



# Western Connecticut Council of Governments Multi-Jurisdiction Hazard Mitigation Plan Update 2021 – 2026

## Municipal Annex for **Bridgewater, CT**

44 Main Street South  
Bridgewater, CT 06752  
August 2021

*Prepared for:*  
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MMI #3101-22

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## 1.0 INTRODUCTION

### 1.1 Purpose of Annex

The purpose of this Hazard Mitigation Plan (HMP) annex is to provide a community-specific hazard risk assessment, capability analysis, and evaluation and prioritization of hazard mitigation measures and projects. Background information and the regional effects of pertinent natural hazards are discussed in the main body of the Western Connecticut Council of Governments (WestCOG) Multi-Jurisdictional Hazard Mitigation Plan. This annex is designed to supplement the information presented in the Multi-Jurisdictional HMP with more specific detail for the Town of Bridgewater and is not to be considered a standalone document.

The primary goal of this HMP, including this Municipal Annex, is to identify natural hazard risks and mitigation opportunities in order to reduce the loss of or damage to life, property, infrastructure, and natural, cultural, and economic resources. This includes the reduction of public and private damage costs. Limiting losses of and damage to life and property will also reduce the social, emotional, and economic disruption associated with a natural disaster.

## 2.0 COMMUNITY PROFILE

### 2.1 Geography

#### 2.1.1 Physical Setting

Incorporated in 1856, the Town of Bridgewater is located in southern Litchfield County and is home to a population of 1,727 (2010 U.S. Census). Bridgewater is bordered by the municipalities of New Milford to the north, Roxbury and Southbury to the east, Newtown to the south and Brookfield to the south-southwest. Refer to Figure 2-1 for a map showing the location of Bridgewater.

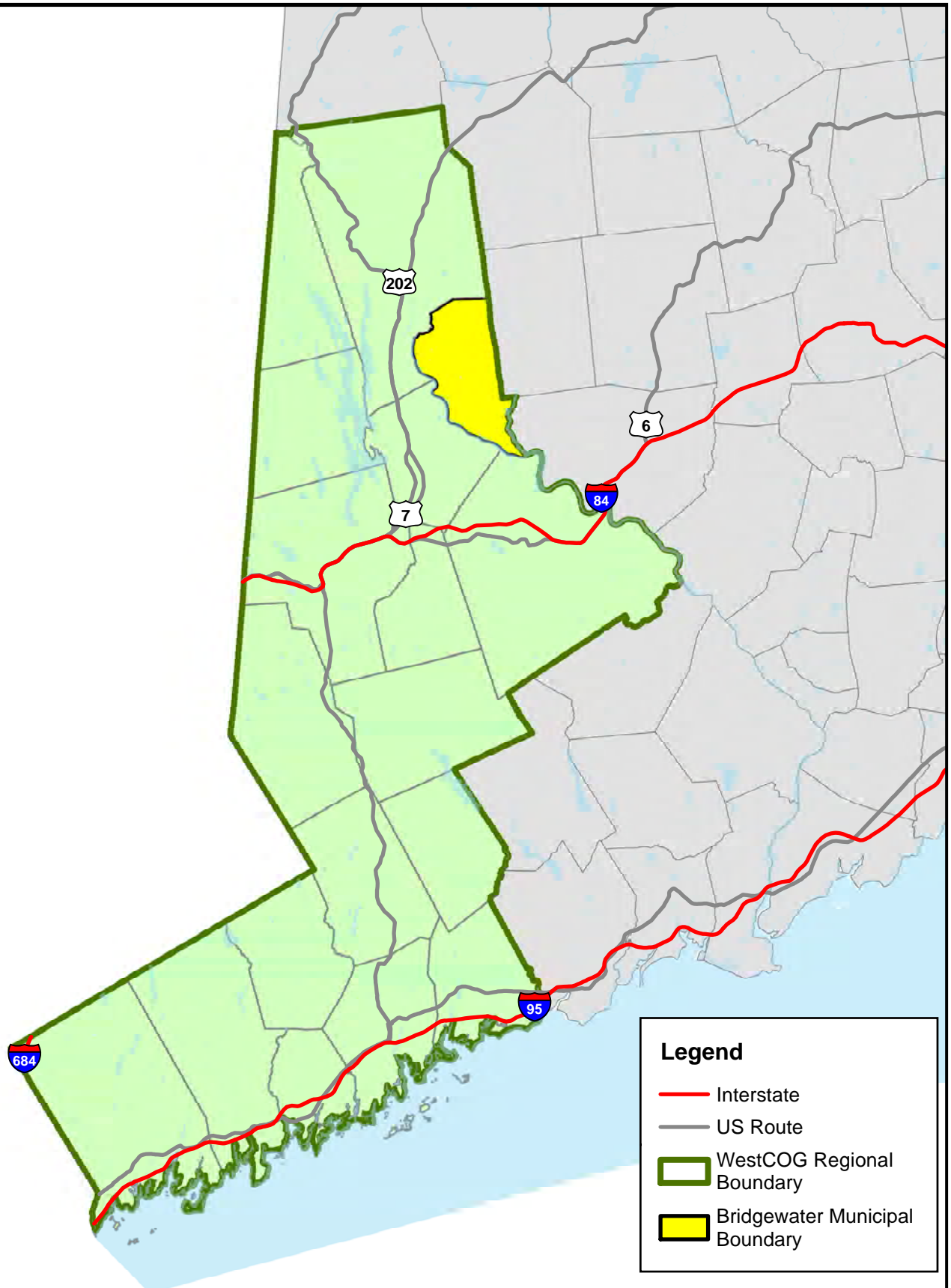
The topography of the town is characterized by a generally rolling terrain with high plateaus, steep slopes and river and stream valleys. The Housatonic River, Shepaug River, Clapboard Oak Brook, Wewaka Brook, Hop Brook and numerous other small rivers and streams course through the town. The varying terrain of Bridgewater makes the town vulnerable to an array of natural hazards.

The Center for Land Use Education and Research (CLEAR) has developed a land cover dataset derived from 2016 satellite imagery to depict statewide land cover. The land cover by percent of total land can be found in Table 2-1.

**Table 2-1: Land Cover by Area**

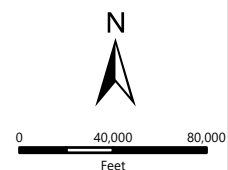
Land Cover Class	Percent of Total Land
<b>Developed</b>	8.0%
<b>Turf &amp; Grass</b>	3.5%
<b>Other Grasses</b>	0.9%
<b>Agricultural Field</b>	18.3%
<b>Deciduous Forest</b>	52.8%
<b>Coniferous Forest</b>	9.6%
<b>Water</b>	5.7%
<b>Non-Forested Wetland</b>	0.03%
<b>Forested Wetland</b>	0.9%
<b>Tidal Wetland</b>	0.04%
<b>Barren Land</b>	0.2%
<b>Utility Corridor</b>	0.0%





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Regional Location of Bridgewater  
WestCOG Hazard Mitigation Plan  
Town of Bridgewater



SCALE 1" = 82,167'  
DATE 11/12/2020  
3101-22  
PROJ. NO.  
**FIG. 