration made federal funds available to local governments in Fairfield County to help cover the costs incurred from the storm and its aftermath. -NOAA Storm DB

March 2, 2007: 3.9 inches of rain fell over South Western Connecticut. Numerous area roadways were flooded and had to be closed to traffic. Several area homes and businesses also experienced varying levels of flood damage. Frozen ground also exacerbated the problem with water unable to soak into the ground leading to increased runoff. This storm event dropped more than three inches of rain in a short period of time and was followed by three weeks of steady rain, which left the ground saturated and rivers full.

August 27, 2006: Torrential rain caused widespread flash flooding throughout the Town of Darien and produced mudslides that closed I-95 in Norwalk between Exits 14 and 17. Hourly rainfall rates were estimated by radar from 3 to 4 inches per hour, mainly between Stamford and Norwalk. Storm total rainfall ranged from 2.5 to over 5 inches. Rainfall amounts of 3.72 inches were measured in Westport.

3.9.3 Probability

While a flood can occur at any time of the year, NOAA has identified three times of the year when floods are most likely to occur:

- Late winter/spring melt;
- Late summer/early fall; and
- Early winter.

The region averages around 3.8 flood events a year. A breakdown of flood events by town is shown in Table 3.9.3-1. According to the 2016 State HMP, Fairfield County

Table 3.9.3-1: Flood Frequency Definitions

Flood Frequency (Years)	Annual Chance
10 Year	10%
50 Year	2%
100 Year	1%
500 Year	0.20%

Table 3.9.3-2: Count of flood events by municipality

Flood type	Darien	Greenwich	New Canaan	Norwalk	Stamford	Weston	Westport	Wilton	Multi Juris.	SWR
Flood	0	2	0	1	2	0	1	0	9	15
Flash Flood	4	8	2	6	5	2	3	1	9	40
Coastal Flood	0	0	0	0	0	0	0	0	15	15
Flood Total	**4**	**10**	**2**	**7**	**7**	**2**	**4**	**1**	**33**	**70**

Figure 3.9.3-1

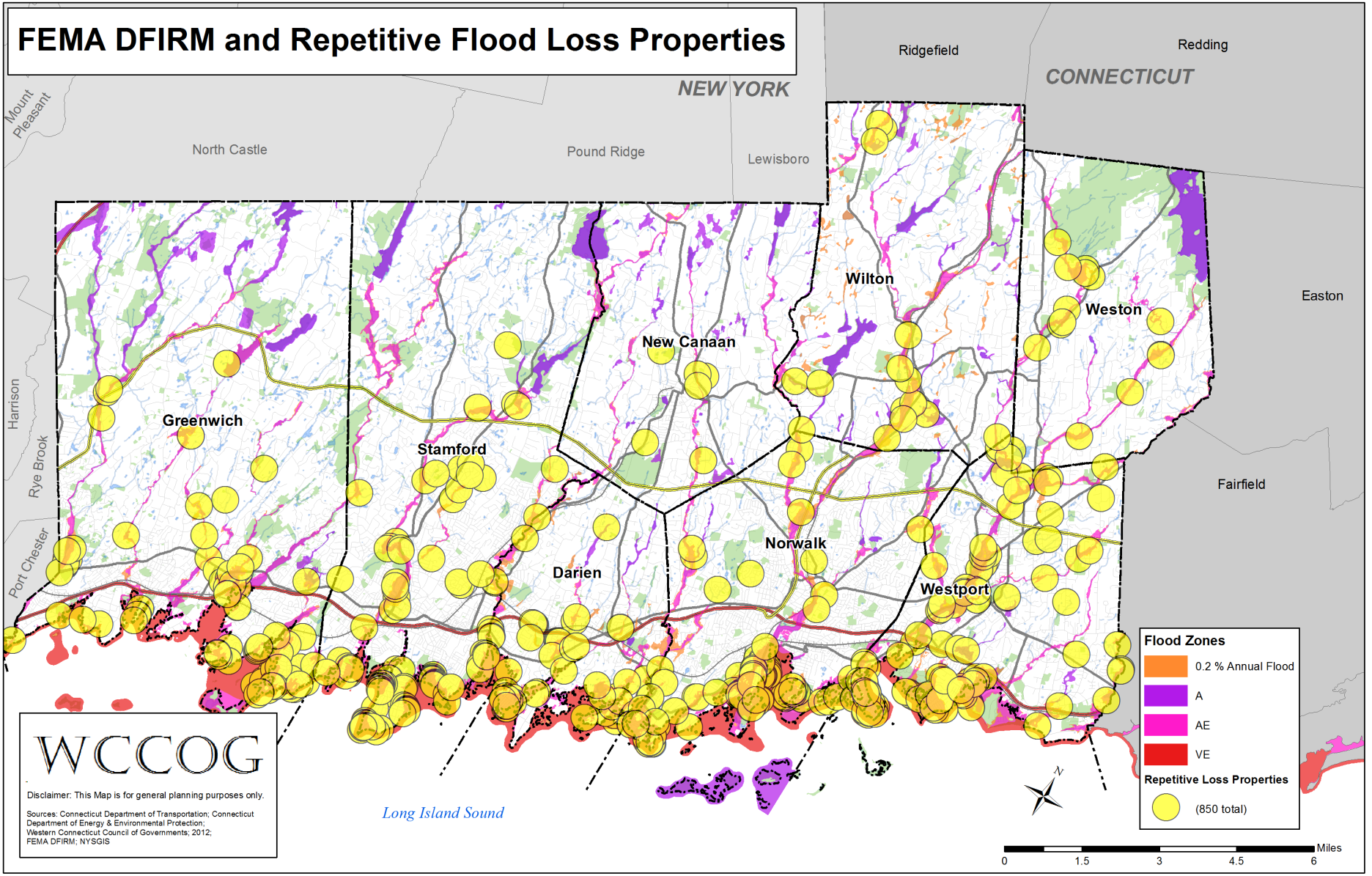

FEMA DFIRM and Repetitive Flood Loss Properties
NEW YORK
CONNECTICUT
Ridgefield
Redding
Mount Pleasant
North Castle
Pound Ridge
Lewisboro
Wilton
Weston
Easton
New Canaan
Greenwich
Stamford
Harrison
Rye Brook
Port Chester
Fairfield
Norwalk
Darien
Westport
Long Island Sound
WCCOG
Disclaimer: This Map is for general planning purposes only.
Sources: Connecticut Department of Transportation; Connecticut Department of Energy & Environmental Protection; Western Connecticut Council of Governments; 2012; FEMA DFIRM; NYSGIS
Flood Zones
0.2 % Annual Flood
A
AE
VE
Repetitive Loss Properties
(850 total)
0
1.5
3
4.5
6
Miles

Table 3.9.4-1: Municipal assets within HAZUS defined coastal and riverine 1% annual flood zones

Source: WCCOG, DEMHS, DEEP, FEMA

	Darien			Greenwich			New Canaan			Norwalk			Stamford			Weston			Westport			Wilton			South Western Region		
	Total	Coastal	Riverine	Total	Coastal	Riverine	Total	Coastal	Riverine	Total	Coastal	Riverine	Total	Coastal	Riverine	Total	Coastal	River-ine	Total	Coastal	Riverine	Total	Coastal	Riverine	Total	Coastal	Riverine
Care Facility	4	0	1	10	0	0	3	0	0	30	0	0	38	1	0	0	0	0	5	0	0	5	0	0	95	1	1
EMC	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	8	0	0
Fire	3	0	0	7	0	0	1	0	0	6	0	0	13	1	1	2	0	1	4	1	0	2	0	0	38	2	2
Housing	3	0	0	12	0	0	0	0	0	21	1	0	3	0	0	0	0	0	3	1	0	4	0	0	46	2	0
Other	6	1	0	73	18	2	7	0	0	56	14	1	11	4	0	4	0	0	30	8	3	6	0	2	193	45	8
Police	1	0	0	2	1	0	1	0	0	3	1	0	2	0	0	1	0	0	1	0	0	1	0	0	12	2	0
Rail/Bus	6	0	0	14	0	0	2	0	0	26	2	0	11	2	1	0	0	0	22	0	1	3	0	0	84	4	2
School	8	0	0	26	1	2	10	0	0	30	0	0	50	0	4	4	0	0	13	1	1	11	0	1	152	2	8
Grand Total	**32**	**1**	**1**	**145**	**20**	**4**	**25**	**0**	**0**	**173**	**18**	**1**	**129**	**8**	**6**	**12**	**0**	**1**	**79**	**11**	**5**	**33**	**0**	**3**	**628**	**58**	**21**

Table 3.9.4-2: Municipal assets within HAZUS defined coastal and riverine 0.2% annual flood zones

Source: WCCOG, DEMHS, DEEP, FEMA

	Darien			Greenwich			New Canaan			Norwalk			Stamford			Weston			Westport			Wilton			South Western Region		
	Total	Coastal	Riverine	Total	Coastal	Riverine	Total	Coastal	Riverine	Total	Coastal	Riverine	Total	Coastal	Riverine	Total	Coastal	River-ine	Total	Coastal	Riverine	Total	Coastal	Riverine	Total	Coastal	Riverine
Care Facility	4	0	1	10	0	0	3	0	0	30	0	0	38	2	0	0	0	0	5	0	0	5	0	0	95	2	1
EMC	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	8	0	0
Fire	3	0	0	7	0	0	1	0	0	6	1	0	13	1	1	2	0	1	4	1	1	2	0	0	38	3	3
Housing	3	0	0	12	0	0	0	0	0	21	2	0	3	1	0	0	0	0	3	2	2	4	0	0	46	5	2
Other	6	1	0	73	19	4	7	0	0	56	16	1	11	5	0	4	0	0	30	8	8	6	0	2	193	49	15
Police	1	0	0	2	1	0	1	0	0	3	1	0	2	0	0	1	0	0	1	0	0	1	0	0	12	2	0
Rail/Bus	6	0	0	14	0	0	2	0	0	26	3	0	11	2	1	0	0	0	22	1	2	3	0	0	84	6	3
School	8	0	0	26	1	2	10	0	0	30	2	1	50	0	5	4	0	0	13	1	1	11	0	1	152	4	10
Grand Total	**32**	**1**	**1**	**145**	**21**	**6**	**25**	**0**	**0**	**173**	**25**	**2**	**129**	**11**	**7**	**12**	**0**	**1**	**79**	**13**	**14**	**33**	**0**	**3**	**628**	**71**	**34**

has the greatest amount of flood events in Connecticut. The frequency of flood events has increased over the past 60 years, according to the Cornell University Extreme Precipitation in New York and New England modeling project (in collaboration with the Northeast Regional Climate Center (NRCC) and the Natural Resources Conservation Service (NRCS)).

Table 3.9.4-3: Flood statistics by municipality.

	Riverine				Coastal			
	Flood Area (Acres)		Damage ($ 1000's)		Flood Area (Acres)		Damage ($ 1000's)	
Municipality	1% Flood	0.2% Flood	1% Flood	0.2% Flood	1% Flood	0.2% Flood	1% Flood	0.2% Flood
Darien	241	303	33231	50824	494	596	64023	92530
Greenwich	1369	1638	71481	109324	904	1153	193473	288006
New Canaan	534	618	19093	29201	--	--	--	--
Norwalk	516	597	107580	164534	1273	1462	249371	436406
Stamford	1421	1689	209421	320290	879	1070	413109	643095
Weston	1062	1168	29062	44448	--	--	--	--
Westport	507	1022	53293	81507	1017	1252	193279	352951
Wilton	940	1059	222010	339544	--	--	--	--
Region	6590	8094	745171	1139670	4567	5533	1113255	1812988

1. Damage statistics for 0.2% flood event for each municipality were derived from the regional 500yr flood event totals and the damage proportions observed in the 1% flood event.

Flood events tend to reoccur in the same location. These areas which repeatedly flood are identified as Special Flood Hazard Areas (SFHA). SFHA are subject to inundation by a flood having a 1-percent or greater chance of being equaled or exceeded in any given year. These areas were historically known as 100-year flood zones and are currently identified as a 1% chance flood, see naming conventions in Table 3.9.3-2. The 1% chance flood is a regulatory standard used by Federal agencies, states and NFIP-participating communities to administer and enforce floodplain management programs. 1% and 0.2% (500-year) flood zones can be seen for the region in Figure 3.9.3-1. Individ-

ual town flood maps can be found in Appendix B-1, while additional information on probability is contained within Table 3.9.1-1 (Town Hazard Profile Table).

3.9.4 Vulnerability and loss estimation

The most vulnerable location are those structures which exist within identified SFHA. The Region has substantial amounts of impervious surface that causes water to flow rapidly over the landscape; it is prone to flash flooding, which often occurs during heavy rain events. Municipal identified assets that fall within 1% and 0.2 % annual flood zones (Identified by Hazus) are presented in Tables 3.9.4-1 and 2.

FEMA's HAZUS-MH Hazard simulation software was used to simulate coastal and riverine flooding within the region. A town by town damage summary is provided in Table 3.9.4-3 for 1% and 0.2% flood events. More detailed results can be found in the appendix.

3.9.5 National Flood Insurance Program

The National Flood Insurance Program (NFIP) is a community program of corrective and preventative measures for reducing flood damage. For communities to be included in the NFIP, they must adopt their flood hazards maps and the community Flood Insurance Study (FIS), as well as the adoption and enforcement of a FEMA-compliant floodplain management ordinance that regulates activity in the floodplain. All eight of the Region's municipalities participate in the NFIP and three of the municipalities participate in the Community Rating System (CRS). More detailed NFIP claim information can be found in Tables 3.9.5-1 and 2.

Table 3.9.5-1: NFIP RLP Claim Statistics by Municipality

Municipality	Building Payments	Contents Payments	Total Payments	Average Payment	Losses	Properties
Darien	$6,863,704.04	$1,478,197.69	$8,341,901.73	$52,464.79	159	59
Greenwich	$12,023,343.71	$1,683,302.31	$13,706,646.02	$34,612.74	396	134
New Canaan	$329,928.34	$39,184.91	$369,113.25	$20,506.29	18	7
Norwalk	$18,847,523.32	$2,109,493.25	$20,957,016.57	$30,549.59	686	245
Stamford	$11,771,394.95	$2,011,897.53	$13,783,292.48	$37,151.73	371	118
Weston	$492,539.07	$58,514.22	$551,053.29	$15,307.04	36	15
Westport	$22,004,678.94	$3,289,923.63	$25,294,602.57	$32,512.34	778	256
Wilton	$760,186.85	$131,803.34	$891,990.19	$20,272.50	44	16

Souce: FEMA NIFP. Generated 12/3/2014

Table 3.9.5-2: NFIP SRL Claim Statistics by Municipality

Municipality	Building Payments	Contents Payments	Total Payments	Average Payment	Losses	Properties
Darien	$881,967.88	$199,582.81	$1,081,550.69	$54,077.53	20	4
Greenwich	$3,457,911.01	$533,542.02	$3,991,453.03	$59,573.93	67	12
Norwalk	$2,142,177.56	$327,849.35	$2,470,026.91	$44,107.62	56	11
Stamford	$1,311,620.26	$88,720.69	$1,400,340.95	$35,008.52	40	9
Westport	$3,187,838.64	$398,432.94	$3,586,271.58	$31,736.92	113	21
Wilton	$95,985.80	$50,435.86	$146,421.66	$24,403.61	6	1

Source: FEMA NFIP. Generated 12/3/2014

A number of flood insured properties have had more than one claim and are referred to as Repetitive Loss Properties (RLP). These properties that have had two or more NFIP losses (greater than 10 days apart) of at least $1,000 each paid within a 10-year period since 1978. A sub category of the RLP is the Severe Repetitive Loss Property (SRL) which includes single-family structures consisting of one to four residences that have:

Incurred flood related damages on four or more separate occasions with the amount of each claim exceeding $5,000 and the cumulative amount of the total claims paid exceeding $20,000

Cumulative amount of the claims exceeds the value of the property, when at least two separate claim payments have been made.

At least two losses must have occurred within a 10-year time span; claims must be more than 10 days apart." 4

The primary goal of the SRL Program has been to reduce excessive flood claim payments and reliance on the National Flood Insurance Fund (NFIF) for flood relief when mitigation is an option.

Total claim and payment statistics for RLPs and SRLs can be found in Table 3.9.5-1 and Table 3.9.5-2. The approximate locations (Locations were modified for privacy) of RLPs can be found in Figure 3.9.2-1

3.10 Hail

Hail – A showery precipitation in the form of irregular pellets or balls of ice more than 5 mm in diameter, falling from a cumulonimbus cloud.

3.10.1 Hazard profile

Within the SWR hail is a low risk hazard, rarely causing substantial damage. This is consistent with assigned municipal hazard profile which is detailed in Table 3.10.1-1. Hail is formed in towering cumulonimbus clouds (thunderheads) when strong updrafts carry water droplets to a height at which they freeze. Eventually, these ice particles become too heavy for the updraft to hold up, and they fall to the ground at speeds of up to 120 mph. Hail falls along paths called swaths, which can vary from a few square acres to up to 10 miles wide and 100 miles long[9]. Hail larger than ¾ inch in diameter result in substantial damage to both property and crops, with some storms producing hail over 2 inches in diameter. Hail causes about $1 billion in damages annually in the U.S. Hail events typically occur in conjunction with severe weather such as super cells and thunder storms. These storm events are described in more detail in section 3.13 Severe Storms.

3.10.2 Historical Hail Events

Below is a collection of historical hail events from 2000-2014 from the NCDC storm events database, along with hail diameter.

July 21, 2010 – 1.75 inch hail in Stamford, 0.88 inch hail in Wilton.
June 6, 2010 – 0.88 inch hail in Wilton
August 7, 2008 – 0.75 inch hail in Norwalk
June 16, 2007 – 0.8 inch hail in Weston, 0.88 in hail in Wilton
July 18 2006 – 1 inch hail in Norwalk and Darien
July 11 2006 – 0.75 in hail in Darien, 0.88 inch hail in New Canaan
May 24, 2004 – 0.75 inch hail in Weston
May 31, 2002 – 0.75 inch hail in Greenwich
August 10, 2001 – 0.75 inch hail in Norwalk
May 29, 2001 – 0.88 inch hail in Darien
May 24, 2000 – 0.75 in hail in Norwalk

3.10.3 Probability

There is a 78% annual chance of a hail event occurring within the SWR as determined from the historic hail events from 2000-2013 found in the NCDC data set. Additional information on probability is contained within Table 3.10.1-1 (Town Hazard Profile Table).

3.10.4 Vulnerability and loss estimation

According to the NCDC the listing of hail events reported zero dollars in reported damage. The storms strong winds and lighting are often the damage causing components. Farms and agriculture businesses are the most vulnerable to hail due to the potential damage, although there are very few agricultural growers in the SWR.

Table 3.10.1-1: Hail Hazard Summary by Municipality

Municipality	Location (Geographic Area)	Maximum Probable Extent (Magnitude/Strength)	Probability of Future Events	Overall Significance Ranking
Darien	negligible	weak	unlikely	low
Greenwich	extensive	weak	unlikely	low
New Canaan	significant/extensive	weak	likely	low
Norwalk	-	-	-	-
Stamford	-	-	-	-
Weston	-	-	-	-
Westport	-	-	-	-
Wilton	extensive	moderate	occasional	low

3.11 Hurricane & Tropical Storms

Tropical Cyclone - is a warm-core, low pressure system without any "front" attached, that develops over the tropical or subtropical waters, and has an organized circulation. Tropical cyclones include three types of systems which are differentiated primarily on wind speed:

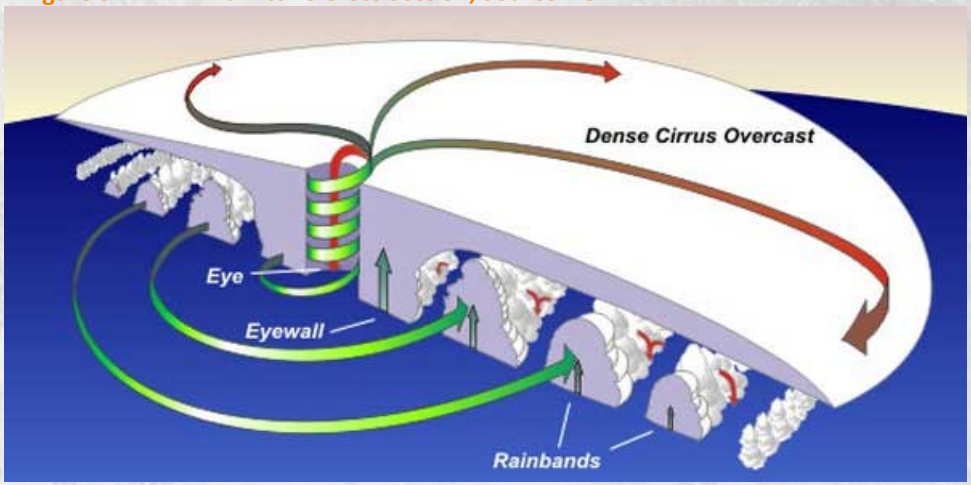
- **Tropical Depression** – A system in which the maximum sustained surface wind is 33 knots (38 mph) or less.
- **Tropical Storm** – A system in which the maximum sustained surface wind ranges from 34 to 63 knots (39 – 73 mph).
- **Hurricanes** (also known as typhoons in the Western Pacific and cyclones in the Indian Ocean) – A system in which the maximum sustained surface wind is 64 or greater (74+ mph). This is the worst and strongest of all tropical systems."

3.11.1 Hazard profile

The SWR is located along the Atlantic coastline and has experienced all three types of tropical cyclone systems, including some of the worst hurricanes to make landfall within the United States. Several types of natural hazards may be associated with tropical cyclones including: storm surge, flooding (both coastal and riverine), tornadoes, and high winds. Figure 3.11.1-1 shows a diagram of the anatomy of a tropical cyclone (hurricane) which consists of:

1. Eye – the center of a hurricane which is the calmest part of the storm, and is typically 20-40 miles across;

Figure 3.11.1-1: Hurricane Cross Section, Source NOAA



2. Eye Wall – surrounds the eye and consists of a ring of tall thunderstorms that produce heavy rains and usually the strongest winds; and
3. Rain bands – curved bands of clouds and thunderstorms that rail away from the eye wall in a spiral fashion. Rain bands are capable of producing high winds, heavy outbursts of rain and tornadoes.

There are several environmental conditions which must be present for a tropical cyclone to form:[10]

- Warm ocean waters (at least 80 degrees) at the surface and to a depth of about 150 feet;
- Relatively moist air near the mid-level of the troposphere;
- A minimum 300 mile distance from the equator;
- A pre-existing near surface disturbance; and
- Low values of vertical wind shear (change in wind speed with height) between the surface and the upper troposphere.

Currently the Saffir/Simpson Wind Scale is used to identify hurricane intensity. The scale is primarily based upon wind speeds. Table 3.11.1-1 displays

Table 3.11.1-1: Hurricane Hazard Summary by Municipality

Municipality	Location (Geographic Area)	Maximum Probable Extent (Magnitude/Strength)	Probability of Future Events	Overall Significance Ranking
Darien	extensive	extreme	likely	high
Greenwich	extensive	extreme	occasional	high
New Canaan	extensive	extreme	likely	high
Norwalk	limited	moderate/severe	likely	medium
Stamford	significant	moderate/severe	likely	medium/high
Weston	extensive	severe	likely	high
Westport	extensive	severe	likely	high
Wilton	extensive	extreme	likely	high

Table 3.11.1-2: Safir Simpson Scale

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

Source: NOAA

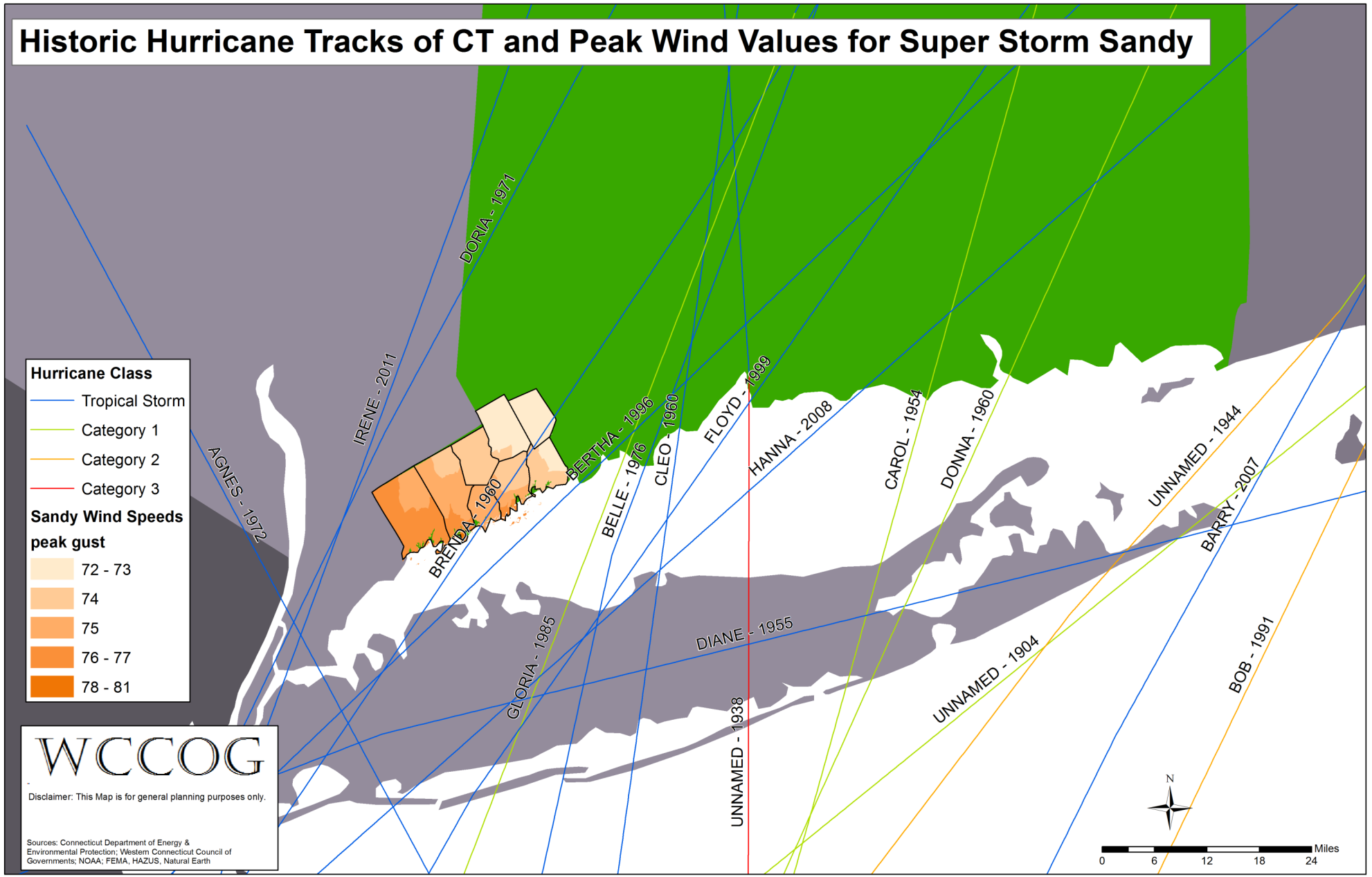
the Saffir/Simpson Hurricane Intensity scale and their respective wind speeds.

Howling winds associated with Nor'easters also have the potential to produce significant storm surge and wind gusts similar to that of a Category 1 hurricane. These severe storm events are described in more detail in section 3.15.

3.11.2 Historical hurricanes & tropical storms

Historically the most destructive hurricane to sweep through the region is the unnamed hurricane of 1938 which killed 600 people and injured 1,700 statewide. Local Historical Hurricane Tracts are shown in Figure 3.11.2-1, note that Hurricane Sandy made landfall in NJ and is not visible in this map. Below is lists the three most recent and destructive hurricanes that have struck the SWR.

Super Storm Sandy - October 29-30, 2012: Post Tropical Storm Sandy was the costliest natural disaster in Southeast New York. Tropical Storm Sandy formed in the Caribbean Sea on October 22. After drifting slowly southwest on October 23, Sandy turned to the north and intensified to a hurricane on October 24, just before making landfall in Jamaica. Hurricane Sandy continued to the north and intensified to a strong category two hurricane before making landfall again in Cuba shortly after Midnight EDT on the 25th. Hurricane Sandy emerged on the other side of Cuba during the morning of the 25th and proceeded to drift northwest as a category one or two hurricane as it moved through the Bahamas on the 25th and 26th. Overnight on the 26th, Hurricane Sandy (Category 1) started to move toward the north northeast, a motion that continued into the evening of the 28th. From there, Sandy's motion became driven by two factors. An anomalously strong blocking ridge over the Canadian Maritimes prevented Sandy from escaping to the east. Simultaneously, an approaching and deepening extra-tropical trough was about to capture Sandy. The combination of the two, turned Sandy to the north overnight on the 28th and then to the north-


Historic Hurricane Tracks of CT and Peak Wind Values for Super Storm Sandy
Hurricane Class
Tropical Storm
Category 1
Category 2
Category 3
Sandy Wind Speeds
peak gust
72 - 73
74
75
76 - 77
78 - 81
WCCOG
Disclaimer: This Map is for general planning purposes only.
Sources: Connecticut Department of Energy & Environmental Protection; Western Connecticut Council of Governments; NOAA; FEMA, HAZUS, Natural Earth
AGNES - 1972
IRENE - 2011
DORIA - 1971
BRENDA - 1960
BERTHA - 1996
BELLE - 1976
CLEO - 1960
FLOYD - 1999
HANNA - 2008
CAROL - 1954
DONNA - 1960
UNNAMED - 1944
BARRY - 2007
GLORIA - 1985
DIANE - 1955
UNNAMED - 1938
UNNAMED - 1904
BOB - 1991
N
0
6
12
18
24
Miles

west on the 29th.

As Sandy continued to move northwest and interact with the mid latitude trough, its interaction continued to make it less tropical, but did not weaken it much. Sandy continued to make a harder turn to the left (west) and made landfall in Atlantic County as a post tropical storm in Brigantine City just north of Atlantic City at 7:30 pm Eastern Daylight Time (EDT) on the 29th. The estimated minimum central pressure was 945 millibars. The lowest recorded central pressure was 945.6 millibars at the Atlantic City Marina at 7:34 pm EDT.

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. These extreme conditions resulted in at least five deaths and widespread property damage of at least $360 million. Emergency managers recommended mandatory evacuations of 362,000 people that lived in low lying areas. Widespread significant statewide power outages of 667,598 lasted up to eight days. Wind gusts of 70 mph were reported in Greenwich, with gusts up to 69 and 68 mph in Norwalk and Trumbull respectively.

"In Stamford, Mayor Michael A. Pavia said 63%of the city was without power" –NY Times

Hurricane Irene - August 28, 2011: As Hurricane Irene moved north along the Atlantic coast and interacted with land, it weakened and made its second landfall as a Tropical Storm near Little Egg Inlet along the southeast NJ Coast on August 28, 2011 around 5:35 am EDT. Tropical Storm Irene made its third landfall in New York City around 9:00 am. Irene brought sustained tropical storm winds, heavy rain, and destructive storm surge. One death and two injuries resulted from high winds:

Approximately 15,000 people evacuated from storm surge along the CT shores of Long Island Sound where a state voluntary evacuation was in effect. Preliminary damage cost estimates included $150-200 million for Individual Assistance covered by Insurance and $40-50 million for Public Assistance. The number of power outages statewide peaked around 900,000 outages. The state lost around 3% of their tree population.

"The New Canaan branch of Metro North suffered extensive damage, and AT&T reported 2,000 downed poles, as well as damage to cellphone towers. On Friday night, the city ordered a mandatory evacuation of flood-prone areas that included nine specific residential streets. The evacuation sent about 25 people to the Red Cross shelter within Stamford High School." Wall street journal

Hurricane Gloria – September 12, 1985: This was the most recent Category 3 hurricane to strike the Region. Hurricane Gloria's damaging winds and torrential rains caused massive power outages throughout the state. The power outages affected 34,000 customers in Norwalk, 9,684 in Stamford, 5,431 in Darien, 4,239 in Weston, 4,076 in Greenwich, 1,128 in New Canaan, 1,050 in Westport and 161 in Wilton. The coastal and low lying areas experienced flooding, but the flooding was relatively modest when compared to the hurricanes in 1938, 1954 and 1955. Hurricane Gloria drove many from their homes to emergency shelters. In addition, New Canaan, Westport, and other municipalities setup emergency water distribution centers to provide clean water to residents who did not have electricity to pump water from their wells.

3.11.3 Probability

The National Weather Service (NWS) National Hurricane Center defines June 1 through November 30 as the Atlantic hurricane season. According to the state's 2016 HMP, September is typically the most active month for tropical cyclones in Connecticut. However it can be said that in general it is impossible to predict when and where a hurricane will occur. Some researchers and Federal agencies like NOAA do not make annual landfall predictions. NOAA states that, "Hurricane landfalls are largely determined by the weather patterns in places the hurricane approaches, which are only predictable when the storm is within several days of making landfall." NOAA does issue a seasonal hurricane outlook that "provides a general guide to the expected overall nature of the upcoming hurricane season." The outlook combines the impacts of three climate factors to analyze an expected level of activity for the season:

- The tropical multi-decadal signal;
- The El Niño/La Niña (ENSO – El Niño Southern Oscillation) cycle; and
- The tropical Atlantic sea surface temperatures.

FEMA's HAZUS-MH software provides probabilistic hurricane tracts for 1% and 0.2% annual hurricane events. Hazus reports detailing the impacts of these hurricane examples can be found in the appendix. Additional information on probability is contained within Table 3.11.1-1 (Town Hazard Profile Table).

3.11.4 Vulnerability and loss estimation

Hurricanes have the greatest destructive potential of all natural disasters occurring in the Region, with all eight municipalities likely to sustain significant damage due to the potential combination of high winds, storm surge and coastal erosion. One retrospective article in the *Stamford Advocate* suggested that the lack of education and warning systems contributed to the loss of life and injuries.

Using FEMA's HAZUS-MH software, a suite of probabilistic hurricane scenarios were performed as well as a hurricane Sandy simulation to estimate the potential loss to property and life for each town and the region as a whole in regards to wind only. Max wind speeds for this simulation can be found in Figure 3.11.2-1., and Sandy flood inundation in Figure 3.15.4-1

The Hurricane Sandy simulation estimated a total economic loss of about $57 million. It is estimated that 53 buildings would sustain at least moderate damage and 729 buildings with minor damage, no buildings are completely destroyed. 3 of the region's 4 hospitals. No other critical facility is expected to suffer moderate damage. The model estimates that a total of over 10,800 tons of debris (197 truckloads) would be generated. Town by town estimated damage totals can be found in Table 3.11.4-1.

Table 3.11.4-1 : HAZUS Estimated Hurricane Sandy Wind Damage in $1000s

Town	Building Damage	Content Damage	Relocation Cost	Rental loss
Darien	3055.2	954.3	2.2	1.8
Greenwich	10535.6	3044.8	74.5	99.1
New Canaan	1803.3	13.6	4.2	4.4
Norwalk	9853.0	2132.4	135.4	197.1
Stamford	14766.7	1450.1	350.9	475.5
Weston	714.8	0.0	0.1	0.0
Westport	4398.6	1616.4	6.0	6.4
Wilton	1407.2	4.5	3.0	3.3
Region	46534.4	9216.1	576.4	787.6

Data Generated through HAZUS

3.12 Landslide

Historically, this hazard has not occurred within the region. This hazard has not been identified as a concern by all jurisdictions within the region.

3.13 Severe Storms (Lightning, Hail, High Wind)

High wind - Sustained wind speeds of 40 mph or greater lasting for one hour or longer, or winds of 58 mph or greater for any duration.

Severe thunderstorm - having large hail, at least 3/4 inches (0.75 inches) in diameter, and/or damaging winds, at least 58 mph, or 50 knots.

Severe weather - a destructive storm or weather. It is usually applied to local, intense, often damaging, storms such as thunderstorms, hail storms and tornadoes, and extended heavy rain but it can also describe more widespread events such as tropical systems, blizzards, nor'easters and derechos.

3.13.1 Hazard profile

Severe Storms regularly strike the SWR and its municipalities are equally susceptible to the hazard. All the municipalities in the region identified this hazard as a likely and highly significant hazard across the board, which is highlighted in Tables 3.13.1-1, 2, and 3. This is likely because severe storms occur so frequently and covers a multitude of potential hazards such as: strong wind; heavy rain; hail; and lightning; which tend to work in conjunction with one another. For the purpose of this section "severe storm" is synonymous with "thunderstorms"

Thunderstorms are formed when the right atmospheric conditions combine to provide moisture, lift, and warm, unstable, rapidly rising air. Thunderstorms can occur any time of the day and in all months of the year, but are most common during summer afternoons and evenings, in conjunction with frontal boundaries. The National Weather Service (NWS) classifies a thunderstorm as severe if it produces hail at least one inch in diameter, winds of 58 mph or greater, or a tornado. About 10% of the estimated 100,000 annual thunderstorms that occur nationwide are considered severe[11]. Thunderstorms affect a smaller area compared to with winter storms or hurricanes, but they can be dangerous and destructive for a number of reasons. Storms can form in less than 30 minutes, giving very little warning; they have the potential to produce lightning, hail, tornadoes, powerful straight-line winds, and heavy rains that produce flash

Table 3.13.1-1: Severe Storm Hazard Summary by Municipality

Municipality	Location (Geographic Area)	Maximum Probable Extent (Magnitude/Strength)	Probability of Future Events	Overall Significance Ranking
Darien	extensive	severe	likely	high
Greenwich	extensive	severe	likely	high
New Canaan	extensive	severe	likely	high
Norwalk	extensive	severe	likely	high
Stamford	extensive	severe	likely	high
Weston	extensive	severe	likely	high
Westport	extensive	severe	likely	high
Wilton	extensive	severe	likely	high

Table 3.13.1-2: Lightning Hazard Summary by Municipality

Municipality	Location (Geographic Area)	Maximum Probable Extent (Magnitude/Strength)	Probability of Future Events	Overall Significance Ranking
Darien	significant	severe	likely	medium
Greenwich	negligible	severe	unlikely	low
New Canaan	extensive	weak	highly likely	low
Norwalk	negligible	weak	unlikely	low
Stamford	extensive	moderate	likely	medium/high
Weston	extensive	moderate	likely	high
Westport	significant	weak	likely	medium
Wilton	extensive	moderate	likely	medium

Table 3.13.1-3: Severe Wind Hazard Summary by Municipality

Municipality	Location (Geographic Area)	Maximum Probable Extent (Magnitude/Strength)	Probability of Future Events	Overall Significance Ranking
Darien	extensive	extreme	likely	high
Greenwich	extensive	severe	occasional	high
New Canaan	extensive	extreme	likely	high
Norwalk	limited	moderate/severe	likely	medium
Stamford	extensive	weak/moderate	likely	medium/high
Weston	extensive	severe	likely	high
Westport	extensive	severe	likely	high
Wilton	extensive	severe	likely	high

flooding.

Winds generated in a thunderstorm can rival those of "weaker" tornadoes, with gusts of 80 to 100 mph covering a wide area.

All thunderstorms produce lightning, and therefore all thunderstorms are dangerous. Lightning often strikes outside of areas where it is raining, and may occur as far as 10 miles away from rainfall. It can strike from any part of the storm, and may even strike after the storm has seemed to pass. Hundreds of people across the nation are injured annually by lightning, most commonly when they are moving to a safe place but have waited too long to seek shelter. Lightning strike victims often suffer long-term effects such as memory loss, sleep disorders, weakness and fatigue, chronic pain, depression and muscle spasms. Lightning has the potential to start both house and wild fires. Lightning causes an average of 55-60 fatalities, 400 injuries, and over $1 billion in insured losses annually nationwide.

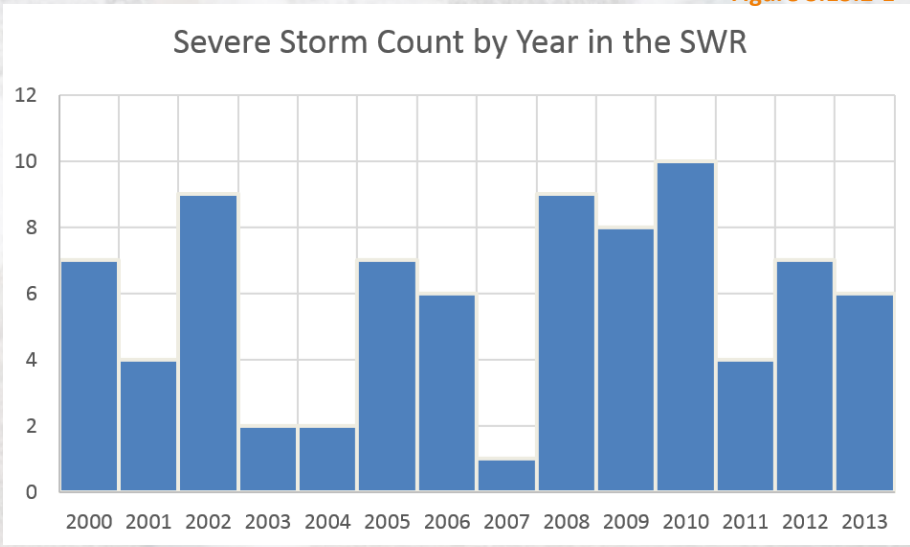
- A description of hail is referenced in section 3.10
- A description of flood is referenced in section 3.9
- A description of tornados is referenced in section 3.18

3.13.2 Historical Severe Storms

The SWR has observed a number of historical storm events, and the National Weather Storm Events Database provides examples of the impacts to the Region. The following examples were chosen to provide a snap shot of impacts severe storms have on the region. Figure 3.13.2-1 lists the number of severe storm events that occurred each year as there are too many to list in detail. See the NOAA NCDC for more details on specific storms:

July 11, 2013 - A line of showers and thunderstorms, with isolated severe thunderstorms embedded, formed along a slow moving cold front pushing through the Tri-State area. A tree was reported down, blocking the intersection of Scofieldtown Road and Old Logging Road in Stamford. A tree was reported down across Interstate 95 at Exit 5, resulting in heavy delays in Greenwich. In Westport, multiple trees and wires were reported down blocking Bonnie Brook Lane, a wire was reported down and blocking the intersection of Evergreen Ave. and Compo Rd. North, and Lightning struck a house, causing the house to fill with smoke. Total Regional damage of $11,000.

Figure 3.13.2-1



Source: NOAA NCDC

July 21, 2010 – Hail, Strong Winds, Thunder & Lighting - A stationary front, coupled with an approaching upper level trough caused severe thunderstorms, including isolated supercells, across Southern Connecticut. One supercell was responsible for a microburst in Middlesex County. Golf ball size hail was reported in Stamford. Widespread tree damage was reported, with some trees snapped a few feet above the ground. One tree fell onto a car on Compo Road North, near State Route 136 in Westport. Multiple trees were reported down throughout New Canaan, including two onto cars. Nickel size hail was reported in Wilton. Trees were reported down in the town of Greenwich. $30,000 in regional damage.

March 13, 2010 - High winds occurred across the area as deep low pressure settled just south of the region, and strong high pressure remained to the north. A wind gust to 58 mph was reported in Westport at 3:20 pm. At Bridgeport Sikorsky Airport, a wind gust of 60 mph was reported at 4:30 pm. The public reported a wind gust to 65 mph in Norwalk at 5:15 pm. There was widespread trees downed by the storm. Some towns that reported many trees down were Darien and Norwalk. Two deaths were reported as a result of fallen trees. One woman from Westport and another woman from Greenwich were killed by fallen trees. The storm caused a $1 million worth of damage.

June 16, 2007 - Pulse severe thunderstorms produced brief damaging winds and large hail across parts of Fairfield and New Haven Counties. In Wilton there was 0.88 inch hail and large tree limbs were knocked down. Weston observed 0.80 inch hail, accumulating up to an inch in thickness. New Canaan observed 0.88 inches of hail.

3.13.3 Probability

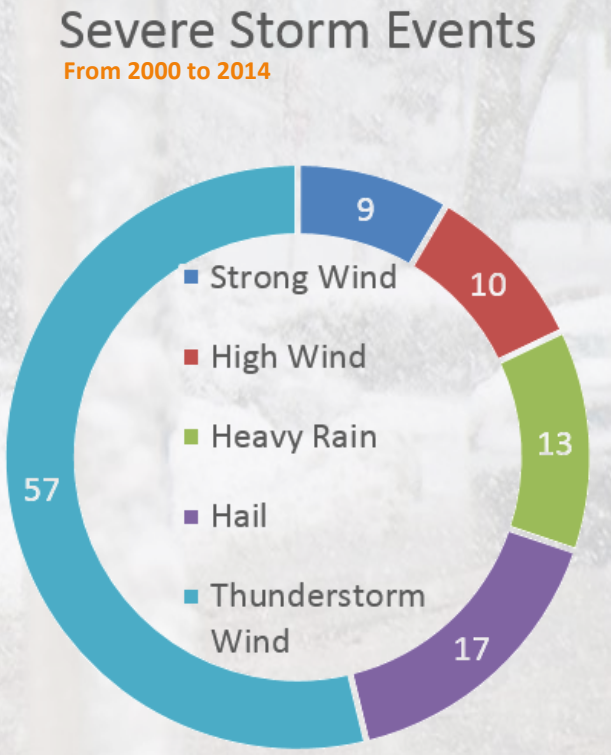
On average around six severe storms are expected to strike the region each year, this is according to the collection of NOAA's NCDC storm events database from 2000-2013. Therefore it is highly likely to observe severe weather annually within the region and all its municipalities. Additional information on probability is contained within Tables 3.13.1-1, 2, and 3 (Town Hazard Profile Tables). A breakdown of storm events from 2000-2014 can be found in Figure 3.13.3-1

3.13.4 Vulnerability and loss estimation

The entire region is equally vulnerable to severe storms. Using the damage estimates from the NCDC Storm Database, annualized losses came to $119k in property damage, 0.64 injuries and 0.36 deaths a year for the region.

Severe Storms are also tied to other natural hazards, high winds will have similar impacts to hurricanes. Lighting can trigger wildfires, and intense rain events can cause flash flooding. The vulnerabilities for these triggered events are discussed in more detail in their respective chapters.

Figure 3.13.3-1:



Source: NOAA, NCDC

3.14 Severe Winter Weather

Blizzard – Includes winter storm conditions of sustained winds or frequent gusts of 35 mph or more that cause major blowing and drifting of snow, reducing visibility to less than one-quarter mile for three or more hours. Extremely cold temperatures often are associated with dangerous blizzard conditions.

Freezing Rain – Rain that freezes on objects such as trees, cars, or roads, and forms a coating or glaze of ice. Temperatures at higher levels are warm enough for rain to form, but surface temperatures are below 32 degrees Fahrenheit, causing the rain to freeze on impact.

Ice Storm – Liquid rain that falls and freezes on contact with cold objects creating ice build-ups of one-quarter inch or more that can cause severe damage.

Nor'easter – A low-pressure disturbance forming along the South Atlantic coast and moving northeast along the Middle Atlantic and the New England coasts to the Atlantic Provinces of Canada. It usually causes strong northeast winds with rain or snow. It is also referred to as a Northeaster or Coastal Storm. Nor'easters normally occur between November 1 and April 1, however it is not highly unusual for a Nor'easter to occur during the mid to latter part of April (early spring).

Sleet – Rain drops that freeze into ice pellets before reaching the ground. Sleet usually bounces when hitting a surface and does not stick to objects. However, it can accumulate like snow and cause a hazard to motorists.

Snow – Frozen precipitation composed of ice particles in complex hexagonal patterns. Snow forms in cold clouds by the direct transfer of water vapor to ice.

Winter Storm – A heavy snow event which has a snow accumulation of more than six inches in 12 hours, or more than 12 inches in 24 hours.

3.14.1 Hazard profile

The SWR is familiar with severe winter weather and all of the towns in the region are vulnerable to its effects. Impacts from winter storm events can cause icy and congested roads, power outages, school and work cancelations, as well as property damage. Winter storms are also associated with high winds which can impact the region as well. High winds however are discussed in section 3.13 Severe Storms.

Winter weather generally includes the occurrence of snow, sleet, freezing rain, and cold temperatures. Three elements are needed to create any type of winter precipitation:

- Cold air – below freezing temperatures in the clouds and near the ground;
- Lift – something to raise the moist air to form the clouds and cause precipitation; and
- Moisture – needed to form clouds and precipitation.

The most severe storms and weather conditions usually occur within the time period of December through March.[12]

The Northeast Snowfall Impact Scale (NESIS), provides a measure of winter storm severity. The scale is based on snow depth, area, population. The description for each category in the NISIS scale is shown in Table 3.14.1-1.

Table 3.14.1-1: Severe Winter Weather Hazard Summary by Municipality

Municipality	Location (Geographic Area)	Maximum Probable Extent (Magnitude/Strength)	Probability of Future Events	Overall Significance Ranking
Darien	extensive	weak	likely	high
Greenwich	extensive	severe	likely	high
New Canaan	extensive	extreme	likely	high
Norwalk	extensive	moderate	likely	medium
Stamford	extensive	weak/moderate	likely	medium/high
Weston	extensive	severe	likely	high
Westport	extensive	severe	likely	high
Wilton	extensive	severe	likely	high

Table 3.14.1-2: NESIS Scale

Category	NESIS Value	Description
1	1 - 2.5	Notable
2	2.5 - 4	Significant
3	4 - 6	Major
4	6 - 10	Crippling
5	10+	Extreme

3.14.2 Historical Winter Storm Events

Table 3.14.2-1 displays the count of severe winter weather from 2000-2013 which were included in the NCDC. Below are a few significant storms included in the NCDC severe storm database:

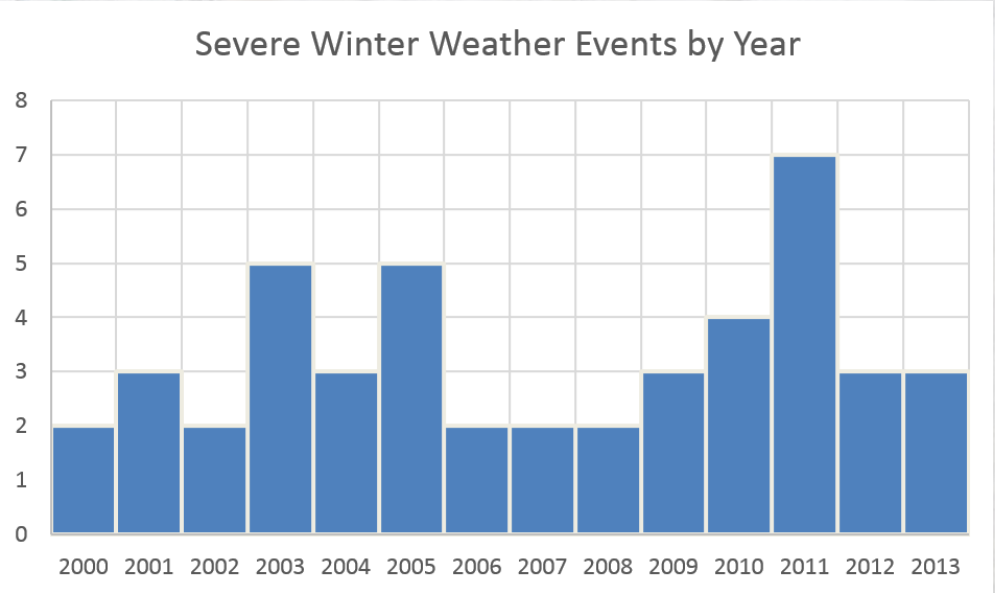
February 7-8, 2013 "Winter Storm Nemo" – By February 7, 2013, this powerful winter storm had prompted winter storm warnings and winter weather advisories for the entire northeastern United States, from the Upper Midwest to New England, including the state of Connecticut. A blizzard warning was also in effect for all of Connecticut and surrounding areas and a state of emergency was declared in Connecticut on February 8. The highest amount of snowfall in the United States recorded from this storm event was 40 inches in Hamden, CT. More than 800 National Guard soldiers and airmen were activated in Connecticut, Massachusetts, and New York to support actions needed on state roads.

October 29-30, 2011 "Winter Storm Alfred" – A historic and unprecedented early season winter storm impacted the area. More than one foot of heavy wet snow fell on interior portions of Southern Connecticut, while coastal areas received mainly rainfall during the event. In addition to the heavy rain and snow, strong winds were experienced along the immediate coastline. Hundreds of thousands of people across southern Connecticut lost power as heavy snow accumulated on trees that still had partial to full foliage during mid-autumn. This caused extensive felling of trees and limbs across the region, which not only downed power lines but also resulted in many road closures. The resulting impacts created many dangerous situations of isolated residential areas with no ingress for emergency vehicles. Communications networks were also significantly disrupted (especially cellular networks). This was the first time a winter storm of this magnitude had ever occurred in October. The event resulted in a total of $247 million in insurance claims including personal, commercial, and auto claims."

February 1-2, 2011 "Groundhog Day Blizzard" – Three to five inches of snow and sleet fell across interior portions of Southern Connecticut during this two-day storm, with two to three inches falling across southern portions. There were isolated reports of up to 10 inches in some areas. Between 1/4 and 3/4 of an inch of ice accreted across Southern Connecticut, with the highest amounts across far Southwestern Connecticut and interior Northeastern Connecticut. This storm event caused widespread power outages, tree damage, the collapse or partial collapse of more than 100 roofs, and resulted in a reported $5.25 million in property damage across four counties in particular (Hartford, New Haven, Tolland, and Windham) as recorded by the NCDC.

March 13-14, 2010: A Nor'easter came through Connecticut causing severe damage across the state. Soaking rains combined with winds exceeding 65mph downed numerous trees, limbs and power lines, closing roads, schools, and businesses across the Region; one person was killed in Westport. Emergency shelters opened in Stamford and Norwalk. Connecticut Light & Power reported nearly 64,000 were without power, with 70 percent of the outages confined to Norwalk, Stamford and Greenwich. It took utility crews and tree workers more than a week to restore power and clear local

Figure 3.14.2-1



Source: NOAA, NCDC

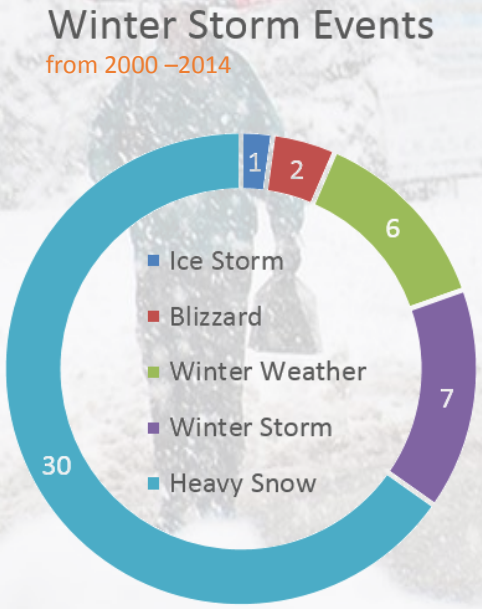
roadways. Individual insurance claims in the South Western Region totaled over $343,000, and accounted for 56% if the claims made in Fairfield County.

3.14.3 Probability

According to the historic data collected from the NCDC during 2000-2014 the SWR can expect on average three severe winter storm events a year. The breakdown of these events can be seen in Figure 3.14.3-1

Research on climate change predicts that the number of major snow storms and snow covered days to decrease, projecting shorter winter seasons for the SWR (by as much as two weeks). Climate models have indicated that fewer but more intense precipitation events will occur during the winter period with more precipitation falling as rain rather than snow.[13] The corresponding change in winter precipitation could result in less frequent but more intense snow storms with heavier (denser) snow. All eight municipalities in the region are equally subjected to this hazard. Additional information on probability is contained within Table 3.14.1-1 (Town Hazard Profile Table).

Figure 3.14.3-1:



Source: NOAA, NCDC

3.14.4 Vulnerability and loss estimation

People living in the more rural areas of the SWR are more vulnerable to potential power losses and property damages which major winter storms generate. In addition, the elderly, poor and homeless populations are also very vulnerable to the impacts created by winter storms due to resource needs (heat, power loss, safe access to food stores, etc.). There is also an increased risk associated with transportation mobility as roads become slick, visibility drops and traffic becomes congested.

The traffic congestion and safe travel of people to and from work can be mitigated by the use of staggered timed releases from work, pre-storm closing of schools, and later start times for companies. Almost all employers and school districts already implement such practices. However, the costs associated with transportation disruptions and the loss of work and school time will continue to increase.

Costs from intense winter weather are tied to property damage and plowing costs. In the city of Stamford for example plowing costs have ranged from $1 million to 1.7 million.

Critical Facilities Exposure. The state contains 1,401 identified critical facilities in the categories of correctional institutions, EMS facilities, fire stations, health departments, law enforcement facilities, nuclear power plants, and storage tank farms. Table 3-14.4-1 on the next page provides a breakdown of the numbers of critical facilities that intersect with areas of the state with maximum recorded snow depths greater than 24-29 inches, 30-35 inches, and greater>=36 inches. A total of 266 critical facilities (42% of the 628 municipal identified assets in the region) are located in an area that has experienced a snow depth of at least 24 inches. The Max Snow Depth Map can be found in Figure 3.14.4-1.

Figure 3.14.4-1

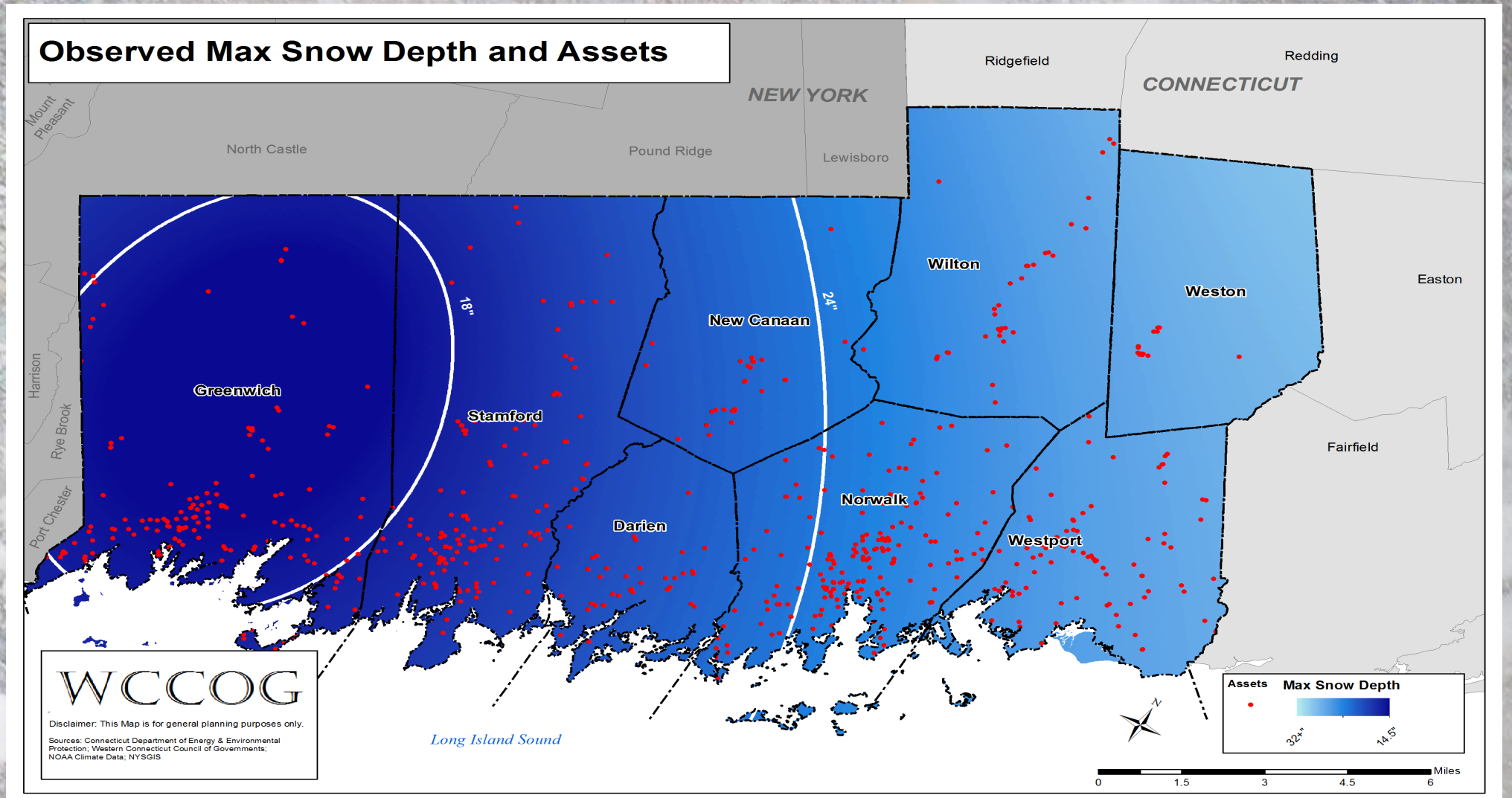


Table 3.14.4-1: Municipal assets within historical max snow depth between 24"-30"

Source: WCCOG, DEMHS, DEEP, FEMA, NOAA, NCDC

	Darien		Greenwich		New Canaan		Norwalk		Stamford		Weston		Westport		Wilton		Region	
	Total	24"-30"	Total	24"-30"	Total	24"-30"	Total	24"-30"	Total	24"-30"	Total	24"-30"	Total	24"-30"	Total	24"-30"	Total	24"-30"
Care Facility	4	0	10	0	3	1	30	29	38	0	0	0	5	5	5	5	95	40
EMC	1	0	1	0	1	0	1	1	1	0	1	1	1	1	1	1	8	4
Fire	3	0	7	0	1	0	6	6	13	0	2	2	4	4	2	2	38	14
Housing	3	0	12	0	0	0	21	18	3	0	0	0	3	3	4	4	46	25
Other	6	0	73	0	7	0	56	42	11	0	4	4	30	30	6	6	193	82
Police	1	0	2	0	1	0	3	3	2	0	1	1	1	1	1	1	12	6
Rail/Bus	6	0	14	0	2	0	26	19	11	0	0	0	22	22	3	3	84	44
School	8	0	26	0	10	1	30	22	50	0	4	4	13	13	11	11	152	51
Grand Total	**32**	**0**	**145**	**0**	**25**	**2**	**173**	**140**	**129**	**0**	**12**	**12**	**79**	**79**	**33**	**33**	**628**	**266**

3.15 Storm Surge

Storm Surge - a temporary rise in sea level along and flooding coastal areas, also preventing sea-bound waterways from draining normally into the sea.

3.15.1 Hazard profile

The region has over 85 miles of coast line spanning five municipalities. These coastal municipalities have identified storm surges being a medium to highly significant hazard.

Storm surges are caused by the difference in wind and barometric pressure between a tropical system and the environment outside the system. The end result is that water is pushed onto a coastline. The height of the surge is measured as the deviation from mean sea level and can reach over 25 feet in extreme circumstances. The most devastating storm surges occur just to the right of the eye of a hurricane. For coastal areas, storm surge is typically the most dangerous and damaging aspect of the storm.

3.15.2 Historical Storm Surges

The NCDC only lists a single storm surge event which is detailed below

August 28, 2011 – Hurricane Irene - The NOAA/NOS tidal gauge at Bridgeport, CT recorded a maximum water level of 12.07 ft. MLLW at 11:06 am EDT, well above the NWS moderate coastal flooding benchmark of 10.4 feet. The United States Army Corps of Engineers (USACOE) tidal gauge at Stamford, CT recorded a maximum water level of 12.7 ft. MLLW at 1030 am EST, well above the NWS moderate coastal flooding benchmark of 11.1 feet.

These water levels caused widespread moderate to major inundation along the coast between 9:30 am and 12:30 pm. In Bridgeport, water from Long Island Sound came up through Bridgeport Harbor and flooded Bridgeport train station tracks. In Fairfield, the combination of fresh water and surge inundated multiple sections of White Street with a few feet of water causing its closure. In addition, water inundation was experienced 1/2 mile inland on Fairfield Beach Rd past 1 Rod Highway. In Westport, the combination of fresh water and surge inundated US1 with one feet of water as the Saugatuck River was forced out of its banks. Additionally closures were experienced along the Saugatuck River near Riverside and Imperial Avenues. In Stamford, water covered about half of Cummings Park due to inundation from Long Island Sound.

3.15.3 Probability

The chance of storm surges is greatest in conjunction with hurricanes and tropical systems. Additional information on probability is contained within Table 3.15.1-1 (Town Hazard Profile Table).

3.15.4 Vulnerability and loss estimation

The Sea, Lake, and Overland Surges from Hurricanes (SLOSH) model is used to evaluate the potential impact of storm surge. Emergency managers use data from SLOSH to identify at-risk populations and determine evacuation areas. Storm surges also affect tidal rivers and creeks, potentially increasing evacuation areas. Figure 3.15.4-1 indicates the potential inland extent of storm surge as a function of hurricane category. It is readily apparent from this figure that Connecticut has significant vulnerability to storm surge. Figure 3.15.4-1 shows the projected storm surge for the SWR using the SLOSH model, the figure also depicts actually inundation from Super Storm Sandy . A list of

Table 3.15.1-1: Storm Surge Hazard Summary by Municipality

Municipality	Location (Geographic Area)	Maximum Probable Extent (Magnitude/Strength)	Probability of Future Events	Overall Significance Ranking
Darien	limited	extreme	likely	medium
Greenwich	limited	severe	occasional	medium
New Canaan	-	-	-	-
Norwalk	limited	moderate/severe	likely	medium
Stamford	significant	severe/extreme	likely	medium/high
Weston	-	-	-	-
Westport	significant	severe	likely	high
Wilton	-	-	-	-

Figure 3.15.4-1

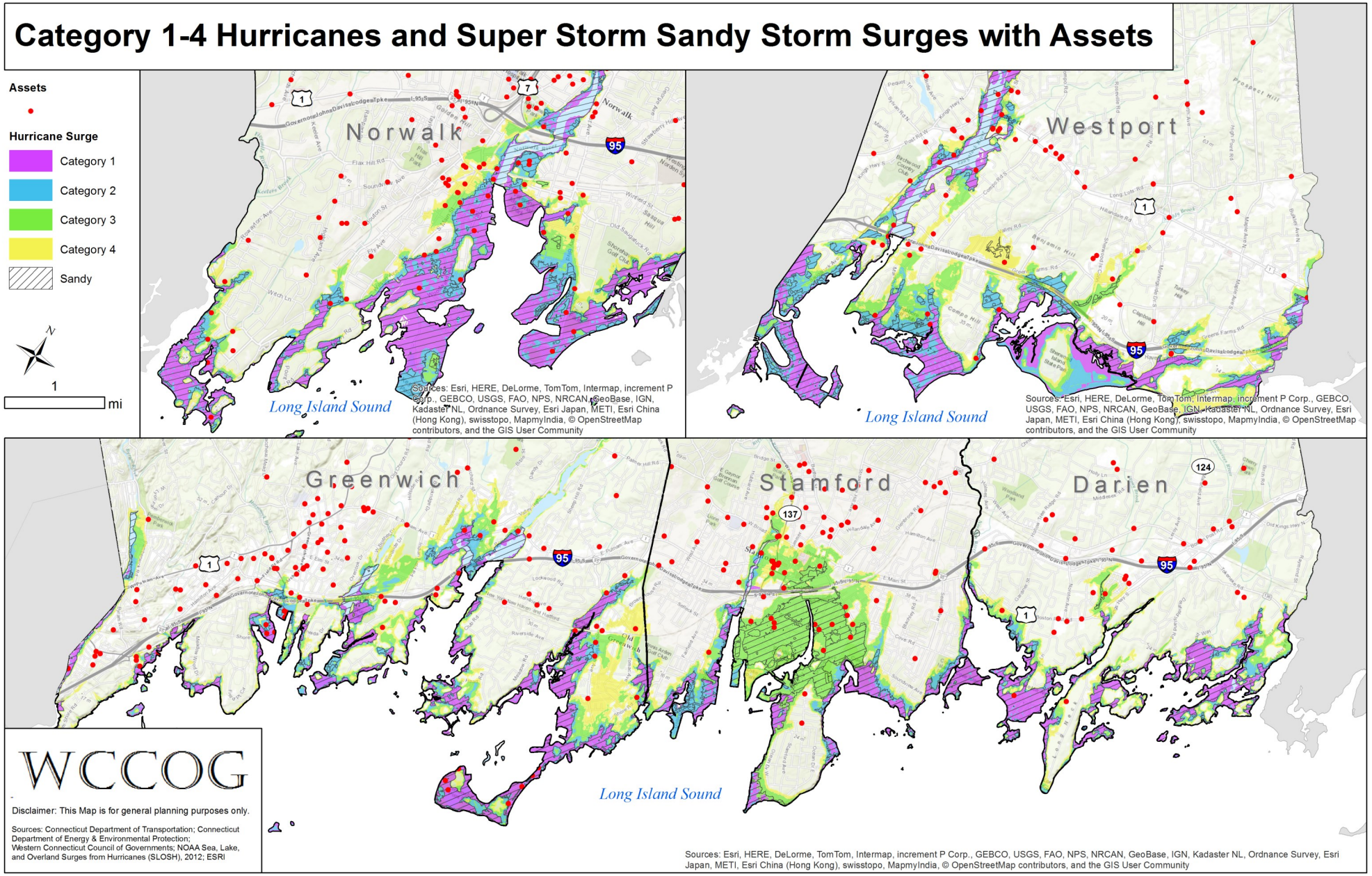


Table 3.15.4-1: Municipal assets within SLOSH category 3 hurricane simulation and Super Storm Sandy inundation zones.

	Darien			Greenwich			New Canaan			Norwalk			Stamford			Weston			Westport			Wilton			South Western Region		
	Total	Sandy	Cat 3	Total	Sandy	Cat 3	Total	Sandy	Cat 3	Total	Sandy	Cat 3	Total	Sandy	Cat 3	Total	Sandy	Cat 3	Total	Sandy	Cat 3	Total	Sandy	Cat 3	Total	Sandy	Cat 3
Care Facility	4	0	0	10	0	0	3	0	0	30	0	2	38	1	4	0	0	0	5	0	0	5	0	0	95	1	6
EMC	1	0	0	1	0	0	1	0	0	1	0	0	1	0	1	1	0	0	1	0	0	1	0	0	8	0	1
Fire	3	0	0	7	0	2	1	0	0	6	0	1	13	1	3	2	0	0	4	1	1	2	0	0	38	2	7
Housing	3	0	0	12	0	0	0	0	0	21	1	3	3	0	1	0	0	0	3	1	1	4	0	0	46	2	5
Other	6	1	1	73	17	21	7	0	0	56	13	18	11	2	7	4	0	0	30	9	11	6	0	0	193	42	58
Police	1	0	0	2	1	1	1	0	0	3	1	1	2	0	0	1	0	0	1	0	0	1	0	0	12	2	2
Rail/Bus	6	0	0	14	0	1	2	0	0	26	2	4	11	2	3	0	0	0	22	0	2	3	0	0	84	4	10
School	8	0	0	26	0	2	10	0	0	30	0	5	50	0	5	4	0	0	13	1	1	11	0	0	152	1	13
Grand Total	**32**	**1**	**1**	**145**	**18**	**27**	**25**	**0**	**0**	**173**	**17**	**34**	**129**	**6**	**24**	**12**	**0**	**0**	**79**	**12**	**16**	**33**	**0**	**0**	**628**	**54**	**102**

assets that fall within this SLOSH zone for each munipality are listed in Table 3.15.4-1.

3.16 Subsidence

Historically, this hazard has not occurred within the region. This hazard has not been identified as a concern by all jurisdictions within the region.

3.17 Tornado

Tornado – A narrow, violently rotating column of air that extends from the base of a thunderstorm to the ground.

3.17.1 Hazard profile

The SWR has historically experienced infrequent and weak tornados within its borders. Nonetheless, the potential impacts of a tornado to a municipality are great enough for many of the towns to consider tornados to be of low to high significance, as illustrated in Table 3.17.1-1.

Most tornados develop from supercell thunderstorms. Supercell thunderstorm tornadoes are the most common and most dangerous type of tornado. NOAA defines this type of tornado as, "a long lived (greater than 1 hour) and highly organized storm feeding off an updraft that is tilted and rotating." There are also non-supercell thunderstorm tornadoes which form without a rotating updraft.

Table 3.17.1-2: Enhanced Fujita Scale

EF Rating	3 second gust (mph)
0	65 -85
1	85 - 110
2	110 - 138
3	138 - 168
4	168 - 200
5	200+

Source: NOAA

Tornados are ranked using the Enhanced Fujita Scale (EFS), as shown in Table 3.17.1-2. The EFS uses three-second gusts estimated at the point of damage based on a judgment of eight levels of damage to the 28 indicators.

Table 3.17.1-1: Tornado Hazard Summary by Municipality

Municipality	Location (Geographic Area)	Maximum Probable Extent (Magnitude/Strength)	Probability of Future Events	Overall Significance Ranking
Darien	significant	severe	unlikely	low
Greenwich	limited	extreme	unlikely	low
New Canaan	extensive	extreme	occasional	high
Norwalk	negligible	weak	unlikely	low
Stamford	extensive	moderate/severe	occasional	high
Weston	extensive	moderate	likely	high
Westport	limited	severe	unlikely	medium
Wilton	limited	extreme	occasional	medium

3.17.2 Historical Tornadoes

A collection of historical tornado events from 2000-2014 can be found on the next page. Data provided from the NCDC storm events database.

July 1, 2013 - Three tornadoes touched down across the state; one in Fairfield County and two in Hartford County. Majority of

impact limited to downed trees, though the EF1 caused notable structural damage near East Windsor

June 24, 2010 – This EF1 tornado impacted Bridgeport in Fairfield County injuring three people and causing at least $3.2 million in reported property damages, according to NCDC records.

July 31, 2009 – This EF1 tornado touched down in Madison in New Haven County and in Shelton in Fairfield County. An estimated $20,000 in property damages were reported between the two counties.

August 29, 1990 – This F0 tornado caused seven injuries in Fairfield County and caused several thousand dollars in damages.

July 14, 1950 – This F2 tornado in Fairfield County injured several people and resulted in an estimated $250,000 in property damages.

3.17.3 Probability

Since tornadoes occur on such small spatial scales and are a product of current weather patterns (they can occur with very little warning), it is difficult to provide a detailed and highly specific predictive analysis for this type of hazard event. Based on historical NCDC data, the region has a 21% annual chance to observe a funnel cloud or tornado. Such an event is equally probable across the region and within each municipality. The state 2014 HMP has identified Fairfield County an area of moderate to high risk based on historical occurrences.

According to NOAA, it is uncertain whether climate change will directly influence the frequency and intensity of tornadoes[41]. However, climate change may directly increase the frequency and intensity of thunderstorms in the future. This potential future increase in thunderstorm activity will be the primary factor to affect the frequency and intensity of future tornado events. This in turn may increase the risk and occurrence of tornadoes within the SWR. Therefore, climate change may act as an underlying influence on future tornado activity. Additional information on probability is contained within Table 3.18.1-1 (Town Hazard Profile Table).

3.17.4 Vulnerability and loss estimation

While some correlation can be made between historical occurrences and the probability of future occurrences in the same area, there is no existing available data or methodology to identify buildings at greater risk to tornado hazard than others in a state-wide analysis. It is therefore assumed that all state-owned and critical facilities are equally exposed to tornado risk and that any potential damages, if not catastrophic, would depend upon building-specific and/or site-specific characteristics.

Since the state is equally vulnerable to a tornado, one can assume that more densely populated areas are likely at higher risk from a tornado, including corresponding damages.

3.18 Tsunami

Historically, this hazard has not occurred within the region. The town of Darien has identified Tsunami as a potential hazard. The impacts of which would be very similar to storm surge and coastal flooding events, the details of which can be found in their respective sections.

Table 3.18.1-1: Tsunami Hazard Summary by Municipality

Municipality	Location (Geographic Area)	Maximum Probable Extent (Magnitude/Strength)	Probability of Future Events	Overall Significance Ranking
Darien	limited	severe	likely	medium
Greenwich	-	-	-	-
New Canaan	-	-	-	-
Norwalk	-	-	-	-
Stamford	-	-	-	-
Weston	-	-	-	-
Westport	-	-	-	-
Wilton	-	-	-	-

3.19 Wildfire

Wildfire - a large, destructive fire that spreads quickly over woodland or brush.

3.19.1 Hazard profile

The SWR has not been particularly susceptible to wildfire. Towns such as Wilton and Weston which are more forested than the other municipalities have identified wild fire as potential hazard (see Table 3.20.1-1 below).

The cause of a wild fire can be natural (e.g., lightning strike) or human induced (e.g., intentional acts of arson, negligently discarded cigarettes, unattended open burning of debris, unattended campfires, etc.). When not quickly detected and contained, wild fires have the potential to cause extensive damage to property and threaten human life. Other impacts may include[14]:

- Increase in the potential for flooding, debris flows, or landslides, as trees absorb ground water and stabilize surface soils;
- Increase in air pollutants that can cause significant health problems;
- Destruction of timber, forage, wildlife habitats, scenic vistas, and watershed, on a temporary basis;
- Development of long-term impacts such as reduced access to recreational areas, destruction of community infrastructure, as well as cultural and economic resources.

There are three important weather factors that affect fire start, fire spread, and associated risk/threat:

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

The magnitude of wild fire events is often characterized by their speed of propagation, total number of acres burned, and potential destructive impacts to people and property. The severity and impact of a wildfire is greatly dependent on how it behaves (as described above), in combination with fire detection, control, and suppression capabilities.

3.19.2 Historical wildfires

The NCDC does not include any historic events having occurred within the SWR, however using the National Fire Incident Reporting System the state identified 409 fire events burning 578 acres of land within Fairfield County during 1999-2013.

3.19.3 Probability

According to the State 2014 HMP, Connecticut is expected to observe >5 wildfire events per year. Of the events that have occurred Fairfield County observes 7.5% of them (around a 37% annual chance for a wildfire event). Future wildfires will likely become more frequent and severe following trends of increased severe weather due to climate change. Additional information on probability is contained within Table 3.20.1-1 (Town Hazard Profile Table).

Table 3.19.1-1: Wildfire Hazard Summary by Municipality

Municipality	Location (Geographic Area)	Maximum Probable Extent (Magnitude/Strength)	Probability of Future Events	Overall Significance Ranking
Darien	negligible	weak	unlikely/occasional	low
Greenwich	limited	moderate	unlikely	low
New Canaan	-	-	-	-
Norwalk	-	-	-	-
Stamford	negligible	weak	unlikely	low
Weston	extensive	extreme	likely	high
Westport	-	-	-	-
Wilton	significant	severe	unlikely	medium

3.19.4 Vulnerability and loss estimation

In addition, drought increases the likelihood of fires, especially in low-density, forested areas common north of the Merritt Parkway in Greenwich, New Canaan, Stamford, Weston and Wilton. The ability to fight fires may also be

Table 3.19.4-1: Municipal assets within wildland urban interface and intermix zones

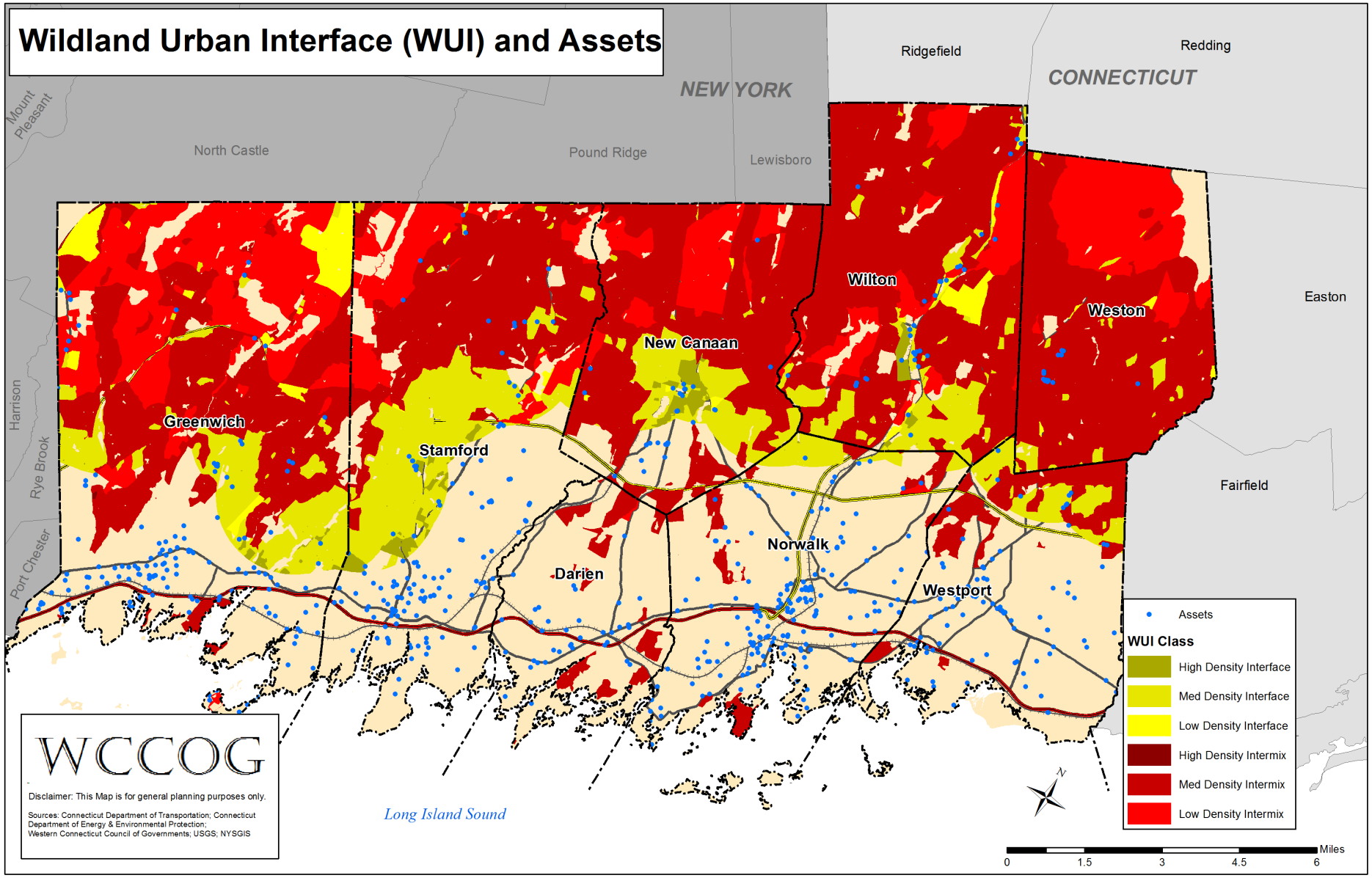
	Darien			Greenwich			New Canaan			Norwalk			Stamford			Weston			Westport			Wilton			South Western Region		
	Total	Inter-face	Intermix	Total	Inter-face	Intermix	Total	Inter-face	Intermix	Total	Inter-face	Intermix	Total	Inter-face	Intermix	Total	Inter-face	Intermix	Total	Inter-face	Intermix	Total	Inter-face	Intermix	Total	Interface	Intermix
Care Facility	4	0	0	10	3	1	3	0	1	30	0	0	38	6	2	0	0	0	5	0	0	5	0	2	95	9	6
EMC	1	0	0	1	0	0	1	1	0	1	0	0	1	0	0	1	0	1	1	0	0	1	0	1	8	1	2
Fire	3	0	0	7	1	1	1	1	0	6	0	0	13	4	0	2	0	2	4	1	0	2	1	1	38	8	4
Housing	3	0	0	12	1	0	0	0	0	21	0	0	3	0	0	0	0	0	3	0	0	4	3	1	46	4	1
Other	6	0	0	73	6	7	7	5	0	56	0	2	11	0	0	4	0	4	30	0	2	6	3	3	193	14	18
Police	1	0	0	2	0	0	1	1	0	3	0	0	2	0	0	1	0	1	1	0	0	1	0	1	12	1	2
Rail/Bus	6	0	0	14	0	0	2	1	0	26	1	1	11	1	0	0	0	0	22	4	2	3	0	3	84	7	6
School	8	0	0	26	5	4	10	3	3	30	1	1	50	10	4	4	0	4	13	2	0	11	4	7	152	25	23
Grand Total	**32**	**0**	**0**	**145**	**16**	**13**	**25**	**12**	**4**	**173**	**2**	**4**	**129**	**21**	**6**	**12**	**0**	**12**	**79**	**7**	**4**	**33**	**11**	**19**	**628**	**69**	**62**

Source: USGS. WCCOG, DEMHS, FEMA

compromised in these areas of the Region. This is of particular concern in Wilton and Weston, which rely on fire ponds and cisterns that could see decreases in water levels associated with drought activity.

The areas considered most vulnerable to wild fire risks and losses are those classified as Wild Urban Interface (WUI) areas. WUI areas are those with at least 1 structure per 40 acres with extensive vegetation. The people and structures located within these areas will continue to be vulnerable to the risk of fires. Figure 3.19.4-1 displays these WUI zones within the region.

The number of assets that fall within WUI areas are listed in Table 3.19.4-1 for each municipality. The majority of the identified assets exist outside the wildland urban interface and intermix zones, as the assets tend to exist in the more developed parts of the region where there are less trees.


Wildland Urban Interface (WUI) and Assets
NEW YORK
CONNECTICUT
Ridgefield
Redding
Mount Pleasant
North Castle
Pound Ridge
Lewisboro
Easton
Wilton
Weston
New Canaan
Greenwich
Stamford
Harrison
Rye Brook
Port Chester
Fairfield
Norwalk
Darien
Westport
Long Island Sound
WCCOG
Disclaimer: This Map is for general planning purposes only.
Sources: Connecticut Department of Transportation; Connecticut Department of Energy & Environmental Protection; Western Connecticut Council of Governments; USGS; NYSGIS
Assets
WUI Class
High Density Interface
Med Density Interface
Low Density Interface
High Density Intermix
Med Density Intermix
Low Density Intermix
N
0
1.5
3
4.5
6
Miles

3.20 Climate Change

Climate Change - direct or indirect human activities that alter the composition of the atmosphere, and, or change in the mean properties of the climate that persist for extended periods of time.

The focus of this section is on the potential impacts of sea level rise (SLR) and extreme precipitation events (EPE) as a result of climate change. SLR creates the potential for critical coastal impacts, while EPE's impact areas susceptible to flooding and poor drainage, such as low lying areas and those with a large percentage of urban land cover (i.e. asphalt and rooftops) which interfere with natural infiltration processes.

Changes in climate influence global temperatures; the quantity, rate and spatial distribution of precipitation; cloud cover and evapo-transpiration, and many other factors. The links to terrestrial impacts in the SWR are primarily through the alteration of the hydrologic cycle and changes in the movement of water in all its forms. The potential impacts cover a broad range of coastal, environmental, socio-economic, land-use, hydrologic, and biological factors.

SLR, one of the most widely acknowledged climate change impacts, is caused by increasing global mean temperatures, especially at high altitudes and latitudes, which disturb the equilibrium of continental glaciers and sea pack ice resulting in melting rates above long-term averages. In addition, water expands as it warms causing the total volume of the oceans to increase with higher mean global temperatures. SLR in turn increases flooding of shoreline areas and coastal erosion along with saltwater intrusion—especially in areas like the SWR that have low gradient shore areas and estuaries. With sufficient intrusion of and higher water levels, land use impacts occur. Buildings, utilities, and transportation assets can be damaged with the potential for tremendous property loss. These processes are not necessarily geographically or temporally fixed, and impacts may occur in unexpected ways. Given the highly developed nature of the SWR near the coast and corresponding elevated property values, the towns of Greenwich, Darien, Norwalk, Stamford, and Westport are highly vulnerable to this process.

A second important climate change process is the changing nature of precipitation events. Extreme precipitation events (EPE) for the purposes of this report, are defined as the number of statistically unusual heavy rain events (e.g. 100-year storms) that cause flooding. EPE's are projected to increase over time as warmer and more humid air, often associated with tropically sourced low pressure systems, come farther north at a higher frequency. Connecticut has a forgiving natural landscape with sandy soils and extensive forest cover that allow for extremely high rates of water infiltration during rain storms. However, the heavily developed nature of the SWR has resulted in many areas undergoing land use changes that reduce the capacity of the environment to handle EPEs. Forested areas converted to turf grass or impervious cover (i.e. roofs, streets, and sidewalks), and the obliteration of well-drained sandy soils by construction practices and different historical land uses, such as urban development have significantly decreased rainfall infiltration rates while increasing stormwater runoff and flooding.

The civil engineering and land use planning response to flooding and runoff has traditionally been to develop drainage infrastructure that removes water quickly away from high value development. However, much of this infrastructure was designed for the early or mid-part of the 20th century and thus engineered for smaller storm events and less rainfall than can be expected in the future. To accommodate the linked alteration of the hydrologic cycle by the combined forces of development and climate change through EPE, municipalities need to consider the location most sensitive to these processes.

3.20.1 Methodology

To assess and understand the impacts of climate change (i.e. SLR and EPE) on the municipalities in the region, geospatial modeling and spatial analyses are utilized within a Geographic Information System (GIS) package. The advantages of using GIS for environmental and land-use modeling are the following:

- Data from multiple scales can be analyzed
- A GIS can handle diverse data sets (e.g. environmental, demographics, and land use) in a single geographic context
- A GIS is scalable for manipulation analysis of very large data sets
- Results can be analyzed, aggregated, and summarized at multiple scales

- Hydrology data is well handled within a GIS using topographic information found in a raster format

WCCOG conducted two such analyses using GIS to determine the risk SLR and EPE posed to the region, including the correlation with critical assets and infrastructure, such as transportation corridors, hospitals, wastewater treatment plants (WWTP), and other key infrastructure. The SLR model factored in TNC-generated future inundation areas for years 2020, 2050, and 2080; this provides better information to key decision makers regarding both potential short- and long-term SLR impacts. The EPE model analyzed a multitude of variables such as impervious area, topography, and drainage areas. The results articulate a spectrum ranging from wet to dry areas, projecting possible areas within the region that may be susceptible to future flood events.

More detailed information regarding the GIS models is located in Appendix B-2. The resulting output from the SLR and EPE models, including potentially vulnerable areas and assets, are presented below in the results section.

3.20.2 Results

Overview

The SLR impact assessment found potential impacts in all five coastal town with over 7000 parcels and seven percent of the regions assets impacted in the most severe 2080 SLR scenario and impacts occurring well inland for some of the major rivers—up to four miles in Westport. The EPE model indicates that hundreds of location on major arterials and highway, and potentially, thousands of locations on local streets and roads are vulnerable for all eight towns in the SWR.

Sea Level Rise (SLR) Vulnerability

This modeling effort found that that all five coastal towns have vulnerable assets, transportation infrastructure, and parcels; and that the impacts are not strictly along the coast of Long Island Sound. Impacts can occur well inland (i.e. north of I-95) and along areas adjacent to the Mianus, Norwalk, and Saugatuck Rivers, which are major estuaries running inland from Long Island Sound. In the year 2020 scenario, a total of 1,731 acres are inundated with 14 patches larger than 10 acres. In the year 2050 scenario, a total of 2,120 acres are inundated with 22 patches larger than 10 acres in size. In the year 2080 scenario, 3,096 acres are inundated with 40 patches larger than 10 acres in size. Approximately, 1,600 parcels are vulnerable across the five towns in the year 2080 scenario related to SLR impacts.

Among the 628 assets for the Region, 12 are vulnerable in 2020, 21 are vulnerable in 2050, and 43 are vulnerable in the year 2080 scenario. Sixteen of which are in the Town of Greenwich. The vulnerable assets include police and fire facilities, a waste water facility, senior housing, but the largest asset type impacted are pump stations (Table 3.20.2-1 marked as "other" asset category). Two noteworthy clusters of potential impacts are at the north end of Norwalk Harbor and well inland along the Saugatuck River in Westport (Figures 3.20.2-1, 2, and 3).

Transportation vulnerability is potentially significant. In the 2020 SLR (Figure 3.20.2-1) and 2050 SLR (Figure 3.20.2-2) scenarios, transportation impacts are somewhat similar with a large jump in the 2080 scenario (Figure 3.20.2-3). For that scenario approximately 5.1 miles of highways, 81.5 miles of streets, and one mile of rail line appear vulnerable to inundation including 24 separate locations along the rail system (Table 3.20.2-3). Five major clus-

Table 3.20.1-1: Sea Level Rise Asset Vulnerability for 2020, 2050 and 2080 scenarios

Source: NOAA. WCCOG, DEMHS, FEMA

	Darien				Greenwich				Norwalk				Stamford				Westport				South Western Region			
	Total	2020	2050	2080	Total	2020	2050	2080	Total	2020	2050	2080	Total	2020	2050	2080	Total	2020	2050	2080	Total	2020	2050	2080
Care Facility	4	0	0	0	10	0	0	0	30	0	0	0	38	0	0	0	5	0	1	0	95	0	1	0
EMC	1	0	0	0	1	0	0	0	1	0	0	0	1	2	2	2	1	0	0	1	8	2	2	3
Fire	3	0	0	0	7	0	0	0	6	0	1	1	13	0	0	0	4	0	0	0	38	0	1	1
Housing	3	0	0	0	12	0	0	2	21	0	0	1	3	0	0	0	3	1	0	0	46	1	0	3
Other	6	0	0	1	73	2	6	13	56	4	5	12	11	0	0	3	30	1	3	5	193	7	14	34
Police	1	0	0	0	2	0	0	0	3	1	2	0	2	0	0	0	1	0	0	0	12	1	2	0
Rail/Bus	6	0	0	0	14	0	0	0	26	0	0	1	11	1	1	1	22	0	0	0	84	1	1	2
School	8	0	0	0	26	0	0	0	30	0	0	0	50	0	0	0	13	0	0	0	152	0	0	0
Grand Total	**32**	**0**	**0**	**1**	**145**	**2**	**6**	**15**	**173**	**5**	**8**	**15**	**129**	**3**	**3**	**6**	**79**	**2**	**4**	**6**	**628**	**12**	**21**	**43**

Table 3.20.2-2: Transportation Impacts from Sea Level Rise (SLR)

Impacts from SLR	Assets (count)	Rail Roads (# locations)	Vul. Roads (miles)	Vul. Arterial Roads / Highways (miles)	SLR Inundation Area (sqml)
2020 SLR	11	17	46.4	1.7	2.7
2050 SLR	20	17	49.2	2.6	3.3
2080 SLR	45	24	81.5	5.1	4.8

ters of impacts occur. One is on the eastern coast of Greenwich Cove. Another occurs in parts of downtown Stamford. A third is along the east bank of the mouth of Five Mile River. The final two are scattered along the estuaries of the Norwalk and Saugatuck Rivers respectively.

Please note that this modeling effort is highly dependent on the accuracy of the predicted elevation change brought about by SLR. The actual date of inundation for any one location is influenced by a wide variety of local, regional, and global factors. These results are intended for planning purposes only. Vulnerability should be further assessed by site assessment, and individual site or parcels impacts are influenced by local topography, infrastructure, and engineering methods.

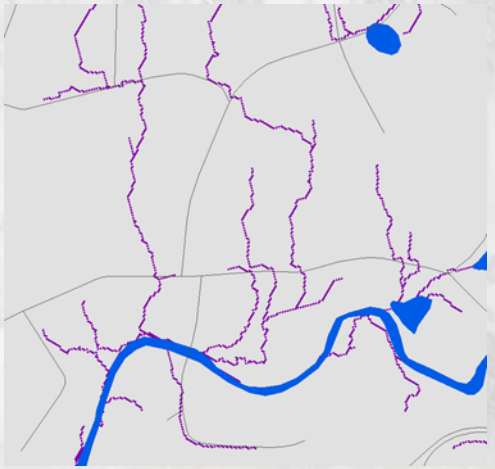
Extreme Precipitation Event (EPE) Vulnerability

The intent of this raster model is to identifying inland locations in the SWR vulnerable to the hydrologic impacts of climate change, specifically extreme precipitation events. The interpretation of this model output is a gradient of values so vulnerability to impacts from EPE can be evaluated from lowest to highest risk. Urban areas, areas with little drainage, and locations in and around streams, rivers, and ponds will tend to elevated risk while forested areas with well drained soils should have the lowest vulnerability to EPE.

The range of model values at each location ranged from a minimum a minimum of 4 (Lower Vulnerability Category) to 31 (Highest Vulnerability Category) with an average of 12 (Figure 3.20.2-4). The categories or vulnerability are 4 to 8 (Lowest); 8 to 12 (Lower); 12 to 16 (Medium); 16 to 20 (Higher); 20 to 31 (Highest). Roughly 70 percent of the region has reduced risk and thirty percent of the region has elevated risk, twenty percent of which lies in the most vulnerable EPE category. Locations with the green colors are typically much drier locations in the landscape and these areas will have very little flooding risk while the yellow to red colors are areas more prone to impacts during EPE.

The least vulnerable and drier areas are primarily to the north of the Merritt Parkway corridor in the uplands areas away from the valley floors, including the hilly areas west of Route 7 in Wilton and the North/South boundary between Greenwich and Stamford. While the more vulnerable areas are typically in areas with urban development, topography that concentrates water flow, and soils that drain slowly such as downtown Stamford and Norwalk. Figure 3.20.2-5 shows all areas with above average vulnerability to EPE. There is also a great deal of local and fine scale difference not easily seen at the municipal or regional scale, and please note that all medium and higher density urban areas are assumed to be most vulnerable to EPE because of the inherent flashiness of runoff in urban land use areas.

Figure 3.20.2-7 (left) : *Purple lines are locations of concentrated runoff from drainage areas of more than two acres. This feature is an important driver of the model. These areas are typically wetter and fill with runoff faster in EPE. Urban areas that have little infiltration are particularly vulnerable to flashy runoff where water is concentrated in channels and low spots.*



The impacts to infrastructure, land, and property inland from the coastal areas are potential significant from EPE. The vulnerability of transportation infrastructure is a particularly important planning consideration because of its role in providing evacuation routes for citizens for a variety of potential threats. This modeling effort suggests that Highways and Arterial-type roads are vulnerable to extreme precipitation events and that further evaluation of the potential impacts are warranted. For instance, about 700 locations along these roads intersected the 500-year FEMA floodplain and about

7,000 different stretches of road crossed areas with the higher or highest vulnerability class (Figure 3.20.2-6). Finally about 2,800 locations along major roads crossed non-perennial drainages that will concentrate water in EPE. A far greater number of potential impacts would be included in this analysis if local roads were included. Though not shown, 1,000s of parcel in the SWR are crossed by dry appearing areas that would be vulnerable in EPE and owners may not recognize their potential vulnerability. In fact about half the parcels in SWR intersect areas that are in the two highest vulnerability categories.

While this model utilized very high resolution data, it is intended for planning purposes only. An assessment of the vulnerability of roads and other assets to drainage and runoff changes depends on the type and quality of site engineering, local land use, year of design, and other factors. The modeling should be interpreted within local regions and that values are for relative interpretation only. Impacts noted in this analysis effort should be evaluated by trained professionals such as civil engineers or landscape architects.

Conclusion:

These analyses suggests that multiple potential impacts from Climate Change related impacts from EPE and SLR are dispersed throughout the Region. Coastal impacts will include transportation infrastructure, emergency management and health care assets, as well as property. Results also indicate that inland areas adjacent to rivers have surprisingly high vulnerability risk. The Vulnerability Modeling for EPE suggests that detailed evaluation of existing drainage infrastructure is important at the site level because of the large number of potential impact sites and that impacts conflict with roads utilized during emergencies. The impacts of climate change caused by EPE and SLR require similar efforts to emergency management planning for other events with heavy rainfall and storm surges. Further efforts should focus on the viability of emergency management routing and evacuation routes and high value transportation infrastructure.

- For both coastal and inland regions, a more detailed analysis of EPE and SLR impacts on infrastructure are possible using the synthesis of high resolution topographic and GIS data. Spatial modeling of the type discussed in this section should be conducted at a much finer scale and with greater specificity. The utilization of oblique imagery will allow for inspection of sites specified by further analysis. Understanding the elevation of water levels in different scenarios and the spatial position in three dimension of related infrastructure will better resolve how infrastructure could be damaged and what sort of interventions can be utilized. A priority list at the parcel scale and for local roads can be created in a GIS to reduce staff field assessment work. Generically recap results
- Highlight/caution/reinforce the need for more detailed work
- Address next steps and follow ups to this exercise
- Overarching connection to hazard mitigation planning in the South Western Region (SWR)

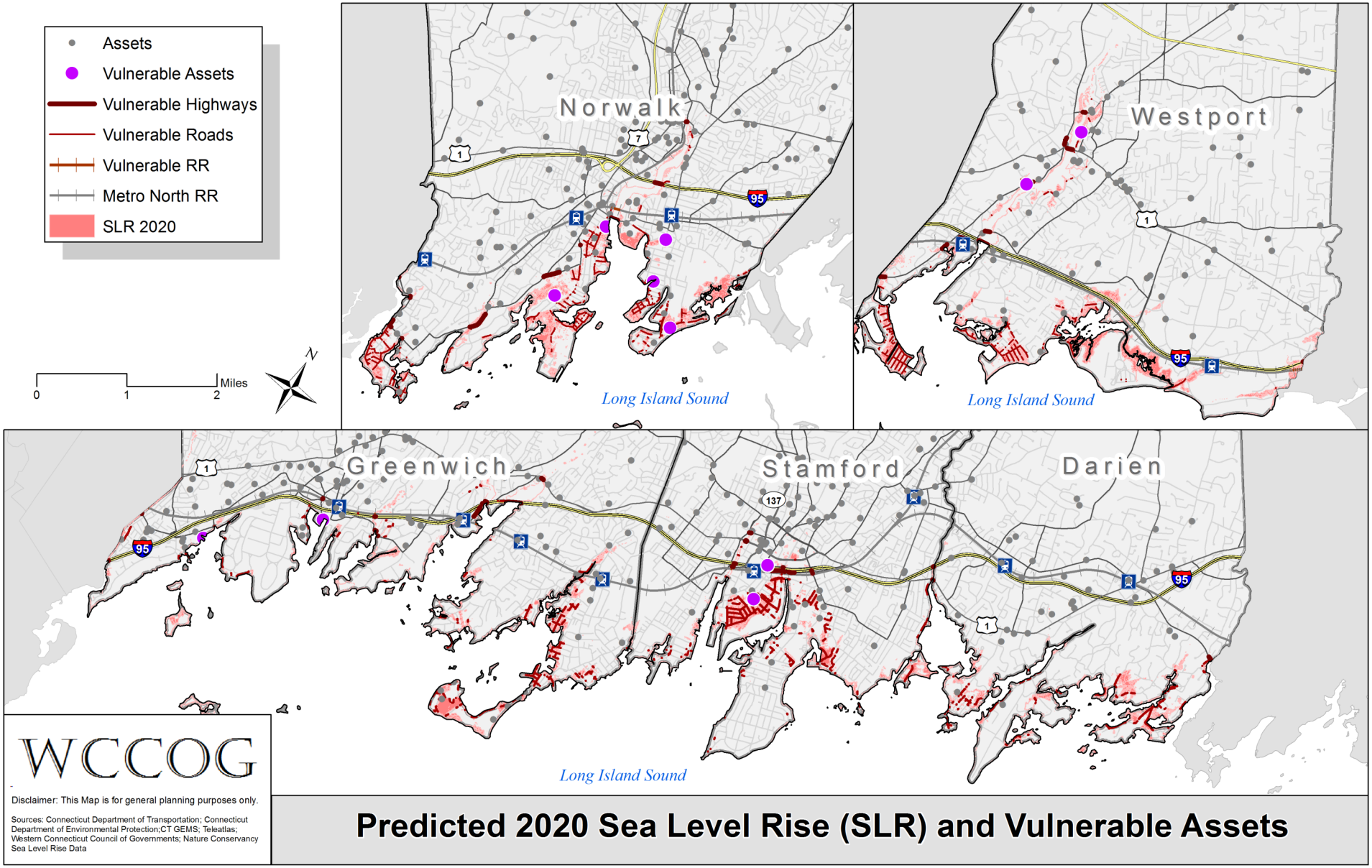
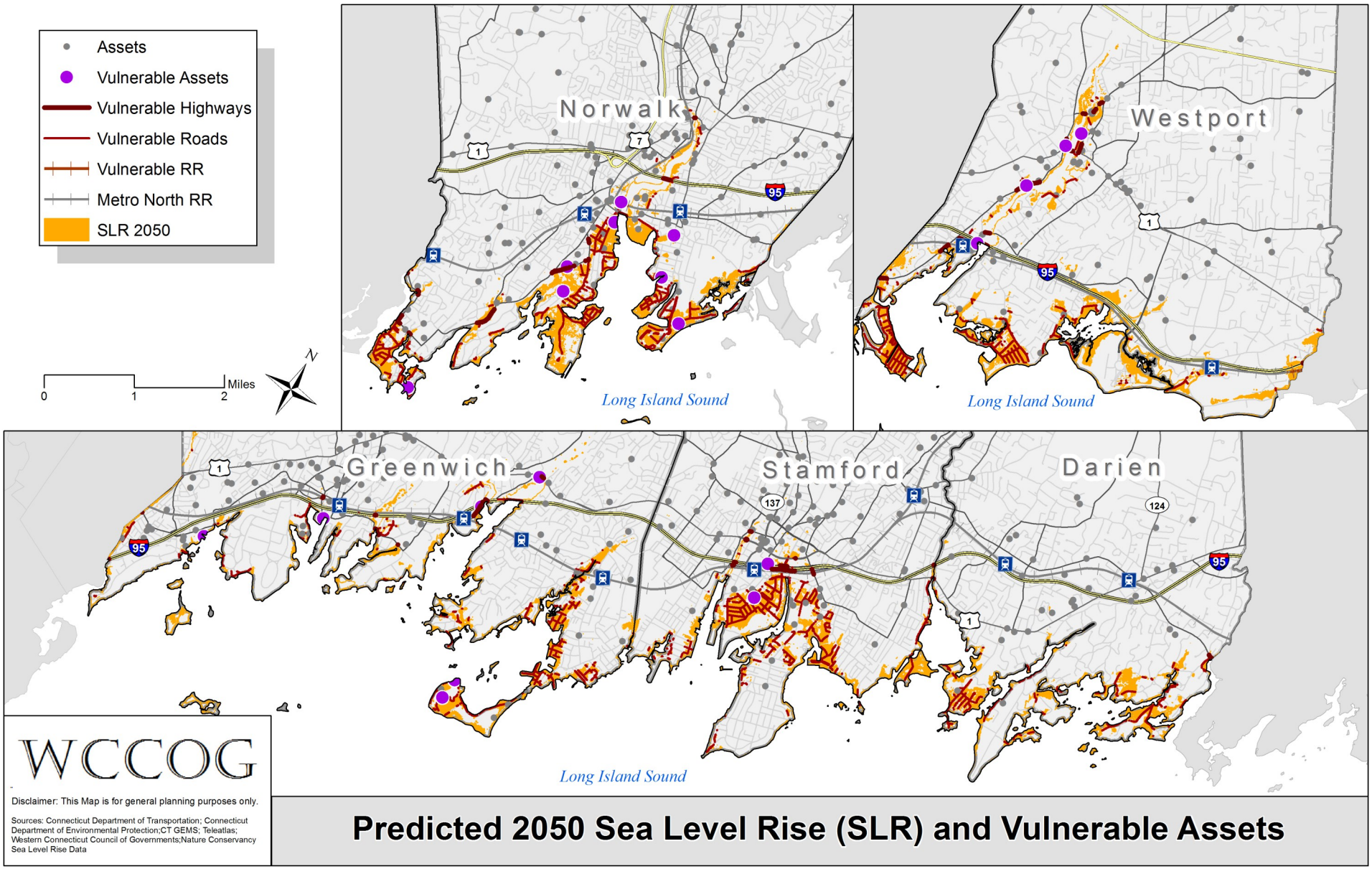

Assets
Vulnerable Assets
Vulnerable Highways
Vulnerable Roads
Vulnerable RR
Metro North RR
SLR 2020
Miles
0
1
2
N
Norwalk
Westport
Greenwich
Stamford
Darien
Long Island Sound
Long Island Sound
Long Island Sound
WCCOG
Disclaimer: This Map is for general planning purposes only.
Sources: Connecticut Department of Transportation; Connecticut Department of Environmental Protection;CT GEMS; Teleatlas; Western Connecticut Council of Governments; Nature Conservancy Sea Level Rise Data
Predicted 2020 Sea Level Rise (SLR) and Vulnerable Assets

Figure 3.20.2-2



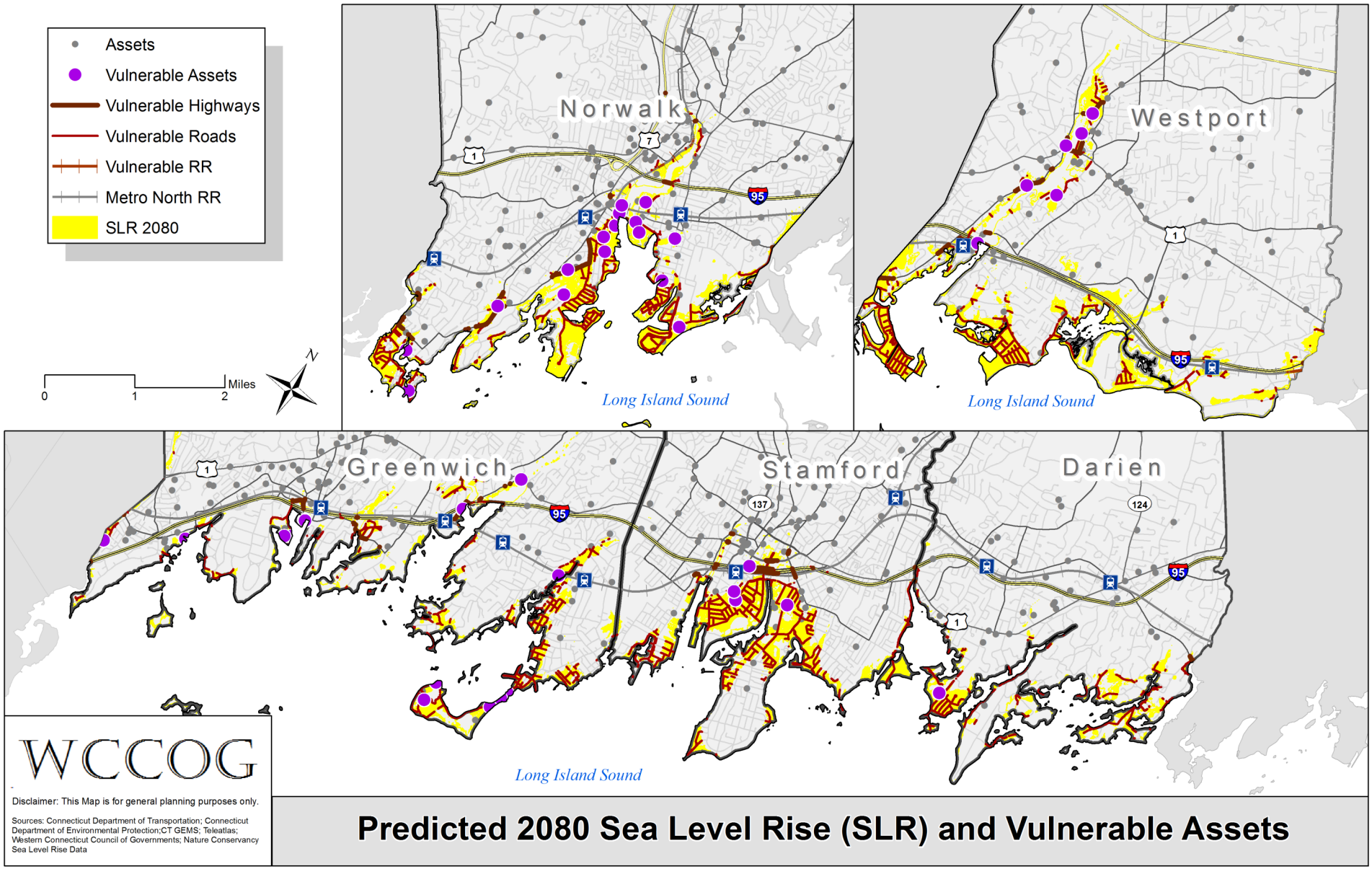
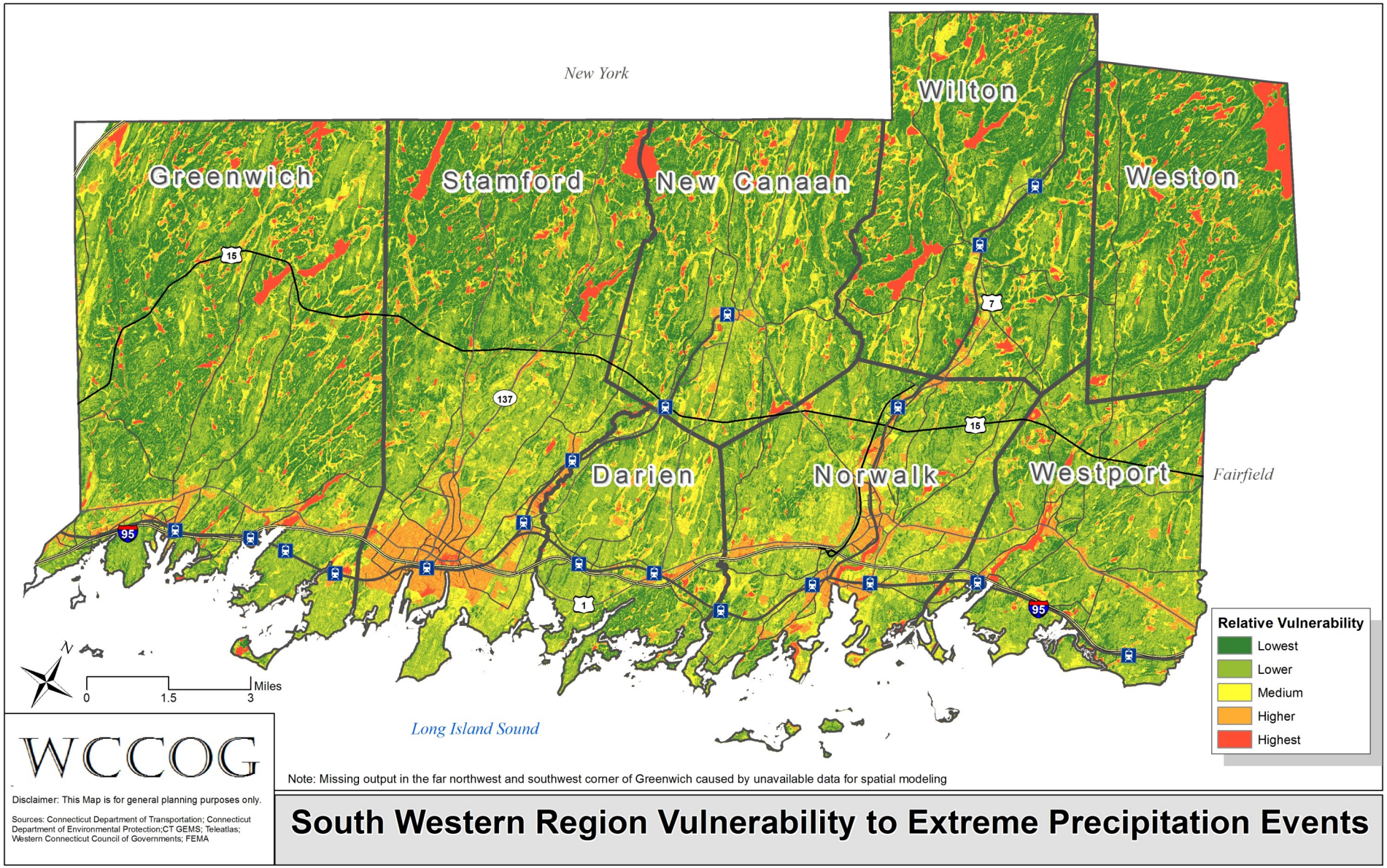
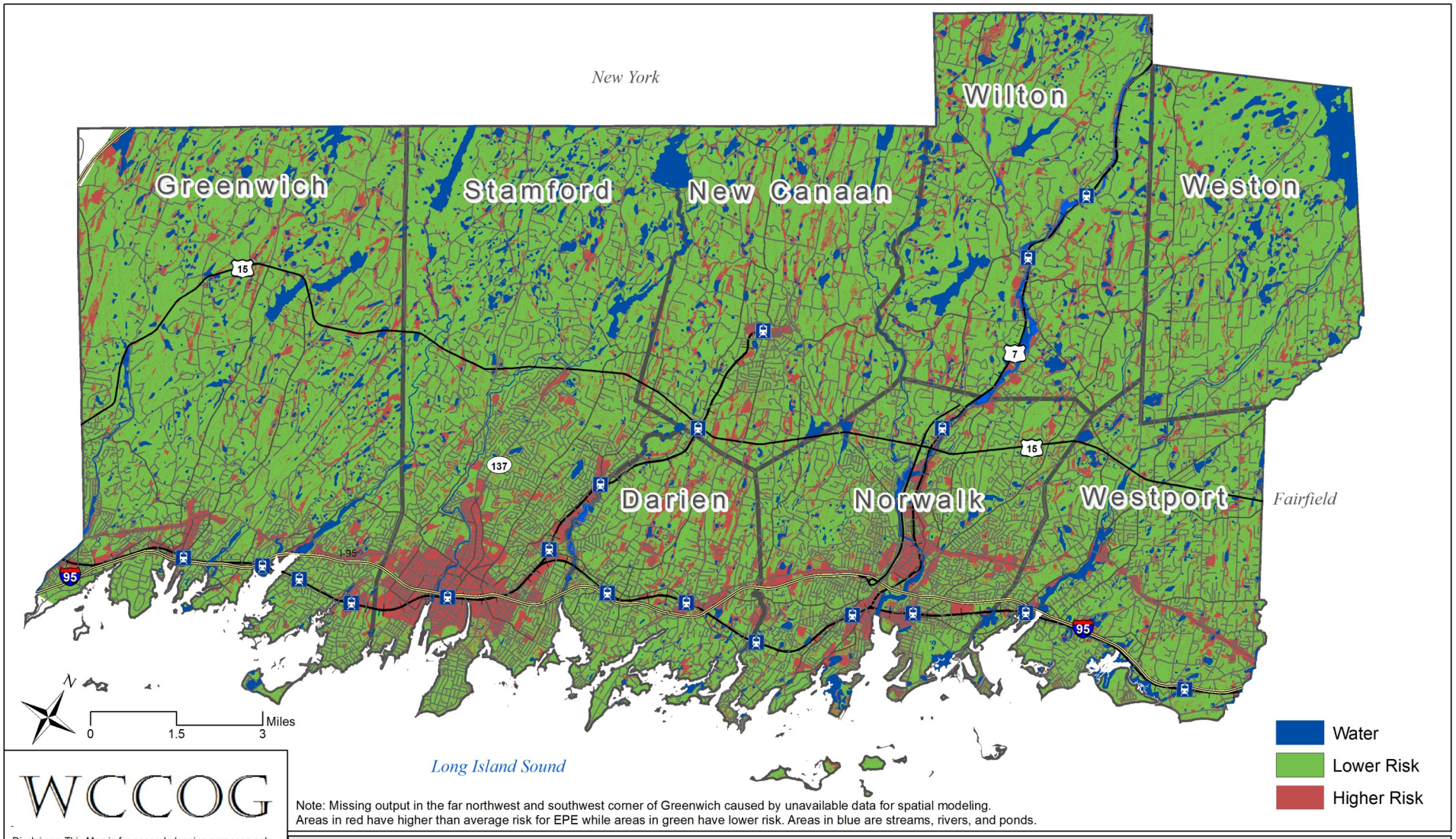

Assets
Vulnerable Assets
Vulnerable Highways
Vulnerable Roads
Vulnerable RR
Metro North RR
SLR 2080
Norwalk
Westport
Greenwich
Stamford
Darien
Long Island Sound
Long Island Sound
Long Island Sound
0
1
2
Miles
N
WCCOG
Disclaimer: This Map is for general planning purposes only.
Sources: Connecticut Department of Transportation; Connecticut Department of Environmental Protection;CT GEMS; Teleatlas; Western Connecticut Council of Governments; Nature Conservancy Sea Level Rise Data
Predicted 2080 Sea Level Rise (SLR) and Vulnerable Assets

Figure 3.20.2-4



South Western Region Vulnerability to Extreme Precipitation Events



WCCOG

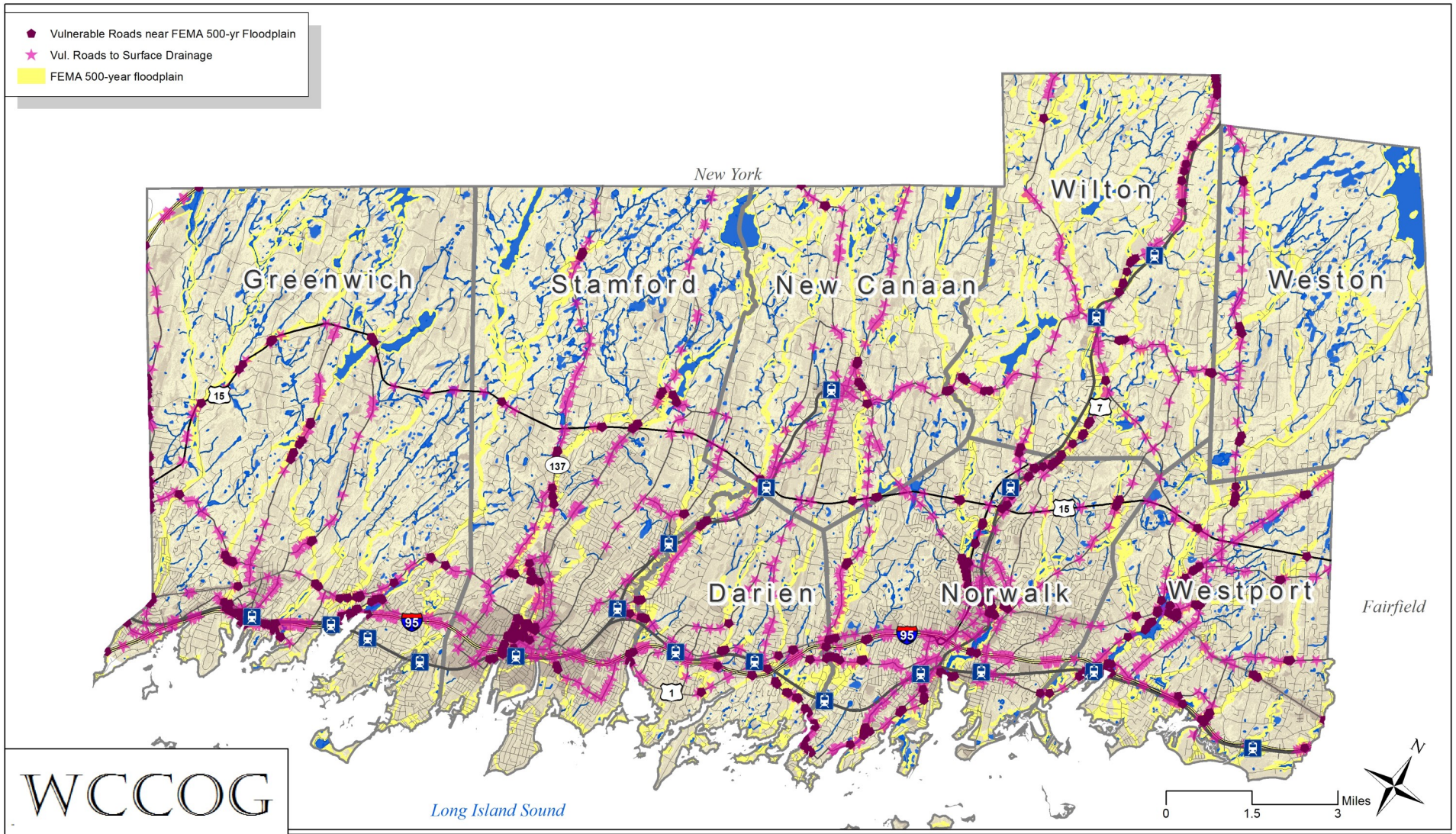
Disclaimer: This Map is for general planning purposes only.

Sources: Connecticut Department of Transportation; Connecticut Department of Environmental Protection;CT GEMS; Teleatlas; Western Connecticut Council of Governments; FEMA

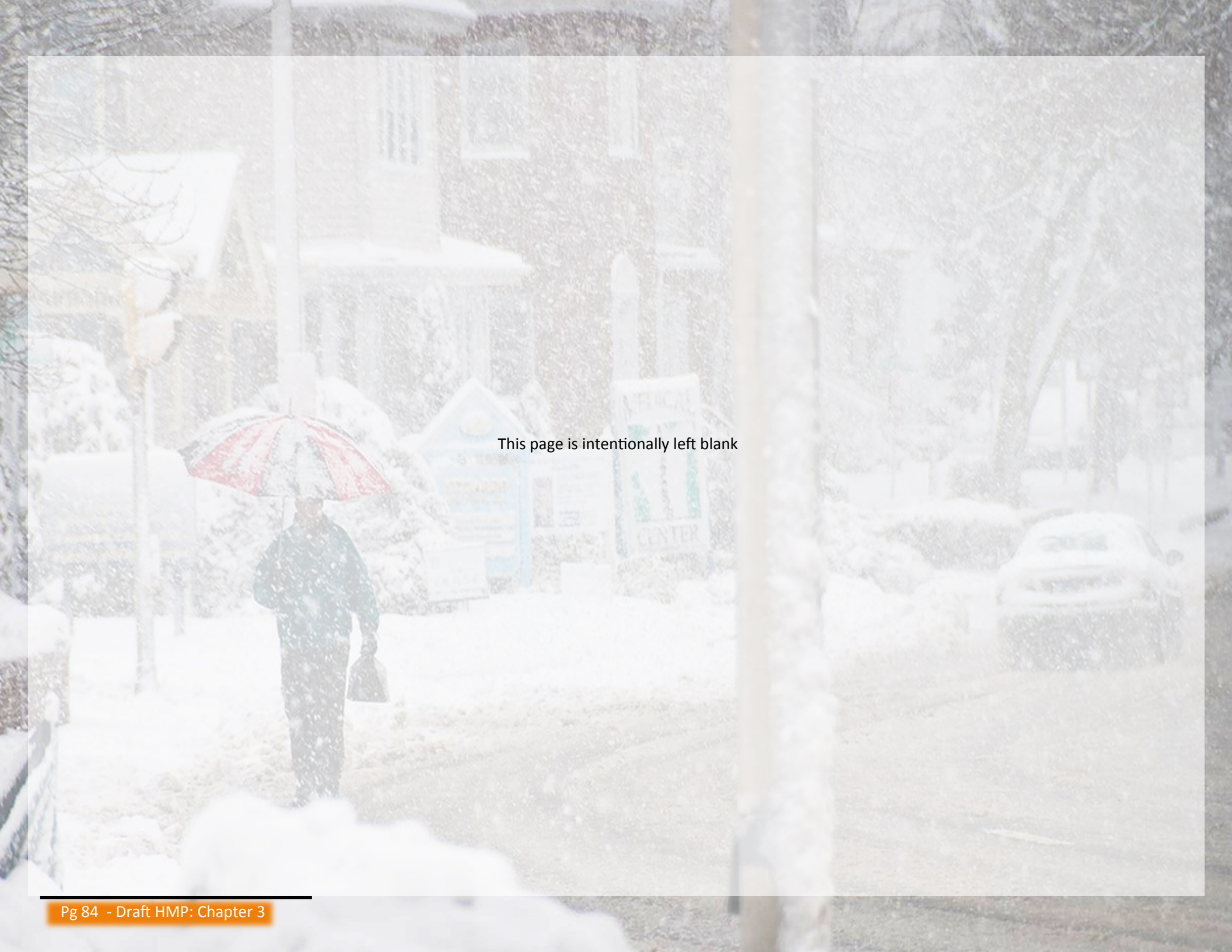
Note: Missing output in the far northwest and southwest corner of Greenwich caused by unavailable data for spatial modeling.
Areas in red have higher than average risk for EPE while areas in green have lower risk. Areas in blue are streams, rivers, and ponds.

South Western Region Higher Risk Areas for Extreme Precipitation Events

Figure 3.20.2-6



South Western Region Vulnerable Highways and Arterials to Extreme Precipitation Events



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Chapter 4:

Hazard Mitigation Strategies

4.0 Mitigation Strategies

Municipal Capabilities, Update to 2011 Strategies and 2016 proposed Strategies

As part of the HMP Update and in accordance with 44 CFR 201.6, mitigation strategies were developed to guide future efforts in reducing the loss of life and property, as a result of natural disasters. The mitigation strategies also serve to reduce repetitive damage and reconstruction in vulnerable areas, which are core components of HMP and historically have come at high costs to local, state as well as federal entities.

The subsections below clearly articulate the mitigation planning process and corresponding results by municipality. Since the likelihood of a severe natural hazard event impacting multiple municipalities is high, the regional components were strongly considered and also included. Specific elements contained herein include: existing capabilities; available resources; goals to reduce/avoid long term vulnerabilities by hazard; progress/changes to existing mitigation efforts (since 2011 plan); action plan prioritization; as well as specific mitigation actions and projects. Integration into other planning mechanisms is addressed as part of Chapter 5 "Plan Maintenance."

4.1 Capabilities and Available Resources

The SWR is comprised of eight municipalities and a regional Council of Governments (COG). As discussed in Chapter 1, the geographic and demographic profiles vary by municipality; this variability also extends into the organizational structures and associated capabilities. Furthermore, the scope of government authority and power is quite extensive, including the capacity to: tax; establish laws, ordinances, and regulations; provide police, fire, and emergency protection; as well as to construct and maintain public facilities. The entire breadth of municipal capabilities are defined within the Connecticut General Statutes Section (CGS) 7-148. Table 4.1-1 below illustrates the regional and local government structure, including legislative and executive responsibilities.

Table 4.1-1 South Western Region - Municipal Government Structure

Municipality	Chief Executive Officer	Legislative Body
Darien	First Selectman	Representative Town Meeting
Greenwich	First Selectman	Representative Town Meeting
New Canaan	First Selectman	Town Council
Norwalk	Mayor	Common Council
Stamford	Mayor	Board of Representatives
Weston	First Selectman	Board of Selectmen/Town Meeting
Westport	First Selectman	Representative Town Meeting
Wilton	First Selectman	Board of Selectmen/Town Meeting
SWRPA/WCCOG	Executive Director	Council of Governments

Source: Local Municipalities, WCCOG

Regional Capabilities and Resources

The Western Connecticut Council of Governments ([WCCOG] formerly a portion of SWRPA) is a form of regional government established under CGS Chapter 127, Title 8 and revised in Title 16a, Chapter 295, Section 16a-4c (2014 Supplement). As a regional planning region, WCCOG provides a geographic framework for which municipalities can address similar interests, while aligning them with state plans and programs[1]. The South Western portion of WCCOG was formed in 1962 and has a strong working relationship with its municipal partners. This existing relationship has afforded SWRPA/WCCOG unparalleled experience with respect to addressing hazard mitigation needs in the region. Such efforts directly relate to transportation, regional, and emergency planning efforts. The premise of such shared undertakings at the regional level is to consolidate and coordinate efforts, which in turn enhance operational efficiencies and save tax dollars.

Regional Emergency Planning Team (REPT) and Emergency Support Functions (ESF)

The eight south western municipalities are part of a larger 14 municipality jurisdictional boundary which forms Region 1 of the State of Connecticut's Department of Emergency Management and Homeland Security (DEMHS). DEMHS Region 1 houses a policy board known as the Regional Emergency Planning Team (REPT), which serves to facilitate emergency management and hazard mitigation efforts within the area. DEMHS Region 1 also utilizes area representatives with a diverse variety of experience to comprise the Emergency Support Function (ESF).

The ESFs serve to support overall DEMHS goals while also providing in depth insight and guidance for certain emergency areas. For example, ESF-6 deals with all emergency operations as it relates to regional mass care. The chairs of ESF-6 are responsible for providing and ensuring adequate amounts of regional assets are available in the event of an emergency, such as portable cots for use in area shelters. The ESF-6 chairs are also responsible for providing annual training and exercises for volunteer staff and municipalities, in order to ensure emergency preparedness and situational awareness in actual emergency events.

More detailed information regarding the REPT and ESF's can be found on DEMHS' website: http://www.ct.gov/demhs/cwp/view.asp?a=1917&q=438790

DEMHS R1 Emergency Evacuation Plan

The South Western region recently prepared Phase 1 of the DEMHS Region 1 Emergency Evacuation Planning and Needs Assessment for its eight municipalities. The document was prepared in part using FY2010 Homeland Security Grant Program (HSGP) funding. Deliverables included a written assessment, "paper" maps depicting key assets and areas vulnerable to certain natural hazards, as well as a web-based interactive mapping proof of concept. The written assessment contained local, regional, state and federal emergency management resources, written recommendations, and aligned itself with homeland security goals and objectives at national, state, and regional levels. The purpose of the data collection and mapping efforts were to gain understanding of needs and gaps at both municipal as well as regional levels, and identify opportunities to effectively bridge them.

Local Emergency Operations Plans (LEOP)

Each municipality is tasked with preparing and updating a Local Emergency Operations Plan (LEOP). The LEOP is intended to outline municipality authority and responsibilities, including available resources for actions taken be-

Table 4.1-2: Local Emergency Operations Plan (LEOP) and Status. Source: DEMHS Region 1, February 2014

Municipality	LEOP Revision Date	Evacuation Annex	Evacuation Notes	Mass Care Annex	Mass Care/ Shelter Notes	Transportation Annex	Transportation Notes
Darien	2012	Yes	Annex E	Yes	Annex F	No	Ref. in Annex E Appendix C EOP 24-16- IV
Greenwich	2012 Draft	Yes	Annex E	Yes	Annex F	No	Ref. Appendix E-18
New Canaan	2011	Yes	Annex 1E	Yes	Annex 1F	No	Ref. Appendix B - VI-A
Norwalk	2012	Yes	Annex 4	Yes	Annex F	No	Addressed in there Evacuation Plan
Stamford	2012	Yes	Annex E	Yes	Annex F	No	*Hazard Specific annex I
Weston	2012	Yes	Annex E	Yes	Annex F	No	Ref. Appendix B - VI-A
Westport	2012	Yes	Annex H	Yes	Annex F	Yes	Annex O
Wilton	2012	Yes	Annex 1E	Yes	Annex F	No	Ref. Annex 1F Appendix C-C

fore, during and after an emergency event[2]. Structurally, LEOP's are created to align with both FEMA (federal) and state goals and objectives, including the preparedness, response, and short-term recovery planning elements necessary for plan inclusion. The result intends to develop and cultivate a partnership between federal, state and local governments, creating an all-hazard, comprehensive and risk-based national emergency management system.

Table 4.1-2 on the previous page depicts the LEOP statuses of the eight South Western municipalities. The table also identifies LEOP sections that specifically deal with evacuation, sheltering/mass care, and transportation elements.

Local Emergency Planning Committee (LEPC)

Local Emergency Planning Committee's (LEPC) are quasi-governmental bodies which function at municipal and/or regional levels. The main purpose of an LEPC is preparedness, which potentially includes roles such as: to identify and catalogue potential hazards, identify available resources, mitigate hazards when feasible, and write emergency plans[3]. The LEPC is structured to anticipate and plan the initial emergency response for foreseeable disasters in their jurisdiction, but not to physically participate in the response. LEPCs are also active in the SWR, although those municipalities that currently utilize and engage LEPC's, including the level of involvement are not widely known, and should be explored further.

Emergency Alerting and Notification Systems

All of the municipalities within this region possess a reverse notification system, although the extent of and specific types vary. The systems themselves may be part of, or in addition to the states CT Alert Emergency Alerting and Notification System (CT Alert ENS). The CT Alert ENS utilizes the state's Enhanced 9-1-1 database, capable of sending alerts to residents of impending hazards and/or other emergencies. Residents can register to receive alerts at: http://www.ctalert.gov/ctalert/site/default.asp

WebEOC/Veochi

All municipalities currently utilize the state-supported WebEOC, an interactive web application for their incident management functions. The software enables the state, region and its municipalities to track and monitor data as well as resources. Capabilities also include event reporting, data repositories, and situational awareness. The latter creates the ability to communicate resource requests to mobile or "field" devices, so long as an internet connection is provided. The software requires diligence from the user end, with a need for continuous updating and sending of information. The program does not currently interface with GIS software in DEMHS Region 1.

DEMHS Region 1 has also contracted with veoci, a virtual emergency management software program parallel to WebEOC. While specific details remain unknown as it relates to the region, research indicates that veoci provides similar services to WebEOC with respect to: Preparedness, Response, Recovery and Mitigation. An interface with GIS (ESRI) software is planned.

National Flood Program, Mapping and Floodplain Regulations

All eight municipalities in the SWR participate in the FEMA National Flood Insurance Program (NFIP) and are currently in good standing, as evidenced in Table 4.1-3 below. Consistent with program requirements, all municipalities have adopted floodplain management regulations which have aided in preventing increases in flood risk from new developments. Chapter 124, Section 8-2 I of the CGS governs the municipal regulation of development within all floodplains, consistent with the definitions set forth in the NFIP.

Table 4.1-3: Community Participation in National Flood Program, Source: FEMA NFIP, November 2014

Community ID	Municipality	Initial FHBM Identified	Initial FIRM Identified	Current Effective Map Date
090005#	DARIEN	7/26/1974	1/2/1981	7/8/2013
090008#	GREENWICH	10/18/1974	9/30/1977	7/8/2013
090010#	NEW CANAAN	7/19/1974	5/16/1977	6/18/2010
090012#	NORWALK	8/2/1974	4/3/1978	10/16/2013
090015#	STAMFORD	3/8/1974	1/16/1981	7/8/2013
090018#	WESTON	7/19/1974	10/17/1978	6/18/2010
090019#	WESTPORT	3/15/1974	7/2/1980	7/8/2013
090020#	WILTON	3/15/1974	11/17/1982	10/16/2013

Community Rating System (CRS)

The CRS is a voluntary incentive program under the umbrella of NFIP. CRS recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements, which results in flood insurance premium discounts ranging from 5% to 45%. The percentage discount directly correlates with the number and type of activities undertaken by the community, each of which is assigned credit points. A class rating (from 1 to 9, 10 indicates no participation) is assigned the community and it based on the amount of credit points. Communities participating in more CRS activities thus receive more points. For example, a Class 1 community would receive a 45% premium discount, while a Class 9 community would receive a 5% discount. The participating South Western communities are detailed below in Table 4.1-4.

Table 4.1-4 Community Rating System (CRS) Participation

FEMA Community Number	Community Name	CRS Entry Date	Current Effective Date	Current Class	% Discount for SFHA*	% Discount for Non-SFHA	Status
Darien	-	-	-	-	-	-	-
Greenwich	-	-	-	-	-	-	-
New Canaan	-	-	-	-	-	-	-
Norwalk	90012	10/1/1993	10/1/1998	10	0	0	R
Stamford	90015	10/1/2002	10/1/2002	7	15	5	C
Weston	-	-	-	-	-	-	-
Westport	90019	10/1/1995	10/1/2000	8	10	5	C
Wilton	-	-	-	-	-	-	-

** For determining CRS discounts, all AR and A99 Zones are treated as non-SFHAs*

***Status: C = Current, R = Rescinded*

Source: Flood Insurance Agents Manual, June 1, 2014

Stormwater and Erosion Control

All municipalities in the State of Connecticut are required to adopt regulations pertaining to soil erosion and sediment control, in accordance with CGS Section 22a-325 to 22a-329. All proposed development applications with soil disturbances greater than a half-acre are required to develop a soil erosion and sediment control plan. The Connecticut Stormwater Quality Manual (2004) and Guidelines for Soil Erosion and Sediment Control (2002), both products of the state's Department of Energy and Environmental Protection (DEEP), provide guidance as it relates to stormwater and erosion control. Recently, DEEP updated their manual and associated guidelines to incorporate Low Impact Development (LID). Additional information regarding Stormwater and Erosion control can be found at DEEP's Stormwater Management website: http://www.ct.gov/deep/cwp/view.asp?a=2721&q=325702&deepNav_GID=1654

Open Space Preservation

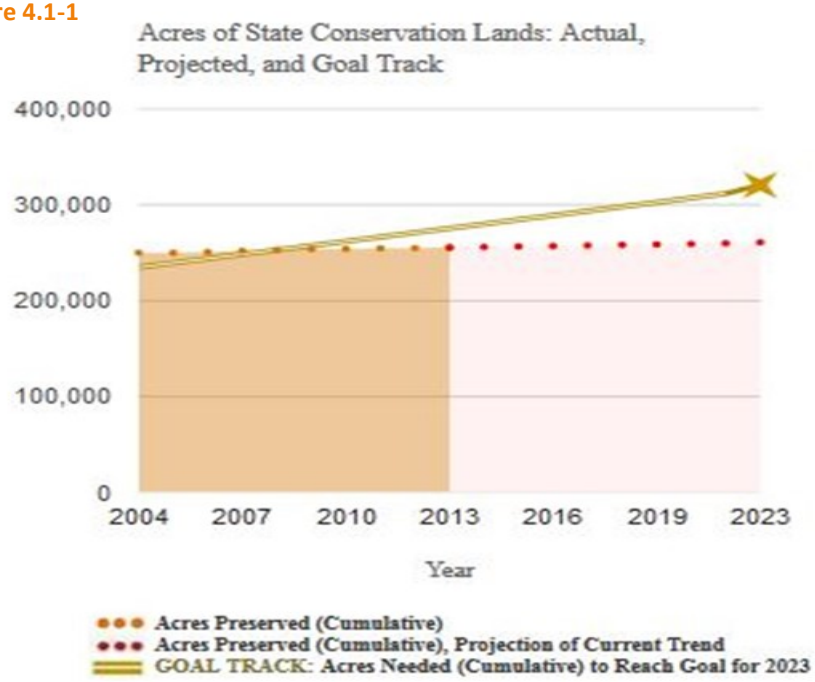
The preservation of undeveloped open space plays a critical role in supporting natural hazard mitigation efforts, specifically as it pertains to flooding and the exacerbating effects associated with runoff from nearby impervious areas. The importance grows exponentially when considering the region itself is already highly developed. Equally important are the land use and zoning regulations, which restrict many development and redevelopment areas more prone to natural hazards, such as within floodplain areas.

The state has set an overall goal to preserve 21% (673,210 acres) of state land area for open space by 2023. Open space uses are intended for public recreation, natural resource conservation, and preservation. Thus far, the State has preserved 255,030 acres statewide[4]. The preservation numbers are derived from CGS Section 23-8, which divides the responsibility to preserve the 21% as follows: State (10% or 320,576 acres); and municipalities, non-profit land conservation entities, and water utilities (11% or 352,634). To help ensure the success of this program, DEEP administers two programs that help to secure such property and are highlighted below:

Recreation and Natural Heritage Trust Program: primary program for acquiring land in order to expand the state's system of parks, forests, wildlife, and other natural open spaces.

Open Space and Watershed Land Acquisition: provides financial assistance to municipalities and nonprofit land conservation organizations to acquire land that will add to a community's open space, enhance recreation-

Figure 4.1-1



Source: Connecticut Council on Environmental Quality (CEQ), 2013

al opportunities, protect unique geographical features, or conserve habitat for living creatures.

According to the Connecticut Council on Environmental Quality's (CEQ) 2013 report, the state is not on track. Figure 4.1-1 is derived from the CEQ report, and illustrates actual preservation amounts verses projected goals.

Plans of Conservation and Development (PoCD)

In accordance with state statutes (CGS Chapter 127, Section 8-35a and Chapter 126, Section 8-23), every ten years regional planning agencies and municipalities are required to update their respective Plan of Conservation and Development (PoCD). The purpose of the plans are to set the long range vision for the community, by providing guidance and recommendations with respect to future land use and economic development policies. Table 4.1-5 below highlights the status of the regions plan, as well as the eight municipalities contained therein:

Regulation of Wetlands and Watercourses

Watercourses which bisect and transect the region create the potential for nearby flooding (riverine flooding), the extent of which is determined by elevation and existing systems in place, among other variables. Such riverine flooding in the SWR is captured as part of the Flood

Table 4.1-5 Area Plans of Conservation and Development (PoCD)

Municipality	Existing PoCD	Responsible Agency (Enacting Zoning Regulations)	Designated Inland Wetlands Agency
Darien*	2016-2026	Planning & Zoning Commission	Planning & Zoning/Environmental Protection Commission
Greenwich	2009-2019	Planning & Zoning Commission	Conservation/Inland Wetlands Commissions
New Canaan	2014-2024	Planning & Zoning Commission	Inland Wetlands and Watercourses Commission
Norwalk	2008-2018	Planning Commission	Planning/Conservation Commission
Stamford*	2015-2025	Planning & Zoning Boards	Planning & Zoning/Land Use Bureau
Weston	2010-2020	Planning and Zoning Commission	Conservation Commission
Westport	2007-2017	Planning & Zoning Commission	Conservation Commission
Wilton	2010-2020	Planning & Zoning Commission	Inland Wetlands Commission
SWRPA/ WCCOG*	2016-2026	Council of Governments	N/A

Table 4.1-6: Municipal Floodplain Regulations

Municipality	Regulation/ Ordinance	Location
Darien	Zoning	Section 820
Greenwich	Zoning	Section 6-139.1
New Canaan	Town Code	Section 9-9
Norwalk	Zoning	Article 110
Stamford	Zoning	Section 7.1
Weston	Town Code	Chapter 212
Westport	Zoning	Section 31-11
Wilton	Zoning	Section 29-9.F
SWRPA/ WCCOG	N/A	N/A

**Currently updating PoCD. Sources for Tables 4.1-5 and 4.1-6: Local Municipalities, WCCOG*

section in Chapter 3. Wetland areas serve as a vital resource with respect to hazard mitigation, among other benefits, they serve to capture and collect storm surges and precipitation runoff, while coastal wetlands/marshland serve as buffers to absorb incoming storm energy, potentially reducing or naturally mitigating associated storm hazards.

Chapter 440 (Sec22a-28 to 22a-45d) of the CGS regulates activity in area wetlands and watercourses, requiring each municipality to establish an inland wetlands agency, delineate wetland and watercourse boundaries, promulgate regulations to protect such areas, bar activities in these areas that are not permitted to do so. The designated inland wetlands agencies, by municipality, can be found in Table 4.1-5 (PoCD Table), while the associated regulations can be found as part of Table 4.1-6, both located on the previous page.

Dam Safety

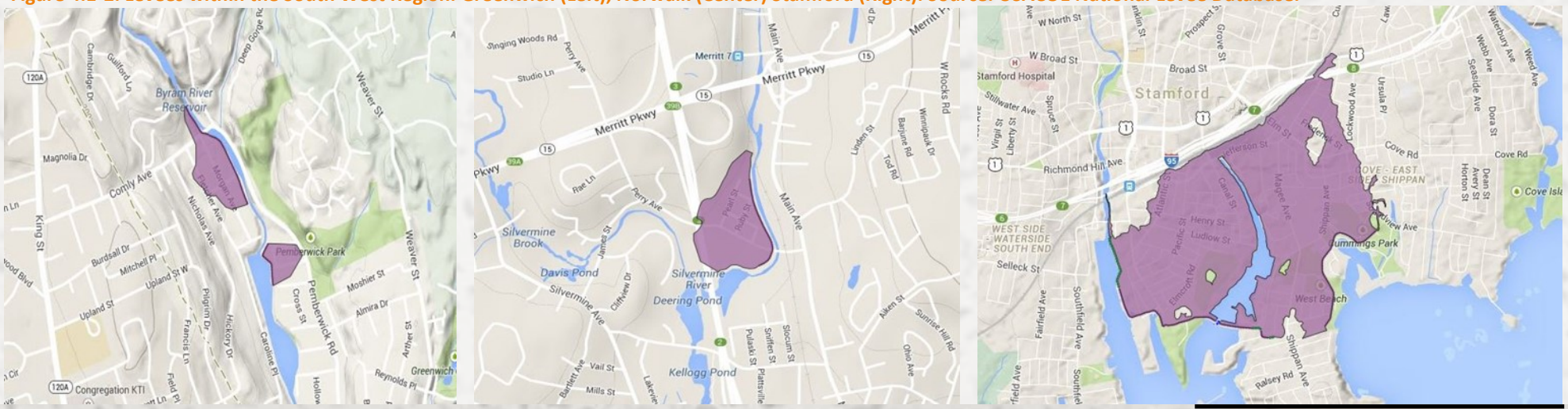
DEEP's Inland Water Resources Division serves as the enforcement arm with respect to state dam safety laws. The office is also responsible for the administration and inspection of existing dams and similar structures, including the associated permitting process for the construction, repair or alteration of dams. The methodology for dam inspection is based on prioritization, including dam classification and potential risk to life and property. Low hazard dams are also targeted for inspection, on a rolling basis. While inspection responsibilities are undertaken by the state, the repair of dams deemed unsafe by the state are the responsibility of the dam owner.

Dam safety in Connecticut is further elaborated in the state's 2014 Natural Hazard Mitigation Plan Update, which reads as follows:

"Dams which receive construction permits for repair and/or reconstruction are designed to pass at least the 100-year rainfall event with one foot of freeboard (a factor of safety against overtopping). The most critical and hazardous dams are required to meet a spillway design standard much higher than passing the runoff from a 100-year rainfall event. Although not all of the dams under CT DEEP jurisdiction have been shown to be able to withstand the 100-year rainfall event, most of the dams meet this standard due to original design requirements or recent spillway upgrades. For the most part if smaller rainfall events (e.g.,10-year and 25-year events) occur more frequently there will be little impact on the ability of Connecticut dams to operate safely.

As more and more state-owned and privately owned dams are repaired, the number of dams that will not meet the State minimum requirements for spillway design diminishes. However, the average age of all dams in Connecticut continues to increase and thus the State must remain vigilant in administering its dam safety regulations and related programs."

Figure 4.1-2: Levees within the South West Region. Greenwich (Left), Norwalk (Center) Stamford (Right). Source: USACOE National Levee Database.



Additional, more localized information on dams within the South Western Region and associated natural hazards can be found in Chapter 3.

Levees

The United States Army Corps of Engineers (USACOE) defines a Levee as a man-made structure, usually an earthen embankment or concrete floodwall, designed and constructed in accordance with sound engineering practices to contain, control, or divert the flow of water so as to provide reasonable assurance of excluding temporary flooding from the leveed area.

Leveed areas currently exist within three South Western municipalities as depicted in Figure 4.1-2, including Norwalk, Greenwich, and Stamford respectively. In Norwalk, a levee exists at the southeastern junction of Route 7 and the Merritt Parkway, just north of the confluence between the Norwalk and Silvermine Rivers. According to the USACOE National Levee Database, the Levee covers approximately 26 acres, and extends 0.45 miles along the west bank of the Norwalk River. In Greenwich, two levees can be found along on either side of the Byram River, in the vicinity of Pemberwick Park. The southernmost levee covers an area of approximately 4.3 acres, while its northernmost counterpart protects an area over a 10 acres in size.

The Levee system in Stamford is sited south of I-95 and near/along the coast. This system is more vast than in Norwalk and Greenwich, and covers near 640 acres in between the Rippowan River east to Cummings Park.

State Building Code

The State Building Code is utilized by area municipalities to enforce and implement code requirements necessary to promote the health and safety of persons within the state. Code requirements can often assist with hazard mitigation efforts, implementing building protocols and strategies that can help reduce risk and associated damage to structures in compliance. The current building code was created in 2005, and Amended in 2009, 2011, and 2013, with a new State Building Code planned for adoption in 2015. The code incorporates standards in high-wind design and seismic activity deemed appropriate for the State. Through the local implementation and adherence to the State Building Code, the SWR municipalities help reduce risks to natural hazards in new developments and substantial redevelopments.

Referrals

The regional referrals committee exists to review, comment and make recommendations on regional developments, such as changes in land use, as required by CGS Statutes. Specific roles of the referrals committee that may assist in potential natural hazard mitigation are included below:

- Any proposed establishment of or changes to a zone affecting the use of a zone within 500 feet of the boundary of another municipality.
- When a subdivision is planned that will abut or include land in two or more municipalities. Referral findings also include input regarding the proposed subdivisions: street layout, storm drainage, sewer and water service, and any other appropriate matters.
- Consistency of Local PoCD's with regional and state plans.

4.2 Municipal Capabilities

4.2.1 Darien Capabilities

The Town of Darien uses regulations as a proactive means to protect the normal functioning of the natural drainage systems, as well as to prevent inappropriate development in flood plains and coastal areas. For instance, the land-use regulations require development in flood hazard and coastal high hazard areas to be designed by a professional engineer to minimize flood damage. In addition, new construction and substantial improvements of residential structures are required to have the lowest floor, including basements, elevated to at least one foot above base flood level. Structures used for the sole purpose of vehicle or other storage are require designs to automatically equalize hydrostatic flood forces on exterior walls, allowing for the entry and exit of flood waters. Furthermore, all new construction and substantial improvements require the space below the lowest floor constructed with breakaway walls, which will collapse under stress without jeopardizing the structural supports of the structure. Such space can only be utilized for building access, parking of vehicles, and/or storage. In regards to floodways, regulations prohibit all development that would result in any increase in flood levels. The regulations also call for the conservation, preservation, and protection of wetlands, marshes, streams, rivers and

ponds as natural resources to avoid flooding, erosion, and pollution. All filling and regrading 20+ cubic yards greater than 25 feet from a residence requires review and action by the Planning and Zoning Commission. Activity cannot extend within 50 feet of inlands wetlands or watercourses, or within 100 feet of a named river unless specifically authorized by Environmental Protection Commission. As part of the subdivision review process, applicants are required to provide a soil erosion and sediment control plan that meets State of Connecticut guidelines.

In the Coastal High Hazard Zones, all new construction and substantial improvements to the bottom of the lowest structural member must be elevated to at least one foot above the base flood elevation, while also attached or anchored to the pile or column foundation to resist flotation, collapse and lateral movement due to the effects of wind and water loads acting simultaneously. In addition, the regulations for Coastal High Hazards Zones prohibit the use of fill for structural support of buildings. These land-use regulations are described in detail with the Town of Darien Zoning and Subdivision Regulations.

Early in 2010, Darien revised the existing flood damage prevention regulations in accordance with the most recent State DEEP and FEMA requirements. Changes in regulations generally coincided with adoption of the Flood Insurance Rate Maps (FIRM) for Fairfield County, which became effective July 8, 2013. The zoning regulations and the language regarding State and Federal permits associated with development were strengthened in order to maintain compliance with the NFIP standards, including the recently enacted state floodplain management requirements. Recently, The Town of Darien hired professional engineers from the firm of Milone and MacBroom to prepare Letters of Map Revision (LOMR) for the Stony Brook and Goodwives River. That work was completed in 2014, was approved by FEMA, and took effect in August/September 2014. This work created new hydrologic modeling for these areas, and used recent topographic mapping to arrive at more detailed and accurate flood mapping, which reflects existing conditions.

Darien also takes a proactive approach towards addressing drainage issues. For instance, the DPW examines and clears public storm drains and grates of debris prior to and during periods of rainfall, snowfall, and storms, whenever possible. Lastly, DPW coordinates studies to address intricate problems as exemplified by the recent studies that examined localized flooding of Heights Road and the Stony Brook and Goodwives River Watershed Evaluations.

4.2.2 Greenwich Capabilities

The Town of Greenwich has been proactive in reducing its vulnerability to natural disasters. Regulations have been used as means to protect the community and natural environment from a variety of hazards. As the Town's Building Zone Regulations states, "The FHO [Flood Hazard Overlay] zone is intended to add additional safeguards to those areas of Greenwich subject to riverine and coastal flooding," and "Promote the public health, safety and general welfare and to minimize public and private losses due to flood conditions in specific areas." Early in 2010, Greenwich revised the existing flood damage prevention regulations in accordance with the most recent State DEEP and FEMA requirements. Changes in regulations generally coincided with adoption of the Flood Insurance Rate Maps (FIRM) for Fairfield County, which became effective on July 8, 2013. The zoning regulations and the language regarding State and Federal permits associated with development were strengthened to maintain compliance with the NFIP standards and recently enacted state floodplain management requirements.

Greenwich has also taken a proactive approach towards addressing drainage issues, debris management, as well as emergency operations and preparedness. The Town completed a town-wide inventory of municipally owned trees, used to develop a maintenance program. The DPW has completed drainage studies for most of the major drainage basins within the Town and for a number of smaller drainage networks that experience localized flooding. Emergency management has also worked to improve the ability of the Emergency Operations Center to function during a severe storm event and since the 2011 plan, a new generator has been installed at one of the Town's emergency shelters.

The Town also works closely with the state and local utilities to monitor the condition of the six Class C Dams within its boundaries. A number of practices are in place to coordinate efforts and provide notification policies between the State of Connecticut DEEP, Aquarion Water Company, private

sector entities, and the town, in order to further dam safety.

Additional efforts include:

- All projects in flood zones and coastal areas are subject to flood zone and coastal regulations, which are enforced by the Planning and Zoning Commission and Zoning Enforcement Officer with the assistance of CTDEEP and FEMA.
- The Town's land use regulations include requirements for sediment and erosion control plans to help ensure proper functioning of manmade and natural drainage systems while construction is being carried out.
- The Town reviews building permit applications for compliance with flood regulations in Connecticut State Building Code (CSBC).
- The Planning and Zoning Department, Zoning Enforcement Officer and DPW-Building Inspection ensure conformance by requiring elevation certificates prior to issuance of a Certificate of Occupancy.
- DPW Building Division inspects flood damaged structures for damaged mechanical, electrical systems, as well as structural damage.
- The Town requires all site plans, subdivisions, and building applications to comply with the Town's Drainage Manual. For most projects, compliance information must be certified by a licensed professional engineer.
- Conservation Commission provides technical assistance to Planning and Zoning in the review of planting plans focusing on vegetation that may slow or reduce flooding.
- Conservation Commission reviews and comments on site plan and subdivision applications to the Planning and Zoning Commission for impervious cover and soil types (percolation rates).
- Conservation Commission reviews site plans and subdivisions from a seasonal perspective considering the effects of frozen conditions on flooding and planting to mitigate flooding.
- Inland Wetlands and Watercourses Agency (IWWA) enforces regulations to direct development away from wetlands and flood plains.
- During its review process and inspections of violations IWWA enforces the removal of obstructions from watercourse that could cause debris loads then lead to increased flood hazards.
- IWWA regulations require management practices and measures that prevent flooding and improve water run-off from sites in accordance with the Town's Drainage Manual.
- DPW–Engineering maintains a Town Drainage Manual that requires zero increase in water run-off from new developments for a 25-year storm event. The Manual also regulates the existing and proposed storm drainage system requirements such as four foot sumps, hoods, etc.
- DPW–Engineering and Highway Divisions continually perform drainage projects as found in their DPW Capital Improvement Plan.
- DPW–Highway Division performs regular maintenance and cleaning of catch basins, grate tops and cleans pipes in the town drainage system.
- DPW-Highway Division monitors weather reports and maintains equipment and loaded trucks in preparation for storm events.
- DPW-Highway performs snow removal for downtown business district and management of snow removal for all schools.
- DPW-Highway and the Fleet Department perform an ongoing maintenance and replacement program of vehicles and provide mechanical assistance.
- DPW-Highway manages snow and ice control supply inventories to be prepared for storms, restocking as needed. Other emergency response equipment managed by Highway is also managed and replaced as necessary to be ready for future events.
- DPW-Highway and Park and Recreation perform continual roving patrols and monitoring of the Town during storm events, including hurricanes, and alert the Police Department and utility companies of any damaged or fallen lines.
- DPW-Building Inspection reviews plans and construction for compliance with CSBC regulations for snow loading and wind loading requirements.
- Police Department possesses emergency equipment (traffic cones, signs, barricades, etc.) on a trailer ready to be deployed when needed during flood or storm events.
- Police Department possesses an amphibious vehicle capable of reaching areas of town that have been affected by flooding.
- Fire Department is prepared to handle life safety issues including high

angle rescue, cold-water rescue, confined space and trench rescue.

- Fire Department is equipped with detection equipment in case hazardous materials become a danger as a result of a storm event. This includes infra-red detection, mercury detection and containment, flammable and combustible vapor detection, radiological material detection, Carbon Monoxide detection, and Oxygen deficiency. The Greenwich Fire Department is a member of the Fairfield County hazards materials team and the training and the equipment to deal with mass contamination.
- Parks and Recreation performs a tree maintenance program organized into three priority groups: 1. Trees that pose potential hazards to vehicles and pedestrians; 2. Trees that pose potential hazards to nearby utilities; 3. Trees that do not pose a direct threat to vehicles, pedestrians, or utilities.
- Parks and Recreation makes recommendations to Planning and Zoning and DPW for appropriate species and location of tree planting near utility lines and buried infrastructure.
- Parks and Recreation performs ice breaking near town marinas at Grass Island and Mianus.
- Procedures are in place to open and maintain the Emergency Operations Center by the Emergency Management Director, Police Chief, Fire Chief, EMS Director and First Selectman.
- Town of Greenwich Emergency Management has developed an emergency preparedness booklet for residents and periodically hosts preparedness programs and events at the local library.
- Emergency Management provides shelters for any evacuees due to significant flooding, and maintains agreements with the Greenwich Chapter of the American Red Cross to manage the shelters. Emergency Management maintains Memorandums of Understanding (MOU) with transportation providers in order to transport the evacuees from areas affected by floodwaters.
- IWWA reviews plans for the appropriate plant species in and around drainage basins based on the depth and stabilization of the basin.
- The Town has developed a telephone number to broadcast emergency information, and the USGS has installed a stream gage in the Byram River, which may be used to warn residents in particular flood prone and flood zone areas.
- The Town has provided an Emergency Information Telephone number (866) 245-4260 that will provide information relative to an ongoing or experienced emergency situation. This info line is accessible by simply dialing the well-publicized number. Several officials have access to placing messages so there is assurance that the system will have information for those seeking guidance. The declaration of a snow emergency could utilize this system.
- State of Connecticut DEEP maintains records and performs inspections of all dams in Town.
- DPW-Engineering also maintains records and performs inspections for all Town of Greenwich owned dams (Mianus Park Pond, Cos Cob Pond, Wooley Pond, East Pond, Mianus River, Montgomery Pond, and Old Pond).
- Each dam owned by Aquarion Water Company has an Emergency Operation Plan (EOP), safety plan, and all Class C dams undergo an annual inspection and regular maintenance. A notification protocol is in place where in the event of a dam disaster, first the Town Police Department and Fire Department are notified, followed by the chief elected official. Police Department would assist with the warning of residents near the dam.
- Conservation Commission has instituted education and outreach programs that encourage business owners and residents to conserve water.
- During drought conditions, Conservation Commission and Health Department would enforce restrictions through the use of drought permits.
- The Town has a Water Supply Team comprised of the Conservation Director (head), Health Director, Fire Chief, and First Selectman.
- The Town currently has a Drought Management Plan for public drinking water supplies.
- *Water Use, Ground-Water Recharge and Availability, and Quality of Water in the Greenwich Area, Southwestern Connecticut* was completed by the Conservation Commission in cooperation with the USGS after a two year study of ground-water resources as mandated by Section 7.2 of the *Town of Greenwich Plan of Conservation and Development*.

- Aquarion Water Company has a three tiered drought management plan utilizing the Southwest Regional Pipeline to transfer untreated water and treated water between area plants as needed.
- Office of Emergency Management may activate the Emergency Operation Plan in order to coordinate the acquisition and distribution of needed water supplies through the Emergency Operation Center.
- Office of Emergency Management may use the Emergency Information Line, the emergency email system, as well as the media to notify residents of the locations of distribution of water supplies.

4.2.3 New Canaan Capabilities

New Canaan uses regulations as a proactive means to protect the normal functioning of natural drainage systems and to prevent inappropriate development in floodplains. For instance, *Zoning* and *Inland Wetland Regulations* require all new construction in flood zones to have the lowest floor, including basement, elevated to or above the base flood level. Improvements to existing structures resulting in a 25% increase in occupied cubic content or ground area shall be elevated to or above the base flood level. A permit is required for all filling or excavation in excess of 200 cubic yards, and any development that disturbs more than one half acre is required to have a soil erosion and sediment control plan that meets State of Connecticut guidelines. Furthermore, the *Zoning* and *Inland Wetland Regulations* also call for the conservation, preservation and protection of wetlands, marshes, streams, rivers and ponds as well as natural resources to avoid flooding, erosion and pollution.

The Environmental Commission works toward the conservation of wetland resources through its *Flood Damage Prevention Regulations*, by avoiding impacts from development on functional wetlands and watercourses. Excavation cannot extend within 50 feet of wetlands, watercourse, stream, pond or river, unless specifically authorized by the Environmental Commission. For instance, these regulations prohibit all development in floodways that would result in any increase in flood levels. The Commission also seeks to restore and enhance degraded wetlands. The Building Department ensures conformance with the Connecticut State Building Code including flood resistant construction and with elevation certification (Section 3107), these land-use and building regulations are described in detail in the town zoning, subdivision, and flood damage prevention regulations.

New Canaan carries out other preventive measures to reduce the likelihood and costs associated with flooding, damaging winds, and heavy snow. For instance, DPW examines and clears public storm drains and grates of debris during periods of rainfall, snowfall, and storms wherever possible. New Canaan also has contracts with commercial vendors to dispose of bulk wood debris.

4.2.4 Norwalk Capabilities

Prevention

Norwalk has rigorous land use regulations designed to protect natural resources while restricting development in flood zones and other hazard-prone areas. Norwalk participates in the Community Rating System (CRS) of the National Flood Insurance Program (NFIP) and continues to be proactive in working to reduce flood hazards throughout the city. Early in 2010 Norwalk revised the existing flood damage prevention regulations in accordance with the most recent state DEEP and FEMA requirements. Changes in regulations coincided with adoption of the Flood Insurance Rate Maps (FIRM) for Fairfield County, which became effective on July 8, 2013. The zoning regulations and the language regarding State and Federal permits associated with development were strengthened to maintain compliance with the NFIP standards and recently enacted state floodplain management requirements. These regulations help prevent the loss of life and property by preventing inappropriate development in flood zones, while also reducing the amount of stormwater discharge that may exacerbate flooding.

The *Zoning Regulations* restrict all new construction and substantial improvements within the 100--year floodplain, as depicted in the most recent FIRM revisions. Substantial improvements are defined as any combination of repairs, reconstruction, alteration, or improvements to a structure taking place during a ten-year period, the cost of which equals or exceeds 50% of the market value either before the improvement or repair is started or, if the structure has been damaged, prior to the damage occurring. In these cases, all residential construction must be elevated to or above the base flood elevation. Likewise, all non-residential construction must be elevated or flood-proofed to the base flood elevation or higher. In regards to elevat-

ed buildings, the areas below the base flood elevation must allow floodwater to flow in all directions, and the building must have at least one access route above the base flood elevation. The city regulations also prohibit all encroachments in regulated floodways.

The *Subdivision Regulations* build upon the aforementioned *Zoning Regulations* to offer additional preventive measures during the site plan submittal process. Specifically, they require a storm drainage plan that minimizes runoff while maximizing infiltration before discharging stormwater into wetlands and watercourses. If stormwater discharge will overload existing downstream drainage facilities, the storm drainage plan must provide adequate retention or detention of the runoff. The regulations also require the protection of natural features including those that contribute to the functioning of the natural drainage system. The regulations also address damaging winds as a result of severe storms. For instance, utility lines are now required to be buried for all new subdivisions, and are encouraged for certain project types, such as major road projects. Such land use regulations are described in more detail as part of the city's *Zoning Regulations* and *Subdivision Regulations* available through Norwalk City Hall.

1. The Building Department, Inland Wetland Commission and DPW carry out additional activities to help prevent the loss of life and property as a result of natural disasters. These agencies work very closely with public safety agencies to address such issues beyond mitigation, including:

2. The Building Department ensures conformance with the Connecticut State Building Code including flood resistant construction and with elevation certification (Section 3107).

3. The Inland Wetlands Commission, through its Inland Wetlands and Watercourses regulations, works toward the conservation of wetland resources through avoiding impacts from development on functional wetlands and watercourses. The Commission also seeks to restore and enhance wetlands that have been degraded.

4. Norwalk assesses the conditions of trees throughout the city, working with Norwalk Clean and Green and Norwalk Tree Alliance, and an as-needed program for tree maintenance is in place.

5. Whenever possible, DPW examines and clears public storm drains and grates of debris during periods of rainfall, snowfall, and storms.

6. All city agencies and departments haven been trained in the use of National Incident Management System (NIMS) and Incident Command System (ICS) which are an integral part of all plans and notification procedures. DPW, Police, Emergency Management and the Chief Executive established the necessary procedures for the implementation of a snow emergency ordinance. This teamwork has resulted in significant improvement of snow removal during winter storms and blizzards, and has reduced stress on infrastructure and emergency response systems.

7. All City departments and City-related agencies are being organized and blended into the emergency management systems as Emergency Support Functions (ESFs).

Emergency Services

Norwalk employs warning systems and emergency planning techniques to help protect life and property before, during and after a natural disaster. For instance, the City of Norwalk Emergency Operations Plan outlines emergency procedures for natural and other disasters. Norwalk has established the position of Director of Combined Dispatch and Emergency Preparedness Planning, highlighting the importance and commitment to Emergency Management and Planning within the city.

Norwalk has recently built a new Fire Station at the site of the existing Volk Station, the new facility includes a state of the art Emergency Operations Center (EOC), and is connected to all public buildings throughout the community via a fiber optic network, including schools.

The City has trained staff in the NIMS and the ICS since the 2011 Update and is now NIMS compliant. Norwalk continues to mitigate potential hazards as described below, and has made these actions a part of their everyday business. For example, Building and Zoning is integrating long range emergency planning into its activities via the emergency planning department.

Public Education

The City of Norwalk has undertaken a number of projects and initiatives to help improve public awareness of the City's vulnerability to natural disas-

ters. The City successfully launched the "Plan 9" campaign, which provided information on nine important items to have during a disaster, informational materials were printed on water bottles, reusable bags and brochures, which were distributed across the City. A number of other brochures and applicable information are posted on the emergency management website. Norwalk has also worked to ensure that information is available to all members of the public. Extra efforts have been taken by the city to reach out to vulnerable populations. The Office of emergency management works closely with community organizations and many of educations brochures are available in several other languages.

Norwalk also uses the "Notify Norwalk System" as a means to notify and alert residents in the event of an emergency. The "Notify Norwalk System" allows residents to register multiple phone numbers (including mobile phones) and email addresses. An Emergency Alert Icon and webpage have also been added to the City of Norwalk's home page. When an alert is active the icon changes to flashing or solid red indicating emergency conditions exist, and information is posted on the emergency alert website.

Natural Resource Protection

Norwalk acquires open space to provide recreational opportunities and/or to help preserve or restore the functions of natural systems. For example, the *Norwalk Plan of Conservation and Development* supports a multi-use trail along the Norwalk River/Route 7 Corridor. In addition, the *Norwalk Harbor Management Plan* calls for the protection of coastal resources such as tidal ponds. Norwalk maintains a Law Enforcement marine unit that trains annually with DEEP and the United States Coast Guard in coastline environmental security. The Marine unit regularly patrols the coastline and accessible river areas.

Norwalk River Watershed Initiative

Norwalk supports the goals of the *Norwalk River Watershed Action Plan* prepared in October 1998 and updated in June 2004 by the Norwalk River Watershed Initiative (NRWI). NRWI successfully implemented many aspects of its action plan including those that mitigate flood hazards. For instance, NRWI organized workshops and prepared outreach materials on stormwater and floodplain management. In addition, NRWI actively promoted open space preservation and protection adjacent to the Norwalk River and other critical areas to ensure the proper functioning of the watershed. Furthermore, a list of non-structural flood control measures was prepared for each existing flood-prone structure within the Norwalk River Watershed. Ongoing efforts were initiated to help implement such non-structural measures. Lastly, NRWI has explored the removal of the Cannondale, Merwin Meadows, and Flock Process Dams to restore the normal functioning of the Norwalk River. These dams no longer serve their intended purposes and lack flood control or protection benefits. Late in 2013, it was announced that the United States Department of Fish and Wildlife had awarded the City of Norwalk nearly $1 million to remove the Flock Process Dam.

4.2.5 Stamford Capabilities

Prevention

The City of Stamford uses land use regulations which serve to minimize the impacts of new development on the natural drainage system, ensure the proper functioning of critical facilities during floods, and to ensure appropriate development in floodplains. Early in 2010 Stamford revised the existing flood damage prevention regulations in accordance with the most recent state DEEP and FEMA requirements. Changes in regulations coincided with adoption of the Flood Insurance Rate Maps (FIRM) for Fairfield County, which became effective as of July 8, 2013. The zoning regulations and the language regarding State and Federal permits associated with development were strengthened to maintain compliance with the NFIP standards and recently enacted state floodplain management requirements.

These land use regulations are enforced by the Land Use Bureau, the Engineering Bureau, the Environmental Protection Board, the Zoning Board, Zoning Board of Appeals, Zoning Enforcement Officer, and in some instances, Connecticut DEEP.

In addition to land use regulations, Stamford has several ongoing activities that help reduce the likelihood of floods. For instance, the Highway Department performs regular maintenance and inspections of the drainage system. As part of Stamford's capital improvement program, it installs storm drains, catch basins, and curbs to increase drainage efficiency and to upgrade the infrastructure. Furthermore, the Citizens Service Bureau in the

Operations Department records all complaints about drainage issues, forwards complaints to Highways or Engineering as is appropriate and keeps records of the work done.

Public Education and Awareness

The following public education and outreach efforts help Stamford increase awareness about flood-prone areas and flood preparedness.

1. The Environmental Protection Board sends out a flood preparedness brochure to all 4,600 residents living within the floodplain annually.
2. The Environmental Protection Board provides Flood Insurance Rate Map (FIRM) information to people who inquire, and publicizes this service by writing annually to the realty and insurance organizations.
3. The Environmental Protection Board assembled flooding and flood protection publications, recommended by the Federal Emergency Management Agency (FEMA) that the public library has entered into its cataloging system.

Stamford's Department of Health has previously worked with the Red Cross to complete a shelter plan for the city that includes a map showing shelters and mass vaccination/medical supply distribution sites along with floodplains, critical facilities and vulnerable populations. The City has also launched a "Be Prepared Stamford" website (www.bepreparedstamford), which is linked to the City's homepage. The site provides information on preparing for and responding to various hazards and natural disasters, as well as public health information.

Emergency Services

Stamford takes the following multi-faceted approach to help protect life and property before, during and after a natural disaster.

1. An automated flood warning system monitors the Rippowam/Mill, Mianus, and Noroton rivers, rainfall, and weather conditions and prepares forecasts of river levels.
2. The City installed a "Reverse 911" system in January 2009**.** It is a web-based program that uses a combination of databases and GIS technologies enabling the City to quickly target a precise geographic area and saturate it with thousands of calls, emails, and instant messages per hour. The City can also create a list of individuals with common characteristics (such as membership in a Neighborhood Crime Watch group, or emergency personnel) and contact them rapidly whenever necessary.
3. A temporary helicopter-landing zone was installed in August 2004 to allow the City to bring in heavy equipment and additional personnel when ground transportation is not viable. A permanent helicopter-landing zone will eventually replace the temporary one.
4. Stamford has made improvements to the existing Emergency Operations Center (EOC) and back up EOC, and has also constructed a state of the art EOC at police headquarters.
5. The City maintains various emergency response plans that protect life and property through pre-established procedures for responding to a natural event.

Natural Resource Protection

Natural resource protection helps preserve or restore the functions of natural systems. Altogether, the City of Stamford has over 345 acres of preserved space within flood zones. This acreage accumulated through a series of small and large open space projects. On the small side, developers conveyed land within the floodplain along Stamford Harbor/East Branch (205 Magee Ave). Afterwards, three buildings were demolished to create 3.3 acres of open space. On the large side, the City recently acquired 35 acres in 2000 to add to Mianus River Park, which is a 220-acre parcel shared by Greenwich and Stamford. In 2006, the National Park Service produced a management plan for the park, which includes trail improvement, riverbank restoration, and erosion mitigation strategies. The Friends of Mianus River Park, City staff, National Park Service, Trout Unlimited, and the DEEP have partnered on the completion of many projects and their work is ongoing.

In addition, Stamford is implementing the Mill River Corridor Project, which contains the following features that would reduce the City's vulnerability to floods and other natural disasters.

1. The Mill Pond Dam was removed by the Army Corps of Engineers in order to restore the natural functioning of the Mill River. The dam removal has helped to reduce both the height and extent of the floodplain in

downtown, having a major impact on potential losses due to flooding.

2. Seventeen flood-prone buildings along the Mill River have been demolished or relocated between 1986 and 2000 to create open space. Since 2000, Stamford has acquired seven additional properties to be maintained as open space.
3. The City has officially accepted the former vehicular bridge on West Main Street as a pedestrian bridge, and it will be rebuilt as a pedestrian-only bridge (and emergency vehicles) above the 100-year floodplain. In addition, eight of the nine piers will be removed and the elevation of the bridge deck will be raised.

Other

Stamford has additional existing mitigation strategies that address hurricanes, drought and severe winter storms. In regards to hurricanes, a hurricane barrier in Stamford Harbor at the end of the East Branch inlet gets raised during severe storms. Under drought scenarios, the City Ordinance permits the Mayor to declare certain water uses unlawful in the event of a water emergency. For severe winter storms, the Public Services Department recently developed more efficient routes and acquired high-powered snow blowers to accommodate heavy snowfalls like those that occurred in the winters of 1995-96, 2002-03 and 2003-04.

4.2.6 Weston Capabilities

Weston is the least populated municipality in the Region and has worked to preserve its rural charm through minimum 2 acres zoning and a limited commercial area. Like New Canaan and Wilton, it lacks coastal frontage, but like the rest of the region continually experiences flooding as a result of even moderate rain events. Weston is particularly vulnerable to severe winter storms, hurricanes and other high wind events. Drought is another significant hazard, and since there is no public water supply serving the town, the potential for health consequences are high. Low water levels may also impact the fire departments ability to respond, as they rely on fire ponds to fight fires. In addition, Weston could experience significant loss should the Samuel Senior Dam fail; this dam impounds the Saugatuck River and has a storage capacity of 42,000 acre feet of water.

Weston uses regulations as a proactive means to protect the normal functioning of the natural drainage systems and to prevent inappropriate development in floodplains. These local ordinances comply with FEMA guidelines, intended to mitigate flood damage. For example, all exterior walls are required to be designed to collapse outward instead of inward, and all electrical equipment must be elevated above the 100-year base flood level. The Conservation Commission enforces inland wetlands regulations that minimize intrusion in or near wetland areas. These regulations minimize the potential for damage to the environment with the additional benefit of reducing property damage in the event of a flood. Furthermore, the Building Inspector ensures conformance with the Connecticut State Building Code including flood resistant construction and with elevation certification (Section 3107).

Early in 2010 Weston revised the existing flood damage prevention regulations in accordance with the most recent state DEEP and FEMA requirements. Changes in regulations coincided with adoption of the Updated Flood Insurance Rate Maps (FIRM) for Fairfield County, which became effective July 8, 2013. The zoning regulations and the language regarding State and Federal permits associated with development were strengthened to maintain compliance with NFIP standards and recently enacted state floodplain management requirements.

In addition, Weston is diligent about maintaining its roadways and storm culverts. Weston budgets for scheduled road maintenance and repaving, maintaining a year-round maintenance schedule for all municipal storm culverts. In addition, the Police Department conducts an annual review of road and accident data to determine if engineering changes to roads could reduce accidents. For example, one review led to improvements on Route 57, prone to flooding even following a moderate storm. Lastly, the DPW is equipped to remove fallen trees and branches from the roadways.

Weston is poised to respond to emergency conditions including those invoked by a natural event. Weston's "Emergency Operations Team" is made up of more than two-dozen officials including police, DPW, the Executive Director of the Weston-Westport Health District, certain private aid groups, and other municipal personnel. The Town of Weston has a two-phase plan that coordinates emergency communications in the most efficient manner to mitigate risks and protect the Town. Emergency response is greatly facilitated by the centralized municipal complex that hosts its Police, Fire, EMS,

Town Hall and school departments. In fact, a school serves as the current emergency shelter, and the intermediate school building was designed with storm resistant interior corridors to provide a sturdy emergency shelter.

Besides the Town of Weston, Aquarion Water Company of Connecticut is also involved in reducing the risk of natural hazards in the municipality. Aquarion, as owner of the Samuel Senior Dam, implement a preventative maintenance schedule on the dam and its associated infrastructure. The Samuel Senior Dam is also equipped with a relief valve between the dam and the Hemlocks Reservoir in Easton, so that Aquarion can change water levels in either reservoir.

Weston uses public awareness and involvement to help reduce the loss of life and property. For instance, Weston encourages its residents to participate in the volunteer fire department and emergency medical services squad. Each year, the League of Women Voters of Weston organizes an event called "Speak Up" where all Town Boards and Commissions, Westport -Weston Health District, fire and police department leaders and the Board of Selectmen meet the public. At this forum, ordinary citizens often come forth with specific suggestions about mitigating natural hazards on both small and large scale.

4.2.7 Westport Capabilities

Flooding

The Town of Westport was a pioneer in flood hazard mitigation in Connecticut, and participated in several FEMA mitigation programs prior to the Disaster Mitigation Act of 2000. Specifically, the flood mitigation efforts were guided by the *1995 Repetitive Loss Plan*, *1997 Hazard Mitigation Plan*, the *2000 Floodplain Management Plan*, as well as the Community Rating System (CRS), which is part of the NFIP. These plans proposed methods to minimize loss due to flooding through mitigation strategies in the following categories: education; flood insurance; CRS; risk assessment data; grant funded projects; regulatory improvement; stream channel, drainage system maintenance and improvement; construction and structural flood mitigation; and flood warning. In 1999, Westport was chosen by FEMA to be a Project Impact community and was awarded a $500,000 grant to implement flood mitigation strategies. Westport has made flood hazard mitigation a continuing priority, as demonstrated by the proactive approach taken by the Town as well as the activities incorporated in town projects, plans, and daily operations.

The Town of Westport also uses regulations to protect the normal functioning of the natural drainage systems and to prevent inappropriate development in flood plains and coastal areas. Early in 2010 Westport revised the existing flood damage prevention regulations and in accordance with the most recent state DEEP and FEMA requirements. Changes in regulations coincided with adoption of the Flood Insurance Rate Maps (FIRM) for Fairfield County, effective July 8, 2013. The zoning regulations and the language regarding State and Federal permits associated with development permits were strengthened to maintain compliance with the National Flood Insurance Program (NFIP) standards and recently enacted state floodplain management requirements.

Severe Storms

Westport has also taken a proactive approach to address wind damage. Recommendations from the *1997 Hazard Mitigation Plan* and the *Predisaster Mitigation Strategy Document, Connecticut's South Western Region* (2005) aimed to reduce Westport's vulnerability to severe storms by implementing strategies addressing flood and wind damage. Specifically, these strategies reduced the likelihood of property damage from storm surges, utility damage and ice jams. In addition, Westport regularly reviews their snow removal procedures and seeks opportunities to reduce costs whenever possible. Westport has also identified strategies to reduce the amount of debris generated during severe storms. Westport has a tree warden, an annual tree maintenance program for public property, and the DPW maintains the necessary equipment to clean up downed tree limbs, brush, and debris following major wind events. Staging areas have been identified for short-term storage, and an agreement with Sherwood Island State Park was reached for temporary storage and processing following major storm events.

Education and preparedness are critical components in reducing vulnerability to severe storm events. Westport officials continue to visit schools and educate children about the risks from natural hazards and necessary preparedness actions. Town staff have also attended trainings on mitigation

measures from FEMA, Building Officials & Code Administrators International Inc., and the DEEP. Information was made available to all building permit applicants and incorporated into the natural hazards reduction information in the town library. Commercial building owners or managers (of buildings with large population clusters) were encouraged to prepare a hazard mitigation plan in addition to their emergency response plans and a mass notification system is also in place to alert residents of an impending storms and other emergencies.

The Town has also devoted significant resources to ensure that emergency responders are prepared during a severe storm event. A weather monitoring station is employed and emergency communications facilities have been updated to withstand high wind. The Westport/Weston Health District, in cooperation with the American Red Cross, the Westport Housing Authority, the Department of Human Services and the local Visiting Nurse agencies continued to maintain a list of residents requiring additional services and support during emergencies. The Town also regularly reviews the *Westport Emergency Operations Plan,* providing updates as needed.

Earthquake

Although the threat of a severe earthquake is low, decision makers were concerned about the suddenness of earthquakes and lack of seismic design in many Westport structures. Therefore, Westport addressed earthquakes in its *1997 Hazard Mitigation Plan* and successfully implemented a number of mitigation strategies aimed at reducing the risk primarily focused on educating the community about the risks. Builders and design professionals active in the town have been provided copies of recommendations and best practices on reducing the risk of earthquake damage. The Town has also begun to evaluate municipally-owned buildings for their ability to withstand earthquakes and wind loading.

Dam Failure

The Town of Westport and the State of Connecticut monitor high risk dams in an effort to minimize the likelihood of dam failure. Owners of Class C dams are required to maintain emergency operations plans (EOP's) for their dams. Builders of new Class B dams are also required to develop EOPs. Many existing class B dam owners also have EOPs. Westport, with the assistance of the State DEEP, requested a copy of the emergency operations plan from each dam owner. Westport has obtained all available copies of failure inundation maps from the owners of all Class B dams in town, as well as and from the owners of the Saugatuck Reservoir Dam (Class C) in Weston. Westport also prepared maps of known or expected dam failure inundation areas for the dams currently without inundation mapping, but were determined to present the greatest threats.

Following moderate to major flooding events, staff of the Westport Engineering Department attempt to visually inspect Class B dams and report any obvious problems to the Dam Safety Unit of DEEP. Dam Safety inspects these dams in approximately 5-year intervals. Dams may be inspected more frequently if problematic conditions are expected or reported. The town also includes the amount of time needed to warn vulnerable populations in their inundation areas as part to the EOP.

Sea Level Rise

Scientific evidence has shown the threat of climate change and the associated risks may be visible during the next century. Sea level rise has been identified as one of the major threats related to climate change. With its expansive coastline, the Town of Westport has begun to examine the community's vulnerability to sea level rise and to identify critical facilities that may be impacted by increased sea levels.

4.2.8 Wilton Capabilities

Prevention

Wilton has rigorous land use regulations designed to protect natural resources and restrict development in flood zones and other hazard-prone areas. These regulations help prevent the loss of life and property by preventing inappropriate development in flood zones and reducing the amount of stormwater discharge that may exacerbate flooding.

Early in 2010 Wilton revised the existing flood damage prevention regulations and in accordance with the most recent state DEEP and FEMA requirements. Changes in regulations coincided with adoption of the Flood Insurance Rate Maps (FIRM) for Fairfield County, effective as of July 8, 2013. The zoning regulations and the language regarding State and Federal permits

associated with development were strengthened to maintain compliance with the NFIP standards and recently enacted state floodplain management requirements.

The *Zoning Regulations* restrict all new construction and substantial improvements in the 100--year floodplain, as depicted on the most recent revision of the FIRM. Substantial improvements mean any combination of repairs, reconstruction, alteration, or improvements to a structure taking place during a ten-year period, the cost of which equals or exceeds 50% of the market value either before the improvement or repair is started or, if the structure has been damaged, before the damage occurred. In these cases, all residential construction must be elevated to the base flood elevation or higher. Similarly, all non-residential construction must be elevated or floodproofed to or above the base flood elevation. In regards to elevated buildings, the areas below the base flood elevation must allow floodwater to flow in all directions, and the building must have at least one access route above the base flood elevation. Lastly, the regulations also prohibit all encroachments in regulated floodways.

The *Subdivision Regulations* build upon the *Zoning Regulations* to offer additional preventive measures during the site plan submittal process. The regulations require a storm drainage plan that minimizes runoff, while maximizing infiltration before discharging stormwater into wetlands and watercourses. If stormwater discharge will overload existing downstream drainage facilities, the storm drainage plan must provide adequate retention or detention of the runoff. In addition, the regulations require the protection of natural features, including those that contribute to the functioning of the natural drainage system. The regulations also serve to address damaging winds as a result of severe storms. For example, utility lines are required to be buried for new subdivisions, and are encouraged for certain projects such as major road endeavors. These land use regulations are described in more detail in the town's *Zoning* and *Subdivision Regulations*.

The Building Department, Inland Wetland Commission, and DPW carry out additional activities that help prevent the loss of life and property as a result of natural disasters, including:

1. The Building Department ensures conformance with the Connecticut State Building Code including flood resistant construction and with elevation certification (Section 3107).
2. The Inland Wetlands Commission, through its Inland Wetlands and Watercourses regulations, works toward the conservation of wetland resources through avoiding impacts from development on functional wetlands and watercourses. The Commission also seeks to restore and enhance wetlands that have been degraded.
3. Wilton implements an as-needed program for tree maintenance.
4. Whenever possible, Public Works examines and clears public storm drains and grates of debris during periods of rainfall, snowfall, and storms.
5. Public Works corrected a drainage problem to prevent icing on Nod Hill Road, removed sediment in box culverts in the flood-prone Wilton Woods neighborhood, and cleaned the catch basins in low lying areas to maintain unobstructed drainage.

Emergency Services

Significant improvements have been made to the telecommunications systems used by emergency responders. Additional antennas were installed on schools and in other critical areas were radio communication problems existed. The system now provides 99% radio coverage to the town. Wilton also uses warning systems and emergency planning to help protect life and property before, during and after a natural disaster. For instance, the Board of Education has an Emergency Operations Plan that outlines emergency procedures for the school district. The plan has procedures in place for flooding, tornado, hurricane, and earthquake events. In addition, the water level of the Norwalk River, rainfall, and weather conditions and forecasts are monitored for potential flooding in Wilton, Norwalk, Redding, and Ridgefield. A mass notification system is utilized to warn local residents of potential threats and the town is continually working to enhance the operations of the system. Wilton has also explored options to allow residents to register non-typical devices to receive alerts (i.e. cell phones, tablets and electronic messaging systems). Wilton has also recently completed an upgrade and renovation to its EOC, which was completed late in 2013 and located at Police Headquarters.

Natural Resource Protection

Wilton has an aggressive open space acquisition policy that helps protect areas prone to flooding and other natural hazards from future development. For example, the *Wilton Plan of Conservation and Development* lists desired public open space acquisitions, including properties with flood storage and other demonstrable mitigation benefits.

Norwalk River Watershed Initiative

Wilton supports the goals of the *Norwalk River Watershed Action Plan* prepared in October 1998 and updated in June 2004 by the Norwalk River Watershed Initiative (NRWI). NRWI successfully implemented many aspects of its action plan including those that mitigate flood hazards. For instance, NRWI organized workshops and prepared outreach materials on stormwater and floodplain management. In addition, NRWI actively promoted open space preservation and protection adjacent to and along the Norwalk River, in addition to other critical areas to ensure the proper functioning of the watershed. A list of non-structural flood control measures was also prepared for each existing flood prone structure in the Norwalk River Watershed. Ongoing efforts have been initiated to implement the non-structural measures. Lastly, NRWI explored the removal of the Cannondale, Merwin Meadows, and Flock Process Dams to restore the normal functioning of the Norwalk River. These dams no longer serve their intended purposes and lack flood control or protection benefits.

Education

The Town of Wilton has worked to ensure that citizens have the information needed to properly plan and prepare for natural disasters. A packet of comprehensive educational brochures and materials were developed and distributed to all local citizens. The brochures identified simple and inexpensive tasks to prepare your family and home for a natural. The Town's Fire department website has also been outfitted with a message banner which can be used to display real-time information in the event of an emergency.

4.3 Mitigation Strategies

4.3.1 Overview

The 2016 HMP mitigation strategies for the SWR and its individual municipalities are comprised of four main components: mitigation goals, objectives, actions, and an action plan for implementation. The aforementioned components provide the structural framework to identify, prioritize, and implement actions which seek to alleviate risk to natural hazards. As provided in FEMA's Local Mitigation Handbook (2013), each component is explained in more detail below:

Mitigation Goals: general guidelines that explain what the community wants to achieve with the plan. Usually broad policy-type statements that are long-term, and represent visions for reducing or avoiding losses from the identified hazards.

Mitigation Objectives: help define or organize mitigation actions. Typically broader than specific actions, while still measureable, unlike goals. Objectives connect goals with the actual mitigation actions.

Mitigation Actions: specific projects and activities that help achieve the goals.

Action Plan: described how mitigation actions will be implemented, including how those actions will be prioritized, administered, and incorporated into the communities existing planning mechanisms.

Figure 4.3.1-1: Hazard Mitigation Planning Process

Source: FEMA Local Mitigation Handbook, 2013

4.3.2 Goals to reduce/avoid long term vulnerabilities (by hazard)

The HMP for the SWR contains separate hazard mitigation strategies for the region and each of the eight municipalities. Consistent with guidance set forth in 44 CFR 201.6(c)(3)(i), the aforementioned mitigation strategies include descriptions of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards. Lastly, the mitigation goals and actions included herein were developed and formulated to ensure that there is at least one action to address each hazard identified, by municipality and for the region.

The evaluation of previous goals and actions, as described in Section 4.3.3 below, also considered: Risk Assessment findings; Outreach Findings; Community Goals; and State Hazard Mitigation Goals. While the ultimate format and output varied by municipality, the considerations used in developing goals and actions remained the same and are all consistent with goals described in the State Hazard Mitigation Plan. Additional information on 2016 Mitigation Strategies and Goals is provided as part of Section 4.4.3.

4.3.3 Progress and Changes to mitigation efforts

The updating of previous mitigation strategies serves as an integral component to this report. Such efforts are critical and aid in refining each municipality's mitigation strategies, particularly in light recent storm events and experiences gained from the 2011 plan implementation. In addition, priorities can change over a five-year period, thus revisiting the previous strategies provide municipal officials the opportunity to reflect on changes in priority (if any).

During the development of the 2016 HMP and consistent with 44 CFR 201.6 (d)(3), representatives from the SWR met with local officials to discuss updates and changes to mitigation efforts developed as part of the 2011 HMP. Such efforts were conducted as part of a series of individual municipal meetings. The steps utilized to complete such "mitigation update tables" included:

- Evaluation of progress in implementation
    - Integration of Hazard Mitigation: the 2011 update tables explain how the municipality incorporated mitigation actions into other planning mechanisms, where applicable.
    - Completion of Mitigation Actions: described the status of mitigation actions identified in the previous plan. The 2011 tables specify plans that were completed and the corresponding results/successes, in addition to highlighting what wasn't completed, illustrating any barriers to implementation (i.e. lack of fund-

ing). Lastly, the tables state which actions will be included as part of the 2016 mitigation strategy.

- Changes in Priorities: where applicable, the 2011 update tables highlight changes in priority. Examples include statements such as "N/A-remove from list" or "N/A-revised for 2016 strategies" or "Included in 2016, expected completion by 2018."

More detailed information regarding events of each municipal meeting, including all associated materials and action items can be found as part of Section 2.1.3 and Appendix A-2. The detailed results of updates and changes to mitigation strategies from the 2011 plan, including those activities which have been carried over for implementation in the 2016 HMP, are presented in the respective 2016 mitigation tables for each jurisdiction (municipality) in section 4.4.3.

Each mitigation update table includes the following information for each hazard mitigation activity:

- Supporting Recommendation: describes specific action activity which supports the corresponding Goals and Objectives of that section.
- Who: articulates the responsible party, agency and/or municipal department
- Priority: identifies priority level (i.e. high, medium, low) assigned to the action.
- Hazard Addressed: depicts the natural hazard(s) targeted by the mitigation action
- 2016 Status Update: provides key information regarding progress and changes to the effort. Also articulates whether or not the effort will carry over into the 2016 HMP.

4.3.3.1 Darien Update to 2011 Mitigation Strategies

Representatives from the WCCOG/SWRPA and officials from the Town of Darien met to discuss updates to the existing mitigation strategy on July 21, 2014 as part of meeting DAR-1. Town participants included the Emergency Management Director (EMD), Planning Director, Director and Assistant Director of Public Works (DPW). The resulting update is presented below in Tables 4.3.3.1-1 to 4.3.3.1-7, and of note, is the column to the far right titled "2016 Status Update", indicates status changes since 2011.

Darien Table Key:

BOS = Board of Selectmen; Building = Town Building Department; CC = Conservation Commission; CTDEP = CT Department of Environmental Protection; CTDOT = CT Department of Transportation; DEMHS 1= CT Department of Emergency Management and Homeland Security Region 1; DPW = Department of Public Works; EM = Emergency Management (Director of EM, Fire and Police); FM = Fire Marshal; IT = Town Information Technology Department; IWC = Inland Wetlands Committee; HD = Health Department; P&Z = Planning and Zoning Commission; Staff = Various Town Staff; SWRPA= South Western Regional Planning Agency.

Goal 1: Reduce the loss of life, property and economic consequences as a result of flooding, high winds, severe storms and dam failure.

Table 4.3.3.1-1 Darien 2011 Mitigation Strategies Objective A: Educate the public in the areas of natural disasters, mitigation activities and preparedness.

ID	Supporting Recommendation	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Enhance Community preparedness programs.	*EM*	*Medium*	*All*	
	· Explore developing a "phased approach" to citizen preparedness (i.e. introductory brochures identifying simple and inexpensive tasks, and more advanced brochures with additional tasks and actions to be done to prepare you family and home for a natural disaster that may be more sophisticated in nature or more expensive).	*EM*	*Medium*	*All*	Continued strategy for 2016-2016, revised to target vulnerable communities in town.
	· Provide "welcome kits" to new home owners for properties located within the flood plain, or with a significant risk of flooding.	*EM*	*Low*	*Flooding*	Completed - new development in flood zone subject to local approvals. Continued strategy for 2016-2021, revised to target vulnerable communities in town.
2.	Develop a series of additional brochures promoting 'best management practices' for natural resources targeted to homeowners. Mail these brochures to all Darien homeowners annually, in concert with other mailings and provide materials on the town website. Topics to be covered in the brochures include:	*Planning, DPW*	*Low*	*Flooding, Coastal Storms*	Completed - information provided on town's website. Included for 2016 HMP as a biannual task.
	· Sound landscaping practices and stormwater management.	*P&Z, DPW*	*Low*	*Flood,*	Included for 2016 HMP as a biannual task. Development reviews are sent to engineering, with more in-depth reviews on a case by case basis
	· How to protect wetlands.	*P&Z, DPW*	*Low*	*Flood, Coastal Storms*	Completed - brochures were created and are posted on town website. P&Z has also conducted press releases to BMPs. Included for 2016 HMP as a biannual task.
	· Understanding tidal wetlands.	*P&Z, DPW*	*Low*	*Flood, Coastal Storms*	Completed - information is provided on towns website. P&Z also performs coastal reviews. Included for 2016 HMP as a biannual task.

Table 4.3.3.1-2 Darien 2011 Ongoing Practices, Objective A: Educate the public in the areas of natural disasters, mitigation activities and preparedness.

ID	Ongoing Practices	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Visit schools and educate children about the risks of floods and other natural hazards and how to prepare for them.	*Police, Fire*	*High*	*All*	N/A - remove from list
2.	Make available literature on natural disasters and preparedness at Darien Town Hall and at the Darien Library. *All education materials and brochures developed by the town are made available at the town library.	*Building, Library*	*High*	*All*	Completed - information provided on town's website. Some brochures located within town hall and with health department. Included for 2016-2021 HMP as an annual task.
3.	Make available information on natural disasters and preparedness on Darien's website with links to state and federal resources.	*EM*	*High*	*All*	Completed - information located on town's website. Strategy to be continued in 2016-2021 plan update.
4.	Inspect and maintain drainage catch basins and systems to provide adequate and optimal flow.	*Public Works*	*High*	*All*	Completed - MS4 program in place. Brochures located with 1st selectman, library, health P&Z, and on town website for BMPs. Merged with 2.1 and 2.9 for 2016
5.	Review and update Darien's GIS system with information on Natural Disasters that can be accessed for emergency as well as planning.	*Planning & Zoning, EM*	*High*	*All*	Strategy to be continued in 2016-2021 plan update.

Table 4.3.3.1-3 Darien 2011 Mitigation Strategies, Objective B: Ensure proper functioning of critical facilities and reduce business disruptions as a result of Natural Hazards.

ID	Supporting Recommendation	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Inventory condition of town-owned culverts and bridges.	*DPW*	*Medium*	*Flooding, Coastal Storms, Hurricane*	Completed - town reviews state bridge reports for area bridges. Merged with 2.9 for 2016-2021
2.	Encourage the study of alternative systems for delivering reliable power to residents.	*DPW, P&Z*	*Low*	*All*	Completed - at least 1/3 of population now has generators. Removed for 2016-2021.
3.	Encourage wherever possible the under-grounding of all utilities to minimize service disruptions due to inclement weather. Require all new development and subdivisions to install underground utilities.	*P&Z*	*Medium*	*Windstorms, Tornadoes, Severe Winter Storms, Hurricanes, Coastal Storms*	Completed - all new development/subdivisions required to put utilities underground (ex. Bishops Gate). Included for 2016-2021 HMP as an annual task.
4.	Work with CT DOT and DEP to maintain flow of streams through expansive wetlands.	*P&Z, DPW*	*Low*	*Flooding, Coastal Storms, Hurricane*	Included for 2016 HMP as an annual task.

5.	Continue to incorporate recommendations from the Stony Brook Watershed Study.	*P&Z, DPW*	*Medium*	*Flooding, Coastal Storms, Hurricane*	Completed - also have incorporated recommendations other watershed studies and waterbodies (ex. 5-mile, Noroton and Goodwives Rivers). Included for 2016 HMP as an annual task.
6.	Consider conducting drainage and watershed evaluations for the remaining waterbodies in the town.	*P&Z, DPW*	*Medium*	*Flooding, Coastal Storms, Hurricane*	Completed - 4/5 done which cover 85% of town. Strategy for 2016 with completion by 2018
7.	Support activities and policies that preserve the quantity and quality of drinking-water aquifers and protect primary and secondary aquifer recharge areas.	*HD, P&Z*	*Medium*	*Drought*	Completed - P&Z protects the small aquifer area in town by adhering to and implementing the recent state aquifer protection program. Included for 2016 HMP as an annual task.
8.	Replace or repair culverts or bridges as needed.	*DPW*	*Medium*	*Flooding, Coastal Storms, Hurricane*	Completed - replacements and repairs conducted as necessary (ex. Noroton Avenue). Strategy to be continued in 2016-2021 plan update.
9.	Bridges and roadways over navigable waterways should be maintained, operated, repaired, built to avoid or reduce potential for any significant adverse impacts on navigation, safety, environmental quality.	*DPW*	*Medium*	*Flooding, Coastal Storms, Hurricane*	Same - see #8. Will be merged with Obj. 2 #1. Included for 2016 HMP as an annual task.
10.	Review and consider new regulations of DEP on stormwater retention including the use of rain gardens.	*P&Z*	*Low*	*Flooding, Coastal Storms, Hurricane*	Completed - P&Z encourages the use of rain gardens where appropriate. Removed for 2016
11.	Maintenance of an emergency operations center or equipment to sustain critical facilities in the event of a disaster (i.e. obtain additional generators).	*EM, Fire, Police*	*High*	*All*	Completed - brand new EOC as of 2012/2013. Included for 2016 HMP as an annual task.
12.	Assess vulnerability of critical facilities to earthquakes, hurricanes, tornadoes and flooding.	*DPW, Building*	*Medium*	*Earthquake, Hurricanes, Tornadoes, Flooding, severe storms*	Completed - conducted as work is done, required by building code. Included for 2016 HMP as an annual task. Merged with #15
13.	Evaluate the town's sheltering needs for severe storm events.	*EM, Fire, Police*	*High*	*All*	Completed. Included for 2016 HMP to be performed within 5 year performance period.
14.	Replace drainage culvert under I-95 to handle peak storm flows and make any other necessary improvements downstream to prevent flooding in the vicinity of Heights Road.	*CTDOT*	*Medium*	*Flooding, Coastal Storms, Hurricane*	N/A - statement inaccurate. Railroad culvert requires work, pending future funding availability
15.	Evaluate vulnerability of critical facilities to hazards related to sea level rise and climate change.	*P&Z, DPW, Building, HD, EM*	*Low*	*Sea Level Rise*	Completed - evaluation and work conducted following previous storms. Included for 2016 HMP as an annual task. Merged with #12.

Table 4.3.3.1-4 Darien 2011 Ongoing Practices, Objective B: Ensure proper functioning of critical facilities and reduce business disruptions as a result of Natural Hazards.

ID	Ongoing Practices	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Inspect and maintain drainage catch basins and systems to provide adequate and optimal flow.	*DPW*	*High*	*All*	Completed - town cleans every catch basin and corresponding forms annually. Merged with 2.9

Table 4.3.3.1-5 Darien 2011 Mitigation Strategies, Objective C: Improve the ability of Darien residents to prepare and respond to Natural Hazards.

ID	Supporting Recommendation	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Upgrade and maintain emergency notification system.	*EM*	*High*	*All*	Completed - Code Red emergency notification system in place. Included for 2016 HMP as an annual task.
2.	Take advantage of Darien's web site to disseminate information to residents (http://www. darienct.gov).	*EM, DPW, EM, HD, P&Z, CEO*	*Medium*	*All*	Completed - routinely post information on town website, including pending/ongoing hazards. Included for 2016 HMP as an annual task.
3.	Maintain the Federal Flood Insurance Program which provides insurance for property owners in flood hazard areas, but encourage development to be located outside flood-prone areas wherever possible, including increased setbacks to account for sea level rise.	*P&Z*	*High*	*Flooding, Coastal Storms, Hurricanes*	Completed - part of NFIP and also helps town with potential mitigation grant programs. Included for 2016 HMP as an annual task.
4.	Establish a practice of distributing recommended 'best-management-practices' for water resource protection brochures to all applicants for subdivision, zoning, and building permit approval.	*P&Z*	*Medium*	*Flooding, Drought, Coastal Storms, Hurricanes*	Merged with 1.2 and continue for 2016-2021 performance period
5.	Support and encourage the development of Long Range Water Supply Plans, to meet the future water supply needs.	*P&Z, HD, DPW*	*Low*	*Drought*	Included for 2016 HMP expected completion 2017-2021.
6.	Ensure that redevelopment does not increase runoff from current conditions.	*P&Z*	*High*	*Flooding, Coastal Storms, Hurricanes*	Completed - DPW reviews large redevelopment projects for potential runoff. Included for 2016 HMP as an annual task. Merged with 3.7
7.	Encourage landowners to retain storm water, such as by using rain barrels or planting rain gardens.	*P&Z*	*High*	*Flooding, Coastal Storms, Hurricanes*	Completed - Aquarion rain barrel program. Included for 2016 HMP as an annual task. Merged with 3.6

Table 4.3.3.1-6 Darien 2011 Mitigation Strategies, Objective D: Improve the ability of the town of Darien to prepare and respond to Natural Hazards.

ID	Supporting Recommendation	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Hold annual meetings with departments that may need to respond to natural disasters, focused on sharing information, coordination, and developing protocols.	*EM, DPW, Fire, Police, HD, P&Z, CEO*	*Low*	*All*	Completed - meetings held where applicable (ex. Before storm events). Included for 2016 HMP as an annual task.
2.	Develop a secure website to be used to share data and information with emergency management and the EOC	*EM, P&Z, DPW*	*Medium*	*All*	Completed - utilize veochi and WebEOC emergency management software programs. Included for 2016
3.	Identify ways to improve the use of GIS for identifying areas and facilities vulnerable to disasters and for use to enhance emergency management.	*EM, P&Z, DPW*	*High*	*All*	Completed - SWRPA/DEMHS Evacuation Planning project identified critical assets/infrastructure vulnerable to hazards, utilizing GIS technology.
4.	Work with DEMHS to enhance Training and exercises on disaster responses and education on Property damage	*EM, DPW*	*Low*	*All*	Completed - Hurricane preparedness drill conducted June 2014. Included for 2016 HMP as an annual
5.	Work with DEMHS to complete and enhance the state and regional debris management plan.	*EM, DPW*	*Medium*	*All*	Completed - participate in regional/state meetings. Locally handled in-house. Removed for 2016.
6.	Support regulatory changes recommended in the POCD regarding Zoning, Subdivision, Inland Wetlands and Watercourses regulations; and Harbors Ordinances.	*P&Z*	*Low*	*Flooding, Coastal Storms, Hurricanes*	PoCD currently being updated, expected completion in 2016 and to be revisited annually. Included for 2016-2021 HMP.
7.	Continue to develop ways to protect open space, particularly coastal lands and land within the flood plain.	*P&Z*	*Low*	*Flooding, Coastal Storms, Hurricanes*	Completed - town recently purchased property on Short Lane and raised a building. Have also purchased a repetitive loss property. Town considered purchasing additional land along Hecker Avenue to further reduce flooding, but was denied by legislative body. Included for 2016 HMP as an annual task.
8.	Conduct a land use/build-out analysis to determine the potential for increase of impervious surfaces, particularly within the flood plain.	*P&Z*	*Low*	*Flooding, Coastal Storms, Hurricanes*	Ongoing - may be addressed in PoCD update. Removed for the 2016 HMP
9.	Encourage acquisition of wetlands beneficial to the Town.	*P&Z*	*Low*	*Flooding, Coastal Storms, Hurricanes*	Completed - part of property purchased by town on Short lane. Included for 2016 HMP as an annual task and merged with 4.7, 10, 11, 18

10.	Encourage the preservation of undeveloped lands within the 100-year flood zone with the use of Open Space purchase, donation or conservation easement.	*P&Z*	*High*	*Flooding, Coastal Storms, Hurricanes*	Completed - seeking HMGP and USDA Conservation Easement funding for home owners (related to Storm Sandy). Included for 2016 HMP as an annual task. Merged with 4.7, 9, 11, 18
11.	Pursue acquisition of waterfront land and easements when opportunities arise.	*P&Z*	*Low*	*Flooding, Coastal Storms, Hurricanes*	Completed. Included for 2016 HMP as an annual task. Merged with 4.7, 9, 10, 18
12.	Continue to provide capital budget funds for drainage projects and investigation of drainage problems.	*DPW*	*High*	*Flooding, Coastal Storms, Hurricanes*	Completed - Abbey and Intervale road project, also considering West Ave project. Catch/drainage basin maintenance. Included for 2016 HMP expected completion 2017-2021.
13.	Continue to encourage best management practices, including innovative Low-Impact Development (LID) practices, for managing stormwater runoff.	*P&Z*	*Medium*	*Flooding, Coastal Storms, Hurricanes*	Included for 2016 HMP expected completion 2017-2021.
14.	Continue monitoring community demographics to ensure vulnerable populations are not at a disproportionately higher risk	*P&Z*	*Medium*	*All*	Completed - vulnerable populations mapped against natural hazard data as part of SWRPA/DEMHS Evacuation Plan-
15.	Evaluate vulnerability of Town landmarks, monuments, and historically and architecturally significant buildings.	*P&Z, Building*	*Low*	*All*	Completed - ex. Rings End road. Removed for 2016
16.	Support local, regional and state efforts to provide protection and preservation of groundwater aquifers.	*HD*	*Low*	*Drought*	Completed. Included for 2016 HMP expected completion 2017-2021.
17.	Continue work with Aquarion to upgrade and maintain infrastructure to ensure proper water delivery for use by fire and	*DPW*	*Low*	*All*	Completed - Aquarion installs hydrants where possible. Working closely with Aquarion. removed for 2016
18.	Consider Properties prone to flooding for elevation or acquisition as needed.	*P&Z, DPW, EM*	*Low*	*Flooding, Coastal Storms, Hurricanes*	Completed - support Selectman's office as opportunities arise. Included for 2016 HMP as an annual task and merged with 4.7, 9, 10, 11.

Table 4.3.3.1-7 Darien 2011 Ongoing Practices, Objective D: Improve the ability of the town of Darien to prepare and respond to Natural Hazards.

ID	Ongoing Practices	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Review and update Darien's GIS system with information on Natural Disasters that can be accessed for emergency as well as planning.	*P&Z, EM*	*High*	*All*	Removed for 2016

4.3.3.2 Greenwich Update to 2011 Mitigation Strategies

As part of meeting GR-1 on July 11, 2014 at Greenwich Town Hall, WCCOG/ SWRPA met with officials from the Town of Greenwich including: Director/ Commissioner of Public Works, Directors of Conservation and Planning, as well as the Chief Engineer. Tables 4.3.3.2-1 to 4.3.3.2-5 highlights the 2011 Strategies, including updates and other noteworthy information as part of the 2016 update.

Greenwich Table Key:

Building = Building Department; BET = Board of Estimate and Taxation; CEO = Chief Elected Official/First Selectman; Cons = Conservation; CTDEP = CT Department of Energy & Environmental Protection; CTDOT = CT Department of Transportation; DEMHS = CT Department of Emergency Management & Homeland Security; DPW= Department of Public Works; EOM = Emergency Operations Manager; FECB = Flood & Erosion Control Board; Fire = Fire Department; GIS = Geographic Information Systems Department; Health = Health Department; IWWA= Inland Wetlands & Water Agency; P&Z = Planning & Zoning; SWRPA = South Western Regional Planning Agency (now WCCOG); TW = Tree Warden; Utilities = Local Utility Companies; ZEO = Zoning Enforcement Officer

Goal 1. To reduce the loss of life and property and economic consequences as a result of natural disasters.

Table 4.3.3.2-1 Greenwich 2011 Mitigation Strategies, Goal 1

Objective A: Expand maintenance activities and execute specific projects that address known drainage issues within the municipality.
Objective B: Review use of town regulations to minimize the impacts of new development on man made and natural drainage systems and to insure development within flood zones is appropriate.
Objective C: Petition FEMA to update the Flood Insurance Rate Maps and Floodway Maps.
Objective D: Improve and expand current flood warning systems and flood response procedures.

ID	Supporting Recommendation	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Focus on implementing public safety projects identified in the town drainage studies.	*DPW*	*High*	*Flooding*	Strategy to be continued in 2016-2021 plan update.
2.	Conducting drainage and watershed evaluations for all waterbodies in the town.	*IWWA*	*Medium*	*Flooding*	Completed - Watershed based plan completed for Mianus River Watershed. Strategy to be continued in 2016-2021 plan update.
3.	Continue to work to identify proper frequency of storm drain clean out.	*DPW*	*Low*	*Flooding*	Completed - DPW continually conducts such efforts. Strategy to be continued in 2016-2021 plan update.
4.	Continue to provide capital budget funds for drainage projects and investigation of drainage problems.	*BET, DPW*	*High*	*Flooding*	Strategy to be continued in 2016-2021 plan update.
5.	Work with the Army Corps of Engineers to address flood-prone areas, such as the Route 1 bridge, Byram and Pemberwick.	*DPW*	*High*	*Flooding*	Strategy to be continued in 2016-2021 plan update.
6.	Evaluate stormwater funding options to pay for needed stormwater improvements.	*DPW*	*Medium*	*Flooding*	Completed - evaluation funded by Town
7.	Work with the state to inventory condition of town owned culverts, bridges and dams.	*DPW, CTDEP, CTDOT*	*Medium*	*Flooding*	Strategy to be continued in 2016-2021 plan update.

8.	Replace or repair culverts or bridges as needed.	*DPW, CTDOT*	*Low*	*Flooding*	Strategy to be continued in 2016-2021 plan update.
9.	Improve drainage systems in Bruce Park to reduce flooding issues.	*P&R*	*Low*	*Flooding*	Strategy completed and removed from list in 2016-2021 update.
10.	Evaluate Binney Park storage shed to determine appropriate flood proofing method, such as raising its elevation.	*P&R*	*Low*	*Flooding*	Strategy to be continued in 2016-2021 plan update.
11.	Implement improvements described in the Old Greenwich Business District and Surrounding Streets- Drainage Study.	*DPW*	*Medium*	*Flooding*	Strategy to be continued in 2016-2021 plan update.
12.	Recommend strengthening regulations to include requirements to maintain vegetation in riparian and flood prone areas	*P&Z, IWWA*	*Medium*	*Flooding*	Completed - Wetlands has such regulations. P&Z also has "Green Area" requirements
13.	Request that FEMA and Army Corps of Engineers assist with the reevaluation of Flood Insurance Rate studies for riverine sections and remapping of Byram River south of Comly Terrace to Post Road	*P&Z, ZEO*	*Medium*	*Flooding*	Strategy to be continued in 2016-2021 plan update.
14.	Recommend strengthening regulations to include requirements to prevent mowing of tidal wetlands	*P&Z, IWWA*	*Medium*	*Flooding*	Strategy to be continued in 2016-2021 plan update.
15.	Consider regulations to require that elevations be provided for development in A-Zones where no elevations have been determined on the FIRM maps	*P&Z, ZEO*	*Medium*	*Flooding*	Completed - new regulations as of June 17, 2014
16.	Review and make appropriate changes to regulations concerning impervious surface cover in flood prone areas	*P&Z,*	*Medium*	*Flooding*	Completed - P&Z now has "Green Area" Zones (see #12)
17.	Review and modernize flood sections of the Building Zone Regulations and add standards for riverine flooding, taking into consideration the cumulative effect of development	*P&Z*	*Medium*	*Flooding*	Completed
18.	As needed consider mitigation of properties identified as Severe Repetitive Loss Properties by the NFIP.	*FECB, P&Z*	*Low*	*Flooding*	Strategy to be continued in 2016-2021 plan update.. Some work has already been conducted
19.	Maintain the Federal Flood Insurance Program which provides insurance for property owners in flood hazard areas, and encourage development to be located outside flood-prone areas wherever possible, including increased setbacks or elevations to account for sea level rise.	*CEO, P&Z, DPW*	*High*	*Flooding*	Progress made towards some compliance. Strategy to be continued in 2016-2021 plan update.

Table 4.3.3.2-2 Greenwich 2011 Ongoing Practices, Goal 1

Objective A: Expand maintenance activities and execute specific projects that address known drainage issues within the municipality.

Objective B: Review use of town regulations to minimize the impacts of new development on man made and natural drainage systems and to insure development within flood zones is appropriate.

Objective C: Petition FEMA to update the Flood Insurance Rate Maps and Floodway Maps.

Objective D: Improve and expand current flood warning systems and flood response procedures.

ID	Ongoing Practices	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Develop clean out schedules for all catch basins and drainage facilities.	*DPW*	*Medium*	*Flood*	Strategy to be continued in 2016-2021 plan update. See #3 above
2.	Maintain and update all notification systems and make sure warning equipment is immediately available.	*EOM, Police*	*High*	*All*	Completed - Blackboard Connect/Reverse Call-out system. Maintenance portion of strategy to be continued in 2016-2021 plan update.
3.	Maintain available shelters and certification by the American Red Cross.	*EOM, Red Cross*	*Medium*	*All*	Strategy to be continued in 2016-2021 plan update.
4.	Review and update memorandums of understanding as needed with Red Cross and transportation providers to make sure they meet the needs of the Town in the event of a flood event.	*EOM, Health*	*Medium*	*Flood*	Strategy to be continued in 2016-2021 plan update.
5.	Update town Drainage Manual to include requirements for maintenance of private drainage facilities for proposed development as called for and defined in P&Z regulations.	*DPW, P&Z*	*Medium*	*Flood*	Completed
6.	Update town Drainage Manual to conform with CT DOT & CT DEP regulations for storm drainage.	*DPW*	*Medium*	*Flood*	Completed
7.	Study the use of V-Zone standards for foundation design in coastal A-Zones	*P&Z, ZEO, Building*	*Medium*	*Flood*	Completed study
8.	Continue to maintain and prepare vehicles to be used in the event evacuations are required during flooding	*Police*	*Medium*	*Flood*	Strategy to be continued in 2016-2021 plan update.
9.	Maintain USGS Stream Gauge in Byram River	*Conservation*	*Medium*	*Flood*	Strategy to be continued in 2016-2021 plan update.. Funded by Town through DPW.
10.	Continue to review and investigate flood damage to structures with permit application and upon complaints.	*Building*	*High*	*Flood*	Strategy to be continued in 2016-2021 plan update.

Goal 2. Reduce the risks of damage to private and public facilities caused by severe storms.

Table 4.3.3.2-3 Greenwich 2011 Mitigation Strategies, Goal 2

Objective E: Continue and expand current maintenance activities, inspections, and requirements and education programs that reduce the vulnerability of existing and new development to severe storm damage.

Objective F: Continue and expand activities related to severe storm warning and emergency preparedness.

Objective G: Improve and expand the town's current severe storm response capabilities.

ID	Supporting Recommendation	Who	Priority*	Hazard Addressed	2016 Status Update
1.	As needed procure equipment to sustain critical facilities in the event of a disaster (i.e. obtain additional generators) to enhance EOC capabilities.	*EOM*	*Low*	*All*	Strategy to be continued in 2016-2021 plan update.
2.	State to evaluate and monitor conditions of all of dams and to enforce existing citations for dam violations.	*CTDEP*	*Medium*	*Dam Failure*	State changing regulations. Strategy to be continued in 2016-2021 plan update.
3.	Continue to inventory condition of town owned culverts and bridges.	*DPW, CTDOT*	*Medium*	*Flooding*	Strategy to be continued in 2016-2021 plan update.
4.	Explore improvements to telecommunications systems to minimize disruption and delays during an emergency.	*Utilities*	*Low*	*All*	Strategy to be continued in 2016-2021 plan update.
5.	Evaluate municipalities' sheltering and evacuation needs for a variety of storm scenarios.	*EOM, DEMHS, SWRPA*	*Low*	*Hurricane, Severe Storms, Tornado, Earthquake*	Strategy to be continued in 2016-2021 plan update.
6.	Continue to maintain emergency notification system and upgrade as needed.	*EOM*	*Low*	*All*	Strategy to be continued in 2016-2021 plan update.. Merged with #4 above
7.	Continue to enhance community preparedness programs.	*EOM*	*Medium*	*All*	
	· Explore developing a “phased approach” to citizen preparedness (i.e. introductory brochures identifying simple and inexpensive tasks, and more advanced brochures with additional tasks and actions to be done to prepare you family and home for a natural disaster that may be more sophisticated in nature or more expensive).				Merged into one unified outreach strategy. Strategy to be continued in 2016-2021 plan update.
	· Continue to provide education materials on preparing for natural disasters.				Strategy to be continued in 2016-2021 plan update. Merged into one unified outreach strategy
8.	Work with State to enhance local information and data sharing using WEB EOC 7.1.	*EOM*	*Medium*	*All*	Strategy to be continued in 2016-2021 plan update.. Changed to maintenance strategy for 2016-2021 performance period.
9.	Continue to identify ways to improve the use of GIS for identifying areas and facilities vulnerable to disasters and for use to enhance emergency management	*GIS, EOM*	*Low*	*All*	Completed - addressed in SWRPA/DEMHS Phase 1 Emergency Evacuation Planning and Needs Assessment. Strategy to be continued in 2016-2021 plan update.

10.	Continue to work with DEMHS to enhance training and exercises on disaster responses and education on Property damage assessment forms.	*EOM*	*Low*	*All*	Strategy to be continued in 2016-2021 plan update.
11.	Work with DEMHS and the DEP to complete and enhance the state and regional debris management plan.	*EOM*	*Medium*	*Severe Storm, Hurricane, Tornado*	Strategy to be continued in 2016-2021 plan update.
12.	Complete the Public Safety Complex and improve the emergency communications systems.	*DPW, EOM*	*Medium*	*All*	Completed - central fire station (CFS) in construction, police station complete. Strategy to be continued in 2016-2021 plan update.
13.	Work with Aquarion Water Company to encourage appropriate water line extensions to meet fire protection needs.	*Fire*	*Low*	*All*	Strategy to be continued in 2016-2021 plan update.
14.	Construct a new firehouse on Upper King Street near the Griff Harris Golf Course.	*DPW, Fire*	*Medium*	*All*	Strategy to be continued in 2016-2021 plan update - looking to construct a fire house in northwest Greenwich
15.	Work with neighboring municipalities to complete a Tree Inventory to assess potential damage for severe storm events.	*TW*	*Low*	*All*	Completed

Table 4.3.3.2-4 Greenwich 2011 Ongoing Practices, Goal 2

Objective E: Continue and expand current maintenance activities, inspections, and requirements and education programs that reduce the vulnerability of existing and new development to severe storm damage.

Objective F: Continue and expand activities related to severe storm warning and emergency preparedness.

Objective G: Improve and expand the town's current severe storm response capabilities.

ID	Ongoing Practices	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Maintain available shelters and certification by the American Red Cross.	*EOM, Red Cross*	*Medium*	*All*	Strategy to be continued in 2016-2021 plan update.
2.	Install Emergency Notification System (Reverse 911) to provide emergency information to residents in the entire town or in a specific geographic location within the Town. It is expected to be able connect to as many as 6,000 phones per minute. This notice will provide not only warning of impending situation by also info regarding how to prepare for partic-	*EOM*	*High*	*All*	Completed - have blackboard connect/reverse call-out system
3.	Maintain the town Drainage Manual to conform with CTDOT & CTDEP regulations for storm drainage.	*DPW*	*Medium*	*All*	Strategy to be continued in 2016-2021 plan update.
4.	Continue process of reviewing plans to ensure compliance with snow and wind load requirements.	*DPW*	*High*	*All*	Completed - conducted by building inspector. Strategy to be continued in 2016-2021 plan update.
5.	Continue program of obtaining new and up-to-date equipment for snow removal and sand/salt operations	*DPW*	*Medium*	*Severe Winter Weather*	Strategy to be continued in 2016-2021 plan update.
6.	Maintain identified snow emergency routes for DPW sand/ salt and plow operations, update as needed.	*DPW*	*Medium*	*Severe Winter Weather*	Strategy to be continued in 2016-2021 plan update.
7.	Continue practice of monitoring of weather updates.	*DPW, EOM, Police*	*Medium*	*All*	Strategy to be continued in 2016-2021 plan update.
8.	Review and update memorandums of understanding as needed with Red Cross and transportation providers to make sure they meet the needs of the Town in the event of a flood event.	*EOM, Health*	*Medium*	*All*	Strategy to be continued in 2016-2021 plan update and merged with similar entry in Goal #1
9.	Review and update mutual aid agreements with surrounding municipalities for fire services.	*Fire*	*Medium*	*All*	Strategy to be continued in 2016-2021 plan update.
10.	Continue to review Erosion and Sedimentation Control Plans and ensure that controls are installed properly prior to any storm event.	*P&Z, IWWA, Building, Conservation*	*Medium*	*Flooding*	Strategy to be continued in 2016-2021 plan update.

Goal 3. Implement and expand drought mitigation plans and initiatives.

Table 4.3.3.2-5 Greenwich 2011 Mitigation Strategies, Goal 3

H. Update Drought Management Plan and review and update regulations as necessary.

I. Educate the public through additional outreach and notification processes.

ID	Supporting Recommendation	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Work to improve communications between the town, state and Aquarion prior to and during drought conditions.	*Conservation*	*High*	*Drought*	Strategy to be continued in 2016-2021 plan update.
2.	Work with State to update the Drought Management Plan.	*Conservation*	*Medium*	*Drought*	Strategy to be continued in 2016-2021 plan update.
3.	Study effectiveness of regulations during drought conditions.	*Health, Aquarion, Conservation*	*Medium*	*Drought*	Completed - determined regulations are effective and sufficient
4.	Review USGS groundwater study and make recommendations for regulations to protect groundwater quality and quantity.	*Conservation*	*Medium*	*Drought*	Strategy to be continued in 2016-2021 plan update.
5.	Work with Aquarion Water Co. on infrastructure improvements, both in town and inter-town.	*Aquarion, Conserva-*	*Medium*	*Drought*	Strategy to be continued in 2016-2021 plan update.
6.	Update drought management plan to be in alignment with State of Connecticut Drought Management plan.	*Aquarion, Conserva-*	*High*	*Drought*	Merged with recommendation #2 above
7.	Identify which dry hydrants work in drought conditions and which do not. Evaluate which hydrants may need to be deeper and areas where more hydrants need to be installed.	*Fire, Conservation*	*Medium*	*Drought*	Strategy to be continued in 2016-2021 plan update.
8.	Consider if underground storage tanks for fire protection need to be required for new development.	*Fire, Conservation*	*Medium*	*Drought*	Completed - conducted during subdivision reviews. Strategy to be continued in 2016-2021 plan update and merged with #7 above.
9.	Review winter drought restrictions and conservation measures, and evaluate possible education and outreach programs that may be helpful.	*Aquarion, Conservation*	*Low*	*Drought*	Removed from 2016-2021 strategies.
10.	Continue outreach programs encouraging water conservation.	*Health, Aquarion, Conservation*	*Medium*	*Drought*	Strategy to be continued in 2016-2021 plan update. Undertaking "project wet"
11.	Develop and continue programs to educate the public on measures to take during winter drought conditions.	*Aquarion, Conserva-*	*Medium*	*Drought*	Removed from 2016-2021 strategies.
12.	Maintain Emergency Operation Plan and specific information needed to respond to drought conditions.	*EOM, Cons, Health*	*Medium*	*Drought*	Strategy to be continued in 2016-2021 plan update.

4.3.3.3 New Canaan Update to 2011 Mitigation Strategies

On July 22, 2014, meeting NC-1 at New Canaan Police Headquarters was convened to discuss, among other items, status and progress updates regarding the implementation of mitigation strategies identified as part of the 2011 HMP. In addition to WCCOG/SWRPA stuff, municipal participants included: EMD, Fire Chief/Deputy EMD, and Assistant Director of Public Works/Senior Engineer. The meeting results, with respect to 2011 Mitigation Strategies, are illustrated below in Tables 4.3.3.3-1 to 4.3.3.3-4:

New Canaan Table Key: DPW = Department of Public Works, Wetlands = Inland Wetlands and Watercourses, Fire = Fire Dept; Police = Police Dept.

Goal 1: To reduce the loss of life and property and economic consequences as a result of natural disasters.

Table 4.3.3.3-1 New Canaan 2011 Mitigation Strategies, Objective A: To reduce the likelihood of flooding by improving existing natural and artificial drainage systems.

ID	Supporting Recommendation	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Reconstruct Nursery Road Bridge to widen waterway opening and mitigate flooding issues.	*DPW*	*High*	*Flooding*	Strategy to be continued in 2016-2021 plan update.
2.	Purchase properties known to have flooding problems and that reside within the 100 year floodplain.	*DPW*	*Medium*	*Flooding*	Strategy to be continued in 2016-2021 plan update.

Table 4.3.3.3-2 New Canaan 2011 Mitigation Strategies, Objective B: Reduce the amount of debris from severe storms through preventive tree maintenance.

ID	Supporting Recommendation	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Budget appropriate money necessary to maintain and remove dead, dying, dangerous or diseased trees.	*DPW*	*Medium*	*Severe Storm, Hurricane, Tornado*	Completed - tree warden tagging trees, actions taken as necessary. Strategy to be continued in 2016-2021 plan update.

Table 4.3.3.3-3 New Canaan 2011 Mitigation Strategies, Objective C: Improve and expand current natural hazard emergency response capabilities.

ID	Supporting Recommendation	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Maintain a reverse 911 or similar system to alert residents of natural phenomena and if necessary, evacuation procedures.	*Fire, Police*	*Medium*	*All*	Completed - Blackboard Connect in place. Actively working towards Smart 911, more expansive service with augmented data from 911 system - contract executed. Strategy to be continued in 2016-2021 plan update.
2.	Develop a strategy and obtain the necessary equipment to provide adequate heat at emergency shelters.	*DPW*	*High*	*All*	Strategy to be continued in 2016-2021 plan update.. Actively seeking funding opportunities to help with equipment procurement.

Table 4.3.3.3-4 New Canaan 2011 Mitigation Strategies, Objective C: Whenever practical, incorporate natural hazard mitigation strategies into existing municipal projects.

ID	Supporting Recommendation	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Review plans that fulfill DEEP Storm Water Management, Phase II requirements and identify projects that may be eligible for FEMA natural hazard mitigation grants.	*Wetlands*	*Medium*	*Flooding*	Strategy to be continued in 2016-2021 plan update.
2.	Review recently completed drainage study of Five Mile River with an eye to adopting and instituting mitigation measures.	*DPW*	*Medium*	*Flooding*	Completed - town implemented all non-cost prohibitive measures. DPW has also replaced Hickok, Valley, Lakeville, and Old Norwalk bridges, among others. Strategy to be continued in 2016-2021 plan update.

4.3.3.4 Norwalk Update to 2011 Mitigation Strategies

During the July 17, 2014 HMP NWK-1 meeting, City of Norwalk Officials and WCCOG/SWRPA gathered at Norwalk Fire Headquarters to discuss and document updates to the 2011 Mitigation Strategies. The results can be found below in Tables 4.3.3.4-1 to 4.3.3.4-7. Representatives from the City of Norwalk who participated in the 2011 strategy updates included: EMD/Fire Chief, Deputy EMD, Director of Public Works, and Senior Engineer.

Norwalk Table Key: DPW = Department of Public Works, 1st District Water = Water Utility, OEM = Office of Emergency Management, Public Safety = Police, Finance = Department of Finance, P&Z = Planning and Zoning

Goal 1: Reduce the loss of life and property and economic consequences as a result of flooding, high winds, severe winter storms and dam failure.

Table 4.3.3.4-1 Norwalk 2011 Mitigation Strategies Objective A: Improve the ability of Norwalk departments to prepare and respond to severe weather and other natural emergencies.

ID	Supporting Recommendation	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Provide adequate back-up generators at critical facilities.	*Multiple*	*High*	*All*	
	· City Hall	*Multiple*	*Low*	*All*	Completed - generators installed at City Hall October, 2014
	· Sanitary sewer pumping stations (in progress)	*Multiple*	*High*	*All*	Completed - generator at treatment plant, all pump stations now have access to generators
	· Storm water pumping stations	*Multiple*	*Medium*	*All*	Completed - some generators at these locations, working towards obtaining more for remaining locations. Strategy to be continued in 2016-2021 plan update.
	· Shelters (shelter area and beyond). BMHS/NHS done	*Multiple*	*High*	*All*	Strategy to be continued in 2016-2021 plan update.
	· Alternate EOC at Norwalk Fire Dept.	*Multiple*	*High*	*All*	Completed - primary EOC now at Norwalk Fire HQ.
2.	Ensure the ability of Departments to function beyond first 24 hours by executing pre-positioned contracts for logistical support.	*OEM Purchasing/ Finance*	*High*	*All*	Strategy to be continued in 2016-2021 plan update.
3.	Maintain the Federal Flood Insurance Program which provides insurance for property owners in flood hazard areas, but encourage development (especially higher density) to be located outside flood-prone areas wherever possible, including increased setbacks to account for sea level rise .	*P&Z*	*High*	*Flooding*	Completed. Strategy to be continued in 2016-2021 plan update.

Table 4.3.3.4-2 Norwalk 2011 Ongoing Practices Objective A: Improve the ability of Norwalk departments to prepare and respond to severe weather and other natural emergencies.

ID	Ongoing Practices	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Continue to maintain an emergency telephone notification system that allows the municipality to alert various segments of the population depending on the nature of the emergency. Encourage residents and businesses to update their contact information within the system.	*OEM*	*High*	*All*	Completed. Strategy to be continued in 2016-2021 plan update.
2.	Plan for the activation of the Emergency Operations Center and an alternate location, including equipment and staff with trained personnel.	*OEM*	*High*	*All*	Completed. Strategy to be continued in 2016-2021 plan update.
3.	Identify and prepare and/or update site-specific emergency evacuation plans for critical facilities such as Norwalk Hospital, King Industries, Merritt 7, Noreen Place office park and other significant complexes as well as the gas pipeline.	*Public Safety*	*Medium*	*All*	Completed. Strategy to be continued in 2016-2021 plan update.
4.	Perform hazard analysis at WWTP/DPW center to identify areas of concern.	*DPW*	*Medium*	*All*	Completed. Strategy to be continued in 2016-2021 plan update.
5.	Evaluate municipalities' sheltering and evacuation needs and how these needs can be met through local and regional sheltering concepts.	*OEM*	*Medium*	*All*	Strategy to be continued in 2016-2021 plan update.

Table 4.3.3.4-3 Norwalk 2011 Ongoing Practices Objective B: Through education and outreach improve the ability of Norwalk residents and business to prepare, respond, mitigate and recover to/from severe weather and other natural emergencies.

For 2016 the Objective has changed to "Improve the ability of Norwalk residents and business to prepare, respond, mitigate and recover to/from severe weather and other natural emergencies. "

ID	Ongoing Practices	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Add natural hazards information to the annual Fire Dept. Open House, web site and the public access channel.	*OEM*	*High*	*All*	Completed - joint open house conducted with DPW every September. Next meeting 9/27/14. Strategy to be continued in 2016-2021 plan update.
2.	Identify special-needs populations for various hazards.	*Public Safety*	*Medium*	*All*	Completed. Strategy to be continued in 2016-2021 plan update.
3.	Provide presentations and workshops to community groups, non-profits and businesses to increase their ability to prepare and respond to emergencies.	*OEM*	*High*	*All*	Completed. Strategy to be continued in 2016-2021 plan update.

Table 4.3.3.4-4 Norwalk 2011 Mitigation Strategies Objective C: Whenever practical, incorporate natural hazard mitigation strategies into existing City projects.

ID	Supporting Recommendation	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Expand maintenance activities such as more frequent catch basin, storm drainage facilities and channel cleaning	*DPW*	*High*	*Flood*	Completed - remains a top priority for 2016-2021, have initiated an effort to map all pertinent areas and perform maintenance as necessary, where staff time and budget permit.
2.	Request capital funding for drainage and flood mitigation projects throughout the City.	*DPW*	*Medium*	*Flood*	Strategy to be continued in 2016-2021 plan update - based on available funding. Norwalk currently funds these efforts.

Table 4.3.3.4-5 Norwalk 2011 Ongoing Practices, Objective C: Whenever practical, incorporate natural hazard mitigation strategies into existing City projects.

ID	Ongoing Practices	Who	Priority*	Hazard Addressed	2016 Status Update
Increase homeowners' awareness about mitigation activities.		*OEM*	*Medium*	*All*	Strategy to be continued in 2016-2021 plan update.

Table 4.3.3.4-6 Norwalk 2011 Mitigation Strategies, Objective D: Reduce the likelihood and potential loss of life and property as a result of dam failure.

For 2016 this objective has been removed.

ID	Supporting Recommendation	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Upgrade the flood spillway of the Browns and Grupes Reservoir Dams.	*1st District Water*	*Low*	*Dam Failure*	Completed. Strategy to be continued in 2016-2021 plan update. Moved to Objective A: "Improve the ability of Norwalk departments to prepare and respond to severe weather and other natural emergencies."

Table 4.3.3.7- Norwalk 2011 Ongoing Practices, Objective D: Reduce the amount of debris from severe storms through preventive tree maintenance and debris planning.

ID	Ongoing Practices	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Encourage more citizen participation to inventory and identify condition of street trees and integrate with City's GIS to optimize tree maintenance activities.	*DPW*	*Medium*	*Severe Storms, Tornado, Earthquake*	Completed - Norwalk Tree Alliance began creating a tree inventory using a laser/GIS approach. Norwalk has dedicated two tree crews in DPW for tree maintenance activities. Also actively working with CL&P. Strategy to be continued in 2016-2021 plan update.
2.	Continue to fund the citywide tree planting and maintenance program. Assess condition of trees and work with Norwalk Tree Alliance in this effort.	*DPW*	*Medium*	*Severe Storms, Tornado, Earthquake*	Completed. Strategy to be continued in 2016-2021 plan update.
3.	Prepare and maintain a debris management plan	*DPW*	*Medium*	*Severe Storms, Tornado, Earthquake*	Completed. Strategy to be continued in 2016-2021 plan update.
4.	Replace diseased trees, plant new trees and improve street tree maintenance	*DPW*	*Medium*	*Severe Storms, Tornado, Earthquake*	Completed. Strategy to be continued in 2016-2021 plan update.

4.3.3.5 Stamford Update to 2011 Mitigation Strategies

Representatives from WCCOG/SWRPA and the City of Stamford convened meeting STAM-1 to discuss progress and implementation status updates to the 2011 Mitigation Strategies. The meeting was held at WCCOG/SWRPA offices on August 1, 2014. Stamford participants included: Director of Public Health, Safety, and Welfare; EMD/Police Captain; Associate Planner; Health Department and Medical Reserve Corps (MRC). Results are presented below in Tables 4.3.3.5-1 to 4.3.3.5-7. **Stamford Table Key:** BOF = Board of Finance; CTDEP = CT Department of Environmental Protection; DoEC= = Department of Emergency Communications; DEMHS = CT Department of Emergency Management and Homeland Security; EM = Emergency Management; Engineering = Engineering Bureau; Grants = Grants Administration Office; HD = Department of Health; LU= Land Use Bureau; MRC = Mill River Collaborative; Operations = Office of Operations; Parks = Parks Department; TMS = Technology Management Services; Utilities = Local Utility Companies.

Goal 1: To reduce the loss of life and property and economic consequences as a result of natural disasters.

Table 4.3.3.5-1 Stamford 2011 Mitigation Strategies, Objective A: Improve the City of Stamford's ability to prepare for and providing emergency and other public services in the event of a natural disaster.

ID	Supporting Recommendation	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Continue to hold annual meetings with departments that may need to respond to natural disasters, focused on sharing information, coordination and to develop protocols.	*EM*	*High*	*All*	Completed - conducted prior to events, as necessary. Strategy to be continued in 2016-2021 plan update.
2.	Update the EOC plan book with current contact information for "key" department personnel, resources and facilities; and all pertinent maps and city plans. Provide copies to each department head and "key" staff.	*EM, Operations*	*High*	*All*	Completed - conducted quarterly. Strategy to be continued in 2016-2021 plan update.
3.	Quarterly review and update the EOC plan book.	*EM, Operations*	*High*	*All*	Completed - merged with #2 above
4.	Develop a secure website to be used to share data and information with emergency management and the EOC during a natural disaster.	*EM, TMS, Operations*	*Low*	*All*	Completed - utilize WebEOC and Veochi. Removed from 2016-2021 strategies list
5.	Work with police to improve communication shared information between the newly designed EOC at police headquarters and the existing EOC in the Government Center.	*EM, Police, Operations*	*Medium*	*All*	N/A - removed from 2016-2021 strategies list
6.	Evaluate the 911 center's ability to function during an emergency or natural disaster and increase and cross train personnel to accommodate the city's needs during a disaster.	*EM, Operations*	*High*	*All*	Completed - have a subject matter expert in place. Consultant recommendations have been received. Strategy to be continued in 2016-2021 plan update, including the addition of clerical and/or support staff.
7.	Work with 911 center and emergency management to develop a system to handle call backs and coordination; and improve direct communications between the 911 center and emergency responders.	*EM, Operations*	*Medium*	*All*	Completed - have a system in place. Strategy to be continued in 2016-2021 plan update.
8.	Work to develop a direct communications link between the EOC and 911 communications center.	*EM, Operations*	*High*	*All*	Existing strategy to be continued in 2016-2021 plan update.

9.	Identify ways to improve the use of GIS for use in identifying areas and facilities vulnerable to disasters and for use to enhance emergency management.	*TMS, EM, Operations*	*High*	*All*	Completed - conducted as part of SWRPA/DEMHS R1 Evacuation planning and needs assessment. Strategy to be continued in 2016-2021 plan update and to include transportation assets and infrastructure
10.	Refine and provide usable sewer and drainage system maps to EOC and Emergency responders.	*TMS, EM, Operations*	*High*	*All*	Active work in progress with DPW. Existing strategy to be continued in 2016-2021 and merged with #9 above.
11.	Ensure that all critical systems maps are easily accessible to 911 and the EOC.	*EM, TMS, Operations*	*Medium*	*All*	Completed - in progress with GIS and IT. Existing strategy to be continued in 2016-2021 and merged with #9 above.
12.	Develop evacuation plan and routes for moving traffic north-south, and east-west in the event of a large scale disaster. Also consider how signal timing will be handled if trained staff are not available.	*EM, Operations, LU, Engineering*	*Low*	*All*	Completed - initiated as part of SWRPA/DEMHS R1 Evacuation planning and needs assessment. State police also working on similar efforts. Existing strategy to be continued in 2016-2021.
13.	Continue working with the Red Cross to maintain and update the	*LU, EM*	*Medium*	*All*	Completed - active work in progress. Strategy to be contin-
14.	Evaluate current sheltering location's ability to handle large scale evacuations.	*EM, Operations, LU, Engineering*	*Low*	*All*	In progress. Strategy to be continued in 2016-2021 plan update.
15.	Develop a sheltering/evacuation process to improve collaboration between the Health Department, Operations, Fire and Police and review the process regularly to ensure each department knows there responsibilities and where resources are located.	*EM, Operations, Fire, Police, Red Cross*	*Low*	*All*	In progress. Strategy to be continued in 2016-2021 plan update.
16.	Explore having pre-recorded messages for a variety of scenarios	*EM, DoEC*	*Low*	*All*	Completed - exploration currently underway. Strategy to be
17.	Consider having pre-recorded messages available in additional languages.	*EM, DoEC*	*Low*	*All*	Completed - actively under discussion. Strategy to be continued in 2016-2021 plan update.
18.	Develop information educating citizens on registration and use of the emergency notification system and investigate the possibility of providing information in other languages.	*EM*	*Medium*	*All*	Completed - have code-red in place. Merged with #17 above for 2016-2021 plan update.
19.	Work with DEMHS to enhance training and exercises on disaster responses and education on property damage assessment forms.	*EM, DEMHS*	*Low*	*All*	Completed - Hurricane drill conducted June 2014. Strategy to be continued in 2016-2021 plan update.
20.	Reduce impervious surfaces by adopting impervious coverage allowances for all zoning districts or amending regulations to decrease need for impervious surfaces.	*LU*	*Medium*	*Flooding, Hurricanes, Severe Storms*	Completed - addressed via zoning. Active work in progress. Strategy to be continued in 2016-2021 plan update.
21.	Acquire snow melting machines to melt excess snow from severe winter storms.	*Operations*	*Low*	*Severe Storms (Winter)*	Strategy to be continued in 2016-2021 plan update. Expected completion before the end of 2017.
22.	Acquire the site at 128 Magee Avenue as a staging area for excess snow, large wood waste and uniformed services.	*Operations*	*Low*	*All*	N/A - Strategy removed for 2016-2021 plan update.
23.	Assess vulnerability of critical facilities to earthquakes, hurricanes, tornadoes and begin to evaluate the potential impact sea level rise may have on these facilities.	*Engineering*	*Low*	*Earth Quake, Hurricane, Tornado, Sea Level Rise*	Strategy removed for 2016-2021 plan update. It is covered by a newly added strategy to perform an in depth coastal risk assessment.
24.	Begin to investigate potential impacts resulting from sea level rise.	*LU*	*Low*	*Sea Level Rise*	Completed - assessed areas and preliminary feasibility. Merged with strategy #11 for 2016-2021 Plan Update

Table 4.3.3.5-2 Stamford 2011 Ongoing Practices, Objective A: Improve the City of Stamford's ability to prepare for and providing emergency and other public services in the event of a natural disaster.

ID	Ongoing Practices	Who	Priority*	Hazard Addressed	2016 Status Update
1.	"Be Prepared Stamford" website (www.bepreparedstamford), was launched, with a link on the City's home page. The site gives information on being prepared for and responding to a disaster, includes fact sheets on various hazards, and provides public health information.	*HD, Red Cross*	*Low*	*All*	Strategy now a high priority and to be continued in 2016-2021 plan update.

Table 4.3.3.5-3 Stamford 2011 Mitigation Strategies, Objective B: Whenever practical, incorporate natural hazard mitigation strategies into existing City projects and plans.

ID	Supporting Recommendation	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Continue to incorporate recommendations from the Mill River Corridor Plan.	*LU, Grants, MRC*	*Low*	*Flooding*	Completed - continuing to acquire properties in flood plain where applicable, identified as part of recommendations. Strategy to be continued in 2016-2021 plan update.

Table 4.3.3.5-4 Stamford 2011 Ongoing Practices, Objective B: Whenever practical, incorporate natural hazard mitigation strategies into existing City projects and plans.

ID	Ongoing Practices	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Incorporate natural hazard awareness, mitigation activities and preparedness into public outreach efforts.	*HD*	*Low*	*All*	Completed - as part of CRS, brochures sent to households in flood plains. Strategy to be continued in 2016-2021 plan update.
2.	Encourage were ever possible the under-grounding of utility lines to minimize service disruptions due to inclement weather. Require all new development and subdivisions install underground utilities.	*LU*	*Medium*	*Severe Storms, Hurricane, Tornado*	Strategy to be continued in 2016-2021 plan update.
3.	Review the Mill River Corridor Project and identify projects that may be eligible for FEMA natural hazard mitigation grants.	*LU, Grants*	*Medium*	*Flooding*	Strategy to be continued in 2016-2021 plan update.

Table 4.3.3.5-5 Stamford 2011 Mitigation Strategies, Objective C: Reduce the likelihood of floods.

ID	Supporting Recommendation	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Move forward with plans to rebuild the West Main Street Bridge for use by pedestrians and emergency vehicles only. Plans shall include elevating the bridge deck above the 100-year flood plain and removing several piers.	*City of Stamford*	*Medium*	*Flooding*	Strategy to be continued in 2016-2021 plan update. Completion estimated between 2019 - 2021.
2.	Encourage acquisition of wetlands beneficial to the City.	*LU, Grants*	*Low*	*Flooding*	Strategy to be continued in 2016-2021 plan update. Completion estimated between 2019 - 2021.
3.	Encourage the preservation of undeveloped lands within the 100-year flood zone with the use of Open Space purchase, donation or conservation easement.	*LU, Grants*	*Low*	*Flooding*	Completed - actively seeking such opportunities. Strategy to be continued in 2016-2021 plan update.
4.	Maintain the Federal Flood Insurance Program which provides insurance for property owners in flood hazard areas, but encourage development (especially higher density) to be located outside flood-prone areas wherever possible, including increased setbacks to account for sea level rise.	*LU*	*High*	*Flooding*	Completed. Strategy to be continued in 2016-2021 plan update.
5.	Pursue acquisition of waterfront land and easements when opportunities arise.	*LU, Grants*	*Low*	*Flooding, Hurricane, Sea Level Rise*	Strategy to be merged with #2 above and continued in 2016-2021 plan update.
6.	Enhance storm drain maintenance activities.	*Operations*	*High*	*Flooding*	
	· Maintain records for storm drain maintenance.				Completed - adopted new program with staffing. Strategy to be continued in 2016-2021 plan update.
	· Continue to work to increase frequency of storm drain clean out.				Completed - adopted new program with staffing. Strategy to be continued in 2016-2021 plan update.
	· Continue to identify and eliminate cross connections between storm and sanitary sewer systems.				Completed - adopted new program with staffing. Strategy to be continued in 2016-2021 plan update.
7.	Continue to provide capital budget funds for drainage projects and investigation of drainage problems.	*BOF*	*High*	*Flooding*	Implemented every year. Strategy to be continued in 2016-2021 plan update.
8.	Ensure that redevelopment reduces runoff from current conditions.	*LU*	*Medium*	*Flooding*	Completed - required by zoning regulations. Strategy to be continued in 2016-2021 plan update.
9.	Continue to encourage best management practices, including innovative Low-Impact Development (LID) practices, for managing stormwater runoff.	*LU*	*Low*	*Flooding*	Completed - LID parking lot project. Strategy to be continued in 2016-2021 plan update.
10.	Work with Aquarion and the state to evaluate and monitor conditions of all dams and to identify properties that may be impacted by a dam failure for all high risk dams in Stamford.	*Engineering, CTDEEP, Aquarion*	*Medium*	*Dam Failure*	Strategy to be continued in 2016-2021 plan update.

Table 4.3.3.5-6 Stamford 2011 Mitigation Strategies, Objective D: Reduce the frequency and severity of power outages and road closures as a result of storm events.

ID	Supporting Recommendation	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Support applications and use for tree management software by the parks department to ease the burden or responding to complaints; improve preventative maintenance for use as an overall planning tool.	*Parks, Operations, LU, Grants*	*Medium*	*Severe Storms, Hurricane, Tornado*	Removed from 2016-2021 plan update and replaced with a new tree strategy.
2.	Work with the City Operations, Parks and Highways Dept. staff, and Connecticut Light and Power staff, to develop a plan for clearing debris in the event of a severe storm.	*EM, Operations Parks, Engineering, Utilities*	*Low*	*Severe Storms, Hurricane, Tornado*	Strategy to be continued in 2016-2021 plan update.
3.	Work with utility companies to improve communications during a storm event and identify a direct contact.	*Operations, Parks, Utilities*	*High*	*Severe Storms, Hurricane, Tornado*	Strategy to be continued in 2016-2021 plan update.
4.	Explore methods to improve and enhance telecommunications.	*EM*	*Low*	*All*	Strategy to be continued in 2016-2021 plan update.
5.	Encourage the study of alternative systems for delivering reliable power to residents.	*LU*	*Low*	*Severe Storms, Hurricane, Tornado*	Strategy to be continued in 2016-2021 plan update.
6.	Work with DEMHS to complete and enhance the state and regional debris management plan and to address local needs.	*Operations, EM*	*Medium*	*Severe Storms, Hurricane, Tornado*	Strategy to be continued in 2016-2021 plan update.
7.	Conduct a town-wide inventory and assessment of street trees; consider conducting the inventory in conjunction with other municipalities in the region.	*Parks*	*Medium*	*Severe Storms, Hurricane, Tornado*	Strategy to be continued in 2016-2021 plan update.
8.	Continue to commit capital funding annually for public tree maintenance and plantings.	*Parks, BOF*	*Medium*	*Severe Storms, Hurricane, Tornado*	Merged with the ongoing practice of "Preventative tree maintenance for 2016-2021 plan update.

Table 4.3.3.5-7 Stamford 2011 Ongoing Practices, Objective D: Reduce the frequency and severity of power outages and road closures as a result of storm events.

ID	Ongoing Practices	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Continue with preventative tree maintenance.	*Parks*	*Medium*	*Severe Storms, Hurricane, Tornado*	Merged with #8 above for the 2016-2021 plan update.

4.3.3.6 Weston Update to 2011 Mitigation Strategies

A thorough review of 2011 Mitigation Strategies were performed with key Weston municipal staff as part of the WTN-1 meeting which took place on July 30, 2014 at Weston Town Hall. The objective was to address and document changes/progress to those strategies identified in 2011. The efforts also served to set the stage for modifications and carryovers to proposed 2016 Mitigation Strategies. Results are presented below in Tables 4.3.3.6-1 to 4.3.3.6-6:

Weston Table Key: BOS = Board of Selectmen; CC = Conservation Commission; P&Z = Planning and Zoning Commission; BOE = Board of Education; DPW = Department of Public Works; EM = Emergency Management (Director of EM, Fire and Police); FM = Fire Marshal

Goal 1: To reduce the loss of life and property and economic consequences as a result of natural emergencies

Table 4.3.3.6-1 Weston 2011 Mitigation Strategies, Objective A: Whenever practical, incorporate natural hazard mitigation strategies into existing town projects.

ID	Supporting Recommendation	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Weston's Beautification Committee and public works should work with residents on proper tree maintenance to minimize debris created during a storm event.	*DPW, BOS, Beautification Committee*	*Low*	*Severe Storm, Hurricane*	Completed - as part of a town initiative, tree maintenance is being performed along utility lines and streets in town. Now mentions "private roads". This is an annual strategy for 2016-2021 plan performance period.
2.	Town Government should actively seek opportunities to purchase or solicit the donation of additional open space, particularly properties located within the flood plain	*BOS, CC*	*Medium*	*Flooding*	Strategy to be continued in 2016-2021 plan update - town actively monitoring for any opportunities
3.	Begin to investigate how sea level rise and climate change may impact the community	*CC, P&Z*	*Low*	*Sea Level Rise*	Strategy to be continued in 2016-2021 plan update.
4.	Implement recommended improvements from the Route 57 and School Road engineering study to ensure safe access to emergency shelters and to facilitate	*DPW*	*Medium*	*All*	Completed - traffic lights have been upgraded; an engineering study with recommendations has also been completed. Strategy to be continued in 2016-
5.	Maintain the Federal Flood Insurance Program which provides insurance for property owners in flood hazard areas, but encourage development to be located outside flood-prone areas wherever possible, including increased setbacks to account for sea level rise.	*CC, P&Z, DPW*	*High*	*Flooding, Severe Storm*	Completed - town currently reviews development proposals with this in mind. Additional of GIS technology will help. Included for 2016-2021 will be revisited annually. Merged with another strategy to "Work with property owners to elevate critical systems (i.e. electrical boxes, hot water heaters etc.) in wet and flood prone areas."

6.	The Conservation Commission should explore LID methodology and, together with the Planning and Zoning Commission, promulgate regulations for Weston that embrace that approach, including revisiting and strengthening regulations controlling changes in rates and direction of runoff from roadways and lots; encouraging retention of existing forests, outcrops, ridges and stone walls; urging selective rather than clear cutting of trees; and updating the Weston Environmental Resources Manual.	*CC, P&Z*	*Medium*	*Flooding*	Commission created an informational worksheet for residents to encourage LID. Included in 2016-2021 update. Target completion by 2017 with annual review. "examine regulations of erosion and runoff"
7.	Develop a GIS application to assist personnel in the event of an emergency or natural disaster.	*BOS, EM*	*High*	*All*	Completed - as part of the SWRPA/DEMHS emergency evacuation planning and needs assessment, mapped Weston assets relative to FEMA flood zone sand other natural hazards. Strategy to be continued in 2016-2021 plan update..

Table 4.3.3.6-2 Weston 2011 Ongoing Practices, Objective A: Whenever practical, incorporate natural hazard mitigation strategies into existing town projects.

ID	Ongoing Practices	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Publish all Town Ordinances on the Town website including those that mitigate natural hazards.	*BOS*	*Medium*	All	Completed - on town website. "Publish" changed to "Maintain" and continued for 2016-2021 performance period.

Table 4.3.3.6-3 Weston 2011 Mitigation Strategies, Objective B: Continue and expand current maintenance activities, inspections, and requirements.

ID	Supporting Recommendation	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Institute water volume monitoring program.	*BOS*	*High*	*Flooding, Drought*	Strategy to be continued in 2016-2021 plan update.
2.	Examine possible regulation requiring engineered systems to control runoff from new subdivision roads and parking lots.	*P&Z, Building*	*Medium*	*Flooding*	Strategy to be continued in 2016-2021 plan update.
3.	Examine possible regulation of erosion and runoff.	*P&Z & CC*	*High*	*Flooding*	Completed - P&Z updated soil disturbance permitting requirements (Regulation 348) in 2011/2012. Continued strategy for 2016, particularly tree removal and runoff
4.	Town Government, together with the Fire Department, Police Department and Town Engineer, should promulgate regulations for all Weston roads to ensure ease of emergency access.	*DPW, P&Z, EM*	*High*	*All*	Completed - Fire Chief reviews new development and site plan regs with respect to emergency access. Roads currently accommodate emergency access. Continued strategy for 2016
5.	Consider developing a town wide driveway ordinance to accommodate emergency vehicles	*P&Z, EM*	*High*		N/A - remove from list
6.	Consider Properties prone to flooding for elevation or acquisition as needed.	*P&Z*	*Medium*	*Flooding, Severe Storm, Hurricane*	Strategy to be continued in 2016-2021 plan update.
7.	Consider a town-wide investigation of culverts or bridges that may need to be replaced or repaired. Conduct necessary repairs or replacement as needed.	*DPW*	*Medium*	*Flooding, Severe Storm, Hurricane*	Completed - town actively reviewing as needed. Have previously applied for FEMA funding for efforts, but are still seeking funding assistance. Strategy to be continued in 2016-2021 plan update.
8.	Work with DEP to enforce existing citations for dam violations	*DPW, P&Z*	*Low*	*Dam Failure, Flooding*	Strategy is removed for 2016, dams monitored by DEEP.
9.	Continue to monitor dam conditions and to identify any unpermitted changes to a dam structure that may impact the dam's integrity or alter the flood path.	*DPW*	*Low*	*Dam Failure, Flooding*	Strategy is removed for 2016, dams monitored by DEEP.
10.	Assess vulnerability of existing critical facilities to earthquakes, hurricanes, tornadoes	*EM, Building*	*Medium*	*Earthquake Hurricane, Tornado*	Strategy for 2016-2021 performance period, expected completion by 2019. Strategy modified in 2016 to consider all hazards.
11.	Consider participation in an inter-municipal tree condition inventory.	*CC, P&Z, BOS, SWRPA*	*Low*	*Hurricane, Severe storm*	Strategy to be continued in 2016-2021 plan update.

Table 4.3.3.6-4 Weston 2011 Ongoing Practices, Objective B: Continue and expand current maintenance activities, inspections, and requirements.

ID	Ongoing Practices	Who	Priority*	Hazard Addressed	2016 Status Update
	Ensure that tree maintenance is being performed along private roads.	*DPW*	*High*	All	Strategy has been merged with objective 1.1 (Tree maintenance for 2016-2021)

Table 4.3.3.6-5 Weston 2011 Mitigation Strategies, Objective C: Continue and expand activities related to natural hazard warning and emergency preparedness.

ID	Supporting Recommendation	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Continue working to expand further development of fire ponds and cisterns.	*FM*	*High*	*All*	Completed - coordinate with Fire Marshall for bridge repairs and subdivisions for the potential feasibility of adding additional fire ponds. Strategy to be continued in 2016-2021 plan update to find additional fire pond, etc areas, including the proposed development of a capital plan to help finance additional
2.	Work with home owners in the vicinity of Cobs Mill Pond and Beaver Brook to remove silt and debris and consider use as fire ponds.	*DPW, FM*	*Low*	*Flooding, Severe Storm*	Strategy to be continued in 2016-2021 plan update, priority has increased considerably, now a high priority. Update now includes drought as an applicable hazard of concern.
3.	Investigate ways to enhance telecommunication infrastructure and emergency communication throughout the town.	*P&Z, DPW, CC, EM*	*High*	*All*	Strategy to be continued in 2016-2021 plan update.
4.	Identify equipment and resources to sustain critical facilities in the event of a disaster (i.e. obtain additional generators), and procure items as needed.	*EM*	*Medium*	*All*	Strategy to be continued in 2016-2021 plan update.
5.	Work with DEMHS to complete and enhance the state and regional debris management plan.	*EM, DPW*	*Medium*	*All*	Completed, will be included for 2016 w/ "Complete" changed to "Maintain"
6.	Evaluate municipalities' sheltering and evacuation needs for a variety of storm scenarios.	*EM, Red Cross*	*Low*	*All*	Strategy modified for 2016-2021 performance period. "Evaluate" to "maintain" and covers all hazards now. This will be performed annually.
7.	Continue to upgrade and maintain emergency notification as necessary.	*EM*	*High*	*All*	Strategy included for 2016-2021 performance period. "Continue to upgrade and" replaced with "Maintain and look for improvements to"
8.	Continue to work with DEMHS to conduct training and exercises on disaster responses and education on Property damage assessment forms.	*EM*	*Medium*	*All*	Strategy to be continued in 2016-2021 plan update.

9.	Work with property owners to elevate critical systems (i.e. electrical boxes, hot water heaters etc.) in wet and flood	*Building, P&Z*	*Low*	*Flooding*	Completed - all new developments and redevelopment in flood prone areas require elevated critical systems. Strate-
10.	Encourage the study of alternative systems for delivering reliable power to residents.	*P&Z, DPW*	*Low*	*All*	Completed - multiple private generators purchased in town. Removed for 2016-2021.
11.	Encourage wherever possible the under-grounding of all utilities to minimize service disruptions due to inclement weather. Require all new development and subdivisions to install underground utilities.	*P&Z, DPW*	*Low*	*All*	Completed - implemented for all new subdivision developments and redevelopment activities. Strategy to be continued in 2016-2021 plan update.
12.	Enhance Community preparedness programs:	*EM, BOE*	*Medium*	*All*	
	· Develop educational materials and brochures promoting emergency preparedness and 'best management practices' for natural resources, targeted to homeowners.				Included for 2016-2021 performance period. Work will be performed annually. Resources changed to "hazards"
	· Explore developing a "phased approach" to citizen preparedness (i.e. introductory brochures identifying simple and inexpensive tasks, and more advanced brochures with additional tasks and actions to be done to prepare your family and home for a natural disaster that may be more sophisticated in nature or more expensive).				Completed - information posted on town website. Many neighborhoods also now have "block captains." Strategy to be continued in 2016-2021 plan update.
	· Provide "welcome kits" to new home owners for properties located within the flood plain, or with a significant risk of flooding.				Strategy to be continued in 2016-2021 plan update.

Table 4.3.3.6-6 Weston 2011 Ongoing Practices, Objective C: Continue and expand activities related to natural hazard warning and emergency preparedness.

ID	Ongoing Practices	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Maintain emergency generators and infrastructure.	*EM*	*Medium*		Completed - emergency equipment and infrastructure maintained. Included for 2016-2021 performance period, but changed to "Maintain and explore options for procurement of back up power (e.g. microgrid, fuel cell)". Expected completion by 2019, and is an annual practice.

4.3.3.7 Westport Update to 2011 Mitigation Strategies

Meetings WPT-1 and WPT-2, held on July 1 and July 22, 2014 respectively, included a discussion of 2011 Mitigation Strategies, including progress updates and noting any difficulties encountered. WPT-1 was held at Westport Fire Headquarters, while the location of WPT-2 was at Westport Town Hall. Municipal participants included: EMD/Fire Chief, Deputy Fire Chief, Assistant Fire Chief, Planner, Conservation Director, and Director of Public Works. . Tables 4.3.3.7-1 to 4.3.3.7-23 highlights all progress and changes to the 2011 Mitigation Strategies:

Westport Table Key: BOS = Board of Selectmen; Building = Town Building Department; CC = Conservation Commission; CEO = Chief Elected Official; CTDEP = CT Department of Energy and Environmental Protection; CTDOT = CT Department of Transportation; DEMHS 1= CT Department of Emergency Management and Homeland Security Region 1; DPW = Department of Public Works; EM = Emergency Management (Director of EM, Fire and Police); FM = Fire Marshal; IT = Town Information Technology Department; IWC = Inland Wetlands Committee; WWHD = Weston Westport Health Department; P&Z = Planning and Zoning Commission; Staff = Various Town Staff; SWRPA= South Western Regional Planning Agency.

Goal 1: Reduce the loss of life and property as a result of floods.

Table 4.3.3.7-1 Westport 2011 Mitigation Strategies Goal 1 Objective A: Educate the public in the areas of storm damage potential, mitigation activities and preparedness.

ID	Supporting Recommendation	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Provide "welcome kits" to new home owners for properties located within the flood plain, or with a significant risk of flooding.	*EM, CC*	*Low*	*Flooding*	Completed - property transfer list received weekly and reviewed to see if who's in aquifer protection and/or wetland overlay zones, in addition to other information. Further efforts conducted on a case-by-case basis, as needed. Strategy to be continued in 2016-2021 plan update.
2.	Encourage landowners to retain storm water, such as using rain barrels or planting rain gardens.	*CC*	*Medium*	*Flooding*	Completed - Strategy to be continued in 2016-2021 plan update.
3.	Encourage private property owners in the potentially troubled areas to properly maintain the stream channel. If necessary, Westport can pursue clearing rights on these parcels using provisions of the state drainage statutes.	*CC, DPW*	*Low*	*Flooding*	Completed - Actively conducted as opportunities arise. Strategy to be continued in 2016-2021 plan update.

Table 4.3.3.7-2 Westport 2011 Ongoing Practices Goal 1 Objective A: Educate the public in the areas of storm damage potential, mitigation activities and preparedness.

ID	Ongoing Practices	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Adopt a Natural Hazards Awareness Week complete with public outreach activities focused on flooding and other natural hazards.	*EM*	*Medium*	*Flooding*	Strategy to be continued in 2016-2021 plan update.
2.	During the Natural Hazards Awareness Week, conduct an annual workshop so that residents, business owners, insurance and real estate agents, and all interested parties can familiarize themselves with functions of a floodplain, the laws governing development in a floodplain, mitigation alternatives, and precautions necessary for living in flood prone areas.	*EM, P&Z*	*Medium*	*Flooding, Severe Storm, Hurricanes*	Strategy to be continued in 2016-2021 plan update.

Table 4.3.3.7-3 Westport 2011 Mitigation Strategies Goal 1, Objective B: Acquire flood prone properties and those which provide valuable recreational opportunities, and flood storage potential and benefit the greatest number of Westport residents.

ID	Supporting Recommendation	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Identify properties prone to flooding that may be considered for elevation or acquisition; consider implementing as necessary or as funding becomes available.	*P&Z, CC, DPW*	*Low*	*Flooding*	Continued strategy for 2016-2021 plan update - working towards acquiring 3 properties since 2011. Increased priority follow Storm Sandy and continues to present and future

Table 4.3.3.7-4 Westport 2011 Ongoing Practices Goal 1, Objective B: Acquire flood prone properties and those which provide valuable recreational opportunities, and flood storage potential and benefit the greatest number of Westport residents.

ID	Ongoing Practices	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Review the Westport Plan of Conservation and Development and other relevant plans to identify open space projects that preserve or restore the functions of natural systems and may be eligible for funding under mitigation grants.	*CC, P&Z*	*Medium*	*Flooding*	Strategy to be continued in 2016-2021 plan update.

Table 4.3.3.7-5 Westport 2011 Mitigation Strategies Goal 1, Objective C:Use town regulations and ordinances to minimize the impacts of new construction on the natural drainage system and to ensure appropriate development occurs in floodplains.

ID	Supporting Recommendation	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Identify and publicize regulations that will preserve and protect watercourses, waterbodies, wetlands, steep slopes, and floodplains, and those that will conserve floodplain fringe areas, wellhead areas, areas of high groundwater availability, and unique/special habitat areas.	*P&Z*	*High*	*Flooding*	Strategy to be continued in 2016-2021 plan update - still working on this, remains a high priority
2.	Further control building in floodplain areas.	*P&Z*	*High*	*Flooding*	Strategy to be continued in 2016-2021 plan update. - not much progress to date
3.	Minimize the amount and intensity of development in coastal "V" flood zones: Eliminate new non-water dependent development from "V" zones and only allow new structures that meet current "V" zone construction.	*P&Z*	*Medium*	*Flooding*	Strategy to be continued in 2016-2021 plan update - remains a medium priority
4.	Require, to the extent possible, minimization of site imperviousness, maintenance of natural buffers, and use of natural	*CC, Staff*	*Low*	*Flooding*	Completed - P&Z/Conservation require vegetative buffers to mitigate impacts to coastal areas. Strategy to be contin-
5.	Change the floodplain regulations to require at least one foot of freeboard for new or substantially improved homes.	*P&Z, Town*	*High*	*Flooding*	Strategy to be continued in 2016-2021 plan update.

6.	Require approval and drainage review before clear cutting for new and redevelopment, especially near steep slopes or with a certain percentage of impervious surface.	*P&Z, CC, IWC, RTM, DPW*	*Medium*	*Flooding*	Strategy to be continued in 2016-2021 plan update - State of Connecticut requires a permit for such efforts
7.	Reduce impervious surfaces by adopting impervious coverage allowances for all zoning districts or amending regulations to decrease need for impervious surfaces. Ensure that redevelopment reduces runoff from current conditions.	*CC, P&Z, DPW*	*Low*	*Flooding*	Partial Completion - P&Z has regulations for impervious coverage. Strategy to be continued in 2016-2021 plan update.
8.	Recommend strengthening regulations to include requirements to maintain vegetation in riparian and flood prone areas.	*CC, P&Z, IWC*	*Medium*	*Flooding*	Completed - see #4 regarding vegetative buffer. Strategy to be merged and continued in 2016-2021 plan update.
9.	Recommend strengthening regulations to include requirements to prevent mowing of tidal wetlands.	*CC, P&Z, IWC*	*Medium*	*Flooding*	N/A - remove from list
10.	Review and make appropriate changes to regulations concerning impervious surface cover in flood prone areas.	*CC, P&Z,*	*Medium*	*Flooding*	Merged with #7 above. Strategy to be continued in 2016-2021 plan update.
11.	Review and modernize flood sections of the Building Zone Regulations and add standards for riverine flooding, taking into consideration the cumulative effect of development.	*CC, P&Z,*	*Medium*	*Flooding*	Completed - P&Z has a regulation for compensatory storage
12.	Study the use of V-Zone standards for foundation design in coastal A-Zones.	*CC, P&Z, Building*	*Medium*	*Flooding*	Strategy to be continued in 2016-2021 plan update.
13.	Review the existing Waterway Protection Line ordinance and consider amendments that place the responsibility for stream channel maintenance on the property owner and give Westport enforcement power. Such ordinances would include stream dumping, channel maintenance, and land clearing disturbances. These ordinances would reduce the likelihood of localized flooding and could lead to additional points toward CRS reclassification.	*CC, DPW*	*Medium*	*Flooding*	Strategy to be continued in 2016-2021 plan update.
14.	Evaluate the zoning regulations for ways to reduce land coverage and building size.	*P&Z, Town*	*Medium*	*Flooding*	Strategy to be continued in 2016-2021 plan update.

Table 4.3.3.7-6 Westport 2011 Mitigation Strategies Goal 1, Objective D: Expand maintenance activities and execute specific projects that alleviate riverine related flooding in addition to the restoration and improvement of natural floodplain and wetland areas.

ID	Supporting Recommendation	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Address Saugatuck River, Sherwood Mill Pond and Sasco Creek/ Pond maintenance and management with strategies to address silting.	*SMPC, SCPC, CC,PRC*	*High*	*Flooding*	Completed - Sasco Brook Watershed Management Plan approved by DEEP. Mill Pond study also completed, with recommendations provided. Strategy to be continued in 2016-2021 plan update.
2.	Undertake preparation of an update to the 1970 master drainage plan (the "Jackson" study).	*DPW, RTM*	*Low*	*Flooding*	No progress - no funding or available staff available in-house. Low priority strategy to be continued in 2016-2021 plan update.
3.	Identify and address storm drainage and flooding issues on private property and in the streets.	*DPW, RTM*	*High*	*Flooding*	Completed - addressed via Zoning Regulations. Strategy to be continued in 2016-2021 plan update.
4.	Address the effect of groundwater on drainage.	*DPW, RTM*	*High*	*Flooding*	Completed - amendment 32-8 begins to address this. Strategy to be continued in 2016-2021 plan update.
5.	Include provision for street drainage improvements and maintenance projects in the municipal budget on an annual basis.	*RTM, BOF*	*High*	*Flooding*	Completed - have replaced some culverts in town. Strategy to be continued in 2016-2021 plan update.
6.	Work with CTDOT and DEP to maintain flow of streams through expansive wetlands.	*CC*	*Medium*	*Flooding*	Strategy to be continued in 2016-2021 plan update.
7.	Maintain catch basins regular maintenance schedule, develop a plan for dealing with backups/failing.	*DPW*	*High*	*Flooding*	Completed - maintenance conducted annually. Backups and failures are addressed on an as-needed basis and as funds permit. Strategy to be continued in 2016-2021 plan update.
8.	Westport will encourage the Aspetuck Land Trust to initiate a maintenance program for Sasco Creek as it passes through their property, in an attempt to foster an understanding that maintaining a clear channel in the northern section of the parcel will reduce flooding occurrences on Gristmill Lane. If necessary, Westport can pursue clearing rights on this parcel using provisions of the state drainage statutes.	*DPW, CC Aspetuck Land Trust*	*Low*	*Flooding*	Strategy to be continued in 2016-2021 plan update.

Table 4.3.3.7-7 Westport 2011 Ongoing Practices Goal 1, Objective E: Mitigate against flood damage by undertaking cost effective structural projects.

ID	Supporting Recommendation	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Undertake a comprehensive study with state and federal agencies to recommend specific strategies for effective erosion abatement.	*CC, Staff*	*Low*	*Flooding*	Strategy to be continued in 2016-2021 plan update.

Table 4.3.3.7-8 Westport 2011 Mitigation Strategies Goal 1, Objective F: Improve and expand current flood warning systems and flood response procedures.

ID	Supporting Recommendation	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Investigate and pursue the purchase of an automated sand bagger.	*EM*	*Medium*	*Flooding*	Strategy to be continued in 2016-2021 plan update and contingent on funding availability
2.	Identify funding sources and install additional staff gauges for smaller streams, including (but not limited to) Sasco Creek,	*EM*	*Medium*	*Flooding*	Completed - adding flood gauge to Saugatuck River. USGS replacing Compo Boat Basin gauge. Strategy to be contin-

Table 4.3.3.7-9 Westport 2011 Mitigation Strategies Goal 1:
Objective G: Westport will endeavor to support increased awareness and purchases of flood insurance.
Objective H: Increase Westport's CRS rating to further reduce flood insurance premiums.
Objective I: Work with FEMA to include more detailed data on the Flood Insurance Rate Maps and Floodway Maps, particularly in unnumbered A-Zones.

ID	Supporting Recommendation	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Provide the updated FIRM maps and information on the National Flood Insurance Program on the Town's website.	*P&Z, IT*	*Medium*	*Flooding*	Completed - with GIS Department
2.	Request that FEMA continue to work to improve the accuracy of the updated FIRM maps, with special attention paid to unnumbered A-zones.	*DPW, CC, P&Z*	*Medium*	*Flooding*	Strategy to be continued in 2016-2021 plan update - Westport has reached out to FEMA
3.	Provide new data to FEMA as it becomes available to enhance efforts already under way.	*DPW, CC, P&Z*	*Low*	*Flooding*	Completed - achieved through Westport's LOMA process. Strategy to be continued in 2016-2021 plan update. - Westport sends FEMA new data as it becomes available

Table 4.3.3.7-10 Westport 2011 Ongoing Practices, Goal 1:
Objective G: Westport will endeavor to support increased awareness and purchases of flood insurance.
Objective H: Increase Westport's CRS rating to further reduce flood insurance premiums.
Objective I: Work with FEMA to include more detailed data on the Flood Insurance Rate Maps and Floodway Maps, particularly in unnumbered A-Zones.

ID	Ongoing Practices	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Make necessary changes to the Floodplain Zoning Regulations so that all insured residents can be eligible for the additional mitigation coverage (coverage for increased cost of compliance with flood regulations).	*P&Z, DEP*	*High*	*Flooding*	Strategy to be continued in 2016-2021 plan update.

Goal 2. Educate the public of wind damage potential, mitigation activities and preparedness.

Table 4.3.3.7-11 Westport 2011 Mitigation Strategies Goal 2:

Objective J: Provide education opportunities to the affected community, builders, developers and town officials so that future construction and landscaping associated with construction is designed to minimize wind damage and retrofitting of existing structures and maintenance of property are implemented to the benefit of public safety and property loss reduction.

Objective K: Ensure clear and concise severe weather alerts reach 100% of the population in Westport.

Objective L: Minimize property loss/damage and personal safety risk due to falling tree damage following a severe storm event.

ID	Supporting Recommendation	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Maintain the severe weather forecasting and warning systems.	*EM*	*High*	*Severe Storm, Hurricane, Tornado*	Completed - weather station at Fire HQ and accessible online. Strategy to be continued in 2016-2021 plan update.

Table 4.3.3.7-12 Westport 2011 Ongoing Practices, Goal 2:

Objective J: Provide education opportunities to the affected community, builders, developers and town officials so that future construction and landscaping associated with construction is designed to minimize wind damage and retrofitting of existing structures and maintenance of property are implemented to the benefit of public safety and property loss reduction.

Objective K: Ensure clear and concise severe weather alerts reach 100% of the population in Westport.

Objective L: Minimize property loss/damage and personal safety risk due to falling tree damage following a severe storm event.

ID	Ongoing Practices	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Educate the public about the meaning of National Weather Service announcements, such as winter storm watch, winter storm warning, ice storm warning, heavy snow warning, bliz-	*EM*	*High*	*All*	Completed - briefings/media releases and reminders about weather events and preparedness techniques conducted as needed. Strategy to be continued in 2016-2021
2.	During the Natural Hazards Awareness Week conduct an annual workshop so that local building contractors, residents, business owners, insurance and real estate agents, and all interested parties can familiarize themselves with wind associated risks, retrofitting techniques, importance of evacuation, and the understanding of warning mechanisms used by West-	*Fire, Building*	*Medium*	*Severe Storm, Hurricane, Tornado*	Completed - Fire does regular press releases to keep the public of situations. Strategy to be continued in 2016-2021 plan update.
3.	During the Natural Hazards Awareness Week, educate residents, business owners, insurance and real estate agents, and all interested parties on the history of Natural Hazards in Connecticut and the risk of such events in Westport.	*EM*	*Medium*	*All*	Completed - civic group briefings, including the Downtown Merchants and Chamber of Commerce. Strategy to be continued in 2016-2021 plan update and merged with row above.
4.	Continue to hold "Severe Weather Awareness" week in March and a "Winter Weather Awareness" week in October. Disseminate information prepared by the Connecticut State Emergency Management Office during these events.	*EM, CEO*	*Medium*	*Severe Storm, Hurricane, Tornado*	Completed - conduct regular public outreach when opportunities arise. Strategy to be continued in 2016-2021 plan update.

5.	Promote the use of functional shutters for properties located along the coast to guard against window breakage which can result in structural failure. Investigate funding sources to promote this relatively inexpensive type of retrofitting on a large scale.	*EM, Building*	*Medium*	*Severe Storm, Hurricane, Tornado*	Strategy to be continued in 2016-2021 plan update.
6.	Advise people of the potential dangerous driving conditions during inclement weather and storm events, and warn them that doing so can be a risk to their lives. Produce a series of announcements on what to do if you are trapped in your car during a severe storm.	*EM, Police, Fire*	*Low*	*All*	Completed - conducted as severe weather strikes. Announcements are made and media outlets are utilized. Strategy to be continued in 2016-2021 plan update.
7.	Encourage the Westport Garden Club, the Beautification Committee and the Tree Board to sponsor events that educate the public about wise landscaping techniques, locating trees away from utilities and wind resistant tree species.	*DPW, CC*	*High*	*Severe Storm, Hurricane, Tornado*	Completed - a tree warden was hired. The warden has a new information kiosk outside his office with pamphlets related the topics described in this strategy. Strategy to be continued in 2016-2021 plan update.
8.	Publish a special section in the local newspaper with emergency information about severe storms. The publications should emphasize emergency procedures when caught out in the open or in a vehicle during a severe storm.	*EM*	*Medium*	*All*	Completed - Utilize "WestportNow" media outlet, among others, for press and media releases (http://www.westportnow.com/). Additionally, the implementation of "Code Red" emergency communication network. Strategy to be continued in 2016-2021 plan update.
9.	Provide a reliable emergency communication system for use in notifying the elderly and disabled.	*EM, Human Services, WWHD*	*Low*	*All*	Completed - Implementation of "Code Red" emergency communication network. Strategy to be continued in 2016-2021 plan update.

Goal 3. Reduce the risk of damage to utility infrastructure in Westport as a result a severe storm event.

Table 4.3.3.7-13 Westport 2011 Mitigation Strategies Goal 3:

Objective M: Ensure falling trees or branches do not damage utility lines during a severe storm event.
Objective N: Ensure improvement of emergency power and communication capabilities during a severe storm event.
Objective O: Keep drainage paths open.
Objective P: Limit damage to utility lines and property and injury or loss of life by fallen trees, tree limbs, and brush.

ID	Supporting Recommendation	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Regularly evaluate the health of town roadway trees; trim or remove dangerous branches and remove unhealthy trees.	*DPW*	*Medium*	*Severe Storm, Hurricane, Tornado*	Completed - Tree Warden has implemented an aggressive program to address this problem. Strategy to be continued in 2016-2021 plan update.
2.	Evaluate the feasibility of moving trees out of the right of way and onto the edge of properties to protect above ground utilities.	*DPW, P&Z*	*Medium*	*Severe Storm, Hurricane, Tornado*	Completed - examined such measures, but found associated costs to be not financially feasible Strategy to be continued in 2016-2021 plan update.
3.	Continue to explore moving existing utilities underground and requiring underground utilities for new developments and subdivisions.	*P&Z, DPW*	*Low*	*All*	Completed - P&Z regulations now require such measures for all new subdivisions. Strategy to be continued in 2016-2021 plan update.

Table 4.3.3.7-14 Westport 2011 Ongoing Practices Goal 3:

Objective M: Ensure falling trees or branches do not damage utility lines during a severe storm event.
Objective N: Ensure improvement of emergency power and communication capabilities during a severe storm event.
Objective O: Keep drainage paths open.
Objective P: Limit damage to utility lines and property and injury or loss of life by fallen trees, tree limbs, and brush.

ID	Ongoing Practices	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Determine how to reuse disposed brush within the community to reduce costs of exporting from Westport (chips, firewood, composting).	*Public Works*	*Medium*	*Severe Storm, Hurricane, Tornado*	Tree warden is currently exploring this option. Insurance requirements and associated liability are also being considered in determining feasibility. Strategy to be continued in 2016-2021 plan update.
2.	Move as many utility lines underground as possible.	*P&Z, DPW*	*Low*	*Severe Storm, Hurricane, Tornado*	See #3 above regarding P&Z subdivision regulations. Strategy to be continued in 2016-2021 plan update.
3.	Place deflectors on key utility lines to reduce accumulation of ice or snow.	*Utilities*	*Medium*	*Severe Storm, Hurricane, Tornado*	Status unknown at moment - need to consult utilities
4.	Encourage appropriate streetscaping and planting, particularly around utilities.	*DPW, P&Z*	*High*	*Severe Storm, Hurricane, Tornado*	Strategy to be continued in 2016-2021 plan update.
5.	Continue tree trimming and maintenance program for trees on public roads.	*Public Works, Utilities*	*High*	*Severe Storm, Hurricane, Tornado*	Completed - see #1 above regarding tree warden's program. Strategy to be continued in 2016-2021 plan update.
6.	Establish protocols to check drainage paths (i.e. catch basins and culverts) prior to a severe storm.	*Public Works*	*Medium*	*Severe Storm, Hurricane, Tornado*	Completed - conducted as time and staff resources permit. Annual maintenance has proven to be very effective. Strategy to be continued in 2016-2021 plan update.

Goal 4. Broaden response capabilities of emergency responders in dealing with the preparation and aftermath of a severe storm event.

Table 4.3.3.7-15 Westport 2011 Mitigation Strategies Goal 4:

Objective Q: Ensure municipal facilities are adequately supplied and equipment is in proper working order.
Objective R: Ensure there are damage assessment capabilities for emergency response personnel following a severe storm event.
Objective S: Improve and expand current severe weather warning systems.
Objective T: Improve and expand response capabilities that serve the disabled, elderly, and vulnerable population groups.

ID	Supporting Recommendation	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Complete and implement a study to address the needs of the Police/ Emergency Medical services.	*RTM*	*High*	*All*	N/A - remove from list
2.	Identify person to work with Emergency Management at the EOC during an emergency to provide information system support.	*GIS, DPW*	*High*		Completed - Town GIS Technician now part of EOC team during an emergency
3.	Work to update vulnerable population database on a quarterly basis.	*DPW*	*High*	*All*	Completed - conducted quarterly and prior to severe storm events. Strategy to be continued in 2016-2021 plan update.
4.	Promote an adequate supply of public water to serve the domestic, commercial and fire protection requirements of Westport.	*Town*	*High*	*All*	Strategy to be continued in 2016-2021 plan update.
5.	Identify additional sites for yard waste and storm debris.	*DPW*	*High*	*All*	Strategy to be continued in 2016-2021 plan update.
6.	Continue to support the extension of public water service and fire hydrants throughout Westport.	*Town*	*Low*	*All*	Strategy to be continued in 2016-2021 plan update and merged with #4 above.
7.	Improve telecommunications.	*Town*	*Medium*	*All*	Completed - code red emergency notification system now in place, also have added warning sirens. Strategy to be continued in 2016-2021 plan update.
8.	Evaluate municipality's sheltering and evacuation needs for a variety of storm scenarios.	*EM, WWHD, Human Services*	*Low*	*All*	Strategy to be continued in 2016-2021 plan update.
9.	Maintain emergency notification system and update as needed.	*EM*	*Medium*	*All*	Completed - see #7 above regarding code red and warning sirens. Strategy to be continued in 2016-2021 plan update.
10.	Work with DEMHS to complete and enhance the state and regional debris management plan.	*EM, DPW*	*Medium*	*All*	Completed - DPW director now involved in discussions with DEMHS following storms Irene and Sandy. Strategy to be continued in 2016-2021 plan update.
11.	Conduct training and exercises on disaster responses and education on property damage assessment forms.	*EM, DEMHS*	*Low*	*All*	Completed - Hurricane drill conducted June 23, 2014. Strategy to be continued in 2016-2021 plan update.

Table 4.3.3.7-16 Westport 2011 Ongoing Practices, Goal 4:

Objective Q: Ensure municipal facilities are adequately supplied and equipment is in proper working order.

Objective R: Ensure there are damage assessment capabilities for emergency response personnel following a severe storm event.

Objective S: Improve and expand current severe weather warning systems.

Objective T: Improve and expand response capabilities that serve the disabled, elderly, and vulnerable population groups.

ID	Ongoing Practices	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Incorporate notification of severe weather events into the town mass notification system.	*EM*	*High*	*All*	Completed - use code red and warning sirens. Siren strategic located, including along the coastline. Strategy to be continued in 2016-2021 plan update.
2.	Train emergency response personnel to assess damage to buildings and their electrical, plumbing and heating systems.	*EM, Fire, Police*	*Medium*	*All*	Completed - developed damage assessment forms for field use. Forms utilize waterproof paper. Strategy to be continued in 2016-2021 plan update.
3.	Review the Emergency Operating Plan and emergency protocols to ensure that emergency responders can perform critical duties in the event of an extended power outage, limited fuel access, and reduced communication capabilities.	*EM, Fire, Police*	*Medium*	*All*	Completed - LEOP completed June, 2014. Strategy to be continued on an annual basis in 2016-2021 plan update.
4.	Perform regular inspections of cones, barricades, sandbags, salt, portable power generators, and bunk trailers to ensure that they are adequate and in good repair in the event of a severe storm.	*EM, DPW*	*High*	*All*	Completed - DPW conducts inspections quarterly, and prior to all storm events as necessary. Strategy to be continued in 2016-2021 plan update.

Goal 5. Reduce losses to public and private structures in Westport from severe storm events.

Table 4.3.3.7-17 Westport 2011 Mitigation Strategies, Goal 5:

Objective U: Ensure existing buildings and historically significant buildings are inventoried to identify potential losses from severe storm events.
Objective V: Encourage implementation of preventive measures for existing development to reduce the vulnerability to severe weather damage.
Objective W: Ensure mobile homes and mobile home parks throughout Westport are inventoried to identify potential for losses from severe storm events.
Objective X: Ensure that critical facilities are protected against wind damage.

ID	Supporting Recommendation	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Inventory condition of problem culverts and bridges and consider repairs or replacement as necessary or as funding becomes available.	*DPW*	*Medium*	*All*	Completed - replaced 3 culverts, 1 bridge, and actively seeking funding to replace Saugatuck Island Bridge. Swing bridge at Bridge Street repaired in 2013. Strategy to be continued in 2016-2021 plan update.
2.	Develop a notification system reminding critical facilities to evaluate storm preparedness every 5 years.	*EM*	*Low*	*All*	Completed - Hurricane drill conducted June, 2014. Hurricane proof film added to lower levels of schools. Strategy to be continued in 2016-2021 plan update.
3.	Develop a notification system for mobile home owners/ residents to evaluate storm preparedness every 5 years or when ownership changes.	*EM*	*Low*	*All*	Strategy to be continued in 2016-2021 plan update.

Table 4.3.3.7-18 Westport 2011 Ongoing Practices, Goal 5:

Objective U: Ensure existing buildings and historically significant buildings are inventoried to identify potential losses from severe storm events.
Objective V: Encourage implementation of preventive measures for existing development to reduce the vulnerability to severe weather damage.
Objective W: Ensure mobile homes and mobile home parks throughout Westport are inventoried to identify potential for losses from severe storm events.
Objective X: Ensure that critical facilities are protected against wind damage.

ID	Ongoing Practices	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Implement specific physical actions that help protect public critical facilities against wind damage as funds become availa-	*EM, DPW*	*Low*	*Severe Storm, Hurricane, Tornado*	Completed - new generators at Town Hall, Fire HQ and Police Station. Strategy to be continued in 2016-2021 plan
2.	Encourage private marinas and yacht clubs to develop management plans that address pollution prevention and hazard mitigation.	*CC, P&Z, EM*	*Medium,*	*All*	Strategy to be continued in 2016-2021 plan update.
3.	Provide information to contractors and owners of mobile homes on ways to anchor their structures to minimize damage from severe storms.	*EM, Housing Authority*	*Low*	*Severe Storm, Hurricane, Tornado*	Strategy to be continued in 2016-2021 plan update.
4.	Update local building codes to reference the most current standards as needed.	*Building*	*Low*	*All*	Strategy to be continued in 2016-2021 plan update.
5.	Initiate storm alerts earlier to allow citizens more time to prepare their structures for severe storm events.	*EM*	*High*	*All*	Strategy to be continued in 2016-2021 plan update.

Goal 6. To reduce loss of life and property as a result of earthquakes.

Table 4.3.3.7-19 Westport 2011 Mitigation Strategies, Goal 6:

Objective Y: Educate the public about the threat of earthquakes.

Objective Z: Assess the vulnerability of critical facilities to earthquakes.

Objective AA: Ensure that future construction of critical facilities is scrutinized more than other developments to determine the suitability of locations in the event of earthquakes hurricanes and tornadoes..

Objective AB: Ensure that emergency responders have the ability to communicate and respond effectively in the event of an earthquake.

ID	Supporting Recommendation	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Work to harden critical facilities and shelter locations to withstand significant weather events, for public use during an emergency.	*EM, Building*	*High*	*All*	Strategy to be continued in 2016-2021 plan update.
2.	Begin to evaluate the structural integrity of Town-owned Critical Facilities and buildings and their ability to withstand earthquakes.	*Building, EM*	*Low*	*Earthquake*	Strategy to be continued in 2016-2021 plan update.
3.	Encourage privately owned critical facilities to evaluate the ability of the buildings to withstand earthquakes and tornadoes, and to address and deficiencies identified.	*Building, EM*	*Low*	*Tornado, Earthquake,*	Strategy to be continued in 2016-2021 plan update.
4.	Develop a notification system reminding critical facilities to evaluate storm preparedness every 5 years.	*EM*	*Low*	*All*	N/A - remove from list
5.	Develop a notification system for mobile home owners/ residents to evaluate storm preparedness every 5 years or when ownership changes.	*EM*	*Low*	*All*	N/A - remove from list
6.	Zoning regulations and other ordinances and municipal laws governing the siting of new development, (new subdivisions of more than 10 houses and critical facilities), will be examined to determine if site geology is properly considered in the siting of critical use facilities. If deficiencies are identified, necessary changes will be studied and incorporated into the review of proposals for the development of such facilities.	*P&Z, Building, DPW*	*Low*	*Earthquake*	N/A - remove from list

Table 4.3.3.7-20 Westport 2011 Mitigation Strategies, Goal 6:

Objective Y: Educate the public about the threat of earthquakes.

Objective Z: Assess the vulnerability of critical facilities to earthquakes.

Objective AA: Ensure that future construction of critical facilities is scrutinized more than other developments to determine the suitability of locations in the event of earthquakes hurricanes and tornadoes.

Objective AB: Ensure that emergency responders have the ability to communicate and respond effectively in the event of an earthquake.

ID	Ongoing Practices	Who	Priority*	Hazard Addressed	2016 Status Update
1.	During the Natural Hazards Awareness Week include activities, workshops and materials about all natural hazards.	*EM, Building*	*Medium*	*All*	Strategy to be continued in 2016-2021 plan update.
2.	Continue to make FEMA's Emergency Management Institute classes available to Town Employees, including Rapid Visual Screening Techniques, designed to teach skills necessary for inventorying earthquake-susceptible commercial buildings. Skills acquired by attending this course could be utilized in	*Town, EM*	*Low*	*All*	Strategy to be continued in 2016-2021 plan update.
3.	Provide the earthquake-related publications to the public library for inclusion with the other natural hazard publications.	*EM, Library*	*Low*	*All*	Strategy to be continued in 2016-2021 plan update.
4.	Request that the Town, including the Board of Education, if applicable, retain the services of a professional engineer to survey all municipally owned buildings for their ability to withstand earthquake and wind loading. Prioritize any retrofitting, giving those buildings to be used as shelters the highest priority. If analysis reveals that a particular building is better suited as a shelter than one that is currently being used, then consider relocating the shelter to that location.	*EM, BOE*	*Low*	*Hurricane, Tornado, Earthquake,*	Strategy to be continued in 2016-2021 plan update.
5.	Maintain and update as needed The Westport Emergency Operations Plan to address earthquakes and other natural disasters.	*EM*	*Medium*	*All*	Strategy to be continued in 2016-2021 plan update.

Goal 7. Implement and expand drought mitigation plans and initiatives.

Table 4.3.3.7-21 Westport 2011 Mitigation Strategies, Goal 6, Objective AC: Update Drought Management Plan and review and update regulations as necessary.

ID	Supporting Recommendation	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Study effectiveness of regulations during drought conditions.	*CC,WWHD, Aquarion*	*Medium*	*Drought*	Completed - water conservation ordinance adopted by town (health department). Strategy to be continued in 2016-2021 plan update.
2.	Review USGS groundwater study and make recommendations for regulations to protect groundwater quality and quantity.	*CC*	*Medium*	*Drought*	N/A - remove from list
3.	Work with Aquarion Water Co. on infrastructure in town and inter-town.	*CC, Aquari-on*	*Medium*	*Drought*	Strategy to be continued in 2016-2021 plan update.. Con-servation will follow up with Acquarion
4.	Update drought management plan to be in alignment with State of Connecticut Drought Management plan.	*CC*	*Medium*	*Drought*	Strategy to be continued in 2016-2021 plan update.
5.	Review winter drought restrictions and conservation measures, and evaluate possible education and outreach pro-grams that may be helpful.	*CC, P&Z*	*Low*	*Drought*	N/A - remove from list
6.	Consider if underground storage tanks for fire protection need to be required for new development.	*Fire, P&Z, CC*	*Medium*	*Drought*	N/A - remove from list

Goal 8. To reduce the loss of life and property as a result of dam failure.

Table 4.3.3.7-22 Westport 2011 Mitigation Strategies, Goal 6:
Objective AD: Help private dam owners obtain financial assistance for dam repairs.
Objective AE: Improve and expand current dam failure warning systems.

ID	Supporting Recommendation	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Work with the State and property owners to identify funding and repair of the Bulkley Pond Dam on Sasco Creek.	*DEEP, CC*	*Low*	*Dam Failure*	Completed - received funding for plans under "project im-pact" initiative. Strategy to be continued in 2016-2021 plan update.
2.	Continue to install warning gauges on local dams as the op-portunity or need arises.	*DPW*	*Medium*	*Dam Failure*	Strategy to be continued in 2016-2021 plan update.

Goal 9. To reduce the potential vulnerability for loss of life and property as a result of sea level rise.

Table 4.3.3.7-23 Westport 2011 Mitigation Strategies, Goal 6:

Objective AF: Ensure that town facilities are able to withstand the potential impacts of sea level rise.

Objective AG: Educate the town and it's citizens as to the potential loss that may result in sea level rise do to climate change.

Objective AH: Work to minimize increased vulnerability to new construction in areas that may be impacted by sea level rise.

ID	Supporting Recommendation	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Continue to monitor information on global sea level rise.	*CC, Staff*	*High*	*Sea Level Rise*	Completed - DPW works with DEEP to update mean high water mark(s). Also try to survey the elevations of coastal storm surge after every major storm. Strategy to be continued in 2016-2021 plan update.
2.	Evaluate how to best prepare for the implications of global sea level rise to best balance public health, safety, and welfare.	*P&Z, Town*	*High*	*Sea Level Rise*	Strategy to be continued in 2016-2021 plan update. - working with The Nature Conservancy
3.	Minimize the amount and intensity of development in coastal "V" flood zones: Eliminate new non-water dependent development from "V" zones and only allow new structures that meet current "V" zone construction.	*P&Z*	*Medium*	*Sea Level Rise*	Strategy to be continued in 2016-2021 plan update.

4.3.3.8 Wilton Update to 2011 Mitigation Strategies

Progress and changes to 2011 Mitigation Strategies were noted during meeting WIL-1 on July 15, 2014. The meeting was located at Wilton Fire Headquarters, and including the following municipal participants: Fire Chief/ Deputy EMD, Deputy Fire Chief/EMD, Director of Planning, Director of Conservation, and a representative from the Health Department. The results are depicted in Tables 4.3.3.8-1 to 4.3.3.8-8 :

Wilton Table Key: BOS = Board of Selectmen; Building = Town Building Department; CC = Conservation Commission; CTDEP = CT Department of Environmental Protection; CTDOT = CT Department of Transportation; DEMHS 1= CT Department of Emergency Management and Homeland Security Region 1; DPW = Department of Public Works; EM = Emergency Management (Director of EM, Fire and Police); FM = Fire Marshal; IT = Town Information Technology Department; IWC = Inland Wetlands Committee; HD = Health Department; P&Z = Planning and Zoning Commission; Staff = Various Town Staff; SWRPA= South Western Regional Planning Agency.

Goal 1. Reduce the loss of life and property and economic consequences as a result of flooding, high winds, severe winter storms and dam failure.

Table 4.3.3.8-1 Wilton 2011 Mitigation Strategies, Objective A: Improve the ability of Wilton residents to prepare for and respond to approaching severe weather.

ID	Supporting Recommendation	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Continue to enhance community preparedness programs.	*EM*	*Medium*	*All*	Completed - Police/Fire publish articles regularly in paper. Utilize social media and other online outlets, which are linked to the town and public health websites. This is a reoccurring strategy for 2016 and will be carried out annually.
2.	Provide "welcome kits" to new home owners for properties within the flood plain, or with a significant risk of flooding.	*EM*	*Medium*	*All*	N/A - not currently a top priority. Remove from list
3.	Upgrade emergency notification system to incorporate cell phone numbers into the data-	*EM*	*High*	*All*	Completed - utilize Code Red emergency notification system. "Upgrade" has been changed to "maintain". This is now an annual strategy and is in-
4.	Explore the use of social media networks to disseminate emergency notifications and se-	*EM*	*Low*	*All*	Completed - see #1 above. This strategy has been increased from low priority to high priority. It will be included for 2016 as an annual strategy.
5.	Develop a prerecorded flood alert message for the emergency notification system to be activated prior to flood events.	*EM*	*High*	*Flooding*	Completed - utilize Code Red emergency notification system
6.	Develop a strategy to provide more information online.	*EM, IT*	*High*	*All*	Completed - see#1 above regarding the dissemination of information through social media, town and public health websites. This strategy has been merged with #4 for 2016
7.	Work with telecommunications entities to promote a modern telecommunications network.	*P&Z, Utilities*	*Medium*	*All*	In progress - currently in construction phase. "remote a modern telecommunications network." has been replaced with "strengthen mobile network telecommunications to increase resiliency". Included for 2016 w/ expected completion in 2019.
8.	Encourage the study of alternative systems for delivering reliable power to residents.	*EM, P&Z, Utilities*	*Low*	*All*	In progress - statewide initiative to provide alternatives. Town has increased permits for generators to provide alternative energy

Table 4.3.3.8-2 Wilton 2011 Ongoing Practices, Objective A: Improve the ability of Wilton residents to prepare for and respond to approaching severe weather.

ID	Ongoing Practices	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Continue to provide education materials on preparing for natural disasters.	*EM*	*Medium*	*All*	Strategy to be continued in 2016-2021 plan update.
2.	Develop a GIS application to assist personnel in the event of an emergency or natural disaster.	*EM, Police, Fire*	*Medium*	*All*	Strategy to be continued in 2016-2021 plan update.

Table 4.3.3.8-3 Wilton 2011 Mitigation Strategies, Objective B: Improve the Town of Wilton's ability to prepare for and respond to natural disasters and severe weather events.

ID	Supporting Recommendation	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Continue to hold regular meetings with town departments that may need to respond to natural disasters, focused on sharing information, coordination and developing protocols.	*EM, P&Z, DPW, Fire, Police, CC*	*High*	*All*	Completed - conducted in advance of disasters and/or planned events. Strategy to be continued in 2016-2021 plan update.
2.	Continue to work with DEMHS to enhance Training and exercises on disaster responses and education on Property damage assessment forms.	*EM, DEMHS*	*Medium*	*All*	Completed - participation in DEMHS training and exercises (i.e. June 2014 Hurricane Drill). Strategy to be continued in 2016-2021 plan update.
3.	Develop a secure website to be used to share data and information with emergency management and the EOC during a natural disaster.	*EM, IT*	*Medium*	*All*	Completed - utilize WebEOC and veoci emergency software programs. Removed from strategies.
4.	Implement a town-wide GIS.	*IT*	*High*	*All*	Strategy to be continued in 2016-2021 plan update..
5.	Identify ways to improve the use of GIS for use in identifying areas and facilities vulnerable to disasters and for use to enhance emergency management.	*EM,IT*	*High*	*All*	Completed - addressed in SWRPA/DEMHS Phase 1 Emergency Evacuation Planning and Needs Assessment. Strategy to be continued in 2016-2021 plan update..
6.	Inventory and update conditions of town owned significant culverts and bridges. and consider repairs or replacement as necessary or as funding becomes available.	*DPW*	*Low*	*Flooding, Severe Storm, Hurricane*	Strategy to be continued in 2016-2021 plan update.
7.	Continue to work with CT DOT and DEEP to maintain flow of streams through expansive wetlands.	*DPW, CC, State*	*Low*	*Flooding, Severe Storm, Hurricane*	Strategy to be continued in 2016-2021 plan update.
8.	Continue to provide capital budget funds for drainage projects and investigation of drainage problems.	*DPW*	*High*	*Flooding, Severe Storm, Hurricane*	Strategy to be continued in 2016-2021 plan update..
9.	Continue to work to implement recommendations from the current storm water management plan.	*DPW, P&Z, CC*	*Medium*	*Flooding, Severe Storm, Hurricane*	Strategy to be continued in 2016-2021 plan update.

10.	Enhance storm drain maintenance activities:				Strategy to be continued in 2016-2021 plan update..
	· Maintain records for storm drain maintenance.	*DPW*	*High*	*Flooding, Severe Storm, Hurricane*	Strategy to be continued in 2016-2021 plan update..
	· Continue to work to increase frequency of storm drain clean out.	*DPW*	*Medium*	*Flooding, Severe Storm, Hurricane*	Strategy to be continued in 2016-2021 plan update..
	· Continue to identify and eliminate cross connections between storm and sanitary sewer systems.	*DPW*	*Low*	*Flooding, Severe Storm, Hurricane*	Removed for 2016-2021 plan update
	· Develop a plan for dealing with back-ups and failures.	*DPW*	*Low*	*Flooding, Severe Storm, Hurricane*	Removed for 2016-2021 plan update
11.	Continue to assess the ecological and health implications of winter road salting and investigate alternatives.	*BOS, DPW*	*Low*	*Severe Storm (Winter)*	Strategy to be continued in 2016-2021 plan update..
12.	Ensure that Fire Station 2 continues to serve western Wilton.	*BOS*	*High*	*All*	Strategy to be continued in 2016-2021 plan update..
13.	Analyze options for meeting expansion needs of Fire Station 2 on-site, on other sites, or by sharing services with neighboring communities.	*EM, BOS*	*High*	*All*	Strategy to be continued in 2016-2021 plan update..
14.	Continue to require the provision of fire water cisterns when development cannot be served by public water.	*EM, P&Z*	*Medium*	*All*	Strategy to be continued in 2016-2021 plan update..
15.	Procure equipment to sustain critical facilities in the event of a disaster and to enhance EOC capabilities as needs are identified.	*EM*	*Low*	*All*	Completed - upgrades made to EOC. Removed for 2016
16.	Continue to monitor the condition of Merwin Meadows dam; if necessary, consider options for dam removal identified in the engineering study.	*DPW*	*Low*	*Dam Failure*	Strategy increasing in importance, and has been modified to explore potential dam removal.
17.	Encourage evaluation of dams under the purview of the DEEP.	*DPW, State*	*Low*	*Dam Failure*	Removed for 2016-2021 plan update
18.	Work with Norwalk's First Taxing district to improve communications and coordinate the release of water from the Browns Reservoir.	*DPW, EM*	*High*	*Dam Failure, Flooding*	Completed - share GIS data with Norwalk, improved communications. Strategy to be continued in 2016-2021 plan update.
19.	Assess vulnerability of critical facilities to earthquakes, hurricanes, tornadoes.	*DPW, Building*	*Medium*	*Earthquake, Hurricane, Tornado*	Completed - addressed in SWRPA/DEMHS Phase 1 Emergency Evacuation Planning and Needs Assessment. Strategy to be continued in 2016-2021 plan update..

20.	Evaluate municipalities' sheltering and evacuation needs for a variety of storm scenarios.	*EM, HD, Red Cross*	*Medium*	*All*	Completed - see above regarding SWRPA/DEMHS project. Strategy to be continued in 2016-2021 plan update..
21.	Train additional volunteer personnel in shelter management and emergency supply distribution.	*EM, CERT, Red Cross*	*High*	*All*	Completed - CERT members actively trained. Continued activity for 2016-2021 plan update.
22.	Establish a database on well water by using information submitted to the local health department for each new well and complaints received.	*HD*	*Low*	*Drought*	Completed - in-house data maintained. Strategy to be continued in 2016-2021 plan update.
23.	Monitor well water quantity issues by reviewing data annually.	*HD, CC*	*Low*	*Drought*	Completed - collection of limited data. Strategy to be continued in 2016-2021 plan update.
24.	Explore the need for a drought ordinance.	*HD, CC,P&Z*	*Medium*	*Drought*	Completed - explored over last few drought events. Hard to implement an standard, uniform ordinance due a variety of variables.
25.	Begin to investigate potential impacts resulting from sea level rise, with special attention paid to waste waters systems.	*CC, P&Z*	*Low*	*Sea Level Rise*	N/A - SLR not a hazard in Wilton - remove from list

Table 4.3.3.8-4 Wilton 2011 Ongoing Practices, Objective B: Improve the Town of Wilton's ability to prepare for and respond to natural disasters and severe weather events.

ID	Ongoing Practices	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Require utility lines to be buried for all new subdivisions and encourage moving utility lines underground during certain projects such as major road projects.	*P&Z*	*High*	*Severe Storm, Hurricane, Tornado*	Completed - have subdivision ordinances in place for underground utilities. Strategy to be continued in 2016-2021 plan update.

Table 4.3.3.8-5 Wilton 2011 Mitigation Strategies, Objective C: Reduce the amount of debris from severe storms through preventive tree maintenance.

ID	Supporting Recommendation	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Work with DEMHS to complete and enhance the state and regional debris management plan and to address local needs.	*EM, DEMHS*	*High*	*Severe Storm, Hurricane, Tornado*	Strategy to be continued in 2016-2021 plan update..
2.	Designate pre-planned locations for debris storage and management	*DPW*	*High*	*Severe Storm, Hurricane, Tornado*	Completed - DPW has designated locations. Strategy to be continued in 2016-2021 plan update.
3.	Conduct a Town-wide inventory and assessment of street trees, consider conducting the inventory in conjunction with other municipalities in the region.	*Tree Committee*	*Low*	*Severe Storm, Hurricane, Tornado*	Strategy to be continued in 2016-2021 plan update.
4.	Continue to commit capital funding annually for public tree maintenance and plantings.	*BOS*	*Low*	*Severe Storm, Hurricane, Tornado*	Strategy to be continued in 2016-2021 plan update.. Part of Wilton's "Tree City USA" designation

Table 4.3.3.8-6 Wilton 2011 Ongoing Practices, Objective C: Reduce the amount of debris from severe storms through preventive tree maintenance.

ID	Ongoing Practices	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Budget appropriate money necessary to maintain and remove dead, dying, dangerous or diseased trees in rights-of-way and on other town land.	*DPW*	*Low*	*Severe Storm, Hurricane, Tornado*	Strategy to be continued in 2016-2021 plan update.
2.	Seek financial assistance to manage tree debris in the Norwalk River.	*DPW*	*Low*	*Severe Storm, Hurricane, Tornado*	Strategy to be continued in 2016-2021 plan update..

Table 4.3.3.8-7 Wilton 2011 Mitigation Strategies, Objective D: Reduce the Town of Wilton's Vulnerability to Flooding.

ID	Supporting Recommendation	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Assure strict adherence to current flood plain regulations.	*P&Z, CC*	*High*	*Flooding*	Completed. Strategy to be continued in 2016-2021 plan update.
2.	Consider conducting drainage and watershed evaluations for all problematic waterbodies in the town.	*CC, DPW*	*Low*	*Flooding*	Completed - Norwalk River Watershed Action Plan. Strategy to be continued in 2016-2021 plan update.
3.	Maintain the Federal Flood Insurance Program which provides insurance for property owners in flood hazard areas, and encourage development to be located outside flood-prone areas wherever possible, including increased setbacks to account for sea level rise.	*P&Z, CC*	*High*	*Flooding*	Completed. Strategy to be continued in 2016-2021 plan update.
4.	Encourage acquisition of wetlands beneficial to the Town.	*CC, IWC, BOS*	*Low*	*Flooding*	Completed - have acquired some open space in flood prone areas. Strategy to be continued in 2016-2021 plan update.
5.	Continue to encourage the preservation of undeveloped lands within the 100-year flood zone with the use of Open Space purchase, donation or conservation easement.	*P&Z, CC, BOS*	*Medium*	*Flooding*	Completed. Strategy to be continued in 2016-2021 plan update.
6.	Revise subdivision regulations to require open space set aside to reflect upland to wetland ratio of parcel.	*P&Z*	*Medium*	*Flooding*	Completed. Strategy to be continued in 2016-2021 plan update.
7.	Ensure that the Town is up-to-date in its storm water management planning (NPDES) requirements.	*DPW*	*High*	*Flooding*	Strategy to be continued in 2016-2021 plan update.
8.	Ensure expert engineering review of projects with potential storm water impacts.	*P&Z, IWC*	*Medium*	*Flooding*	Completed. Strategy to be continued in 2016-2021 plan update.
9.	Require drainage review for all projects that exceed a certain threshold of land clearing or a certain percentage of impervious surface.	*P&Z*	*Medium*	*Flooding*	Completed to some extent, with limited applicability. Strategy to be continued in 2016-2021 plan update.
10.	Consider requiring a drainage review when a certain amount	*P&Z, BOS*	*Medium*	*Flooding*	Completed to some extent, with limited applicability.

11.	Reduce impervious surfaces by adopting impervious coverage allowances for all zoning districts or amending regulations to decrease need for impervious surfaces.	*P&Z*	*Low*	*Flooding*	Completed - ordinances in place and based on opportunities, where they arise. Strategy to be continued in 2016-2021 plan update.
12.	Ensure that redevelopment reduces runoff from current conditions.	*P&Z, CC*	*High*	*Flooding*	Completed - where appropriate, consistently evaluated. Strategy to be continued in 2016-2021 plan update.
13.	Consider requiring Low Impact Development (LID) techniques for all new development, including Town projects and road projects.	*P&Z, DPW*	*Medium*	*Flooding*	Completed - where appropriate, consistently evaluated. Strategy to be continued in 2016-2021 plan update.
14.	Assist property owners along the Norwalk River with retrofitting properties using LID principles.	*CC*	*Medium*	*Flooding*	Completed - via the Norwalk River Watershed Initiative. Strategy to be continued in 2016-2021 plan update.
15.	Ensure that redevelopment incorporates measures to improve storm water quality and quantity.	*P&Z*	*Medium*	*Flooding*	Completed. Strategy to be continued in 2016-2021 plan update.
16.	Promote infiltration rather than diverting runoff into the Town's drainage system.	*P&Z, DPW*	*Medium*	*Flooding*	Completed. Strategy to be continued in 2016-2021 plan update.
17.	Encourage landowners to retain storm water, such as by using rain barrels or planting rain gardens.	*CC*	*High*	*Flooding*	Completed. Strategy to be continued in 2016-2021 plan update.
18.	Educate on the benefits of riparian and wetlands protection.	*CC*	*Low*	*Flooding*	Completed. Strategy to be continued in 2016-2021 plan update.

Table 4.3.3.8-8 Wilton 2011 Mitigation Strategies, Objective D: Reduce the Town of Wilton's Vulnerability to Flooding.

ID	Ongoing Practices	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Continue to use and enforce zoning and subdivision regulations to protect natural resources and restrict development in flood zones and other high risk areas.	*P&Z*	*High*	*Flooding*	Completed. Strategy to be continued in 2016-2021 plan update.

4.3.3.9 Regional Update to 2011 Mitigation Strategies

Progress and changes to 2011 Mitigation Strategies were noted after careful review and the results are depicted in Tables 4.3.3-1 to 4.3.3-7 below:

Regional Table Key: SWRPA = South Western Regional Planning Agency (now Western Connecticut Council of Governments or WCCOG), EM = Emergency Management, DEMHS 1 = State Department of Emergency Management and Homeland Security Region 1, Red Cross = American Red Cross, DEEP = State Department of Energy and Environmental Protection, ACOE = United States Army Corps of Engineers, PDM AC = Hazard Mitigation Plan Advisory Committee

Goal 1. Reduce the loss of life, property and economic consequences as a result of Natural Disasters.

Table 4.3.3.9-1 Regional 2011 Mitigation Strategies - Objective A: Provide support and assistance to local municipalities.

In 2016 HMP report, the Objective A is modified and two more objectives are included. The three new objectives are: "Provide education and outreach to municipalities , stakeholders, and the public.", "Provide planning and technical assistance to the region.", and "Table 4. Regional Strategies - Objective C: Support additional federal, state, regional, and municipal initiatives."

ID	Supporting Recommendation	Who	Priority*	Hazard Addressed	2016 Status Update
1.	Work with the State to enhance the Debris management plan and to develop a document useful for the region's municipalities.	*SWRPA, DEMHS 1*	*Medium*	*All*	Strategy to be continued in 2016-2021 plan update.
2.	Work with municipalities and DEMHS to develop shelter-evacuation routes for a variety of storm scenarios.	*SWRPA, DEMHS 1*	*Low*	*All*	Region currently working DEMHS and Red Cross to re-designate Regional Evacuation Shelters. Some evacuation efforts, including transportation network vulnerabilities, completed as part of DEMHS/SWRPA Emergency Evacuation Planning and Needs Assessment. Continued strategy for 2016-2021.
3.	Encourage the state to evaluate large-scale evacuation scenarios for CT that includes a mass evacuation of New York.	*SWRPA, Local EM*	*Low*	*All*	Not much progress aside from initial efforts of DEMHS/ SWRPA Emergency Evacuation Needs Assessment. Strategy to be continued in 2016-2021 plan update.
4.	Work with Municipalities, DEMHS, and the Red Cross to explore shared/regional sheltering locations.	*SWRPA, DEMHS 1, Red Cross*	*Low*	*All*	Completed - DEMHS 1 and Red Cross working towards finalizing shared/regional sheltering locations. As of 11/5/14, shelters proposed in Stamford, Norwalk, and Bridgeport (2). Strategy to be continued in 2016-2021 plan update to further discuss specific shelter logistics and details.
5.	Work with DEMHS to complete and enhance the state and regional debris management plan and to address local needs.	*SWRPA, DEMHS 1*	*Medium*	*Flood, Severe Storm, Hurricane, Tornado*	Same as #1 - merge two line items for 2016-2021 strategy

6.	Encourage the development of a regional website with emergency management information (i.e. DEMHS site that can be linked to).	*DEMHS 1*	*Medium*	*All*	Website nearing completion, also have a location to share documents and calendars amongst Regional Emergency Planning Team (REPT) participants. Continued strategy for 2016-2021 plan update.
7.	Identify a Regional Resource for Benefit Cost Analysis	*SWRPA, DEEP*	*High*	*All*	No major progress to date. Change "who" from DEEP to DEMHS, who now handles hazard mitigation efforts
8.	Participate in the development of the state drought management plan.	*SWRPA, DEEP*	*Medium*	*Drought*	State drought plan currently being drafted. Continued strategy for 2016-2021 plan update.
9.	Hold Semiannual meeting with PDM Advisory Committee to discuss progress towards plan implementation, best practices, and collaboration.	*SWRPA, PDM AC*	*Medium*	*All*	Completed: conducted as part of ongoing Hazard Mitigation Plan maintenance and implementation. Continued strategy for 2016-2021 plan update
10.	Work with local municipalities to identify and coordinate desired training programs that may be beneficial in improving mitigation practices in the region.	*SWRPA, DEMHS, DEEP*	*Low*	*All*	Subject to training program availability. Continued strategy for 2016-2021 plan update.
11.	Continue to work to have an Army Corps of Engineers Reconnaissance Study conducted of the Region's rivers and streams.	*SWRPA, Congress, ACOE*	*High*	*Flood, Severe Storm, Hurricane, Tornado*	Continued strategy for 2016-2021 plan update. Congressman Himes remains committed to continuing efforts to bring study to Fairfield County.

4.4 Specific Mitigation Actions and Projects

As defined in FEMA's Local Mitigation Handbook (2013), a mitigation action is a specific action, project, activity, or process taken to reduce or eliminate long-term risk to people and property from hazards and their impacts. The SWR and its eight municipalities are committed to reducing risk to and associated damage from natural disasters.

Following the review of 2011 strategy updates presented in Section 4.3.3, successive meetings with each municipality were conducted to identify new mitigation actions for inclusion in the 2016 update. The new mitigation actions and projects also included those strategies carried over from 2011 and in some cases, were revised to reflect changes in priorities or revised to reflect new project phases.

Specific 2016 Mitigation Actions and Strategies by region and each individual municipality are illustrated in this section. The strategies presented below house at least one action per hazard, for each municipality, there is also an emphasis on both new and existing buildings, as well as infrastructure.

4.4.1 Action Prioritization

The 2016 HMP Update utilized the FEMA-developed "STAPLEE" method to accurately assess and prioritize corresponding Mitigation Strategies and Actions. The STAPLEE method provides a systematic approach to addressing all strategies in a consistent and uniform manner, articulating the various dimensions of feasibility criteria that must be considered before an action is implemented. Seven distinct categories comprise the STAPLEE Feasibility Criteria, which are highlighted below.

- Social
- Technical
- Administrative
- Political
- Legal
- Economic
- Environmental

Specific meeting dates, by municipality, where 2016 Mitigation Strategies were prioritized and rated using the STAPLEE Criteria can be found in Chapter 2 as part of Table 2.1.3-1

4.4.2 Action Plan

As discussed above, new and carryover 2016 Mitigation Strategies were developed and prioritized using FEMA's STAPLEE Feasibility Criteria. When prioritizing the strategies, participants were provided with an assortment of supplemental materials aimed towards assisting in weighing associated benefits and costs for each action and utilized for each STAPLEE criteria category. A priority rating score was established and is summarized in the bullets presented below.

Priority Rating Methodology:

0 = Very Low Priority; no tangible benefits
1 = Low Priority; benefits unlikely, costs are likely
2 = Medium Priority; benefits likely, costs unlikely
3 = High Priority; tangible benefits, no significant costs

In addition to using the FEMA STAPLEE guidance in rating and prioritizing strategies, a supplemental STAPLEE matrix was created and is presented below:

A value from zero (0) to three (3) was assigned for each STAPLEE feasibility criteria, the sum total of all seven categories, divided by seven (7) served as the "Total Score", for which the priority rankings were assigned. It is also worth noting that where priorities based on the Total Score deviated from the viewpoint of participants, the appropriate priority was assessed and contained an explanation of why the final priority ranking differed from the ranking methodology described above. For example, if a total score equaled 1 and was thus a Low Priority, but local officials felt that the specific action should remain a high priority, the high priority ranking was assigned, along with an explanation as to why.

In addition, the planning teams for each municipality also considered the following factors in their assessment of Mitigation Strategies:

- Feasibility of implementation
- Potential mitigation gains/benefits, including secondary gains/benefits,

such as:

- Avoiding and reducing future losses
- Improvement upon existing programs
- Supporting other municipal priorities
- Potential costs, including unforeseen consequences and any resulting adverse impacts
- Consistency with goals, objectives, and actions identified in State of Connecticut Natural Hazard Mitigation Plan
- Continued compliance with NFIP

4.4.3 2016 Mitigation Strategies by Municipality

As noted in Table 2.1.3-1 in Chapter 2, which highlights the specific meetings and workshops where 2016 Mitigation Strategies were discussed, the tables presented below capture all strategies for the region and each separate, distinct municipality. These strategies comprise the 2016 HMP Update Mitigation Strategies, and serve as the basis for which Chapter 5 "Plan Maintenance.

Each Mitigation Strategy table includes the following information for each hazard mitigation activity:

- Supporting Recommendation: describes specific action activity which supports the corresponding Goals and Objectives of that section.
- Who: articulates the responsible party, agency and/or municipal department tasked with implementation of the stated Mitigation Strategy.
- STAPLEE Priority and Feasibility Criteria: described in more detail above in the "Action Prioritization" section.
- Total Score: average value of STAPLEE rating criteria (sum total/7), used as primary basis for Priority ranking.
- Priority: identifies priority level (i.e. high, medium, low) assigned to the action. Based on the seven STAPLEE ratings and Total Score columns, unless otherwise specified.
- Potential Funding Source: lists potential funding sources (where applicable), by agency.
- Estimated Cost: provides cost estimate associated with implementation of mitigation action/strategy. Estimates are based on the best available information, but are subject to change.
- Hazard Addressed: depicts the natural hazard(s) targeted by the mitigation action
- Approximate Timeline: provides estimate of time needed to complete and implement mitigation action. Where actions are anticipated to take longer than five years, an time estimate of the first project phase is provided.

Figure 4.4.2-1: Example- STAPLEE Stat Card

Mitigation Strategy:

Hazards Addressed:

Responsible Party:

WCCOG

Criteria	Question	NO!	unlikely	likely	YES!
Social	Are there social benefits?				
Technical	Will the strategy solve the problem?				
Administrative	Does your town have all the capabilities to implement/maintain the strategy?				
Political	Is there public and political support for this strategy				
Legal	Is there state and legal authority to implement this strategy				
Economic	Is the strategy affordable, with readily/easily available financial support?				
Environmental	Are there primarily environmental benefits associated with the strategy?				

Potential Funding Source:					
Aprox. Cost		$5-25k	$25-50k	$100-500k	>500k*
Aprox. Time Line		Annually	< 1 year	1-3 years	>3 years*
Strategy Type		Infrastr.	Societal	Ecosys.	Other*

* Please write in response in the empty space to the left.

STAPLEE Question adapted from FEMA

Table 4.4.3-1: Summary of 2016 Mitigation Strategies by

	Education and Outreach			Emergency Preparedness and Response					Prevention				Structural and Other Physical Projects				Natural Resource Protection		
Mitigation Strategies	Informational Public Outreach	Targeted Public Outreach	Intra-municipal Coordination and Outreach	Improve Coordination and Working Relationships	Develop/Improve/Maintain Notification/Warning and Communication Systems	Integrate/Expand/Maintain Emergency Software and Mapping Capabilities	Trainings and Exercises	New/Upgraded Facilities/Equipment	Identify/Assess Risks and Vulnerabilities	Identify/Assess/Protect Vulnerable Populations and Assets	Enhance/Strengthen Planning, Zoning, Building and Development Regulations	Encourage/Require Resiliency Techniques to Properties in Hazard Prone Areas	Property Acquisition/Relocation	Improve Drainage, Culverts, Roads, and Bridges (including Maintenance)	Protect/Improve Utility Infrastructure	Harden/Strengthen Critical Assets	Encourage/Incorporate Best Management Practices to Reduce Hazard Impacts	Tree Management and Maintenance	Implement/Maintain Natural Mitigation Systems
Darien	✓	✓	✓	▪	✓	✓	✓	▪	✓	✓	✓	✓	▪	✓	✓	✓	✓	▪	✓
Greenwich	✓	✓	▪	✓	✓	✓	✓	✓	✓	✓	✓	✓	▪	✓	✓	✓	✓	✓	✓
New Canaan	✓	✓	▪	✓	✓	▪	▪	✓	✓	✓	▪	▪	✓	✓	✓	✓	▪	✓	▪
Norwalk	✓	✓	▪	✓	✓	▪	✓	✓	✓	✓	▪	▪	▪	✓	✓	✓	✓	✓	▪
Stamford	✓	▪	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Weston	✓	✓	▪	▪	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	▪
Westport	✓	✓	▪	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Wilton	✓	▪	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	▪	✓	✓	✓
Region	✓	✓	✓	✓	✓	✓	✓	▪	✓	✓	▪	▪	▪	▪	▪	▪	✓	✓	▪

4.4.3.1 Darien 2016 Mitigation Strategies

Challenges

Portions of Darien have historically experienced repetitive losses due to flooding, in particular Noroton Bay and Tokeneke neighborhoods. Darien has limited options to address drainage issues in Noroton Bay and Tokeneke because these areas are served by privately held roads and drainage systems.

U.S. Route 1 near the railroad bridge experiences regular flooding as a result of rain events. Due to the geometry of the roadway, rail bridge and adjacent development, solutions to address this problem are cost prohibitive and could cause major disruptions to rail service and the community.

A Darien-sponsored study found that localized flooding of a portion of Heights Road was attributable to an undersized drainage culvert under I95. This culvert cannot handle peak storm flows from upstream. The study also looked into existing conditions downstream to evaluate the potential for downstream flooding, once the culvert under I95 was corrected.

Mitigation Strategies

Features highlighted in gray are "High Priority"

Darien Table Key: Building = Town Building Department; CTDEEP = CT Department of Environmental Protection; CTDOT = CT Department of Transportation; DEMHS 1= CT Division of Emergency Management & Homeland Security Region 1; DPW = Department of Public Works; EM = Emergency Management (Director of EM, Fire and Police); FM = Fire Marshal; IT = Town Information Technology Department; IWC = Inland Wetlands Committee; HD = Health Department; P&Z = Planning and Zoning Commission; Staff = Various Town Staff; Metro-North = Metro-North Railroad; OPM = CT Office of Policy & Management; EPA = Environmental Protection Agency; FTA = Federal Transit Administration

*Rated a high priority by municipality, independent of STAPLEE results

Goal 1: Reduce the loss of life, property and economic consequences as a result of flooding, high winds, severe storms and dam failure.

Table 4.4.3.1-1 Darien 2016 Mitigation Strategies Objective A: Educate the public in the areas of natural disasters, mitigation activities and preparedness.

ID	Supporting Recommendation	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Targeted outreach and education to vulnerable communities and neighborhood associations to inform them of natural hazards that may impact them. Includes preparedness techniques such as understanding why voluntary evacuations should be taken seriously, the potential for emergency responders to not access parts of the community during severe events, and other concerns.	*EM*	*3*	*2*	*3*	*3*	*3*	*3*	*0*	*2.429*	*High**	*FEMA, Town*	*$5,000-25,000*	*All*	*Annually*

2.	Develop a series of additional brochures or website information promoting 'best management practices' for natural resources targeted to homeowners. Brochure examples include: sound landscaping practices and stormwater management; how to protect wetlands; understanding tidal wetlands.	*Planning, DPW*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*Medium*	*FEMA/ DEMHS, Town, EPA, DEEP*	*$5-25k*	*Flooding, Coastal Storms*	*1year, bi annually*

Table 4.4.3.1-2 Darien 2016 Ongoing Practices, Objective A: Educate the public in the areas of natural disasters, mitigation activities and preparedness.

ID	Ongoing Practices	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Make available information on natural disasters and preparedness on Darien's website with links to state and federal resources.	*EM*	*3*	*2*	*2*	*3*	*3*	*3*	*2*	*2.57*	*High*	*Town, FEMA/ DEMHS*	*$0-10k*	*All*	*Annually*
2.	Review and continually update Darien's GIS system with information on Natural Disasters and other map layers that can be accessed for emergency as well as planning.	*Planning & Zoning, EM*	*2*	*2*	*3*	*3*	*3*	*1.5*	*2*	*2.36*	*Medium*	*FEMA/ DEMHS*	*$5-50k*	*All*	*bi-annual*

Table 4.4.3.1-3 Darien 2016 Mitigation Strategies, Objective B: Ensure proper functioning of critical facilities and reduce business disruptions as a result of Natural Hazards.

ID	Supporting Recommendation	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Encourage wherever possible the under-grounding of all utilities to minimize service disruptions due to inclement weather. Require all new development and subdivisions to install underground utilities.	*P&Z*	*2*	*2*	*2*	*2*	*3*	*2*	*2*	*2.14*	*Medium*	*Town*	*0*	*Wind-storms, Tornadoes, Severe Winter Storms, Hurricanes, Coastal Storms*	*Annually*
2.	Work with CTDOT and DEEP to maintain flow of streams through expansive wetlands.	*P&Z, DPW*	*2*	*2*	*2*	*2*	*2*	*2*	*3*	*2.14*	*Medium*	*Town*	*5-25k*	*Flooding, Coastal Storms, Hurricane*	*Annually*
3.	Continue to incorporate recommendations from the Stony Brook Watershed Study.	*P&Z, DPW*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2.00*	*Medium*	*FEMA/ DEMHS, DEEP, EPA, OPM, Town*	*5-25k*	*Flooding, Coastal Storms, Hurricane*	*Annually*
4.	Consider conducting drainage and watershed evaluations for the remaining waterbodies in the town.	*P&Z, DPW*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2.00*	*Medium*	*DEEP, EPA,*	*25-50k*	*Flooding, Coastal Storms, Hurricane*	*2 years*

5.	Support activities and policies that preserve the quantity and quality of drinking-water aquifers and protect primary and secondary aquifer recharge areas.	*HD, P&Z*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3.00*	*High*	*Town*	*5-25k*	*Drought*	*Annually*
6.	Bridges, roadways and culverts, including those over navigable waterways should be maintained, inventoried, operated, repaired, and built to avoid or reduce potential for any significant adverse impacts on navigation, safety, environmental quality.	*DPW*	*2*	*2*	*2*	*2*	*3*	*3*	*2*	*2.29*	*Medium*	*Town*	*5-25k*	*Flooding, Coastal Storms, Hurricane*	*Annually*
7.	Maintenance of an emergency operations center or equipment to sustain critical facilities in the event of a disaster (i.e. obtain additional generators).	*EM, Fire, Police*	*3*	*3*	*3*	*3*	*3*	*3*	*2*	*2.86*	*High*	*FEMA/ DEMHS, Town*	*$5-25k*	*All*	*Annually*
8.	Assess and evaluate vulnerability of critical facilities to natural hazards as work is conducted/ performed	*P&Z, DPW, Building, HD, EM*	*2.5*	*2*	*2*	*3*	*3*	*2*	*2.5*	*2.43*	*Medium*	*FEMA/ DEMHS, Town*	*$50-200k*	*All*	*1-3years*
9.	Evaluate the town's sheltering needs for severe storm events.	*EM, Fire, Police*	*3*	*3*	*3*	*3*	*3*	*2*	*2*	*2.71*	*High*	*FEMA/ DEMHS, Town*	*$5k-1m+ depending on activity*	*All*	*To be addressed in 2016-2021 plan update*
10.	Conduct an engineering study to access the flood impacts and associated mitigation measures along Route 1 at the Metro-North rail overpass	*CTDOT, Metro-North, Town*	*3*	*3*	*0*	*3*	*3*	*1*	*3*	*2.29*	*High**	*FEMA, FTA, CTDOT*	*$500,000-1 million+*	*Flooding, Coastal Storms, Hurricane, Severe Winter Weather, Severe Storms, Climate Change*	*To be addressed in 2016-2021 plan update*
11.	Conduct outreach and education to volunteer Fire Department staff regarding emergency shelter operations, including associated protocols and best management practices.	*EM, Fire*	*3*	*2*	*3*	*3*	*3*	*3*	*0*	*2.43*	*High**	*FEMA, DEMHS, Town*	*$5,000-25,000*	*All*	*Annually*

Table 4.4.3.1-4 Darien 2016 Mitigation Strategies, Objective C: Improve the ability of Darien residents to prepare and respond to Natural Hazards.

ID	Supporting Recommendation	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Upgrade and maintain emergency notification system.	*EM*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3.00*	*High*	*Town*	*$14k*	*All*	*Annually*
2.	Take advantage of Darien's web site to disseminate information to residents (http://www. dari-enct.gov).	*EM, DPW, EM, HD, P&Z, CEO*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3.00*	*Medium*	*Town*	*$5-25k*	*All*	*Annually*
3.	Maintain the Federal Flood Insurance Program which provides insurance for property owners in flood hazard areas, but encourage development to be located outside flood-prone areas wherever possible, including increased setbacks to account for sea level rise.	*P&Z*	*3*	*0*	*3*	*3*	*3*	*3*	*3*	*2.57*	*High*	*FEMA, Town*	*25k*	*Flooding, Coastal Storms, Hurricanes*	*Annual ongoing*
4.	Support and encourage the development of Long Range Water Supply Plans, to meet the future water supply needs.	*P&Z, HD, DPW*	*2*	*2*	*0*	*3*	*3*	*3*	*3*	*2.29*	*Medium*	*DEEP, EPA, OPM*	*$25-30k*	*Drought*	*1-5 years*
5.	Ensure that redevelopment does not increase stormwater runoff, utilizing "green" technology such as: rain barrels, rain gardens, and other technology where applicable.	*P&Z*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3.00*	*High*	*Town*	*5k*	*Flooding, Coastal Storms, Hurricanes*	*Annual ongoing*

Table 4.4.3.1-5 Darien 2016 Mitigation Strategies, Objective D: Improve the ability of the town of Darien to prepare and respond to Natural Hazards.

ID	Supporting Recommendation	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Hold annual meetings with departments that may need to respond to natural disasters, focused on sharing information, coordination, and developing protocols.	*EM, DPW, Fire, Police, HD, P&Z, CEO*	*2*	*0*	*3*	*3*	*3*	*3*	*2*	*2.29*	*Medium*	*Town*	*5k*	*All*	*As needed, annually*
2.	Maintain and update secure website to be used to share data and information with emergency management and the EOC during a natural disaster.	*EM, P&Z, DPW*	*2*	*2*	*3*	*2*	*3*	*2*	*2*	*2.29*	*Medium*	*FEMA/ DEMHS, town*	*25-100k*	*All*	*Annual as needed*
3.	Work with DEMHS to enhance Training and exercises on disaster responses and education on Property damage assessment forms.	*EM, DPW*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3.00*	*High*	*FEMA/ DEMHS, EPA, DEEP, OPM, Town*	*$5-100k*	*All*	*Annually*
4.	Support regulatory changes recommended in the PoCD regarding Zoning, Subdivision, Inland Wetlands and Watercourses regulations; and Harbors Ordinances.	*P&Z*	*3*	*2*	*2*	*2*	*3*	*2*	*3*	*2.43*	*Medium*	*Town*	*5k*	*Flooding, Coastal Storms, Hurricanes*	*Annually*
5.	Explore ways to protect and preserve open space, particularly coastal lands, wetlands and land within the flood plain. Acquire or protect land in the flood zone to minimize the risk of flooding.	*P&Z*	*3*	*3*	*2*	*2*	*3*	*1.5*	*3*	*2.50*	*High*	*FEMA/ DEMHS*	*Varies by property*	*Flooding, Coastal Storms, Hurricanes*	*Annually*

6.	Continue to provide capital budget funds for drainage projects and investigation of drainage problems.	*DPW*	*3*	*2*	*2*	*2*	*3*	*2*	*3*	*2.43*	*High*	*Town, EPA, DEEP*	*$25k*	*Flooding, Coastal Storms, Hurricanes*	*1-5 years*
7.	Continue to encourage best management practices, including innovative Low-Impact Development (LID) practices, for managing stormwater runoff.	*P&Z*	*3*	*2*	*2*	*3*	*3*	*3*	*2*	*2.57*	*High*	*EPA,DEEP, Town*	*$10k*	*Flooding, Coastal Storms, Hurricanes*	*1-5 years*
8.	Support local, regional and state efforts to provide protection and preservation of groundwater aquifers.	*HD*	*3*	*1*	*2*	*2*	*3*	*3*	*1*	*2.14*	*Medium*	*EPA, DEEP*	*$5k*	*Drought*	*Annually*

4.4.3.2 Greenwich 2016 Mitigation Strategies

Challenges

- Several A-Zones still exist where no elevations have been determined on the FIRM maps which make it difficult to apply appropriate standards during the review process.
- The cumulative impact of development in riverine flood areas poses new issues that need to be addressed in the flood sections of the Building Zone Regulations.
- The Town has developed a telephone number to broadcast emergency information, but the notification process for warning residents' townwide or in particular storm hazard areas can be further addressed.
- Information on emergency preparedness for residents would help educate about potential hazards and risks and provide information that can be used to prepare for such events.
- DPW-Highway facility at Indian Field Road does not have generator independence and a loss of power could affect radio communications and fueling functions at the facility.
- DPW-Highway employees on plow and salt and sand routes must rest according to requirements during long and frequent shifts.
- DPW-Highway vehicles must return to the southern portions of Town to reload sand and salt which may require driving miles from their plow routes.
- Use of GIS resources would allow the Town to study (estimate) the number and location of properties and structures within areas that could be affected by dam failure
- Groundwater/ surface water studies should be expanded to include private wells.
- Dry hydrants that work or do not work during drought conditions have not been identified.
- Droughts may occur during winter months when irrigation and pool filling are not yet factors contributing to the drought.
- Opportunity exists to improve the state drought plan to address regional drought issues Proposed Mitigation Strategies

Mitigation Strategies

Features highlighted in gray are "High Priority"

Greenwich Table Key: Building = Building Department; CEO = Chief Elected Official/First Selectman; Cons = Conservation; CTDEP = CT Department of Environmental Protection; CTDOT = CT Department of Transportation; DEMHS = CT Division of Emergency Management & Homeland Security; DPW= Department of Public Works; EOM = Emergency Operations Manager; FECB = Flood & Erosion Control Board; Fire = Fire Department; GIS = Geographic Information Systems Department; Health = Health Department; IWWA= Inland Wetlands & Water Agency; P&Z = Planning & Zoning; TW = Tree Warden; Utilities = Local Utility Companies; ZEO = Zoning Enforcement Officer, WCCOG = Western Connecticut Council of Governments (formerly SWRPA); USGS = United States Geological Survey; NRCS = National Resources Conservation Service; Fleet = Town Fleet (vehicle) Maintenance

*Rated a high priority by municipality, independent of STAPLEE results

Goal 1: To reduce the loss of life and property and economic consequences as a result of natural disasters.

Table 4.4.3.2-1 Greenwich 2016 Mitigation Strategies, Goal 1

Objective A: Expand maintenance activities and execute specific projects that address known drainage issues within the municipality.

Objective B: Review use of town regulations to minimize the impacts of new development on man made and natural drainage systems and to insure development within flood zones is appropriate.

Objective C: Petition FEMA to update the Flood Insurance Rate Maps and Floodway Maps.

Objective D: Improve and expand current flood warning systems and flood response procedures.

ID	Supporting Recommendation	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Focus on implementing public safety projects identified in the town drainage studies.	DPW	3	3	2	3	3	2	1	2.43	Medium	Capital Improvements, CTDOT	1-10m	Flooding	Phase 1 to be addressed within 5 year performance period
2.	Conducting drainage and watershed evaluations for all waterbodies in the town. (Looking at water quality)	DPW	3	2	2	3	3	2	3	2.57	High	Town, CTDEEP	$500,000+	Flooding	To be addressed within 5 year performance period
3.	Continue proper operation and maintenance of storm water system.	DPW	3	2	2	3	3	3	2	2.57	High	Town	1-2m	Flooding	Annually
4.	Continue to provide capital budget funds for drainage projects and investigation of drainage problems.	CEO, DPW	3	3	3	3	3	3	1	2.71	High	Town - Capital Improvements	1m	Flooding	Annually

5.	Work with the Army Corps of Engineers to address the Byram river areas, such as the Route 1 bridge, Byram and Pemberwick.	DPW	3	2	2	3	3	2	1	2.29	Medium	Town-Capital Improvements	30-40m	Flooding	Multi-phased project, initial work will be conducted within 5 year performance period
6.	Work with the state to inventory condition of town owned culverts, bridges and dams and repair and place as needed.	DPW, CTDEEP, CTDOT	3	3	3	3	3	3	1	2.71	High	Town-Capital Improvements, CTDOT	1-10m	Flooding	Annually
7.	Evaluate Binney Park storage shed to determine appropriate flood proofing method, such as raising its elevation.	P&R	2	2.5	2	3	3	1.5	2	2.29	Medium	FEMA, DEMHS, Town	$500,000+ (depending on measure taken)	Flooding	To be addressed within 5 year performance period
8.	Implement improvements described in the Old Greenwich Business District and Surrounding Streets- Drainage Study.	DPW	3	2	3	3	3	2	1	2.43	Medium	Town,	10-15m	Flooding	Annually
9.	Request that FEMA and Army Corps of Engineers reevaluate the Flood Insurance Rate studies for riverine sections.	P&Z, ZEO	3	3	2	3	3	3	3	2.86	High	USACOE, FEMA	5-25k	Flooding	To be addressed within 5 year performance period
10.	Conduct education and outreach regarding Best Management Practices (BMPs) for maintaining and restoring tidal wetlands.	P&Z, CC	3	2	3	3	3	3	3	2.86	High	Town, NOAA, EPA, DEEP	5-25k	Flooding	Annually
11.	Maintain the NFIP. Also promote mitigation of properties in the flood zone, including first floor elevations to account for Sea Level Rise	P&Z, CC	3	2.5	3	3	3	1.5	2	2.57	High	FEMA, HUD, State of CT Agencies	10m+ (depending on mitigation technique and property value)	Flooding, Sea Level Rise	Annually

12.	Evaluate and implement a strategy for a living shoreline (ex. To protect Greenwich Point and surrounding area).	CC, P&Z, P&R	3	2	3	2	3	1.5	3	2.50	High	NOAA, HUD, USACOE, FEMA, DEMHS, OPM, CIRCA	$1m+	Flooding, Hurricanes, Severe Weather, Wind, Sea Level Rise	2-5 years
13.	Vulnerability Assessment of town owned infrastructure	EM,DPW, WCCOG	3	2	3	3	3	3	1.5	2.64	High	Town, FEMA/ DEMHS, WCCOG	$100-500k	All Hazards	1-2 years
14.	Manage roadside forests to reduce storm impacts.	CL&P, P&R, Town	3	2	2.5	3	3	3	1.5	2.57	High	Town, Private	1m-2m	Wind, Snow	Annually
15.	Conduct a town wide tree management program	DPW, Private, Citizens	3	2	3	2	2	3	1	2.29	Medium	Town, FEMA/ DEMHS, OPM	1.5M+	Flooding, Ice/snow, wind	< 5years

Table 4.4.3.2-2 Greenwich 2016 Ongoing Practices, Goal 1

Objective A: Expand maintenance activities and execute specific projects that address known drainage issues within the municipality.

Objective B: Review use of town regulations to minimize the impacts of new development on man made and natural drainage systems and to insure development within flood zones is appropriate.

Objective C: Petition FEMA to update the Flood Insurance Rate Maps and Floodway Maps.

Objective D: Improve and expand current flood warning systems and flood response procedures.

ID	Ongoing Practices	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Maintain available shelters and certification by the American Red Cross.	EOM, Red Cross	3	2	2	3	3	2	2	2.43	Medium	FEMA, DEMHS, Town, Private	50-100k	All	Annually
2.	Review and update memorandums of understanding as needed with Red Cross and transportation providers to make sure they meet the needs of the Town in the event of a flood event.	EOM, Health	3	2	2	3	3	2.5	2	2.50	High	Town	5-25k	All	Annually/as needed
3.	Continue to maintain and prepare vehicles to be used in the event evacuations are required during flooding	Police, Fleet	3	2	3	3	3	2	2	2.57	High	FEMA, DEMHS, Town	50-200k	All	Annually
4.	Maintain and continue to identify sites for stream and tidal gauges.	DPW, CC	3	3	3	3	3	3	2	2.86	High	USGS, NOAA, FEMA, DEMHS, Town	50-100k	Flooding, Sea Level Rise, Hurricanes, Drought	Annually (ongoing)
5.	Continue to review and investigate flood damage to structures with permit application and upon complaints.	DPW	3	1.5	3	3	3	3	1	2.50	High	Town	25-50k	Flooding, severe storm	Annual

Goal 2. Reduce the risks of damage to private and public facilities caused by severe storms.

Table 4.4.3.2-3 Greenwich 2016 Mitigation Strategies, Goal 2

Objective E: Continue and expand current maintenance activities, inspections, and requirements and education programs that reduce the vulnerability of existing and new development to severe storm damage.

Objective F: Continue and expand activities related to severe storm warning and emergency preparedness.

Objective G: Improve and expand the town's current severe storm response capabilities.

ID	Supporting Recommendation	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Mitigate flooding in Cos Cob region and Cos Cob Firehouse.	DPW, Fire, Engineering	3	3	3	3	3	1.5	1	2.50	High*	FEMA/ DEMHS, OPM, USDOT/ CTDOT, Town, DEEP, EPA, WCCOG	1m-23m, dependent on construction option	Flooding	Phase 1 : 3 years
2.	Improve resiliency of the Waste Water Treatment Plant (e.g. Develop Berm, Raise the plant, Relocation)	DPW	3	3	3	3	3	1.5	3	2.79	High*	Town, DEEP/ EPA, NFWF, FEMA/ DEMHS	$30m+	Flood, storm surge, SLR	3-8 years
3.	As needed procure equipment to sustain critical facilities in the event of a disaster (i.e. obtain additional generators) to enhance EOC capabilities.	EOM	3	2	2	3	3	1	2	2.29	Medium	FEMA,DEMHS	100-500k+ (depending on measure taken)	All	Annually
4.	State to evaluate and monitor conditions of all of dams and promote maintenance and repair.	CTDEEP	3	2	1	3	3	2	1.5	2.21	Medium	FEMA, OPM, EPA, DEEP, USFWS, NOAA	500k+ depending on maintenance activities	Dam Failure	Annually
5.	Explore improvements to telecommunications systems to minimize disruption and delays during an emergency. Continue to maintain emergency notification system and upgrade as needed.	EOM, Utilities	3	2	2	3	2	1	1	2.00	Medium	FEMA, DEMHS, Utilities	50-100k+ (depending on measures taken)	All	Annually

6.	Evaluate municipalities' sheltering and evacuation needs for a variety of storm scenarios.	EOM, DEMHS, WCCOG	3	2	3	3	3	2.5	2	2.64	High	FEMA, DEMHS, OPM, USDOT, CTDOT	50-150k	Hurricane, Severe Storms, Tornado, Earthquake	1-3 years
7.	Improve and enlarge storage of fuel tanks	Fleet DPW	3	3	3	2	3	2	2	2.57	High	Town	$100-500k	All Hazards	1-3 years
8.	Develop communication & education strategy for at risk populations & disaster preparedness.	EOM	3	2	3	3	3	3	1.5	2.64	High	Town, HUD, CDDG, FEMA/ DEMHS,	50-100k	All Hazards	Annually
9.	Provide targeted education and outreach for households in isolated locations (Isolated during hazards).	EOM, Neighborhood Associations, CC	3	3	3	3	3	3	2	2.86	High*	Town, HUD, CDDG, FEMA/ DEMHS,	$100-500k	All Hazards	1-3 years
10.	Improve Communication channel for residents	EM, IT, Police	3	3	3	3	3	3	2	2.86	High	Town, FEMA/ DEMHS, OPM	100k-500k	All Hazards	Annually
11.	Coordination and cooperation with utilities.	Utilities, WCCOG, CT and NY	3	3	0	3	3	0	3	2.14	Medium	FEMA/ DEMHS	500k+	Wind, Snow	Annually
12.	Work with State to enhance and maintain local information and data sharing using WEB EOC 7.1.	EOM	2	2	2	3	3	2	1	2.14	Medium	FEMA, DEMHS, Town	20-60k	All	Annually
13.	Implement and maintain interactive GIS software which coordinates with all town departments. (Monitors closed roads, downed trees, truck resources location.) Improved IT for live updates	All Town Dept., WCCOG	3	3	3	3	3	3	2	2.86	High*	FEMA/ DEMHS, OPM, USDOT/ CTDOT, Town	100k-300k +ongoing maintenance	All Hazards	1-3 years +annually
14.	Continue to work with DEMHS to enhance training and exercises on disaster responses and education on Property damage assessment forms.	EOM	3	2	3	3	3	2	2	2.57	High	FEMA, DEMHS, USDOT, CTDOT	15-100k (depending on exercise type and size)	All	Annually

15.	Work with DEMHS to complete and enhance the state and regional debris management plan and to address local needs.	EM, DPW, DEMHS	3	3	2	3	2	2	3	2.57	High	FEMA, DEMHS, DEEP, OPM, CTDOT, NRCS, EPA, USACOE	$100-500k	Severe Storm, Hurricane, Tornado	1-3 years
16.	Complete the Public Safety Complex.	DPW, EOM	3	3	3	3	3	3	1	2.71	High	Capital Improvements	20-25m	All	Phase 1 1-3 years
17.	Improve Power Grid Resiliency	CL&P	3	2	0	3	3	1.5	2	2.07	Medium	Private, FEMA/ DEMHS	500k+ millions	Wind	>3 years
18.	Upgrade and maintain storm drain system	DPW	3	2	3	3	3	2	3	2.71	High	Town, FEMA/ DEMHS, OPM, DEEP, EPA	>40k	Flooding	15 years total. Phase 1 to be addressed in 5 year performance period
19.	Work with Aquarion Water Company to encourage appropriate water line extensions to meet fire protection needs.	Fire	3	2	1	3	2	1	2	2.00	Medium	Town-Capital Improvements	500k+ (depending on length/ scope of extension)	All	To be addressed in 5 year performance period
20.	Plan for Fire house in North West Greenwich	CEO, DPW, Fire	3	2	1.5	2	3	1.5	1	2.00	Medium	Town-Capital Improvements	3-5m	All	3-5 years

Table 4.4.3.2-4 Greenwich 2016 Ongoing Practices, Goal 2

Objective E: Continue and expand current maintenance activities, inspections, and requirements and education programs that reduce the vulnerability of existing and new development to severe storm damage.

Objective F: Continue and expand activities related to severe storm warning and emergency preparedness.

Objective G: Improve and expand the town's current severe storm response capabilities.

ID	Ongoing Practices	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Maintain the town Drainage Manual to conform with CTDOT & CTDEEP regulations for storm drainage.	DPW	3	2	3	3	3	3	2	2.71	High	Town	10k	Flooding	Annually
2.	Continue process of reviewing plans to ensure compliance with snow and wind load requirements.	DPW	3	3	3	3	3	3	1	2.71	High	Town	10k	Severe Storm	Annually
3.	Continue program of obtaining new and up-to-date equipment for snow removal and sand/salt operations	DPW	3	3	3	3	3	3	1.5	2.79	High	Town	50-200k	Severe Storm	Annually
4.	Maintain identified snow emergency routes for DPW sand/salt and plow operations, update as needed.	DPW	3	3	3	3	3	3	1	2.71	High	Town	>5k	Severe Storm	Annually
5.	Continue practice of monitoring of weather updates.	DPW, EOM, Police	3	3	3	3	3	3	1	2.71	High	Town	>5k	All	Annually
6.	Review and update mutual aid agreements with surrounding municipalities for fire services.	Fire	3	2	3	3	3	2	2	2.57	High	Town	5-10k	All	Annually
7.	Continue to review Erosion and Sedimentation Control Plans and ensure that controls are installed properly prior to any storm event.	P&Z, IWWA, Conservation, DPW	3	3	3	3	3	2	3	2.86	High	Town	5-25k (regulatory portion)	Flooding, Severe Storm	Annually

Goal 3. Implement and expand drought mitigation plans and initiatives.

Table 4.4.3.2-5 Greenwich 2016 Mitigation Strategies, Goal 3

H. Update Drought Management Plan and review and update regulations as necessary.

I. Educate the public through additional outreach and notification processes.

ID	Supporting Recommendation	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Continue improving communications between the town, state and Aquarion prior to and during drought conditions.	CC	3	2	3	3	3	3	2	2.71	High	Town, Utilities	5-25k	Drought	Annually (ongoing as needed)
2.	Work with State to update the Drought Management Plan.	CC, Aquarion	3	2	3	2	2	2	2	2.29	Medium	Town, FEMA, DEMHS, Utilities, EPA, DEEP	25-50k	Drought	1-3 years
3.	Review USGS groundwater study and make recommendations for regulations to protect groundwater quality and quantity.	CC, Health, P&Z	3	2	2	2	2.5	3	3	2.50	High	Town, EPA, DEEP, USGS	5-25k	Drought	2-5 years
4.	Work with Aquarion Water Co. on infrastructure improvements, both in town and inter-town.	Aquarion, CC	3	2	3	3	3	2	3	2.71	High	Aquarion, Town	100-500k	Drought	Annually (ongoing strategy)
5.	Identify which dry hydrants work in drought conditions and which do not. Evaluate which hydrants may need to be deeper and areas where more hydrants need to be installed. Explore the need for underground storage tanks for fire protection should be required for new development	Fire, CC	3	3	3	3	3	2	2	2.71	High	FEMA, DEMHS, NRCS, USGS	50-75k	Drought	Annually
6.	Continue outreach programs encouraging water conservation.	Health, Aquarion, CC	3	2	3	3	3	3	3	2.86	High	Town	5-25k	Drought	Annually
7.	Maintain Emergency Operation Plan and specific information needed to respond to drought conditions.	EOM, CC, Health	3	2	3	3	3	3	3	2.86	High	Town	5-25k	Drought	Annually

4.4.3.3 New Canaan 2016 Mitigation Strategies

New Canaan has a relatively low vulnerability to flooding and subsequently took a modest approach towards natural hazard mitigation.

Challenges

New Canaan's town center is a very pleasant and pedestrian-friendly commercial district frequented by patrons throughout the year. However, heavy snow often interferes with the commercial activity because snow is piled along the edge of the sidewalks and interferes with pedestrian circulation. In response, the *Plan of Conservation and Development* proposed a designated disposal area for snow from the Town Center area. The Public Works Department built a designated snow disposal area in 2007.

The natural and artificial drainage system is negatively impacted by silting. For instance, Mill Pond and Mead Park Pond needed to be dredged because silt had reduced their flood storage capacity. Mill Pond is the only significant Town-owned body of water on the Five Mile River. It was dredged to a maximum depth of nine feet in 2008. Likewise, the Mead Park Pond is the only significant Town-owned body of water on the Noroton River. It is currently being dredged to a maximum depth of thirteen feet.

A fire horn mounted on the roof of the Fire Department at 60 Main Street served as the heart of New Canaan's emergency warning systems through 2001. This system was deactivated in 2001 because it became too costly to maintain, and pagers became the preferred method to notify emergency personnel. New Canaan has also instituted a Reverse 911 System to notify residents, emergency personnel and staff of emergency situations.

Saxe and West Middle Schools, as well as New Canaan High School serve as emergency shelters. The middle schools and the high school have power generators to use in emergencies, but they are not powerful enough to provide adequate heat or cooling in areas used for shelters. The Town is currently reviewing these facilities for upgrades to their generators.

Many of the residents located along the Five Mile River experience flooding, even after regular rain events. The town invested in a hydrologic study of the watershed to assess vulnerable areas and identify possible recommendations to alleviate flooding along the river. The study identified a number of recommendations, primarily engineering solutions, which have proven to be expensive and cost prohibitive.

Many New Canaan home and business owners have not had a major disaster and may underestimate the potential for a severe storm event, hurricane or other natural disaster to impact the community. High winds often damage trees and result in power outages, road closures, disrupted communication systems and damaged property. New Canaan has many beautiful tree lined streets that are admired by residents and passersby. Unfortunately, October rains often wash fallen leaves towards storm drains, which become clogged and cause localized flooding.

Mitigation Strategies

Features highlighted in gray are "High Priority"

New Canaan Table Key: BOS = Board of Selectmen; BOE = Board of Ed, Building = Town Building Department; CC = Conservation Commission; CL&P=CT Light & Power; DEEP = CT Department of Environmental Protection; CTDOT = CT Department of Transportation; DEMHS 1= CT Division of Emergency Management and Homeland Security Region 1; DPW = Department of Public Works; EM = Emergency Management (Director of EM, Fire and Police); FM = Fire Marshal; IT = Town Information Technology Department; IWC = Inland Wetlands Committee; HD = Health Department; P&Z = Planning and Zoning Commission; Staff = Various Town Staff; HUD = U.S. Department of Housing and Urban Development

*Rated a high priority by municipality, independent of STAPLEE results

Goal 1: To reduce the loss of life and property and economic consequences as a result of natural disasters.

Table 4.4.3.3-1 New Canaan 2016 Mitigation Strategies, Objective A: To reduce the likelihood of flooding by improving existing natural and artificial drainage systems.

ID	Supporting Recommendation	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Maintenance dredging of Mill and Mead Ponds, including other areas as necessary	*DPW*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*High*	*Town Operational, other as applicable*	*$20,000+/ year*	*Flooding*	*2 weeks*
2.	Reconstruct Nursery Road Bridge to widen waterway opening and mitigate flooding issues.	*DPW*	*3*	*2*	*3*	*1*	*3*	*3*	*2*	*2.4286*	*Medium*	*FEMA, DEMHS, DEEP, USACOE, CTDOT*	*Dependent on type of construction*	*Flooding*	*Dependent on type of construction*
3.	Purchase properties known to have flooding problems and that reside within the 100 year floodplain.	*DPW*	*3*	*0*	*1*	*0*	*1*	*1*	*1*	*1*	*Low*	*FEMA*	*Depends on value of property to be purchased*	*Flooding*	*Annually*

Table 4.4.3.3-2 New Canaan 2016 Mitigation Strategies, Objective B: Reduce the amount of debris from severe storms through preventive tree maintenance.

ID	Ongoing Practices	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Budget appropriate money necessary to maintain and remove dead, dying, dangerous or diseased trees.	*DPW*	*2*	*3*	*3*	*3*	*3*	*3*	*1*	*2.5714*	*High*	*Town Operational, other as applicable*	*$100,000 to $500,000+*	*Severe Storm, Hurricane, Tornado*	*Annually*

Table 4.4.3.3-3 New Canaan 2016 Mitigation Strategies, Objective C: Improve and expand current natural hazard emergency response capabilities.

ID	Supporting Recommendation	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Maintain a reverse 911 or similar system to alert residents of natural phenomena and if necessary, evacuation procedures.	*EM*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*High*	*Town Operational, other as applicable*	*$25,000+/ year*	*All*	*Annually*
2.	Enhance services to at-risk populations	*EM, HD, Various State Agencies*	*3*	*3*	*3*	*3*	*3*	*2*	*0*	*2*	*High*	*FEMA, HUD, CT Housing, DEMHS, Town General Fund*	$500,000+	*All*	*1-3 years*
3.	Develop a strategy and obtain the necessary equipment (including generators) to provide adequate heat at emergency shelters.	*DPW*	*3*	*3*	*3*	*3*	*3*	*1*	*3*	*2.7143*	*High*	*FEMA, DEMHS, other*	*~$1.5 million*	*All*	*1-3 years*
4.	Improve access along the transportation network during emergencies.	*DPW, CL&P*	*3*	*3*	*3*	*3*	*1*	*3*	*1*	*2.4286*	*High**	*FEMA, DEMHS, CTDOT, Town General Fund*	*$500,000+*	*Wind, Severe Storms, Severe Winter Weather, Tornado*	*1-3 years*
5.	Enhance the resiliency of the power grid. Explore options to install a micro-grid (gas-powered) for downtown and emergency services	*Town, CL&P, BOE*	*3*	*3*	*2*	*3*	*2*	*2*	*3*	*2.5714*	*High*	*FEMA, DEMHS, Utilities, DEEP, Town*	*$500,000+*	*All*	*1-3 years*

Table 4.4.3.3-4 New Canaan 2016 Mitigation Strategies, Objective C: Whenever practical, incorporate natural hazard mitigation strategies into existing municipal projects.

ID	Supporting Recommendation	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Review plans that fulfill DEEP Storm Water Management, Phase II requirements and identify projects that may be eligible for FEMA natural hazard mitigation grants.	*Wetlands*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*High*	*FEMA, DEEP, Town*	*$5,000 to 25,000*	*Flooding*	*Annually*
2.	Review completed drainage study of Five Mile River with an eye to adopting and instituting mitigation measures.	*DPW*	*3*	*1*	*2*	*1*	*2*	*2*	*2*	*1.8571*	*Medium*	*FEMA, DEMHS, DEEP, USACOE*	*$5,000 to 25,000 (review only)*	*Flooding*	*1-3 years (review only)*

4.4.3.4 Norwalk 2016 Mitigation Strategies

Challenges

- Due to mitigation, many Norwalk residents have not experienced a flood, hurricane or other natural disaster and may underestimate Norwalk's vulnerability to natural hazards.
- Norwalk is the most densely populated municipality in the South Western Region, which increases the potential loss of life and property from a natural disaster.
- Based on land use and development patterns throughout the city, urban flooding is a chronic problem, and often occurs as a result of regular rain events.
- The dam failure of the Browns and Grupes Reservoir Dams would result in catastrophic loss in the Silvermine Watershed and lower Norwalk River Watershed. These dams have sound structures, but the flood spillways of the Browns and Grupes Reservoir Dams do not meet State standards. The States of Connecticut and New York recommend dam improvements to address these deficiencies.

Mitigation Strategies

Features highlighted in gray are "High Priority"

Norwalk Table Key: Multiple = multiple agencies/departments; DEMHS = CT Division of Emergency Management & Homeland Security; DPW = Department of Public Works 1st District Water = Water Utility; OEM = Office of Emergency Management; Public Safety = Police; Finance = Department of Finance; P&Z = Planning and Zoning; CL&P = Connecticut Light & Power (utilities);

*Rated a high priority by municipality, independent of STAPLEE results

Goal 1: Reduce the loss of life and property and economic consequences as a result of flooding, high winds, severe winter storms and dam failure.

Table 4.4.3.4-1 Norwalk 2016 Mitigation Strategies Objective A: Improve the ability of Norwalk departments to prepare and respond to severe weather and other natural emergencies.

ID	Supporting Recommendation	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Provide adequate back-up generators at sanitary sewer pumping stations (in progress)	*Multiple*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3.00*	*High*	*FEMA, DEMHS, City/ Capital*	$25,000-50,000	*All*	1 year
2.	Provide adequate back-up generators at storm water pumping stations	*Multiple*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3.00*	*High*	*FEMA, DEMHS, City/ Capital*	$25,000-50,000	*All*	1 year
3.	Ensure the ability of Departments to function beyond first 24 hours by executing pre-positioned contracts for logistical support.	*OEM Purchasing/ Finance*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3.00*	*High*	*City*	*0*	*All*	*annually*

4.	Maintain the Federal Flood Insurance Program which provides insurance for property owners in flood hazard area. Participate in CRS program	*P&Z*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3.00*	*High*	*City*	*$5-25k*	*flooding*	*annually*
5.	Encourage development (especially higher density) to be located outside flood-prone areas wherever possible, including increased setbacks to account for sea level rise .	*P&Z*	*2.5*	*2*	*1*	*1*	*0*	*2*	*2*	*1.50*	*Low*	*City*	*<$5,000*	*Flooding, Sea Level Rise, Severe storms, Hurricanes*	*annually*
6.	Improve coordination with CL&P for emergency response efforts	*OEM, CL&P*	*3*	*3*	*3*	*3*	*0*	*3*	*3*	*2.57*	*High**	*DEMHS, CL&P/ PURA, City*	*$500,000+*	*Severe Winter Weather, Severe Storms, Tornado, Wind*	*1-3 years*
7.	Work to identify a suitable site to store DPW communications and vehicles out of harms way, during flood events.	*OEM, DPW, WPCA*	*3*	*2*	*2*	*2*	*3*	*3*	*0*	*2.14*	*High**	*DPW*	*$25,000-50,000*	*Flooding*	*1-3 years*
8.	Implement improvements described in the Old Greenwich Business District and Surrounding Streets- Drainage Study.	*DPW*	*3*	*2*	*3*	*3*	*3*	*2*	*1*	*2.43*	*Medium*	*Town,*	*10-15m*	*Flooding*	*Annually*
9.	Request that FEMA and Army Corps of Engineers reevaluate the Flood Insurance Rate studies for riverine sections.	*P&Z, ZEO*	*3*	*3*	*2*	*3*	*3*	*3*	*3*	*2.86*	*High*	*USAC-OE, FEMA*	*5-25k*	*Flooding*	*To be addressed within 5 year performance period*
10.	Upgrade the flood spillway of the Browns and Grupes Reservoir Dams.	*1st District Water*	*2*	*2*	*2*	3	3	2	3	*2.43*	*Medium*	FEMA, DEMHS, DEEP, USAC-OE, City	$1-3 million	*Dam Failure, Flooding*	*Annually*

Table 4.4.3.4-2 Norwalk 2016 Ongoing Practices Objective A: Improve the ability of Norwalk departments to prepare and respond to severe weather and other natural emergencies.

ID	Ongoing Practices	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Continue to maintain an emergency telephone notification system that allows the municipality to alert various segments of the population depending on the nature of the emergency. Encourage residents and businesses to update their contact information within the system.	*OEM*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3.00*	*High*	*city budget*	*$25,000-50,000*	*All*	*annually*
2.	Plan for the activation of the Emergency Operations Center and an alternate location, including equipment and staff with trained personnel.	*OEM*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3.00*	*High*	*city budget*	*$5,000-25,000*	*All*	*annually*
3.	Identify and prepare and/or update site-specific emergency evacuation plans for critical facilities such as Norwalk Hospital, King Industries, Merritt 7, Norden Place office park and other significant complexes as well as the gas pipeline, Public Works Center, Treatment Plant	*Public Safety*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3.00*	*High*	*city budget*	*$5,000-25,000*	*All*	*annually*
4.	Perform hazard analysis at WWTP/DPW center to identify areas of concern.	*DPW*	*3*	*2*	*3*	*3*	*3*	*2*	*3*	*2.71*	*High*	*EPA, DEEP*	*$500,000+ (depending on measure taken)*	*All*	3+ years
5.	Evaluate municipalities' sheltering and evacuation needs and how these needs can be met through local and regional sheltering concepts.	*OEM*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3.00*	*High*	*city budget*	*$5,000-25,000*	*All*	*annually*

Table 4.4.3.4- 3 Norwalk 2016 Mitigation Strategies Objective B: Improve the ability of Norwalk residents and business to prepare, respond, mitigate and recover to/from severe weather and other natural emergencies.

ID	Ongoing Practices	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Add natural hazards information to the annual Fire Dept Open House, web site and the public access channel.	*OEM*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3.00*	*High*	*city (if needed)*	*$0*	*All*	*annually*
2.	Provide outreach and education to all residents of their vulnerabilities to natural hazards. Ensure outreach is targeted to those with limited English proficiency, and those with visual/auditory impairments. Including preparedness, mitigation and recovery	*OEM*	*3*	*2*	*3*	*3*	*2.5*	*3*	*3*	*2.79*	*High*	*city*	*$0*	*All*	*annually*
3.	Identify special-needs populations for various hazards and equip emergency shelter with appropriate supportive equipment.	*Public Safety*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3.00*	*High*	*city*	*$10,000-25,000*	*All*	*annually*
4.	Provide presentations and workshops to community groups, non-profits and businesses to increase their ability to prepare and respond to emergencies.	*OEM*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3.00*	*High*	*city*	*$1,000-5,000*	*All*	*annually*
5.	Increase harbor shore communication and create an individual resiliency plan that assists in making at-risk residents more resilient to natural hazards. For example, teaching residents how to do a flood audit to protect/ safeguard against flooding	*OEM, Residents*	*3*	*2*	*0*	*3*	*3*	*0*	*3*	*2.00*	*Medium*	*FEMA, DEMHS, DEEP, USAC-OE, City*	*$100,000-$500,000*	*Flooding, Hurricane, Sea Level Rise*	*1-3 years*
6.	Build a barrier system to prevent debris associated with flooding from impacting King Industries and associated chemical storage	*Private (King Chemical)*	*3*	*2*	*0*	*2*	*2*	*2*	*3*	*2.00*	*Medium*	*EPA, DECD, FEMA, DEMHS, Private*	*$3+ million*	*Flooding, Hurricane, Sea Level Rise*	*5 years*

Table 4.4.3.4-4 Norwalk 2016 Mitigation Strategies Objective C: Whenever practical, incorporate natural hazard mitigation strategies into existing City projects.

ID	Supporting Recommendation	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Expand maintenance activities such as more frequent catch basin, storm drainage facilities and channel cleaning	*DPW*	*3*	*2*	*3*	*3*	*3*	*3*	*3*	*2.86*	*High*	*city (operating)*	*$100,000-500,000*	*Flood*	*annually*
2.	Request capital funding for drainage and flood mitigation projects throughout the City.	*DPW*	*3*	*2*	*3*	*2*	*2*	*2*	*3*	*2.43*	*Medium**	*Capital Improvements*	*$3million+*	*Flood*	3 years
3.	Raise at-risk pump stations to make them more resilient to natural hazards.	*DPW, OEM*	*3*	*2*	*0*	*2*	*3*	*0*	*3*	*1.86*	*Medium**	*FEMA, USACOE*	*$500,000+*	*Flood, Hurricane, Sea Level Rise*	*3+ years*
4.	Raise and expand levee protecting Wastewater Treatment Plant	*DPW, OEM*	*3*	*3*	*3*	*2*	*3*	*2*	*3*	*2.71*	*High*	*FEMA, EPA, DEEP*	*$4+ million*	*Flood, Hurricane, Sea Level Rise*	*3+ years*

Table 4.4.3.4-5 Norwalk 2016 Ongoing Practices, Objective D: Reduce the amount of debris from severe storms through preventive tree maintenance and debris planning

ID	Ongoing Practices	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Encourage more citizen participation to inventory and identify condition of street trees and integrate with City's GIS to optimize tree maintenance and mitigation activities.	*DPW, CL&P, Residents*	*3*	*3*	*2*	*2*	*2*	*0*	*3*	*2.14*	*Medium*	*CL&P, City*	*$500,000+*	*Severe Storms, Severe Winter Weather, Wind, Tornado, Earthquake*	*3+ to start, then conducted annually*
2.	Continue to fund the citywide tree planting and maintenance program. Assess condition of trees and work with Norwalk Tree Alliance in this effort.	*DPW*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3.00*	*High*	*city*	*50k+*	*Severe Storms, Tornado, Earthquake*	*annually*
3.	Prepare and maintain a debris management plan	*DPW*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3.00*	*High*	*city, FEMA, DEMHS*	*250,000+*	*Severe Storms, Tornado, Earthquake*	*annually*
4.	Replace diseased trees, plant new trees and improve street tree maintenance	*DPW*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3.00*	*High*	*city*	*50k+*	*Severe Storms, Tornado, Earthquake*	*annually*

4.4.3.5 Stamford 2016 Mitigation Strategies

Challenges

The following list provides insight into the specific challenges that Stamford faces in its natural hazard mitigation efforts.

1. Holly Pond is in need of dredging, particularly north of Mathew Street up to East Main Street. The cost to dredge Holly Pond was estimated to cost $12-16 million. Currently funds do not exist within the City's budget to cover the cost of dredging.
2. The seawall along this section of Holly Pond is in need of repair, which cannot be done until Holly Pond is dredged.
3. The Public Services Department would like to acquire a 1-acre piece of property currently being used as a junkyard. This property is just south of downtown at 128 Magee Ave., next to I-95, and located in the middle of public services facilities including a sewage treatment plant, Public Services vehicle maintenance garage, and a regional firefighters training center. The property could be used in conjunction with snow-melting machines and a storm-filtering station to serve as a melting station for excess snow. In addition, the property could be used as a staging area for large wood waste and for uniformed services.
4. The Parks Maintenance Department lacks the resources or equipment necessary to perform preventative tree maintenance.
5. The Mill River Corridor Project is very ambitious and will require diverse funding sources to accomplish all the action items such as those listed below.
    - The City is seeking funds to rebuild the closed vehicular West Main Street Bridge as a pedestrian bridge with a walking surface above the 100-year floodplain level. The City is preparing a contract for design of the replacement bridge, and there is $1.5 million in place from ISTEA funding to build it, although this is not likely to be sufficient to meet the actual cost.
    - Although a number of key properties were purchased and structures cleared, several critical properties, both residential and commercial, remain to be acquired. They include two commercial properties (0.25 acres total) and three residential properties (4 acres total). Thus far, the properties have been purchased with a combination of city funds, CTDEEP open space grants, and Federal NOAA grants. The City plans to pursue similar funding sources for the remaining properties.
6. The City wants to widen and raise the I-95 overpasses at Atlantic Street, Canal Street and Elm Street. These bridges range in height from 12 feet 6 inches to 13 feet and 1 inch and are subsequently too low for many trucks. In addition, these bridges are vulnerable to flooding, and the drainage issues would be addressed during the course of renovation.
7. The City of Stamford works to regularly maintain and service the storm drain system, and to monitor complaints received by citizens; however an improved recordkeeping system is needed to track complaints and maintenance, which can be accessed by other city departments as needed.
8. The stormwater runoff systems cannot currently handle 50-year storms. In general, the City needs to improve storm drain maintenance (inlets, outlets, culverts, and catch basins), maintain better records on the maintenance of the storm drainage infrastructure, and try to eliminate cross connections between the sanitary and storm systems.
9. Address drainage problems at the I-95 overpasses (between I-95 and Metro North train lines) located at Atlantic Street, Canal Street, and Elm Street. There is currently a feasibility study being done.
10. In the event of a natural disaster, over ten departments may need to provide a coordinated response. While there is a protocol for snow emergencies, additional protocols need to be developed for hurricanes and severe storms.
11. Some repairs were made in 2000 on the seawall at the south end of the Noroton River on Weed Avenue between Mathews Street and Cove Road; however, additional recommended repairs have been put on hold due to limited resources.

Mitigation Strategies

Features highlighted in gray are "High Priority"

Stamford Table Key: BOF = Board of Finance; CTDEEP = CT Dept of Environmental Protection; DoEC= Department of Emergency Communications; DEMHS = CT Division of Emergency Management and Homeland Security; EM = Emergency Management; Engineering = Engineering Bureau; Grants = Grants Administration Office; HD = Dept of Health; LU= Land Use Bureau; MRC = Mill River Collaborative; Operations = Office of Operations; Parks = Parks Department; TMS = Technology Management Services; Utilities = Local Utility Companies, NFWF = U.S. Fish & Wildlife Service.; EMPG = Emergency Management Performance Grants; USDOT = U.S. Dept of Transportation; OPM = CT Office of Policy & Management; ACOE = U.S. Army Corps of Engineers; HUD = U.S. Dept of Housing and Urban Development

*Rated a high priority by municipality, independent of STAPLEE results

Goal 1: To reduce the loss of life and property and economic consequences as a result of natural disasters.

Table 4.4.3.5-1 Stamford 2016 Mitigation Strategies, Objective A: Improve the City of Stamford's ability to prepare for and providing emergency and other public services in the event of a natural disaster.

ID	Supporting Recommendation	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Continue to hold annual meetings with departments that may need to respond to natural disasters, focused on sharing information, coordination and to develop protocols.	*EM*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3.00*	*High*	City	$25,000	*All*	*Annually*
2.	Update the EOC plan book with current contact information for "key" department personnel, resources and facilities; and all pertinent maps and city plans. Provide copies to each department head and "key" staff.	*EM, Operations*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3.00*	*High*	*City*	*$5,000-25,000*	*All*	*Annually*
3.	Evaluate the 911 center's ability to function during an emergency or natural disaster and increase and cross train personnel to accommodate the city's needs during a disaster. Explore adding clerical and/or technical support staff to EOC.	*EM, Operations*	*3*	*3*	*2*	*3*	*3*	*2*	*3*	*2.71*	*High*	*City, FEMA, DEMHS, EMPG*	*$60,000-80,000*	*All*	*Annually*

4.	Work with 911 center and emergency management to develop a system to handle call backs and coordination; and improve direct communications between the 911 center and emergency responders.	*EM, Operations*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3.00*	*High*	*City*	*$5,000-25,000*	*All*	*Annually*
5.	Work to develop a direct communications link between the EOC and 911 communications center.	*EM, Operations*	*3*	*2*	*3*	*2.5*	*3*	*1*	*3*	*2.50*	*High*	*City*	~$100,000 for set up	*All*	*1-3 years, then annually (dispatch as needed)*
6.	Identify ways to improve the use of GIS for use in identifying areas and facilities (including transportation assets) vulnerable to disasters and for use to enhance emergency management. Ensure that all critical systems maps are easily accessible to 911 and the EOC, including sewer and drainage system maps.	*TMS, EM, Operations, GIS*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3.00*	*High*	*City, FEMA, DEMHS, USDOT, CTDOT*	*$100,000-500,000*	*All*	*1-3 years (plan), then annually*
7.	Explore and develop a regional communications plan. Includes communications, sharing resources, identifying common strengths, weaknesses, and vulnerabilities. Identify opportunities to mitigate weaknesses and vulnerabilities.	*EM, TMS, Operations, DEMHS, WCCOG*	*3*	*2*	*3*	*3*	*3*	*3*	*1*	*2.57*	*High*	*FEMA, DEMHS, USDOT, CTDOT, OPM, City of Stamford*	*$100,000-500,000*	*All*	*1-3 years*
8.	Develop a coordinated evacuation and preparedness plan. Plan should address impacts to transportation corridors. Explore the use of color coded evacuation signs in vulnerable areas.	*EM, Operations, LU, Engineering, WCCOG*	*3*	*3*	*3*	*3*	*2*	*1*	*3*	*2.57*	*High*	*FEMA, DEMHS, USDOT, CTDOT, OPM*	*$100,000-500,000+ (depends if part of regional plan)*	*All*	*1-5 years (depends on level of analysis)*
9.	Continue working with the Red Cross to maintain and update the city's shelter plan.	*LU, EM*	*3*	*3*	*3*	*3*	*3*	*2.5*	*3*	*2.93*	*High*	*FEMA, DEMHS*	*$5,000-$25,000*	*All*	*Annually*

10.	Evaluate current sheltering location's ability to handle large scale evacuations.	*EM, Operations, LU, Engineering*	*3*	*1*	*0*	*0.5*	*3*	*0*	*3*	*1.50*	*Low*	*TBD*	*$500,000+*	*All*	*1-3 years*
11.	Develop a sheltering/evacuation process to improve collaboration between the Health Department, Operations, Fire and Police and review the process regularly to ensure each department knows there responsibilities and where resources are located.	*EM, Operations, Fire, Police, Red Cross*	*3*	*2*	*2*	*3*	*3*	*3*	*2*	*2.57*	*High*	*City*	*$25,000-50,000*	*All*	*Annually*
12.	Explore having pre-recorded messages for a variety of scenarios for use by the City's Reverse 911 system, including in additional languages. Work to educate citizens on registration and use of system.	*EM, DoEC*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3.00*	*High*	*City*	*$5,000-25,000*	*All*	*Annually*
13.	Work with DEMHS to enhance training and exercises on disaster responses and education on property damage assessment forms.	*EM, DEMHS*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3.00*	*High*	*FEMA, DEMHS*	*$5,000-25,000*	*All*	*Annually*
14.	Reduce impervious surfaces by adopting impervious coverage allowances for all zoning districts or amending regulations to decrease need for impervious surfaces.	*LU*	*2*	*3*	*3*	*2*	*3*	*3*	*3*	*2.71*	*High*	*Town/NA*	*$75,000 City*	*Flooding, Hurricanes, Severe Storms*	*< 1 year*
15.	Acquire snow melting machines to melt excess snow from severe winter storms.	*Operations*	*2*	*2*	*3*	*2*	*3*	*1*	*2*	*2.14*	*Medium*	*CTDOT, USDOT, FEMA/ DEMHS*	*100k-500k*	*Severe Storms (Winter)*	*<1year*

Table 4.4.3.5-2 Stamford 2016 Ongoing Practices, Objective A: Improve the City of Stamford's ability to prepare for and providing emergency and other public services in the event of a natural disaster.

ID	Ongoing Practices	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Continue utilizing the "Be Prepared Stamford" website (www.bepreparedstamford), for outreach and education to the public. The site provides information on disaster preparedness and response, including fact sheets on various hazards and public health information. Actively coordinate additional outreach and education opportunities with the public utilizing community networks and associations.	*EM,HD, Operations, Private*	*3*	*2*	*3*	*3*	*3*	*3*	*2*	*2.71*	*High*	*General Budget*	*$25,000 to 100,000+ (depends on level of outreach)*	*All*	*Annually*

Table 4.4.3.5-3 Stamford 2016 Mitigation Strategies, Objective B: Whenever practical, incorporate natural hazard mitigation strategies into existing City projects and plans.

ID	Supporting Recommendation	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Continue to incorporate recommendations from the Mill River Corridor Plan.	*LU, Grants, MRC*	*3*	*2*	*3*	*3*	*3*	*2*	*3*	*2.71*	*High*	*FEMA, ACOE, DEEP, City, private, NFWF,FEMA,DOT, DEEP, State,*	*4 million,*	*Flooding*	*3-5years*
2.	Perform an infiltration assessment to reduce inflows to the sewage treatment plant	*Operations, Engineering, HD, LU*	*3*	*3*	*3*	*3*	*3*	*0*	*3*	*2.57*	*High*	*EPA, DEEP, DECD, City Budget*	*$500,000+*	*Flooding, Sea Level Rise, Climate Change*	*3-5 years*

Table 4.4.3.5-4 Stamford 2016 Ongoing Practices, Objective B: Whenever practical, incorporate natural hazard mitigation strategies into existing City projects and plans.

ID	Ongoing Practices	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Incorporate natural hazard awareness, mitigation activities and preparedness into public outreach efforts.	*HD*	*3*	*2*	*3*	*3*	*3*	*3*	*2*	*2.71*	*High*	*City*	*25-50k*	All	Annually
2.	Encourage were ever possible the under-grounding of utility lines to minimize service disruptions due to inclement weather. Encourage all new development and subdivisions install underground utilities.	*LU*	*2*	*2*	*3*	*2*	*3*	*3*	*3*	*2.57*	*High*	*City, private*	*5-25k*	*Severe Storms, Hurricane, Tornado*	*Annually*
3.	Review the Mill River Corridor Project and identify projects that may be eligible for FEMA natural hazard mitigation grants.	*LU, Grants*	*3*	*2*	*3*	*3*	*3*	*3*	*3*	*2.86*	*High*	*FEMA/ DEMHS*	*5-25k*	Flooding, Severe Storms Sea level Rise	Annually

Table 4.4.3.5-5 Stamford 2016 Mitigation Strategies, Objective C: Reduce the likelihood of floods.

ID	Supporting Recommendation	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Move forward with plans to rebuild the West Main Street Bridge for use by pedestrians and emergency vehicles only. Plans shall include elevating the bridge deck above the 100-year flood plain and removing several piers.	*LU, City of Stamford*	*3*	*3*	*3*	*3*	*3*	*2*	*3*	*2.86*	*High*	*USDOT, City*	*5m+*	*Flooding*	*To be completed within 5-year plan update period*
2.	Encourage acquisition of wetlands, waterfront land, and easements beneficial to the City.	*LU, Grants*	*3*	*2*	*2*	*1.5*	*3*	*1*	*3*	*2.21*	*Medium*	*City, DEEP, NFWF, Grants, Private*	*500+ millions.*	*Flooding, Hurricane, Sea Level Rise, Climate Change*	*3-5 years*

3.	Encourage the preservation of undeveloped lands within the 100-year flood zone with the use of Open Space purchase, donation or conservation easement.	*LU, Grants*	*3*	*2*	*3*	*3*	*3*	*1*	*3*	*2.57*	*High*	*NFWF, City, DEEP, Private*	*5-25k*	*Flooding*	*Annually*
4.	Maintain the Federal Flood Insurance Program which provides insurance for property owners in flood hazard areas, but encourage development (especially higher density) to be located outside flood-prone areas wherever possible, including increased setbacks to account for sea level rise.	*LU*	*3*	*2*	*3*	*3*	*3*	*3*	*3*	*2.86*	*High*	*City*	*5-25k*	*Flooding*	*Annually*
5.	Enhance storm drain maintenance activities - Maintain records for storm drain maintenance.	*Operations*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3.00*	*High*	*DEEP, EPA,Storm Water Association*	*100-500k*	*Flooding, Severe Weather, Climate Change*	*Annually*
6.	Enhance storm drain maintenance activities - Continue to work to increase frequency of storm drain and sewer clean out, including inspections	*Operations*	*3*	*2*	*1*	*3*	*3*	*1*	*3*	*2.29*	Medium	*Storm-water Association, EPA, DEEP, General Fund*	*$500,000 to 1 million+ (depending on # of cleanings/ inspections)*	*Flooding, Severe Weather, Climate Change*	*Annually*
7.	Enhance storm drain maintenance activities - Continue to identify and eliminate cross connections between storm and sanitary sewer systems.	*Operations*	*3*	*2*	*3*	*3*	*3*	*1*	*3*	*2.57*	High	*City and Private*	*Varies per year 100k-500k*	*Flooding, Severe Weather, Climate Change*	*Annually*
8.	Continue to provide capital budget funds for drainage projects and investigation of drainage problems.	*BOF*	*3*	*2*	*3*	*3*	*3*	*1*	*3*	*2.57*	*High*	*City, FEMA/ DEMHS,*	*100k-500k*	*Flooding*	*Annually*
9.	Ensure that redevelopment reduces runoff from current conditions.	*LU*	*2*	*2*	*3*	*2*	*3*	*3*	*3*	*2.57*	*High*	*City*	*5-25k*	*Flooding*	*Annually*
10.	Continue to encourage best management practices, including innovative Low-Impact Development (LID) practices, for managing stormwater runoff.	*LU*	*2*	*2*	*3*	*2*	*3*	*3*	*3*	*2.57*	*High*	*City*	*75k*	*Flooding*	*Annually*

11.	Work with Aquarion and the state to evaluate and monitor conditions of all dams and to identify properties that may be impacted by a dam failure for all high risk dams in Stamford.	*Engineering, DEEP, Aquarion*	*3*	*3*	*3*	*3*	*3*	*2*	*3*	*2.86*	*High*	*City, ACOE, FEMA/ DEMHS*	*100-500k*	*Dam Failure*	*Annually*
12.	Conduct a detailed flood/coastal risk assessment to improve resiliency efforts to key assets and vulnerable populations	*LU, Engineering, Operations, EM, GIS*	*3*	*3*	*3*	*2*	*3*	*1*	*1*	*2.29*	*High**	*FEMA, DEMHS, CTDOT, DEEP, EPA, HUD, NOAA, UCONN/ CIRCA, OPM, USFWS*	*$500,000+ both city and regionally*	*Flooding, Hurricane, Sea Level Rise, Climate Change, Severe Storms*	*1-3 years*
13.	Assess the integrity of the Hurricane barrier and dykes to withstand increased flooding and storm intensity (including storm surge). Explore opportunities to retrofit as needed.	*USACOE, EM, Engineering, Operations, LU, Fire*	*3*	*3*	*2*	*3*	*2*	*1*	*0*	*2.00*	*High**	*USACOE, NOAA, FEMA, Congress*	*$500,000+ (assessment only)*	*Flooding, Hurricane, Sea Level Rise, Climate Change, Severe Storms*	*3+ years (assessment only, construction additional time and money)*

Table 4.4.3.5-6 Stamford 2016 Mitigation Strategies, Objective D: Reduce the frequency and severity of power outages and road closures as a result of storm events.

ID	Supporting Recommendation	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Work with the City Operations, Parks and Highways Dept. staff, and Connecticut Light and Power staff, to maintain and update a plan for clearing debris in the event of a severe storm.	*EM, Operations Parks, Engineering, Utilities*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3.00*	*High*	*TBD*	*$5-25k*	*Severe Storms, Hurricane, Tornado*	*Annually*
2.	Work with utility companies to improve communications during a storm event and identify a direct contact.	*Operations, Parks, Utilities*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3.00*	*High*	*N/A*	*$0*	*Severe Storms, Hurricane, Tornado*	*Annually*
3.	Explore methods to improve and enhance telecommunications, including county wide radio.	*EM*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3.00*	*High*	*DEMHS, CITY, FEMA*	*$5-25k*	*All*	*1 Year & annual maintenance*
4.	Encourage the study of alternative systems for delivering reliable power to residents.	*LU*	*3*	*2*	*2*	*3*	*3*	*2*	*1*	*2.29*	*Medium*	*Private, City, Department of Energy,*	*25-50k*	*Severe Storms, Hurricane, Tornado*	*Annually*
5.	Work with DEMHS to complete and enhance the state and regional debris management plan and to address local needs.	*Operations, EM*	*3*	*2*	*2*	*3*	*2*	*2.5*	*3*	*2.50*	*High*	*FEMA/ OPM*	*5-25k*	*Severe Storms, Hurricane, Tornado*	*1-3 years*
6.	Conduct a town-wide inventory and assessment of street trees; consider conducting the inventory in conjunction with other municipalities in the region.	*Parks, GIS*	*2*	*2*	*2*	*1*	*3*	*2*	*3*	*2.14*	*High**	*Capital Budget, Utilities*	*$100,000 to 500,000*	*Severe Storms, Wind, Severe Winter Weather Hurricane, Tornado, Climate Change*	*1-3 years*
7.	Continue to commit capital funding annually for public tree maintenance and plantings and continue with preventative tree maintenance.	*Parks, BOF*	*3*	*3*	*2*	*2*	*3*	*3*	*3*	*2.71*	*High*	*Capital Budget, DEEP, Urban Forestry Grants*	*100-500k*	*Severe Storms, Hurricane, Tornado*	*Annually—where possible*

4.4.3.6 Weston 2016 Mitigation Strategies

Challenges

The Town of Weston relies on a volunteer fire department and an emergency medical services squad to provide 24/7 coverage. Fortunately, volunteers continue to step up to provide these life support services willingly and without salary. Weston provides incentives to volunteers through property tax relief and inclusion in Weston's medical plan. Nevertheless, it is a major challenge to keep Weston the kind of community where "neighbors help neighbors" (the EMS expression).

Like many other municipalities, Weston is experiencing a steady increase in automobile traffic on state highways. The increased traffic volume has also impacted emergency response, particularly along Route 57. Congestion at the intersection of Route 57 with School House Road continually hinders passage of emergency vehicles and during a severe storm event may prevent access to the emergency shelter. The intersection of Route 57, Route 53 and Georgetown Road is another area that provides a challenge for emergency responders. In addition to congestion, the geometry of the intersection creates an obstructed view and is difficult for emergency vehicles to maneuver through. This increase in traffic volume may lead to an increase in accidents including weather-related incidents and may exacerbate the impacts of closed roads due to fallen debris.

Due to mitigation and recent weather patterns, many Weston residents have not experienced a hurricane or other natural disaster and may underestimate Weston's vulnerability to natural hazards. The Town is working to increase awareness of the community's vulnerability to natural disasters.

Mitigation Strategies

Features highlighted in gray are "High Priority"

Weston Table Key: BOS = Board of Selectmen; CC = Conservation Commission; P&Z = Planning and Zoning Commission; BOE = Board of Education; DEMHS = CT Division of Emergency Management and Homeland Security; DPW = Department of Public Works; EM = Emergency Management (Director of EM, Fire and Police); FM = Fire Marshal, WCCOG = Western Connecticut Council of Governments (formerly SWRPA); TNC = The Nature Conservancy; ACOE = U.S. Army Corps of Engineers; CTDOT = CT Dept of Transportation; OPM = CT Office of Policy & Management; NRCS = Natural Resources Conservation Service; EPA = Environmental Protection Agency; DHS = Department of Homeland Security; HUD = U.S. Department of Housing and Urban Development

*Rated a high priority by municipality, independent of STAPLEE results

Goal 1: To reduce the loss of life and property and economic consequences as a result of natural emergencies

Table 4.4.3.6-1 Weston 2016 Mitigation Strategies, Objective A: Whenever practical, incorporate natural hazard mitigation strategies into existing town projects.

ID	Supporting Recommendation	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Weston's Beautification Committee and public works should work with residents on proper tree maintenance to minimize debris created during a storm event including private roads.	*DPW, BOS, Beautification Committee*	*3*	*2*	*2*	*3*	*1.5*	*2.5*	*3*	*2.43*	*Medium*	*FEMA/ DEMHS, Utilities, Town*	*$25-150k (depending on maintenance activities)*	*Severe Storm, Hurricane, Wind, Tornado, Severe Winter storms*	Annually

2.	Town Government should actively seek opportunities to purchase or solicit the donation of additional open space, particularly properties located within the flood plain	*BOS, CC*	*3*	*1.5*	*2*	*2*	*3*	*1*	*3*	*2.21*	*Medium*	*FEMA, DEEP, Farmland Preservation, Town, TNC*	*Dependent on property 250k/acre, 10m+*	*Flooding*	1-3 year
3.	Begin to investigate how climate change may impact the community	*CC, P&Z*	*3*	*0*	*1*	*3*	*3*	*0*	*3*	*1.86*	*Medium*	*ACOE, FEMA, DEEP,EPA*	*100k*	*Sea Level Rise*	1-3 year
4.	Implement recommended improvements from the Route 57 and School Road engineering study to ensure safe access to emergency shelters and to facilitate emergency response.	*DPW*	*3*	*2.5*	*1.5*	*2.5*	*2.5*	*1*	*2*	*2.14*	*Medium*	*CTDOT, USDOT, FEMA/ DEMHS, HUD*	*$100-500k+ (depending on measures taken)*	*All*	Will be addressed within 5 year planning period
5.	Maintain the Federal Flood Insurance Program which provides insurance for property owners in flood hazard areas, but encourage development to be located outside flood-prone areas wherever possible, including increased setbacks and working with owners to elevate critical systems (i.e. electrical boxes, hot water heaters etc.) in wet and flood prone areas.	*P&Z, CC DPW*	*3*	*3*	*2*	*3*	*3*	*3*	*3*	*2.86*	*High*	*High*	*Town*	*25-50k*	Flooding, Severe Storm
6.	The Conservation Commission should explore LID methodology and, together with the Planning and Zoning Commission, promulgate regulations for Weston that embrace that approach, including revisiting and strengthening regulations controlling changes in rates and direction of runoff from roadways and lots; encouraging retention of existing forests, outcrops, ridges and stone walls; urging selective rather than clear cutting of trees; examine regulation of erosion and runoff; and updating the Weston Environmental Resources Manual.	*CC, P&Z*	*3*	*2*	*3*	*3*	*3*	*3*	*3*	*2.86*	*High*	*Town, OPM, NRCS,*	*25-50k*	*Flooding*	Less than a year, then annually
7.	Develop a GIS application to assist personnel in the event of an emergency or natural disaster.	*BOS, EM*	*3*	*2*	*2*	*3*	*3*	*2*	*3*	*2.57*	*High*	*FEMA/ DEMHS, OPM, Town*	*$100-500k+*	*All*	*1-3 year + annually*

Table 4.4.3.6-2 Weston 2016 Ongoing Practices, Objective A: Whenever practical, incorporate natural hazard mitigation strategies into existing town projects.

ID	Ongoing Practices	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Publish all Town Ordinances on the Town website including those that mitigate natural hazards.	*BOS*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3.00*	*High*	*Town*	*$5-20k*	*All*	*Annually*

Table 4.4.3.6-3 Weston 2016 Mitigation Strategies, Objective B: Continue and expand current maintenance activities, inspections, and requirements.

ID	Supporting Recommendation	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Institute water volume monitoring program. Water Reduction Sprinkling Program	*BOS*	*3*	*2*	*3*	*1.5*	*3*	*3*	*3*	*2.64*	*High*	*Town, home owner*	*5-25k*	*Flooding, Drought*	1-3 year+ annually.
2.	Examine possible regulation requiring engineered storm water management systems to control runoff from new subdivision roads and parking lots.	*P&Z, Engineering*	*3*	*2*	*3*	*3*	*3*	*3*	*3*	*2.86*	*High*	*Town*	*5-25k*	*Flooding*	1-3 years
4.	Work with all stakeholders to ensure adequate emergency access and safety for all Weston roads.	*DPW, P&Z, EM, CTDOT, CL&P, Private*	*3*	*3*	*1.5*	*2*	*3*	*2*	*0*	*2.07*	*Medium*	*FEMA, DEMHS, CTDOT, WCCOG*	*$100,000 to 500,000*	*All*	*3-5 years*

5.	Consider a town-wide investigation of culverts or bridges that may need to be replaced or repaired. Conduct necessary repairs or replacement as needed.	*DPW*	*3*	*2.5*	*1.5*	*2.5*	*2.5*	*1*	*3*	*2.29*	*Medium*	*FEMA/ DEMHS, EPA, DEEP, Town, CTDOT, USDOT*	*$100-500k*	*Flooding, Severe Storm, Hurricane*	1-3 years
6.	Assess vulnerability of existing critical facilities to earthquakes, hurricanes, tornadoes	*EM, Building*	*3*	*2.5*	*2.5*	*3*	*3*	*1*	*2.5*	*2.50*	*High*	*FEMA/ DEMHS,DHS,OPM*	*$500k +*	*Earthquake Hurricane, Tornado*	*To be completed within 5-year performance period*
7.	Consider participation in an intermunicipal tree condition inventory.	*CC, P&Z, BOS, WCCOG*	*2*	*2*	*1*	*1.5*	*3*	*0*	*3*	*1.79*	*Medium*	*FEMA, DEEP, Municipal Funds, OPM*	*100-500k*	*Hurricane, Severe storm*	*1-3 years*
8.	Implement strategies identified in vulnerability assessment.	*EM, Building Dept.*	*3*	*3*	*1*	*3*	*3*	*1*	*2*	*2.29*	*Medium*	*FEMA/ DEMHS,DHS,OPM*	*500k+*	*All*	*Will be addressed with 5-year performance period*

Table 4.4.3.6-4 Weston 2016 Mitigation Strategies, Objective C: Continue and expand activities related to natural hazard warning and emergency preparedness.

ID	Supporting Recommendation	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Develop a Capital Plan for Fire Ponds and Hydrants	*FM, P&Z, Engineer, BOS, DPW, CC*	*3*	*3*	*2*	*2*	*3*	*3*	*3*	*2.71*	*High*	*FEMA, DEMHS, Town Capital Budget*	*$100,000 to 500,000*	*Wind, Floods, Severe Storms, Drought*	*Over 5 years, first phase of preliminary efforts will take place in 5 year HMP period*

2.	Maintain existing fire ponds. Work with home owners in the vicinity of Cobs Mill Pond and Beaver Brook to remove silt and debris and consider use as fire ponds. Explore additional areas for new fire ponds, cisterns, and hydrants.	*DPW, FM*	*3*	*3*	*2*	*2*	*3*	*3*	*3*	*2.71*	*High*	*Home Owners, Town Capital Budget, ACOE, FEMA, DEMHS*	*50-200k*	*Wind, Floods, Severe Storms, Drought*	*Annually*
3.	Investigate ways to enhance/ improve telecommunication infrastructure and emergency communication throughout the town.	*P&Z, DPW, CC, EM, Private*	*3*	*3*	*3*	*3*	*3*	*3*	*2*	*2.86*	*High*	*FEMA, DEMHS,Town Operating, Private*	*$15,000 to $25,000*	*All*	*Annually*
4.	Identify and upgrade critical facilities (public and private) to ensure resiliency against natural hazards	*BOS, EM, Private*	*3*	*3*	*3*	*2*	*3*	*2*	*0*	*2.29*	*Medium*	*Town (capital), Private, Public Safety Bond, FEMA, DEMHS, CTDOT*	*$500,000+ (depends on facility)*	*All*	*3-5 years (depends on specific facility)*
5.	Work with DEMHS to maintain and enhance the state and regional debris management plan.	*EM, DPW*	*3*	*3*	*1.5*	*3*	*3*	*1*	*3*	*2.50*	*High*	*FEMA/ DEMHS,CTDOT, CT Dept. Military, Town DPW, EPA< DEEP, Coastguard, USACOE*	*$5-25k*	*All*	Annually
6.	Maintain municipalities' sheltering and evacuation needs for all hazards.	*EM, Red Cross*	*3*	*3*	*2*	*3*	*3*	*3*	*2*	*2.71*	*High*	*FEMA/ DEMHS, Red Cross*	*$5-25k*	*All*	Annually

7.	Maintain and look for improvements to emergency notification as necessary.	*EM*	*3*	*2*	*2*	*3*	*3*	*1.5*	*2*	*2.36*	*Medium*	*FEMA/ DEMHS,DHS*	*$25-50k*	*All*	Annually
8.	Continue to work with DEMHS to conduct training and exercises on disaster responses and education on Property damage assessment forms.	*EM*	*3*	*2*	*2*	*3*	*3*	*3*	*2*	*2.57*	*High*	*FEMA/ DEMHS, WCCOG, DHS, CTDOT*	*$50-100k+*	*All*	Annually
9.	Encourage wherever possible the under-grounding of all utilities to minimize service disruptions due to inclement weather. Require all new development and subdivisions to install underground utilities.	*P&Z, DPW*	*1.5*	*1.5*	*3*	*2*	*3*	*3*	*3*	*2.43*	*Medium*	*Town*	*5-25k*	*All*	Annually
10.	Enhance Community preparedness programs: Develop educational materials and brochures promoting emergency preparedness and 'best management practices' for natural hazards, targeted to homeowners.	EM	3	2	2	3	3	2	2	*2.43*	*Medium*	*FEMA, DEMHS, HUD, DHS*	$5-25k	*All*	Annually
11.	Enhance Community preparedness programs: Explore developing a "phased approach" to citizen preparedness (i.e. introductory brochures identifying simple and inexpensive tasks, and more advanced brochures with additional tasks and actions to be done to prepare your family and home for a natural disaster that may be more sophisticated in nature or more expensive).	EM, BOE	3	2	2	2	3	2	1	*2.14*	*Medium*	Private, HUD, FEMA, DEMHS	$5-25k	*All*	Annually

Table 4.4.3.6-5 Weston 2016 Ongoing Practices, Objective C: Continue and expand activities related to natural hazard warning and emergency preparedness.

ID	Supporting Recommendation	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Maintain and explore options for the procurement of emergency backup power (e.g. microgrid, fuel cell).	*EM*	*3*	*3*	*2*	*3*	*3*	*1.5*	*3*	*2.64*	*High*	*DOE, FE-MA/ DEMHS*	*$500k-1m+*	*All*	*1-3 years*

Challenges

Flooding

- Many Westport home and business owners have not resided in the town long enough to experience major flooding. Therefore, these property owners may mistakenly believe that the routine street flooding and abnormally high tides represent the extent of the effects of flooding in Westport.
- Approximately 1290 flood insurance policies are in effect in Westport. However, a vulnerability assessment indicated that approximately 3,000 structures are in flood zones. This comparison indicates a significant gap in coverage. Westport has made progress, increasing coverage of vulnerable properties. Since 2005 over 300 policies have been added.
- The FEMA Flood Insurance Rate Maps (FIRMS) and Floodway Maps are the most widely used means of assessing the risk of flooding associated with a property. The recent FIRM map update (Fairfield County maps effective June 2010) have addressed many of problems and discrepancies associated with the previous maps. However, there are still sections of Westport represented by unnumbered A Zones (zones for which elevations have not been determined) that may be vulnerable to flooding.
- Some of the undeveloped land in flood prone areas is not protected against future development. In addition, some repetitive loss properties cannot be easily protected against future damage from floods.
- In June 1988, the Army Corps of Engineers released a report entitled, "Water Resources Study – Long Island Sound, Tidal Flood Management West Central Connecticut". This report identified three areas most affected by tidal flooding: Compo Beach, Old Mill Beach, and Saugatuck Shores. In its assessment of mitigation opportunities, the report concluded that relocation of homes out of this area was not feasible due to the "large size and market value associated with many of the homes, in addition to the problem of moving people from what they consider to be a very desirable location". The report emphasized that elevating homes, flood warning, and evacuation would be more effective in reducing flood damage and loss of life.
- Sasco Creek experiences significant ice jamming problems in the vicinity of Grist Mill Lane and the adjacent Aspetuck Land Trust parcel to the south. Although ice jams deep within the Land Trust parcel are generally not a problem and are looked upon as a natural occurrence, jams due to debris at the north end of the parcel sometimes create flooding threats to several upstream properties on Grist Mill Lane.
- Pussy Willow Brook is in danger of ice jams similar to those experienced on Sasco Creek. The areas of Pussy Willow Brook that could experience ice jamming are on private property.
- Though Project Impact funds were used to evaluate and prepare plans for repair of the Bulkley Pond dam, it is privately owned and the likelihood of repair by the owner is slim given the cost. This leaves several dozen properties downstream vulnerable in the case of dam failure and the loss of valuable wildlife habitat that has been present for more than 200 years.
- It is still a problem that several areas in town were not studied during the preparation of the FIRMS. This leads to known areas of town susceptible to flooding because our floodplain regulations do not apply.

Severe Storms and Tornadoes

Severe storms—which includes hurricanes, tropical storms, tornadoes, severe thunderstorms, severe winter storms (blizzards and ice storms), nor'easters and other coastal storms —are characterized by intense precipitation and damaging winds that often cause costly property damage and business disruption through power outages and road closures. Although flooding in the region is often associated with severe storms, the following strategies focus on damaging winds and tornadoes, rather than on flooding which was addressed in the previous section.

- Many Westport residents have not experienced a hurricane or tornado event and may mistakenly underestimate the potential impacts of high winds.
- Above-ground utilities are prone to wind damage.
- Falling trees or falling branches damage structures due to improper or inadequate pruning.
- High winds often damage trees and result in power outages, disrupt communication systems and damage property.

- Westport lacks a comprehensive policy that addresses debris from storms.
- Westport lacks a formal program for assessing damage after a severe storm event.
- Westport has limited tree planning education programs or tree trimming/maintenance programs for private citizens.
- Unanchored mobile homes, marinas and yacht clubs are particularly vulnerable to wind damage.
- Damage to structures from severe storm events, especially older buildings is significant.
- Flooding occurs from obstructed drainage paths, which may be exacerbated by storm debris.
- Winter storms often lead to slippery conditions and road accidents.
- Snow and ice could damage communications and power lines and result in power and telecommunication outages.
- Structures may be damaged by the weight of snow and ice and falling trees and branches.
- Winter storm debris may trigger road closures and flooding.
- Freezing temperatures can lead to burst pipes, ruptured water mains and frozen fuel lines.

Earthquake

- Many Westport residents have not experienced an earthquake and may mistakenly underestimate the potential impacts.
- Although unlikely, many structures in Westport are prone to earthquakes due to lack of seismic design.
- Many critical facilities in Westport have not been assessed for their vulnerability to earthquakes.

Dam Failure

- Nash Pond Dam in Westport and the Saugatuck Reservoir Dam in Weston pose the greatest risk to Westport. Based on information currently on file in the Westport Emergency Management Office, warning time between dam failure of the Saugatuck Reservoir Dam and flooding in Westport is less than fifteen minutes.
- The Bulkley Pond Dam on Sasco Creek is a low priority dam but in immediate danger of failing leaving many properties in Westport and Fairfield vulnerable. The dam is privately owned and funds to repair the dam are scarce.

Sea Level Rise

- Much of the development in the Town of Westport occurred before the threat of Sea Level Rise was realized, making existing structures in coast areas particularly vulnerable.
- Models for sea level rise are continually changing as new data becomes available and therefore the true extent of the town's vulnerability is still unknown

Mitigation Strategies

Features highlighted in gray are "High Priority"

Westport Table Key: BOS = Board of Selectmen; Building = Town Building Department; CC = Conservation Commission; CEO = Chief Elected Official; CTDEEP = CT Department of Environmental Protection; CTDOT = CT Department of Transportation; DEMHS 1= CT Division of Emergency Management and Homeland Security Region 1; DPW = Department of Public Works; EM = Emergency Management (Director of EM, Fire and Police); FM = Fire Marshal; IT = Town Information Technology Department; IWC = Inland Wetlands Committee; WWHD = Weston Westport Health Department; P&Z = Planning and Zoning Commission; Staff = Various Town Staff; WCCOG=Western Connecticut Council of Governments (formerly SWRPA), SMPC = Sherwood Mill Pond Committee, SBPAC = Sasco Brook Pollution Abatement Committee, PRC = Parks & Recreation, NFWF = National Fish and Wildlife Foundation, USDOT: US Dept of Transportation; HUD = U.S. Dept of Housing and Urban Development; NFWF: U.S. Fish & Wildlife; EPA = Environmental Protection Agency; NRCS = Natural Resource Conservation Service; OPM = CT Office of Policy & Management; ACOE = U.S. Army Corps of Engineers; NOAA = National Oceanic and Atmospheric Administration

*Rated a high priority by municipality, independent of STAPLEE results

Goal 1: Reduce the loss of life and property as a result of floods.

Table 4.4.3.7-1 Westport 2016 Mitigation Strategies Goal 1 Objective A: Educate the public in the areas of storm damage potential, mitigation activities and preparedness.

ID	Supporting Recommendation	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Provide "welcome kits" to new home owners for properties located within the flood plain, or with a significant risk of flooding.	*EM, P&Z, CC*	*3*	*3*	*2*	*3*	*3*	*2*	*1*	*2.43*	*Medium*	*FEMA, EPA, DEEP, Town*	*$1,000*	*Flooding*	*Annually*
2.	Encourage landowners to retain storm water, such as using rain barrels or planting rain gardens.	*CC*	*2*	*3*	*3*	*3*	*1*	*2*	*3*	*2.43*	*Medium*	*Town*	*Varies w/ size and # of permits*	*Flooding*	*Annually*
3.	Encourage private property owners in the potentially troubled areas to properly maintain the stream channel. If necessary, Westport can pursue clearing rights on these parcels.	*CC, DPW*	*1*	*1*	*1*	*2*	*1*	*2*	*2*	*1.43*	*Low*	*Town*	*Varies - dependent on the # of troubled areas*	*Flooding*	*within 5 year plan period- structured around storm events*

Table 4.4.3.7-2 Westport 2016 Ongoing Practices Goal 1 Objective A: Educate the public in the areas of storm damage potential, mitigation activities and preparedness.

ID	Ongoing Practices	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Incorporate a Natural Hazards Awareness Week and conduct corresponding outreach the community and all interested parties. Activities will focus on flooding and other natural hazards, including associated hazard functions, governing laws/regulations, mitigation strategies and precautions. Outreach will also be conducted throughout the year, wherever possible	*EM, P&Z, CC, Buildings*	*3*	*2*	*1*	*3*	*3*	*1*	*2*	*2.14*	*Medium*	*FEMA, DEMHS, Town*	*$15,000*	*Flooding, Severe Storm, Hurricanes*	*Annually*
2.	Continue annual outreach pamphlet to properties within the 100-year flood zone and repetitive loss properties, as required by CRS	*P&Z,*	*3*	*2*	*2*	*3*	*3*	*2*	*2*	*2.43*	*Medium*	*Town/ other*	*$5,000*	*Flooding*	*Annually*

Table 4.4.3.7-3 Westport 2016 Mitigation Strategies Goal 1, Objective B: Acquire flood prone properties and those which provide valuable recreational opportunities, and flood storage potential and benefit the greatest number of Westport residents.

ID	Supporting Recommendation	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Acquire properties within the flood-plain as funding becomes available.	*P&Z, CC, DPW*	*3*	*2*	*2*	*2*	*1*	*3*	*3*	*2.29*	*High**	*FEMA/ Town / HUD / Other*	*$10,000,000+ dependent on future storm events*	*Flooding*	*5 years*

Table 4.4.3.7-4 Westport 2016 Ongoing Practices Goal 1, Objective B: Acquire flood prone properties and those which provide valuable recreational opportunities, and flood storage potential and benefit the greatest number of Westport residents.

ID	Ongoing Practices	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Review the Westport Plan of Conservation and Development and other relevant plans to identify open space projects that preserve or restore the functions of natural systems and may be eligible for funding under mitigation grants.	*CC, P&Z*	*3*	*2*	*3*	*3*	*3*	*2*	*3*	*2.71*	*High*	*Flooding*	*$5,000*	*Flooding*	*1 Year 2017*

Table 4.4.3.7-5 Westport 2016 Mitigation Strategies Goal 1, Objective C:Use town regulations and ordinances to minimize the impacts of new construction on the natural drainage system and to ensure appropriate development occurs in floodplains.

ID	Supporting Recommendation	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Identify and publicize regulations that will preserve and protect watercourses, waterbodies, wetlands, steep slopes, and floodplains, and those that will conserve floodplain fringe areas, wellhead areas, areas of high groundwater availability, and unique/special habitat areas.	*P&Z*	*1*	*1*	*2*	*1*	*3*	*3*	*3*	*2.00*	*Medium*	*Town - as staff & resources permit*	*<$10,000*	*Flooding*	*2 years*

2.	Further control building in floodplain areas.	*P&Z*	*1*	*1*	*2*	*1*	*3*	*3*	*3*	*2.00*	*Medium*	*Town - as staff & resources permit*	*$10,000*	*Flooding*	*Annually*
3.	Minimize the amount and intensity of development in "V" flood zones, new non-water dependent development from "V" zones	*P&Z*	*2*	*2*	*3*	*2*	*3*	*3*	*3*	*2.57*	*High*	*Town-as staff & resources permit*	*$10,000*	*Flooding*	*2-years*
4.	Require, to the extent possible, minimization of site imperviousness, maintenance of natural buffers, and use of natural drainage systems in riparian and floodplain areas.	*CC, P&Z*	*2*	*3*	*3*	*3*	*1*	*2*	*3*	*2.43*	*Medium*	*Town-as staff & resources permit*	*Varies by area in question - < $30,000*	*Flooding*	*Annually, where possible*
5.	Change the floodplain regulations to require at least one foot of freeboard for new or substantially improved homes.	*P&Z, Town*	*1*	*1*	*2*	*1*	*3*	*3*	*3*	*2.00*	*Medium*	*Town - as staff & resources permit*	*$10,000*	*Flooding*	*2 years*
6.	Require approval and drainage review before clear cutting for new and redevelopment, especially near steep slopes or with a certain percentage of impervious surface.	*P&Z, CC, RTM, DPW*	*2*	*1*	*1*	*2*	*1*	*2*	*3*	*1.71*	*Medium*	*Town-as staff & resources permit*	*$10,000*	*Flooding*	*Annually*
7.	Reduce impervious surfaces by adopting impervious coverage allowances for all zoning districts or amending regulations to decrease need for impervious surfaces. Ensure that redevelopment does not increase runoff from current conditions.	*CC, P&Z, DPW*	*2*	*2*	*2*	*2*	*3*	*2*	*3*	*2.29*	*Medium*	*Town-as staff & resources permit*	*>$10,000*	*Flooding*	*2 years*
8.	Study the use of V-Zone standards for coastal A-Zones.	*P&Z, Building*	*1*	*1*	*2*	*1*	*3*	*3*	*3*	*2.00*	*Medium*	*Town-as staff & resources permit*	*>$10,000*	*Flooding*	*2 years*

9.	Adopt an ordinance that would place responsibility for stream channel maintenance on the property owner and give Westport enforcement power. Such ordinances would include stream dumping, channel maintenance, and land clearing disturbances. These ordinances would reduce the likelihood of localized flooding and could lead to additional points toward CRS reclassification.	*CC, DPW*	*1*	*1*	*1*	*2*	*1*	*2*	*2*	*1.43*	*Low*	*Town-as staff & resources permit*	*$10,000*	*Flooding*	*Annually - as time permits*
10.	Evaluate the zoning regulations for ways to reduce land coverage and building size, including in flood zones	*P&Z, Town*	*1*	*2*	*3*	*2*	*3*	*2*	*3*	*2.29*	*Medium*	*Town-as staff & resources permit*	*$10,000*	*Flooding*	*2 years*
11.	Modify zoning regulations to require freeboard	*P&Z*	*1*	*2*	*3*	*2*	*3*	*2*	*3*	*2.29*	*Medium*	*Town-as staff & resources permit*	*$10,000*	*Flooding, Sea Level Rise, Hurricanes*	*2 years*
12.	Modify zoning regulations to change the time horizon for work that is to be included in substantial improvement from 5 years to life of structure	*P&Z*	*1*	*2*	*3*	*2*	*3*	*2*	*3*	*2.29*	*Medium*	*Town-as staff & resources permit*	*$10,000*	*All*	*2 years*
13.	Modify Zoning Regulations to require that any building or structure even if only a portion of which lies in a flood hazard zone is designed to be fully protected as if the entire structure were in the zone	*P&Z*	*1*	*2*	*3*	*2*	*3*	*2*	*3*	*2.29*	*Medium*	*Town-as staff & resources permit*	*$10,000*	*Flooding*	*2 years*
14.	Modify Zoning Regulations to require that any building or structure even if only a portion of which lies in a more restrictive flood hazard zone that the building be designed to be fully protected as if the entire structure were in the more restrictive zone	*P&Z*	*1*	*2*	*3*	*2*	*3*	*2*	*3*	*2.29*	*Medium*	*Town-as staff & resources permit*	*$10,000*	*Flooding*	*2 years*
15.	Modify Zoning Regulations to prohibit structures entirely or partially over water unless water dependent uses	*P&Z*	*1*	*2*	*3*	*2*	*3*	*2*	*3*	*2.29*	*Medium*	*Town-as staff & resources permit*	*$10,000*	*Flooding, Sea Level Rise, Hurricanes, Severe Storms*	*2 years*

Table 4.4.3.7-6 Westport 2016 Ongoing Practices, Goal 1, Objective C: Use town regulations and ordinances to minimize the impacts of new construction on the natural drainage system and to ensure appropriate development occurs in floodplains.

ID	Ongoing Practices	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Regularly review subdivision regulations and make appropriate changes to encourage alternatives to placing lots in flood prone areas and to minimize impermeable ground coverings, if necessary.	*P&Z*	*2*	*2*	*3*	*2*	*2*	*1*	*3*	*2.14*	*Medium*	*Town-as staff & resources permit*	*$10,000*	*Flooding*	*2 years*

Table 4.4.3.7-7 Westport 2016 Mitigation Strategies Goal 1, Objective D: Expand maintenance activities and execute specific projects that alleviate riverine related flooding in addition to the restoration and improvement of natural floodplain and wetland areas.

ID	Supporting Recommendation	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Address Saugatuck River, Sherwood Mill Pond and Sasco Creek/ Pond maintenance and management with strategies to address silting.	*SMPC, SBPAC, CC,PRC*	*3*	*2*	*2*	*2*	*2*	*1*	*3*	*2.14*	*Medium*	*EPA, DEEP, NRCS*	*$20,000*	*Flooding*	*5 years*
2.	Undertake preparation of an update to the 1970 master drainage plan (the "Jackson" study).	*DPW, RTM*	*3*	*2*	*1*	*1*	*2*	*1*	*2*	*1.71*	*Medium*	*EPA, DEEP, NFWF*	*$200,000*	*Flooding*	*5 years*
3.	Identify and address storm drainage and flooding issues on private property and in the streets.	*DPW, RTM*	*3*	*2*	*1*	*1*	*2*	*1*	*2*	*1.71*	*Medium*	*Town-as staff & resources permit*	*$40,000*	*Flooding*	*Annually*
4.	Address the effect of groundwater on drainage.	*DPW, RTM*	*3*	*3*	*3*	*2*	*2*	*3*	*3*	*2.71*	*High*	*Town*	*<$10,000*	*Flooding*	*Annually*

5.	Include provision for street drainage improvements and maintenance projects in the municipal budget on an annual basis.	*RTM, BOF*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3.00*	*High*	*Town*	*Varies by improve-ment*	*Flooding*	*Annually*
6.	Maintain catch basins regular maintenance schedule, develop a plan for dealing with backups/failing.	*DPW*	*3*	*2*	*1*	*2*	*3*	*1*	*3*	*2.14*	*Medium*	*Town-as staff & resources permit*	*$200,000/ year*	*Flooding*	*Annually*
7.	Westport will encourage the Aspetuck Land Trust to initiate a maintenance program for Sasco Creek as it passes through their property, in an attempt to foster an understanding that maintaining a clear channel in the northern section of the parcel will reduce flooding occurrences on Gristmill Lane. If necessary, Westport can pursue clearing rights on these parcels.	*DPW, CC Aspetuc k Land Trust*	*3*	*2*	*2*	*2*	*1*	*2*	*3*	*2.14*	*Medium*	*EPA, DEEP, HUD, FE-MA, NFWF*	*Less than $10,000*	*Flooding*	*2 years*

Table 4.4.3.7-8 Westport 2016 Ongoing Practices Goal 1, Objective E: Mitigate against flood damage by undertaking cost effective structural projects.

ID	Supporting Recommendation	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Pursue and support comprehensive studies that recommend specific strategies for effective erosion abatement.	*CC, DPW*	*3*	*1*	*1*	*2*	*1*	*1*	*3*	*1.71*	*Medium*	*DEEP*	*$50,000 - 70,000*	*Flooding*	*5 years*

Table 4.4.3.7-9 Westport 2016 Mitigation Strategies Goal 1, Objective F: Improve and expand current flood warning systems and flood response procedures.

ID	Supporting Recommendation	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Investigate and pursue the purchase of an automated sand bagger.	*EM*	*2*	*2*	*2*	*3*	*2*	*2*	*1*	*2.00*	*Medium*	*Town, OPM*	*$10,000-15,000*	*Flooding*	*5 years*
2.	Identify funding sources and install additional staff gauges for smaller streams, including (but not limited to) Sasco Creek, Muddy Brook and Upper Willow Brook.	*EM*	*1*	*1*	*1*	*2*	*1*	*2*	*2*	*1.43*	*Low*	*ACOE*	*$1,000-5,000*	*Flooding*	*5 years*
3.	Obtain FEMA training on post disaster single-family dwelling assessments and other flood related issues.	*EM, P&Z, CC, Buildings*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3.00*	*High*	*Other/ DEEP*	*$5,000*	*Flooding*	*1 year, then annually*
4	Make FEMA's Emergency Management Institute classes available to Town Employees, including Rapid Visual Screening Techniques, designed to teach skills necessary for inventorying disaster-susceptible buildings. Skills acquired by attending this course could be utilized in implementing the Hazard Mitigation Plan.	*Town, EM*	*3*	*2*	*1*	*1*	*1*	*2*	*2*	*1.71*	*Medium*	*FEMA*	*$15,000*	*All*	5 years

Table 4.4.3.7-10 Westport 2016 Mitigation Strategies Goal 1:

Objective G: Westport will endeavor to support increased awareness and purchases of flood insurance.

Objective H: Increase Westport's CRS rating to further reduce flood insurance premiums.

Objective I: Work with FEMA to include more detailed data on the Flood Insurance Rate Maps and Floodway Maps, particularly in unnumbered A-Zones.

ID	Supporting Recommendation	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Provide the updated FIRM maps and information on the National Flood Insurance Program on the Town's website.	*P&Z, IT*	*3*	*3*	*2*	*3*	*3*	*3*	*3*	*2.86*	*High*	*Town*	*$5,000*	*Flooding*	*Annually*
2.	Request that FEMA continue to work to improve the accuracy of the updated FIRM maps, with special attention paid to unnumbered A-zones.	*DPW, P&Z*	*3*	*1*	*1*	*3*	*3*	*3*	*3*	*2.43*	*Medium*	*Town, FEMA*	*<$5,000*	*Flooding*	*Annually*
3.	Provide new data to FEMA as it becomes available to enhance efforts already under way.	*DPW, P&Z*	*3*	*1*	*1*	*3*	*3*	*3*	*3*	*2.43*	*Medium*	*Town*	*<$5,000*	*Flooding*	*Annually*
4.	Obtain and update town GIS with Coastal AE Zones (Limit of Moderate Wave Action [LiMWA]) due to new Building Code requirements for properties within this area	*DPW, GIS, Buildings*	*3*	*2*	*2*	*3*	*3*	*3*	*3*	*2.71*	*High*	*Town*	*<$5,000*	*Flooding*	*Annually*
5.	Provide the Building Department with database of properties within Coastal AE Zones (Limit of Moderate Wave Action [LiMWA])	*P&Z, GIS*	*3*	*2*	*2*	*3*	*3*	*3*	*3*	*2.71*	*High*	*Town*	*<$5,000*	*Flooding*	*Annually*
6.	Encourage elevations of existing homes to comply with Floodplain Regulations	*EM, P&Z*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3.00*	*High*	*Town, FEMA*	*<$5,000*	*Flooding, Sea Level Rise*	*Annually*

Goal 2. Educate the public of wind damage potential, mitigation activities and preparedness.

Table 4.4.3.7-11 Westport 2016 Mitigation Strategies Goal 2:

Objective J: Provide education opportunities to the affected community, builders, developers and town officials so that future construction and landscaping associated with construction is designed to minimize wind damage and retrofitting of existing structures and maintenance of property are implemented to the benefit of public safety and property loss reduction.

Objective K: Ensure clear and concise severe weather alerts reach 100% of the population in Westport.

Objective L: Minimize property loss/damage and personal safety risk due to falling tree damage following a severe storm event.

ID	Supporting Recommendation	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Maintain the severe weather forecasting and warning systems.	*EM*	*3*	*3*	*2*	*3*	*2*	*3*	*3*	*2.71*	*High*	*Municipal Budget*	*$15,000/ year*	*Severe Storm, Hurricane, Tornado*	*Annually*

Table 4.4.3.7-12 Westport 2016 Ongoing Practices Goal 2:

Objective J: Provide education opportunities to the affected community, builders, developers and town officials so that future construction and landscaping associated with construction is designed to minimize wind damage and retrofitting of existing structures and maintenance of property are implemented to the benefit of public safety and property loss reduction.

Objective K: Ensure clear and concise severe weather alerts reach 100% of the population in Westport.

Objective L: Minimize property loss/damage and personal safety risk due to falling tree damage following a severe storm event.

ID	Ongoing Practices	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Educate the public about the meaning of National Weather Service announcements, such as winter storm watch, winter storm warning, ice storm warning, heavy snow warning, blizzard warning, severe blizzard warning and high wind warning.	*EM*	*3*	*3*	*3*	*3*	*2*	*3*	*3*	*2.86*	*High*	*Town, FEMA , DEMHS (EM Budget or PDM Grant)*	*$2000-4000*	*All*	*Annually*

2.	During the Natural Hazards Awareness Week conduct an annual workshop so that local building contractors, residents, business owners, insurance and real estate agents, and all interested parties can familiarize themselves with wind associated risks, retrofitting techniques, importance of evacuation, and the understanding of warning mechanisms used by Westport.	*EM, Fire, Buildings, P&Z, CC*	*3*	*2*	*1*	*3*	*3*	*1*	*2*	*2.14*	*Medium*	*Town, FEMA, DEMHS, USDOT, CTDOT,OPM*	*$15,000*	*Severe Storm, Hurricane, Tornado*	Annually
3.	Continue to hold "Severe Weather Awareness" week in March and a "Winter Weather Awareness" week in October. Disseminate information prepared by the Connecticut State Emergency Management Office during these events.	*EM, CEO*	*2*	*2*	*2*	*3*	*2*	*2*	*2*	*2.14*	*Medium*	*Town*	*$2000-4000*	*Severe Storm, Hurricane, Tornado*	Annually
4.	Promote the use of functional shutters for properties located along the coast to guard against window breakage which can result in structural failure. Investigate funding sources to promote this relatively inexpensive type of retrofitting on a large scale.	*EM, Building*	*1*	*2*	*1*	*2*	*2*	*2*	*1*	*1.57*	*Medium*	*Town*	*$5,000*	*Severe Storm, Hurricane, Tornado*	5 years
5.	Advise people of the potential dangerous driving conditions during inclement weather and storm events, and warn them that doing so can be a risk to their lives. Produce a series of announcements on what to do if you are trapped in your car during a severe storm.	*EM, Police, Fire*	*2*	*1*	*1*	*2*	*1*	*1*	*1*	*1.29*	*Low*	*FEMA, DEMHS*	*$2000-4000*	*All*	*Annually*

6.	Encourage the Westport Garden Club, the Beautification Committee and the Tree Board to sponsor events that educate the public about wise landscaping techniques, locating trees away from utilities and wind resistant tree species.	*DPW, CC*	*3*	*3*	*3*	*3*	*2*	*3*	*3*	*2.86*	*High*	*Town, Private*	*Less than $10,000*	*Severe Storm, Hurricane, Tornado*	*2 years, then annually*
7.	Publish a special section in the local media with emergency information about severe storms. The publications should emphasize emergency procedures when caught out in the open or in a vehicle during a severe storm.	*EM*	*3*	*3*	*2*	*3*	*2*	*2*	*2*	*2.43*	*Medium*	*Town, FEMA, DEMHS (EM Budget or Grant)*	*$1000-2500*	*All*	*Annually*
8.	Provide a reliable emergency communication system for use in notifying the vulnerable populations.	*EM, Human Services, WWHD*	*3*	*1*	*1*	*3*	*2*	*2*	*2*	*2.00*	*Medium*	*Town (EM Budget)*	*$10,000*	*All*	*To be completed in five year planning period*

Goal 3 Reduce the risk of damage to utility infrastructure in Westport as a result a severe storm event.

Table 4.4.3.7-13 Westport 2016 Mitigation Strategies Goal 3:

Objective M: Ensure falling trees or branches do not damage utility lines during a severe storm event.

Objective N: Ensure improvement of emergency power and communication capabilities during a severe storm event.

Objective O: Keep drainage paths open.

Objective P: Limit damage to utility lines and property and injury or loss of life by fallen trees, tree limbs, and brush.

ID	Supporting Recommendation	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Regularly evaluate the health of town roadway trees; trim or remove dangerous branches and remove unhealthy trees.	*DPW*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3.00*	*High*	*Town, Utilities, FEMA, DEMHS*	*$40,000 annually*	*Severe Storm, Hurricane, Tornado*	*Annually*
2.	Evaluate the feasibility of moving trees out of the right of way and onto the edge of properties to protect above ground utilities.	*DPW, P&Z*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1.00*	*Low*	*Town, Utilities*	*$40,000*	*Severe Storm, Hurricane, Tornado*	*5 years*
3.	Continue to explore moving existing utilities underground and requiring underground utilities for new developments and subdivisions, as well as within existing coastal areas.	*P&Z, DPW*	*3*	*1*	*2*	*3*	*3*	*3*	*3*	*2.57*	*High*	*Town, Utilities*	*Varies by project*	*All*	*Annually*
4.	Retrofit existing above ground utility structures to make them more disaster resilient.	*Town, DPW, EM, P&Z, Utilities*	*3*	*1*	*2*	*3*	*3*	*3*	*3*	*2.57*	*High*	*Utilities*	*Based on consultation with utilities*	*All*	*To be addressed within 5 year planning period*

Table 4.4.3.7-14 Westport 2016 Ongoing Practices Goal 3:

Objective M: Ensure falling trees or branches do not damage utility lines during a severe storm event.

Objective N: Ensure improvement of emergency power and communication capabilities during a severe storm event.

Objective O: Keep drainage paths open.

Objective P: Limit damage to utility lines and property and injury or loss of life by fallen trees, tree limbs, and brush.

ID	Ongoing Practices	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Determine how to reuse disposed brush within the community to reduce costs of exporting from Westport (chips, firewood, composting).	*Public Works*	*3*	*3*	*2*	*2*	*2*	*2*	*3*	*2.43*	*Medium*	*Town, DEMHS*	*<$10,000*	*Severe Storm, Hurricane, Tornado*	3 years
2.	Encourage moving as many utility lines underground as possible.	*P&Z, DPW*	*3*	*1*	*2*	*3*	*3*	*3*	*3*	*2.57*	*High*	*Private*	*Varies*	*Severe Storm, Hurricane, Tornado*	*To be addressed within 5 year planning period*
3.	Place deflectors on key utility lines to reduce accumulation of ice or snow.	*Utilities*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1.00*	*Low*	*Private*	*Based on consultation with utilities*	*Severe Storm, Hurricane, Tornado*	5 years
4.	Encourage appropriate streetscaping and planting, particularly around utilities.	*DPW, P&Z*	*3*	*3*	*2*	*3*	*3*	*2*	*2*	*2.57*	*High*	*Private*	*Varies*	*Severe Storm, Hurricane, Tornado*	Annually
5.	Continue tree trimming and maintenance program for trees on public roads.	*Public Works, Utilities*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3.00*	*High*	*N/A*	*$400,000*	*Severe Storm, Hurricane, Tornado*	Annually
6.	Establish protocols to check drainage paths (i.e. catch basins and culverts) prior to a severe storm.	*Public Works*	*3*	*3*	*1*	*2*	*2*	*1*	*2*	*2.00*	*Medium*	*EPA, DEEP, Town*	*Depends on Project (<$100,000)*	*Severe Storm, Hurricane, Tornado*	5 years

Goal 4 Broaden response capabilities of emergency responders in dealing with the preparation and aftermath of a severe storm event.

Table 4.4.3.7-15 Westport 2016 Mitigation Strategies Goal 4:

Objective Q: Ensure municipal facilities are adequately supplied and equipment is in proper working order.

Objective R: Ensure there are damage assessment capabilities for emergency response personnel following a severe storm event.

Objective S: Improve and expand current severe weather warning systems.

Objective T: Improve and expand response capabilities that serve the disabled, elderly, and vulnerable population groups.

ID	Supporting Recommendation	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Work to identify and update data-base of vulnerable populations, including effective communication.	*DPW, EM*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3.00*	*High*	*FEMA, DEMHS,T own*	*$5,000-40,000*	*All*	*Annually*
2.	Promote an adequate supply of public water to serve the domestic, commercial and fire protection re-quirements of Westport, including hydrants	*Fire*	*3*	*3*	*3*	*3*	*3*	*2*		*2.43*	*Medium*	*FEMA, DEMHS, DEEP*	*<$500,000*	*All*	*To be ad-dressed within 5 year plan-ning period*
3.	Identify additional sites for yard waste and storm debris.	*DPW*	*3*	*3*	*2*	*1*	*1*	*1*	*2*	*1.86*	*Medium*	*FEMA, DEMHS, EPA, DEEP, Town*	*<$10,000*	*All*	*To be ad-dressed within 5 year plan-ning period*
4.	Improve telecommunications.	*Fire, Police*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2.00*	*Medium*	*PURA, FEMA, DEMHS, HUD, Town, Other*	*Dependent on scope of project*	*All*	*5 years*
5.	Evaluate municipality's sheltering and evacuation needs for a variety of storm scenarios.	*EM, WWHD, Human Services*	*2*	*2*	*2*	*3*	*1*	*2*	*2*	*2.00*	*Medium*	*Municipal Budget*	*$1000-2500*	*All*	*Annually*
6.	Maintain emergency notification system and update as needed.	*EM*	*3*	*2*	*2*	*3*	*2*	*3*	*2*	*2.43*	*Medium*	*FEMA, DEMHS, Town, Other*	*$10,000*	*All*	*Annually*

7.	Work with DEMHS to complete and enhance the state and regional debris management plan.	*EM, DPW*	*3*	*3*	*2*	*1*	*1*	*1*	*2*	*1.86*	*Medium*	*DEMHS*	*<$10,000*	*All*	*To be addressed within 5 year planning period*
8.	Conduct training and exercises on disaster responses and education on property damage assessment forms.	*EM, DEMHS*	*2*	*2*	*1*	*1*	*1*	*2*	*1*	*1.43*	*Low*	*FEMA, DEMHS, OPM, Town, Other*	*$3000-5000*	*All*	*5 years*
9.	Improve coordination with CL&P and NU	*EM, Police, Fire, DPW*	*3*	*2*	*2*	*3*	*2.5*	*3*	*3*	*2.64*	*High*	*FEMA, DEMHS, PURA, Town*	*$5,000-25,000*	*All*	*Annually*
10.	Identify opportunities for cooperation and coordination with private road associations	*EM, DPW, Private*	*3*	*2*	*1.5*	*3*	*2*	*3*	*2*	*2.36*	*Medium**	*Town, Private*	*$5,000-25,000*	*All*	*Annually*

Table 4.4.3.7-16 Westport 2016 Ongoing Practices Goal 4:

Objective Q: Ensure municipal facilities are adequately supplied and equipment is in proper working order.

Objective R: Ensure there are damage assessment capabilities for emergency response personnel following a severe storm event.

Objective S: Improve and expand current severe weather warning systems.

Objective T: Improve and expand response capabilities that serve the disabled, elderly, and vulnerable population groups.

ID	Ongoing Practices	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Incorporate notification of severe weather events into the town mass notification system.	*EM*	*3*	*3*	*2*	*3*	*2*	*3*	*3*	*2.71*	*High*	*FEMA, DEMHS, OPM, NOAA, Other*	*$10,000*	*All*	Annually
2.	Train emergency response personnel to assess damage to buildings and their electrical, plumbing and heating systems.	*EM, Fire, BD, DPW*	*2*	*2*	*2*	*2*	*2*	*3*	*2*	*2.14*	*Medium*	*FEMA, DEMHS, Town*	*$3000-5000*	*All*	bi-annually and to be addressed within 5-year planning period
3.	Review the Emergency Operating Plan and emergency protocols to ensure that emergency responders can perform critical duties in the event of an extended power outage, limited fuel access, and reduced communication capabilities.	*EM, Fire, Police*	*2*	*2*	*2*	*1*	*2*	*3*	*2*	*2.00*	*Medium*	*Town*	*$10,000*	*All*	Annually
4.	Perform regular inspections of cones, barricades, sandbags, salt, portable power generators, and bunk trailers to ensure that they are adequate and in good repair in the event of a severe storm.	*EM, DPW*	*3*	*3*	*2*	*3*	*3*	*3*	*3*	*2.86*	*High*	*Town Municipal Budget*	*$2000-5000*	*All*	Annually and as needed

Goal 5: Reduce losses to public and private structures in Westport from severe storm events.

Table 4.4.3.7-17 Westport 2016 Mitigation Strategies, Goal 5:

Objective U: Ensure existing buildings and historically significant buildings are inventoried to identify potential losses from severe storm events.

Objective V: Encourage implementation of preventive measures for existing development to reduce the vulnerability to severe weather damage.

Objective W: Ensure mobile homes and mobile home parks throughout Westport are inventoried to identify potential for losses from severe storm events.

Objective X: Ensure that critical facilities are protected against wind damage.

ID	Supporting Recommendation	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Inventory condition of problem culverts and bridges and consider repairs or replacement as necessary or as funding becomes available.	*DPW*	*3*	*3*	*2*	*2*	*2*	*2*	*2*	*2.29*	*Medium*	*Town, EPA, DEEP*	*$100,000*	*All*	*5 years*
2.	Develop a notification system reminding critical facilities to evaluate storm preparedness, as applicable.	*EM*	*2*	*1*	*1*	*1*	*1*	*2*	*2*	*1.43*	*Low*	*Town, FEMA, DEMHS*	*$2,000*	*All*	*5 Years*
3.	Develop a notification system for mobile home owners/residents to evaluate storm preparedness.	*EM*	*2*	*1*	*1*	*1*	*1*	*2*	*1*	*1.29*	*Low*	*Town, HUD*	*$2,000*	*All*	*5 Years*
4.	Improve (bridge) access to Saugatuck Shores community	*EM, DPW, CC*	*3*	*2.5*	*2*	*2.5*	*3*	*1*	*2*	*2.29*	*Medium**	*FEMA, DEMHS, USDOT, HUD*	*$500,000+ (depends on specific construction/ mitigation measure)*	*All*	*Phase 1 to be addressed within 5 year planning period*

Table 4.4.3.7-18 Westport 2016 Ongoing Practices, Goal 5:

Objective U: Ensure existing buildings and historically significant buildings are inventoried to identify potential losses from severe storm events.

Objective V: Encourage implementation of preventive measures for existing development to reduce the vulnerability to severe weather damage.

Objective W: Ensure mobile homes and mobile home parks throughout Westport are inventoried to identify potential for losses from severe storm events.

Objective X: Ensure that critical facilities are protected against wind damage.

ID	Ongoing Practices	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Implement specific physical actions that help protect public critical facilities against wind damage as funds become available.	*EM, DPW*	*1*	*1*	*2*	*1*	*1*	*2*	*1*	*1.29*	*Low*	*FEMA, DEMHS, HUD, Town, Other*	*$100,000*	*Severe Storm, Hurricane, Tornado, Wind*	*Within 5 years*
2.	Encourage private marinas and yacht clubs to develop management plans that address pollution prevention and hazard mitigation.	*CC, P&Z, EM, Boating Advisory Committee*	*3*	*3*	*2*	*3*	*3*	*2*	*3*	*2.71*	*High*	*DEEP/ Private*	*$10,000*	*All*	2-years
3.	Update local building codes to reference the most current standards as needed.	*Building*	*3*	*3*	*2*	*3*	*3*	*3*	*2*	*2.71*	*High*	*Town*	*<$10,000*	*All*	*To be addressed within 5 year planning period*
4.	Initiate storm alerts earlier to allow citizens more time to prepare their structures for severe storm events.	*EM*	*3*	*3*	*2*	*3*	*2*	*3*	*3*	*2.71*	*High*	*FEMA, DEMHS, Town*	*$1000-5000*	*All*	*To be addressed within 5 year planning period*

Goal 6: To reduce loss of life and property as a result of earthquakes.

Table 4.4.3.7-19 Westport 2016 Mitigation Strategies, Goal 6:

Objective Y: Educate the public about the threat of earthquakes.

Objective Z: Assess the vulnerability of critical facilities to earthquakes.

Objective AA: Ensure that future construction of critical facilities is scrutinized more than other developments to determine the suitability of locations in the event of earthquakes hurricanes and tornadoes..

Objective AB: Ensure that emergency responders have the ability to communicate and respond effectively in the event of an earthquake.

ID	Supporting Recommendation	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Begin to evaluate and work to harden the structural integrity of Town-owned Critical Facilities and buildings and their ability to withstand earthquakes.	*Building, EM*	*2*	*1*	*1*	*1*	*1*	*1*	*1*	*1.14*	*Low*	*FEMA, DEMHS, HUD, Town*	*50,000*	*Earthquake*	*Within 5 years*
2.	Encourage privately owned critical facilities to evaluate the ability of the buildings to withstand earthquakes and tornadoes, and to address and deficiencies identified.	*Building, EM*	*2*	*1*	*1*	*1*	*1*	*1*	*1*	*1.14*	*Low*	*Private*	*Less than 5,000*	*Tornado, Earthquake*	*Within 5 years*

Table 4.4.3.7-20 Westport 2016 Ongoing Practices, Goal 6:

Objective Y: Educate the public about the threat of earthquakes.

Objective Z: Assess the vulnerability of critical facilities to earthquakes.

Objective AA: Ensure that future construction of critical facilities is scrutinized more than other developments to determine the suitability of locations in the event of earthquakes hurricanes and tornadoes..

Objective AB: Ensure that emergency responders have the ability to communicate and respond effectively in the event of an earthquake.

ID	Ongoing Practices	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	During the Natural Hazards Awareness Week include activities, workshops and materials about all natural hazards.	*EM, CC, Buildings, P&Z*	*3*	*2*	*1*	*3*	*3*	*1*	*2*	*2.14*	*Medium*	*FEMA, DEMHS, Town*	*15,000*	*All*	Annually
2.	Provide the earthquake-related publications to the public library for inclusion with the other natural hazard publications.	*EM, Library*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1.00*	*Low*	*FEMA*	*<10,000*	*All*	*To be addressed within 5 year planning period*
3.	Request that the Town, including the Board of Education, if applicable, retain the services of a professional engineer to survey all municipally owned buildings for their ability to withstand earthquake and wind loading. Prioritize any retrofitting, giving those buildings to be used as shelters the highest priority. If analysis reveals that a particular building is better suited as a shelter than one that is currently being used, then consider relocating the shelter to that location.	*EM, BOE*	*3*	*2*	*1*	*3*	*2*	*1*	*1*	*1.86*	*Medium*	*BOE or Municipal Budget*	*25,000+*	*Hurricane, Tornado, Earthquake*	Within 2 years
4.	Maintain and update as needed The Westport Emergency Operations Plan to address earthquakes and other natural disasters.	*EM*	*3*	*2*	*1*	*3*	*3*	*1*	*2*	*2.14*	*Medium*	*EM*	*<10,000*	*All*	Annually

Goal 7: Implement and expand drought mitigation plans and initiatives.

Table 4.4.3.7-21 Westport 2016 Mitigation Strategies, Goal 6, Objective AC: Update Drought Management Plan and review and update regulations as necessary.

ID	Supporting Recommendation	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Study effectiveness of regulations during drought conditions.	*CC,WWHD, Aquarion*	*3*	*1*	*1*	*2*	*2*	*2*	*3*	*2.00*	*Medium*	*Town*	*$5,000-25,000*	*Drought, Climate change*	*5 years*
3.	Work with Aquarion Water Co. on infrastructure in town and inter-town.	*CC, Aquarion*	*3*	*1*	*2*	*3*	*2*	*3*	*3*	*2.43*	*Medium*	*Town*	*$5,000-25,000*	*Drought, Climate change*	*To be addressed within 5 year planning period*
4.	Update drought management plan to be in alignment with State of Connecticut Drought Management plan.	*WWHD*	*3*	*2*	*2*	*3*	*2*	*3*	*3*	*2.57*	*High*	*Town*	*$5,000-25,000*	*Drought, Climate change*	*5 years*

Goal 8: To reduce the loss of life and property as a result of dam failure.

Table 4.4.3.7-22 Westport 2016 Mitigation Strategies, Goal 6:

Objective AD: Help private dam owners obtain financial assistance for dam repairs.

Objective AE: Improve and expand current dam failure warning systems.

ID	Supporting Recommendation	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Work with the State Department of Energy and Environmental Protection, local conservation officials and dam owners to identify which dams are no longer serviceable and could be removed. Work to coordinate and identify funding opportunities.	*EM, , DEEP, DPW, CC*	*1*	*1*	*1*	*1*	*2*	*1*	*2*	*1.29*	*Low*	*EPA, DEEP, FEMA, DEMHS*	*$50,000-100,000*	*Dam Failure*	*5 years*

2.	Work with the State and property owners to identify funding and repair of the Bulkley Pond Dam on Sasco Creek.	*DEEP, CC*	*3*	*2*	*2*	*1*	*1*	*3*	*3*	*2.14*	*Medium*	*EPA, DEEP, FEMA, DEMHS*	*100,000*	*Dam Failure*	*5 years*
3.	Continue to install and maintain warning gauges on local dams as the opportunity or need arises.	*DPW*	*3*	*3*	*1*	*1*	*1*	*1*	*2*	*1.71*	*Medium*	*Town, USGS, NOAA, FEMA, DEMHS, EPA, DEEP*	*10,000*	*Dam Failure*	*5 years*
4.	Ensure Emergency Operations Plans are updated and on file with local emergency management officials. Local emergency management officials will assist dam owners as needed.	*EM, Police, Fire*	*3*	*3*	*2*	*3*	*3*	*2*	*2*	*2.57*	*High*	*EM Budget*	*<10,000*	*Dam Failure*	*Annually*
5.	Work with dam owners to ensure that maintenance and inspections are conducted as required and documented with local and state emergency management officials.	*EM, DPW, CC, DEEP*	*3*	*3*	*2*	*3*	*3*	*2*	*2*	*2.57*	*High*	*Operating Budget/ Private*	*1,000-3,000*	*Dam Failure*	*Annually*
6.	Develop and conduct a Dam Failure Exercise that involve all stakeholders and encourages preparedness through practice using public notifications systems. Assess and practice evacuation and response plans. Practice communication and coordination of local and state emergency response personnel	*EM, DPW, CC, P&Z, DEEP*	*2*	*2*	*1*	*2*	*2*	*1*	*1*	*1.57*	*Medium*	*FEMA PDM Grant*	*10,000-15,000*	*Dam Failure*	*Within 2 years and then on-going*
7.	Develop public awareness information material to distribute to property owners/occupants in the dam failure inundation zones.	*EM, DPW, CC, P&Z, Buildings*	*2*	*2*	*1*	*2*	*1*	*1*	*1*	*1.43*	*Low*	*EM Budget*	*1000*	*Dam Failure*	*Within 5 years*

Goal 9: To reduce the potential vulnerability for loss of life and property as a result of sea level rise.

Table 4.4.3.7-23 Westport 2016 Mitigation Strategies, Goal 6:

Objective AF: Ensure that town facilities are able to withstand the potential impacts of sea level rise.

Objective AG: Educate the town and it's citizens as to the potential loss that may result in sea level rise do to climate change.

Objective AH: Work to minimize increased vulnerability to new construction in areas that may be impacted by sea level rise.

ID	Supporting Recommendation	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Continue to monitor information on global sea level rise.	*CC,EM, DPW, P&Z*	*3*	*3*	*2*	*3*	*3*	*2*	*3*	*2.71*	*High*	*FEMA, DEMHS, EPA, DEEP, HUD, Town*	*25,000*	*Sea Level Rise*	*To be addressed within 5 year planning period*
2.	Evaluate how to best prepare for the implications of global sea level rise to best balance public health, safety, and welfare.	*P&Z,, EM, DPW, CC*	*2*	*2*	*1*	*3*	*1*	*2*	*3*	*2.00*	*Medium*	*FEMA, DEMHS, EPA, DEEP, HUD, Town*	*$5,000-50,000 (Varies by activity)*	*Sea Level Rise*	*5 years*
3.	Minimize the amount and intensity of development in coastal "V" flood zones: Eliminate new non-water dependent development from "V" zones and only allow new structures that meet current "V" zone construction.	*P&Z*	*2*	*2*	*3*	*2*	*3*	*3*	*3*	*2.57*	*High*	*Town*	*10,000*	*Sea Level Rise*	*2 years*
4.	Modify Zoning Regulations to require freeboard.	*P&Z*	*1*	*2*	*3*	*3*	*3*	*2*	*3*	*2.43*	*Medium*	*Town*	*10,000*	*Severe Storm, Hurricane, Sea Level Rise*	*2 years*
5.	Encourage elevations of existing homes to comply with Floodplain Regulations.	*P&Z*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3.00*	*High*	*Town*	*<$5,000*	*Severe Storm, Hurricane, Sea Level Rise*	*To be addressed within 5 year planning period*
6.	Acquire properties prone to flooding as funding becomes available.	*P&Z*	*3*	*2*	*2*	*2*	*1*	*3*	*3*	*2.29*	*Medium*	*FEMA/ Town / HUD / Other*	*10,000,000 + dependent on future storm events*	*Severe Storm, Hurricane, Sea Level Rise*	*To be addressed within 5 year planning period*

4.4.3.8 Wilton 2016 Mitigation Strategies

Challenges

- Wilton regularly receives proposals for commercial and multi-family housing projects along Route 7 and areas adjacent to the Norwalk River. Even though stormwater discharge is minimized through the municipality's regulations, the cumulative effect of relatively intense land use may increase the likelihood of flooding in commercial and densely populated areas in the Norwalk River floodplain.
- South Norwalk Electric and Water (SNEW) owns the Popes Pond and South Norwalk Reservoir Dams. Even though SNEW maintains an emergency operating plan for each dam, the plans lack dependable protocols to contact property owners in the event of a dam emergency. A reverse 911 or similar system could provide rapid notification of property owners in the event of a dam emergency.
- Flooding regularly occurs near the confluence of the Silvermine River and Comstock Brook. Flooding in this area is intensified when water is released from upstream reservoirs, often without warning.
- Tree debris often results in street closures. In addition, tree debris creates blockages in the Norwalk River, which sometimes lead to flooding on U.S. Route 7.
- Wilton has three emergency shelters with limited capacity, one of which lies in an area prone to flooding.
- Many Wilton residents have not experienced a hurricane or tornado event and may mistakenly underestimate the potential impacts of high winds.

Mitigation Strategies

Wilton Table Key: BOS = Board of Selectmen; Building = Town Building Department; CC = Conservation Commission; CTDEEP = CT Department of Environmental Protection; CTDOT = CT Department of Transportation; DEMHS 1= CT Division of Emergency Management and Homeland Security Region 1; DPW = Department of Public Works; EM = Emergency Management (Director of EM, Fire and Police); FM = Fire Marshal; IT = Town Information Technology Department; IWC = Inland Wetlands Committee; HD = Health Department; P&Z = Planning and Zoning Commission; Staff = Various Town Staff; WCCOG=Western Connecticut Council of Governments (formerly SWRPA); UFWF=United States Fish & Wildlife Service; OPM = CT Office of Policy & Management; EMPG = Emergency Management Performance Grant; NOAA = National Oceanic & Atmospheric Administration; FHWA = Federal Highway Administration; EPA = Environmental Protection Agency

Features highlighted in gray are "High Priority"

*Rated a high priority by municipality, independent of STAPLEE results

Goal 1: Reduce the loss of life and property and economic consequences as a result of flooding, high winds, severe winter storms and dam failure.

Table 4.4.3.8-1 Wilton 2016 Mitigation Strategies, Objective A: Improve the ability of Wilton residents to prepare for and respond to approaching severe weather.

ID	Supporting Recommendation	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Continue to enhance community preparedness programs, including dissemination of emergency notifications and severe weather warnings	*EM*	*3*	*2*	*2*	*3*	*2*	*2*	*2*	*2.29*	*Medium*	Town	$110k+	*All*	Annually

2.	Maintain emergency notification system to incorporate cell phone numbers into the database.	*EM*	*3*	*2*	*2*	*3*	*2*	*2*	*2*	*2.29*	*Medium*	*Town*	*$20k+*	*All*	Annually
3.	Continue the use of social media networks to disseminate emergency notifications and severe weather warnings, and develop social media strategy.	*EM*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3.00*	*High*	FEMA, DEMHS, Town, OPM, EMPG	$60k - $160k (includes staff time)	*All*	Annually
4.	Work with telecommunications entities to strengthen mobile network telecommunications to increase resiliency.	*P&Z, Utilities*	*3*	*3*	*1*	*2*	*1*	*1*	*1*	*1.71*	*Medium*	Utilities, PURA	$10m+	*All*	1-3 years, depends on extent
5.	Work with assisted living facilities in town to ensure preparedness and resiliency to natural hazards, including providing the town a better understanding of needs and vulnerabilities for each facility.	*EM*	*2*	*3*	*1*	*3*	*2*	*0*	*0*	*1.57*	*Medium*	*FEMA, DEMHS, Town*	*$100,000*	*All*	*1-3 years, plus annual reporting*
6.	Encourage the study of alternative systems for delivering reliable power to residents.	*EM, P&Z, Utilities*	*3*	*1*	*2*	*3*	*3*	*2*	*2*	*2.29*	*Medium*	FEMA, DEEP, WCCOG, Local	5-25k	*All*	1 year, annually

Table 4.4.3.8-2 Wilton 2016 Ongoing Practices, Objective A: Improve the ability of Wilton residents to prepare for and respond to approaching severe weather.

ID	Ongoing Practices	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Continue to provide education materials on preparing for natural disasters. Including exploring template guides for EOC operators.	*EM*	*3*	*2*	*1*	*2*	*2*	*1*	*2*	*1.86*	*Medium*	*FEMA/ DEMHS*	*$25-50k*	*All*	*1-3 years*
2.	Develop a GIS application to assist personnel in the event of an emergency or natural disaster.	*EM, Police, Fire*	*3*	*2*	*1*	*2*	*2*	*1*	*2*	*1.86*	*Medium*	*FEMA/ DEMHS, OPM, DEEP, CTDOT, HUD*	*$100-300k*	*All*	*Bi annually*

Table 4.4.3.8-3 Wilton 2016 Mitigation Strategies, Objective B: Improve the Town of Wilton's ability to prepare for and respond to natural disasters and severe weather events.

ID	Supporting Recommendation	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Continue to hold regular meetings with town departments that may need to respond to natural disasters, focused on sharing information, coordination and developing protocols.	*EM, P&Z, DPW, Fire, Police, CC*	*2*	*2*	*3*	*3*	*3*	*3*	*2*	*2.57*	*High*	*Town*	*5k*	*All*	Annually
2.	Continue to work with DEMHS to enhance Training and exercises on disaster responses and education on Property damage assessment forms.	*EM, DEMHS*	*2*	*3*	*2*	*2*	*2*	*1*	*2*	*2.00*	*Medium*	*FEMA/ DEMHS, CTDOT, DEEP*	*$50-100k (dependent on drills op)*	*All*	Annually
3.	Implement a town-wide GIS.	*IT*	*3*	*1.5*	*1*	*2*	*3*	*3*	*3*	*2.36*	*Medium*	*WCCOG, OPM, State Programs*	*100-500k*	*All*	1-3 years, then annual maintenance

4.	Identify ways to improve the use of GIS for use in identifying areas and facilities vulnerable to disasters and for use to enhance emergency management.	*EM,IT*	*3*	*1.5*	*1*	*2*	*3*	*3*	*3*	*2.36*	*Medium*	*WCCOG, OPM, State Programs*	*100-500k*	*All*	1-3 years
5.	Inventory and update conditions of town owned significant culverts and bridges. and consider repairs or replacement as necessary or as funding becomes available.	*DPW*	*3*	*2*	*3*	*3*	*2*	*2*	*3*	*2.57*	*High*	*FEMA, Local, State, DEEP*	*$25-50k*	*Flooding, Severe Storm, Hurricane*	Annually
6.	Continue to work with CTDOT and DEEP to maintain flow of streams through expansive wetlands.	*DPW, CC, State*	*2*	*2*	*1*	*2*	*2*	*1*	*3*	*1.86*	*Medium*	*FEMA, DEEP, Local, WCCOG*	*25-50k*	*Flooding, Severe Storm, Hurricane*	*Annually*
7.	Continue to provide capital budget funds for drainage projects and investigation of drainage problems.	*DPW*	*3*	*2*	*3*	*3*	*2*	*2*	*3*	*2.57*	*High*	*DEEP, RPI*	*1-5m*	*Flooding, Severe Storm, Hurricane*	*3 + years*
8.	Continue to work to implement recommendations from the current storm water management plan.	*DPW, P&Z, CC*	*3*	*2*	*3*	*3*	*2*	*2*	*3*	*2.57*	*High*	*FEMA, Local, State, DEEP*	*25-50k*	*Flooding, Severe Storm, Hurricane*	*3+ years then annually*
9.	Enhance storm drain maintenance activities: Maintain records for storm drain maintenance.	*DPW*	*3*	*2*	*3*	*3*	*2*	*2*	*3*	*2.57*	*High*	*FEMA, Local, State, DEEP*	*25-50*	*Flooding, Severe Storm, Hurricane*	*3+ years then annually*
10.	Enhance storm drain maintenance activities: Continue to work to increase frequency of storm drain clean out.	*DPW*	*3*	*2*	*3*	*3*	*2*	*2*	*3*	*2.57*	*High*	*FEMA, Local, State, DEEP*	*25-51*	*Flooding, Severe Storm, Hurricane*	*3+ years then annually*
11.	Continue to assess the ecological and health implications of winter road salting and investigate alternatives.	*BOS, DPW,CC*	*1.5*	*3*	*3*	*2*	*3*	*1*	*3*	*2.36*	*Medium*	*CTDOT, DEEP, OPM, Local*	*5-25k (dependent on scope)*	*Severe Storm (Winter)*	*1-3 years*

12.	Ensure that Fire Station 2 continues to serve western Wilton and analyze options for meeting expansion needs of Fire Station 2 on-site, on other sites, or by sharing services with neighboring communities.	*BOS, Fire*	*3*	*3*	*3*	*3*	*1*	*2*	*2*	*2.43*	*Medium*	*Town, FEMA/ DEMHS*	*5-25k*	*All*	*1-3 years*
13.	Continue to require the provision of fire water cisterns when development cannot be served by public water. Explore opportunities to add cisterns.	*EM, P&Z*	*3*	*3*	*2*	*2*	*1*	*2*	*1*	*2.00*	*Medium*	*DEMA, DEMHS, Town*	*100k-1m*	*All*	*1-3 years*
14.	Consider options for Merwin Meadows dam removal as identified in the engineering study.	*DPW, DEEP*	*3*	*3*	*3*	*2*	*3*	*0*	*3*	*2.43*	*Medium*	*UFWF, FEMA, EPA, DEEP*	*$2-3+ million*	*Dam Failure, Flooding*	*1-3 years*
15.	Work with Norwalk's First Taxing district to improve communications and coordinate the release of water from the Browns Reservoir.	*DPW, EM*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2.00*	*Medium*	*DEEP*	*$5-25k*	*Dam Failure, Flooding*	*Annually*
16.	Assess vulnerability of critical facilities, including shelters and evacuation routes, to a variety of storm scenarios.	*EM, HD,DPW, Building, Red Cross*	*3*	*3*	*1*	*2*	*1*	*1*	*2*	*1.86*	*Medium*	*FEMA, DEMHS, HUD, CTDOT, FHWA, OPM, EPA, NOAA, USACOE*	*$80-100k*	*All*	*1-3 years*
17.	Train additional volunteer personnel in shelter management and emergency supply distribution.	*EM, CERT, Red Cross*	*3*	*3*	*1*	*2*	*1*	*1*	*2*	*1.86*	*Medium*	*FEMA, DEMHS*	*$10-15k*	*All*	*Annually*
18.	Establish a database on well water by using information submitted to the local health department for each new well and complaints received.	*HD*	*2*	*2*	*1*	*3*	*3*	*2*	*2*	*2.14*	*Medium*	*FEMA/DEMHS, DEEP, Local, OPM*	*$50-100k*	*Drought*	*1-2 years*
19.	Monitor well water quantity issues by reviewing data annually.	*HD, CC*	*3*	*3*	*2*	*2*	*3*	*3*	*3*	*2.71*	*High*	*FEMA/DEMHS, DEEP, Local, OPM*	*$5-25k*	*Drought*	*Annually*
20.	Explore the need for a drought ordinance.	*HD, CC,P&Z*	*2*	*1*	*3*	*2*	*3*	*3*	*2*	*2.29*	*Medium*	*Local*	*$1-5k*	*Drought*	*1 Year*

Table 4.4.3.8-4 Wilton 2016 Ongoing Practices, Objective B: Improve the Town of Wilton's ability to prepare for and respond to natural disasters and severe weather events.

ID	Ongoing Practices	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Require utility lines to be buried for all new subdivisions and encourage moving utility lines underground during certain projects such as major road projects.	*P&Z*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3.00*	*High*	*Town*	*5-25k*	*Severe Storm, Hurricane, Tornado*	*Annually*

Table 4.4.3.8-5 Wilton 2016 Mitigation Strategies, Objective C: Reduce the amount of debris from severe storms through preventive tree maintenance.

ID	Supporting Recommendation	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Work with DEMHS to complete and enhance the state and regional debris management plan and to address local needs.	*EM, DPW, DEMHS*	*3*	*3*	*2*	*3*	*2*	*2*	*3*	*2.57*	*High*	FEMA, DEMHS, DEEP, OPM, CTDOT, NRCS, EPA, USACOE	$100-500k	*Severe Storm, Hurricane, Tornado*	1-3 years
2.	Designate pre-planned locations for debris storage and management	*DPW*	*3*	*3*	*2*	*3*	*2*	*2*	*3*	*2.57*	*High*	State local federal, FEMA, DEEP	500k - 1m	*Severe Storm, Hurricane, Tornado*	>1 year, annually
3.	Conduct a Town-wide inventory and assessment of street trees, consider conducting the inventory in conjunction with other municipalities in the region.	*Tree Committee, CC*	*2*	*2*	*2*	*2*	*3*	*2*	*2*	*2.14*	*Medium*	FEMA, DEMHS, DEEP, OPM, CTDOT	10-50k (dependent on scope)	*Severe Storm, Hurricane, Tornado*	1-3 years
4.	Continue to commit capital funding annually for public tree maintenance and plantings.	*BOS, CC*	*3*	*3*	*3*	*3*	*3*	*3*	*2*	*2.86*	*High*	*Local*	*$100-300k*	*Severe Storm, Hurricane, Tornado*	Annually

Table 4.4.3.8-6 Wilton 2016 Ongoing Practices, Objective C: Reduce the amount of debris from severe storms through preventive tree maintenance.

ID	Ongoing Practices	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Budget appropriate money necessary to maintain and remove dead, dying, dangerous or diseased trees in rights-of-way and on other town land.	*DPW*	*3*	*2*	*2*	*1*	*1*	*2*	*3*	*2.00*	*Medium*	*Town, Utilities*	*100-500k*	*Severe Storm, Hurricane, Tornado*	*Annually*
2.	Seek financial assistance to manage tree debris in the Norwalk River.	*DPW, CC*	*2*	*3*	*2*	*2*	*3*	*2*	*3*	*2.43*	*Medium*	*FEMA, DEMHS, Local, OPM*	*100k-200k*	*Severe Storm, Hurricane, Tornado*	*Bi-annually*

Table 4.4.3.8-7 Wilton 2016 Mitigation Strategies, Objective D: Reduce the Town of Wilton's Vulnerability to Flooding.

ID	Supporting Recommendation	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Assure strict adherence to current flood plain regulations.	*P&Z, CC*	*3*	*2*	*3*	*3*	*3*	*3*	*3*	*2.86*	*High*	Local, State	5-25k	*Flooding*	>1 year
2.	Consider conducting drainage and watershed evaluations for all problematic waterbodies in the town.	*CC, DPW*	*2*	*2*	*1*	*2*	*3*	*1*	*3*	*2.00*	*Medium*	FEMA, DEEP, EPA, OPM, Local	100-500k	*Flooding*	1 -3 years
3.	Maintain the Federal Flood Insurance Program which provides insurance for property owners in flood hazard areas, and encourage development to be located outside flood-prone areas wherever possible, including increased setbacks.	*P&Z, CC*	*3*	*2*	*3*	*3*	*3*	*3*	*3*	*2.86*	*High*	*local, state*	*5-25k*	*Flooding*	< 1 Year
4.	Encourage acquisition of wetlands beneficial to the Town.	*CC, IWC, BOS*	*3*	*2*	*3*	*3*	*3*	*3*	*3*	*2.86*	*High*	Local, State	5-25k	*Flooding*	< 1 Year

5.	Continue to encourage the preservation of undeveloped lands within the 100-year flood zone with the use of Open Space purchase, donation or conservation easement.	*P&Z, CC, BOS*	*3*	*2*	*3*	*3*	*3*	*3*	*3*	*2.86*	*High*	Local, State	5-25k	*Flooding*	< 1 year
6.	Revise subdivision regulations to require open space set aside to reflect upland to wetland ratio of parcel.	*P&Z*	*3*	*2*	*3*	*3*	*3*	*3*	*3*	*2.86*	*High*	Local, State	5-25k	*Flooding*	< 1 year
7.	Ensure that the Town is up-to-date in its storm water management planning (NPDES) requirements.	*DPW*	*3*	*2*	*3*	*3*	*3*	*3*	*3*	*2.86*	*High*	FEMA, DEEP, EPA, OPM, Local	25k-50k	*Flooding*	< 1 year
8.	Ensure expert engineering review of projects with potential storm water impacts.	*P&Z, IWC*	*3*	*2*	*3*	*3*	*3*	*1*	*3*	*2.57*	*High*	FEMA, DEEP, EPA, OPM, Local	100-500k	*Flooding*	1-3 years
9.	Require drainage review for all projects that exceed a certain threshold of land clearing or a certain percentage of impervious surface.	*P&Z*	*3*	*2*	*3*	*3*	*3*	*3*	*3*	*2.86*	*High*	Local, State	5-25k	*Flooding*	< 1 year
10.	Consider requiring a drainage review when a certain amount of land is cleared of vegetation.	*P&Z, BOS*	*3*	*2*	*3*	*3*	*3*	*3*	*3*	*2.86*	*High*	Local, State	41784	*Flooding*	< 1 year
11.	Reduce impervious surfaces by adopting impervious coverage allowances for all zoning districts or amending regulations to decrease need for impervious surfaces.	*P&Z*	*3*	*2*	*3*	*3*	*3*	*1*	*3*	*2.57*	*High*	FEMA, DEEP,CTDOT, EPA, OPM, Local	25-50k	*Flooding*	1-3 years
12.	Ensure that redevelopment reduces runoff from current conditions.	*P&Z, CC*	*3*	*2*	*3*	*3*	*3*	*3*	*3*	*2.86*	*High*	local, state	5-25k	*Flooding*	< 1 year
13.	Consider requiring Low Impact Development (LID) techniques for all new development, including Town projects and road projects.	*P&Z, DPW*	*2*	*2*	*3*	*2*	*2*	*2*	*3*	*2.29*	*Medium*	Local	5-25k	*Flooding*	1-3 years

14.	Assist property owners along the Norwalk River with retrofitting properties using LID principles.	*CC*	*3*	*2*	*2*	*2*	*3*	*1*	*3*	*2.29*	*Medium*	FEMA, DEEP, EPA, OPM, Local	1-5m+	*Flooding*	1-5 years.
15.	Ensure that redevelopment incorporates measures to improve storm water quality and quantity.	*P&Z*	*3*	*2*	*3*	*3*	*3*	*3*	*3*	*2.86*	*High*	Local, State	5-25k	*Flooding*	*<year*
16.	Promote infiltration rather than diverting runoff into the Town's drainage system.	*P&Z, DPW*	*2*	*2*	*2*	*2*	*3*	*3*	*3*	*2.43*	*Medium*	Local, OPM, DEEP	5-25k	*Flooding*	*1 Year, +annually*
17.	Encourage landowners to retain storm water, such as by using rain barrels or planting rain gardens.	*CC*	*3*	*2*	*3*	*3*	*3*	*3*	*3*	*2.86*	*High*	local, state	5-25k	*Flooding*	*<year*
18.	Educate on the benefits of riparian and wetlands protection.	*CC*	*2*	*2*	*3*	*3*	*3*	*3*	*3*	*2.71*	*High*	*DEEP, OPM, Local*	*5-25k*	*Flooding*	*1year+annually.*
19.	Prepare an assessment of bridges/ overpasses along Route 7 to determine susceptibility to flooding and corresponding mitigation measures (natural and engineered)	*CTDOT, WCCOG*	*3*	*3*	*2*	*2*	*3*	*0*	*2*	*2.14*	*High**	*FEMA, FHWA, CTDOT, USACOE*	*$500,000 (assessment), $10+ mitigation activities*	*Flooding*	*3+ years (assessment only)*

Table 4.4.3.8-8 Wilton 2016 Mitigation Strategies, Objective D: Reduce the Town of Wilton's Vulnerability to Flooding.

ID	Ongoing Practices	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Continue to use and enforce zoning and subdivision regulations to protect natural resources and restrict development in flood zones and other high risk areas.	*P&Z*	*3*	*2*	*3*	*3*	*3*	*3*	*3*	*2.86*	*High*	*local state*	*5-25k*	*Flooding*	*Annually*

4.4.3.9 Regional 2016 Mitigation Strategies

Capabilities

The municipalities of South Western Connecticut have taken a proactive approach to disaster mitigation as described above. Each municipality has developed a mitigation program that effectively addresses the needs of the community. During the development of the plan, several opportunities were identified to enhance inter-municipal collaboration. Regional recommendations focused on methods to assist the municipalities in enhancing the existing mitigation program and in facilitating inter-municipal cooperation.

Challenges

Mitigation Strategies

Features highlighted in gray are "High Priority"

Regional Table Key: WCCOG = Western Connecticut Council of Governments (formerly SWRPA); DEMHS = CT Division of Emergency Management and Homeland Security; Local EM = Local Emergency Management; USACOE = United States Army Corps of Engineers; Red Cross = American Red Cross; Congress = United States Congress; OPM = CT Office of Policy & Management; HUD = U.S. Dept of Housing and Urban Development; NOAA = National Oceanic and Atmospheric Administration; DOI = U.S. Dept of the Interior

*Rated a high priority by municipality, independent of STAPLEE results

Goal 1. Reduce the loss of life, property and economic consequences as a result of Natural Disasters.

Table 4.4.3.9-1 Regional 2016 Mitigation Strategies, Objective A: Provide education and outreach to municipalities , stakeholders, and the public.

ID	Supporting Recommendation	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Work with Municipalities, DEMHS, and the Red Cross to continue shared/regional sheltering locations.	*WCCOG, DEMHS 1, Red Cross*	*3*	*2*	*2*	*2*	*3*	*2.5*	*2.5*	*2.43*	*Medium*	*FEMA, DEMHS, OPM, HUD, CT Housing, Private*	*5-25k*	*All*	*Annually*
2.	Perform/assist with outreach and other project efforts for the public regarding hazards and emergency preparedness, including vulnerable populations	*DEMHS, WCCOG, Municipality*	*3*	*2*	*3*	*3*	*3*	*3*	*2*	*2.71*	*Medium*	*FEMA, DEMHS*	*5-50k*	*All*	*Annually*

3.	Assist with and encourage better coordination between municipalities and utility companies. Explore opportunities for workshops and other sources of information exchange and dialogue.	*WCCOG, DEMHS, Utilities, Local*	*3*	*2*	*3*	*3*	*3*	*2.5*	*2*	*2.64*	*Medium*	*FEMA/ DEMHS, Utilities, OPM, Local, CTDOT, DEEP*	*5-100k (depending on scope and geography)*	*All*	*Annually*
4.	Work with local municipalities to identify and coordinate desired training and workshop programs that may be beneficial in improving mitigation practices in the region.	*WCCOG, DEMHS*	*2*	*2*	*3*	*3*	*3*	*2*	*2*	*2.43*	*Medium*	*FEMA, DEMHS, OPM, CTDOT*	*5-100k (dependent on scope)*	*All*	*Annually*

Table 4.4.3.9-2: Regional 2016 Mitigation Strategies, Objective B: Provide planning and technical assistance to the region.

ID	Supporting Recommendation	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Work with the State, Region, and local municipalities to enhance the Debris management plan to ensure its usefulness.	*WCCOG, DEMHS 1, Municipalities*	*3*	*2*	*2.5*	*2.5*	*3*	*3*	*3*	*2.71*	*High*	*FEMA, DEMHS, HUD, OPM, CT Housing, EPA, DEEP, NOAA, CTDOT*	*100-500k*	*All*	*1-3 years*
2.	Work with municipalities and DEMHS to develop shelter-evacuation routes for a variety of storm scenarios. Document the results in a planning document. Encourage the state to evaluate large-scale evacuation scenarios for CT that includes a mass evacuation of New York.	*WCCOG, DEMHS 1, Local EM*	*3*	*2.5*	*3*	*3*	*3*	*2.5*	*2.5*	*2.79*	*High*	*FEMA, DEMHS, HUD, OPM, CT Housing, DOI, CTDOT*	*50-250k*	*All*	*1-3 years*
3.	Hold Semiannual meeting with the HMP Advisory Committee to discuss progress towards plan implementation, best practices, and collaboration.	*WCCOG, HMPAC*	*3*	*2*	*3*	*3*	*3*	*3*	*2*	*2.71*	*High*	*FEMA, DEMHS, OPM*	*<10k*	*All*	*Quarterly,Annually*

4.	Explore and develop a regional communications plan. Includes communications, sharing resources, identifying common strengths, weaknesses, and vulnerabilities. Identify opportunities to mitigate weaknesses and vulnerabilities.	*WCCOG, DEMHS, Utilities*	*3*	*2*	*2*	*3*	*1*	*2*	*3*	*2.29*	*Medium*	*FEMA, DEMHS, OPM, Utilities*	*25-120k (dependent on scope)*	*All*	1-3 years
5.	Conduct a tree damage vulnerability analysis and assess susceptibility of critical assets and infrastructure.	*WCCOG, DEMHS, Utilities*	*3*	*2.5*	*3*	*3*	*3*	*2*	*3*	*2.79*	*High*	*FEMA, DEMHS, OPM, EPA, DEEP, CTDOT, Utilities*	*25-120k (dependent on scope)*	*All*	1-3 years
6.	Perform a watershed health analysis to scan region's watersheds, including area land use types and impervious area. Results will help determine vulnerable areas based on flow regime and storm runoff.	*WCCOG, DEEP, Watershed Groups*	*3*	*2*	*2.5*	*3*	*3*	*2*	*3*	*2.64*	*High*	*FEMA, DEMHS, DEEP, OPM, EPA, NOAA*	*25-120k (dependent on scope)*	*Flooding, Severe Storms, Hurricane, Severe Weather*	1-3 years
7.	Support the development and maintenance of the ESF-7 Asset Inventory. Explore opportunities to sustain inventory, and the potential development of an associated plan.	*WCCOG, DEMHS*	*3*	*2.5*	*2.5*	*3*	*3*	*2*	*2*	*2.57*	*High*	*FEMA, DEMHS, DEEP, OPM, EPA, CTDOT, Municipalities*	*<15k (development support), maintenance contingent on more refined scope.*	*All*	1-3 years, then annually
8.	Initiate Phase 2 of the DEMHS R1 Emergency Evacuation Planning and Needs Assessment. Explore the feasibility of evacuation routes and transportation modes in Region relative to natural hazards, including identification of hazard-prone areas along key routes (i.e. transportation suitability analysis). Assess vulnerable assets from HMP and develop a short-list of feasible mitigation measures to explore for implementation	*WCCOG, DEMHS*	*3*	*2*	*3*	*3*	*3*	*2*	*3*	*2.71*	*High*	*FEMA, DEMHS, HUD, CT Housing, OPM, CTDOT, EPA, DEEP, NOAA*	*25-250k (dependent on scope)*	*All*	1-3 years
9.	Assist with projects and efforts that involve two or more participating municipalities, and other regional incentives, where desired. For example: a regional communications/dispatch center; a plan identifying interfaces with WebEOC, Veochi, GIS and other software applications.	*DEMHS, WCCOG, Municipality*	*3*	*2*	*3*	*3*	*3*	*3*	*2*	*2.71*	*High*	*FEMA, DEMHS, OPM, Local*	*5-100k (Depending on scope)*	All	1-3 Years then annually

Table 4.4.3.9-3 Regional 2016 Mitigation Strategies, Objective C: Support additional federal, state, regional, and municipal initiatives

ID	Supporting Recommendation	Who	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total Score	Priority*	Potential Funding Source	Estimated Cost	Hazard Addressed	Approximate Timeline
1.	Continue to work to have an Army Corps of Engineers Reconnaissance Study conducted of the Region's rivers and streams.	*WCCOG, Congress, USACOE*	*3*	*2.5*	*2*	*3*	*1*	*2*	*3*	*2.36*	*Medium*	*Congressional Authorization*	*5-50k*	*Flood, Severe Storm, Hurricane, Sea Level Rise*	*To be addressed within 5-year performance period.*
2.	Continue the development of a regional website with emergency management information (i.e. DEMHS site that can be linked to).	*DEMHS 1*	*3*	*2*	*2*	*3*	*2*	*2*	*2*	*2.29*	*Medium*	*FEMA, DEMHS, OPM, DOI*	*5-25k (Depending on action taken)*	*All*	*1-3 years then annually*
3.	Participate in the development/ update of the state emergency preparedness plans.	*WCCOG, DEMHS 1*	*3*	*2*	*2*	*3*	*3*	*2*	*3*	*2.57*	*High*	*FEMA, DEMHS, All CT State Agencies, Utilities*	*<25k*	*All*	*To be addressed within 5-year performance period.*
4.	Explore opportunities to secure technical assistance for Hazard Mitigation Grant Program (HMGP) applications (i.e. home elevation grants)	*DEMHS, Local EM, WCCOG*	*3*	*2*	*2*	*3*	*3*	*2*	*2*	*2.43*	*Medium*	*FEMA, DEMHS, Local*	*<15k (exploration only)*	*All*	Annually
5.	Create and maintain a regional stormwater clearinghouse to assist municipalities with stormwater BMPs, appropriate mitigation techniques, and regulatory compliance.	*WCCOG, Local*	*3*	*2*	*3*	*3*	*3*	*2.5*	*3*	*2.79*	*High*	*EPA, DEEP, OPM, Local*	*10-75k (clearing house only)*	All	1-3 years + annual maintenance

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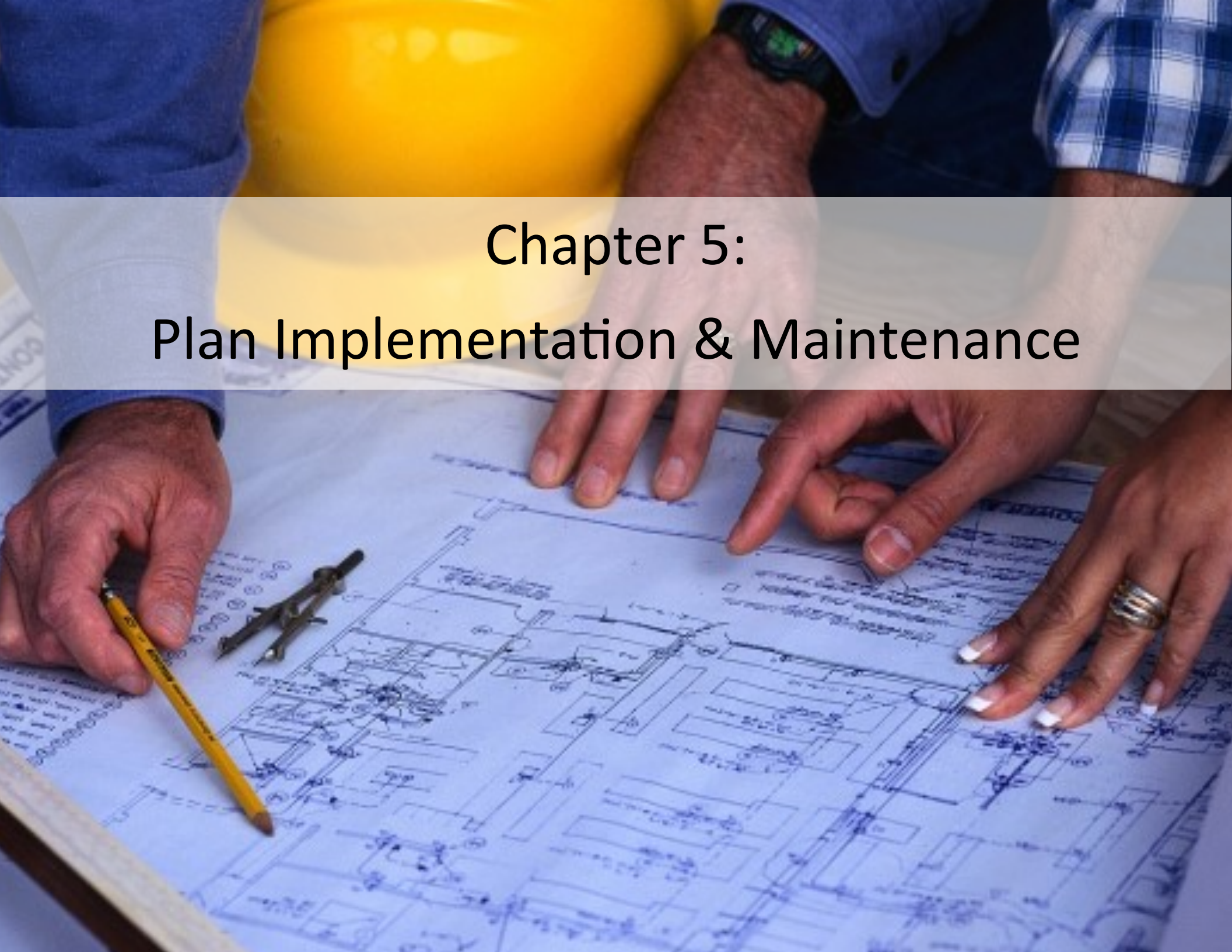

Chapter 5:

Plan Implementation & Maintenance

5.0 Plan Implementation & Maintenance

As a living document, the importance of keeping the plan current is paramount. Over time, changes to hazards, available information and data, as well as actions and priorities tend to occur, which may require plan adjustments. Such "real-time" adjustments help aid in keeping the HMP both current and relevant. The plan itself contains a circular process of core steps that are embedded within the South Western Region HMP, and detailed below in Figure 5.0-1. This process will be revisited annually and serves to bring the plan to life, helping build and strengthen institutional capacity with respect to the implementation of mitigation strategies, but also to adequately assess and adjust for changes within the region. This section and it's components describe how to develop procedures to monitor, evaluate, and update the HMP over time, in accordance with 44 CFR Section 201.6(c)(4)(i).

Figure 5.0-1: Core Steps in Hazard Mitigation Planning Process

Image Source: FEMA

5.1 Keeping the plan current

5.1.1 Plan Monitoring and Mitigation Strategy Implementation

Plan monitoring will be championed by the 2016 HMP Update Advisory Committee, who represent the primary HMP contacts on the front line. The Advisory Committee is comprised of municipally-appointed representatives from each of the eight municipalities in the South Western Region, including WWCOG/SWRPA. Many of the representatives have direct ties to local and regional emergency management operations, but also include officials from planning, conservation, and other municipal departments. Table 5.1.1-1 below illustrates the primary municipal contacts for plan implementation monitoring.

In addition to the Advisory Committee contacts presented above, a secondary group of municipal officials played an instrumental role in plan development, and represent an even greater cross section of expertise and backgrounds with respect to hazard mitigation. Participants of this group are highlighted in Section 2.1.2 "The Planning Team."

The HMP Advisory Committee will coordinate and convene annual reviews of the plan to assess overall implementation, difficulties/challenges, and any departures from what is currently captured in this plan. Proposed annual meeting reviews are scheduled for spring, which permit the region and its municipalities the time necessary in order to potentially plan and apply for annual federal disaster mitigation grant applications. The HMP Advisory Committee, as official HMP liaisons to their respective municipalities, will concurrently conduct annual outreach to each municipality while also partaking in the regional discussion. FEMA, DEMHS, as well as other federal and/or state agencies with expertise in hazard mitigation may also participate in certain discussions, where applicable. Such efforts are designed to solicit and capture all necessary data with respect to plan reviews, including any potential changes. Additional meetings will be convened prior to and following an area natural hazard event, as appropriate.

With respect to actual details, the following elements from the plan will be carefully reviewed at the aforementioned meeting reviews:

- Assess overall plan implementation progress
- Evaluate specific sites and areas vulnerable to natural hazards

- Includes all critical assets and infrastructure
- Identify cost-effective mitigation measures to benefit these areas
- Summarize mitigation strategies that have taken place
- Monitor plan and effectiveness of remaining mitigation strategies
- Review and adjust overall goals and mitigation strategies (where applicable)

Of critical importance is consistently revisiting such variables to ensure that mitigation measures are adequately addressing the needs of each area, which is in line with FEMA goals of reducing the loss of life and property, to the greatest extent possible.

Mitigation Strategies

The key components required to implement mitigation strategies are identified in Section 4.2.4 (2016 Mitigation Actions), where the associated tables identify the party responsible for implementation, as well as the priority, potential funding source, estimated cost and approximate timeline associated with each strategy. In short, this provides the "how, when and by whom" the plan will be implemented.

Table 5.1.1-1 Primary HMP Implementation Contacts

Municipality	2016 HMP Appointee(s)	Title	Phone	E-mail
Darien	Mr. Marc McEwan	Deputy Fire Marshal/EMD	(203) 656-7345	mmcewan@darienct.gov
	Mr. Jeremy Ginsberg	Director of Planning & Zoning	(203) 656-7351	jginsberg@darienct.gov
Greenwich	Mr. Daniel Warzoha	Emergency Management Director (EMD)	(203) 622-2222	emoc@greenwichct.org
	Ms. Denise Savageau	Conservation Director	(203) 622-6461	dsavageau@greenwichct.org
	Ms. Katie DeLuca	Director of Planning & Zoning	(203) 622-7894	Katie.DeLuca@greenwichct.org
New Canaan	Mr. Tiger Mann	Senior Engineer	(203) 594-3054	Tiger.Mann@newcanaanct.gov
	Mr. Steve Bury	Steve Bury	(203) 594-3054	Steve.bury@newcanaanct.gov
Norwalk	Chief Denis McCarthy	Fire Chief/EMD	(203) 854-0200	dmccarthy@Norwalkct.org
	Ms. Michele DeLuca	Deputy EMD	(203) 854-0200	MDeLuca@norwalkct.org
Stamford	Captain Thomas Lombardo	Police Captain/EMD	(203) 977-5900	TLombardo@StamfordCT.gov
	Ms. Erin McKenna	Associate Planner	(203) 977-4076	EMcKenna@StamfordCT.gov
Weston	Sergeant Mike Ferullo	Police Sergeant/EMD	(203) 222-2600	mferullo@westonpolice.com
Westport	Chief Andrew Kingsbury	Fire Chief/EMD	(203) 341-5000	akingsbury@westportct.gov
	Ms. Michelle Perillie	Planner	(203) 341-1030	mperillie@westportct.gov
	Ms. Alicia Mozian	Conservation Director	(203) 341-1170	amozian@westportct.gov
Wilton	Deputy Chief Mark Amatrudo	Deputy Fire Chief/EMD	(203) 834-6246	mark.amatrudo@wiltonct.org
	Chief Ronald Kanterman	Fire Chief/Deputy EMD	(203) 834-6246	ronald.kanterman@wiltonct.org
WCCOG/SWRPA	Mr. Robert Sachnin	Senior Regional Planner	(203) 316-5190	rsachnin@westernctcog.org
	Mr. Michael Towle	Regional Planner	(203) 316-5190	mtowle@westernctcog.org

The implementation of specific strategies and actions is largely contingent on the availability of resources. The region and its municipalities must carefully consider all variables before implementing specific strategies, including: costs, availability of funding, as well as economic and environmental considerations. Some of this information has previously been captured during the development of this plan's mitigation strategies, as part of the STAPLEE priority rating system. Those strategies with high STAPLEE priorities are likely the most feasible, while also containing more benefits than costs. Generally speaking, preference

should be given to those high priority strategies for aforementioned reasons. However, as time progresses, such considerations may change and will likely require revisiting, the details of which are further explained below.

Implementation

WCCOG/SWRPA, as part of the Advisory Committee, will assume the lead role and associated responsibility for the five-year plan update. The municipal Advisory Committee members will provide assistance when/where needed. Approximately two and a half years prior to the expiration of the existing Plan, the Advisory Committee will initiate the update process. A formal review of the existing plan will commence and a summary of implementation strategies will be developed. The review of all relevant municipal, state, and regional plans/studies will also be conducted concurrently, in addition to a survey of existing best practices and successful mitigation strategies implemented nationwide. The update will address any changes regarding potential threats posed by natural disasters, including a new risk assessment using the best available data and the associated determination of vulnerable areas, setting the stage for the development of future mitigation strategies. During the update process, municipalities will be asked to review their existing goals and objectives relative to the aforementioned new risk assessment. Following this effort, new mitigation strategies will be formally developed, in an effort to minimize local vulnerability and reduce identified risks where possible. Proposed mitigation strategies will be reviewed and prioritized by each municipality in accordable with the latest FEMA and State of Connecticut guidance.

The public will have a number of opportunities to participate in the planning process. In addition to a kick-off meeting for the plan update, several public information sessions will be held at key points during the planning process, including four hazard mitigation workshops (i.e. as goals and objectives are being developed, and as mitigation strategies are identified). Public involvement will be coordinated following the process and will employ strategies identified in Region's current public participation plan. Media releases will be issued for all public information sessions, with relevant information posted online. Draft documents will be made available for a 30-day public review and comment period, and additional strategies to engage the community will be employed, as identified in the public participation plan and where appropriate.

Before the end of the five-year period, the updated Plan will be submitted to the DEMHS and FEMA for approval. WCCOG/SWRPA will notify all plan participants and interested stakeholders when the updated plan is complete and once FEMA and State approval has been received.

5.1.2 Incorporation/Implementation through existing Programs

Electronic copies of the approved Plan will be provided to all town departments in each of the Region's municipalities. The process for inclusion and implementation of mitigation strategies will be handled individually by each municipality. The department responsible for implementation and review are indicated in the table of recommended strategies for each municipality in Section 4.2.4. Table 5.1.2-1 outlines the mechanisms available and previously used to incorporate mitigation strategies, which are described in more detail as part of Chapter4, Section 4.1.

As illustrated in Section 2.1.1 "The Planning Team", municipal departments involved in natural hazard mitigation include, but are not limited to: Building, Conservation, Emergency Management, Engineering Finance, Fire, Planning and Zoning, Police, Public Works, in addition to various boards and commissions. Where practical, the municipalities will incorporate the mitigation strategies outlined in this Plan into the following existing programs and activities:

- **Local and Regional Plan of Conservation and Development (PoCD)** – Each municipality in the region develops and updates a plan of conservation and development, intended to guide future development within their jurisdiction. WCCOG/SWRPA and its municipalities should take steps to ensure consistency between their plans of conservation and development and the Region's current HMP.
- **Local and Regional All-Hazards Plans and Emergency Operations Plans (LEOP)** – These plans are part of an overall emergency management program and directly correlate to hazard mitigation planning in the South Western Region.
- **Local Planning and Zoning Regulations** – Each municipality maintains planning and zoning regulations that govern development within their

Table 5.1.2-1 Available Mechanisms for Incorporation of Existing and Proposed Mitigation Strategies.

Municipality	PoCD	EOP	P&Z Regs	Flood Plain Mgmt. & Regs	Local Board & Commissions	FEMA CRS
Darien	✓	✓	✓	✓	✓	
Greenwich	✓	✓	✓	✓	✓	
New Canaan	✓	✓	✓	✓	✓	
Norwalk	✓	✓	✓	✓	✓	✓
Stamford	✓	✓	✓	✓	✓	✓
Weston	✓	✓	✓	✓	✓	
Westport	✓	✓	✓	✓	✓	✓
Wilton	✓	✓	✓	✓	✓	

Source: FEMA, DEMHS Region 1, Local Municipalities

town. As regulations are reviewed and updated, recommendations in the HMP should be considered. Such efforts should work to ensure effective and appropriate hazard mitigation strategies across the region and its municipalities.

- **Local Stormwater and Drainage Manuals** – A number of the Region's municipalities maintain stormwater or drainage manuals as a resource for the community. As manuals are updated portions of this plan may be incorporated, specifically as it pertains towards flooding and associated runoff.
- **Flood Control/Wetland Protection/Emergency Response and Preparedness** - A number of the Region's municipalities have departments, town boards and/or commissions tasked with flood control, wetland protection, and emergency response/preparedness. As new projects are proposed, efforts should be made to ensure consistency with current mitigation strategies and practices, as well as those identified in the Plan. Potential risk and vulnerabilities by associated natural hazard should also be considered.
- **FEMA's Community Rating System** - Many existing and proposed HMP mitigation strategies also contribute positively toward a community's score in this program, which impacts flood insurance rates (applies to Norwalk, Stamford and Westport only).
- **Other plans, programs, studies and projects** – other efforts that would help the participating municipalities achieve the goals and objectives of the HMP should be considered, where applicable. As projects, plans and studies are developed, efforts should be made to incorporate HMP-recommended strategies, ensuring consistency and overlap with the Region's HMP.

5.1.3 Schedule

The proposed planning schedule for 2016—2020 can be found in Table 5.1.3-1 on the next page.

5.2 Plan Availability and Continued Public Participation

After adoption, copies of the Plan will be catalogued and made available at WCCOG/SWRPA's office and other appropriate public agencies within the Region, and at the main libraries in each municipality. In addition, the Plan will be available on WCCOG/SWRPA's website at www.swrpa.org. The existence and location of these copies will be publicized in newspapers in the Region. In this way, the Plan's availability will further promote the goals and objectives of this Plan by increasing awareness about natural disasters and natural hazard mitigation.

During plan review, monitoring and updates, opportunities for public involvement will be provided and championed by WCCOG/SWRPA. Public involvement will be conducted and follow the practices and recommendations outlined in the *most recent Public Participation Plan for the South Western Region Metropolitan Planning Organization*, updated annually. However, each municipality will be responsible for coordinating any necessary public outreach associated with implementation of recommendations from this plan following local practices.

The public is invited to send written comments about the Plan for consideration for future Plan updates. Written comments should be addressed to:

Western Connecticut Council of Governments (WCCOG)
Attn: Robert Sachnin, AICP
Stamford Government Center
888 Washington Blvd., 3rd Floor
Stamford, CT 06901

WCCOG/SWRPA will be responsible for making public comments available for consideration during the Plan review process discussed above.

Table 5.1.3: Schedule for 2016-2021 HMP Update

	2016				2017				2018				2019				2020			
2016-2021 Plan Approval and Adoption																				
FEMA Review & Approval	●	●	●																	
Local & Regional Adoption			●	●	●															
Plan Distribution			●	●	●															
Plan Monitoring and Implementation																				
Annual Reviews & Updates						●				●				●				●		
Public Involvement						●				●				●				●		
HMP Update Process																				
Apply for Grant Funding							●													
Regional Board Approval							●													
Municipal Approval(s)							●													
HMP Development																				
Critical Assets & Infrastructure Update									●	●										
Risk Assessment Update										●	●	●	●	●	●					
Mitigation Strategies Update												●	●	●	●	●	●			
Document Preparation, Review & Potential Revisions														●	●	●	●	●	●	●
Public Involvement										●			●		●	●	●	●	●	●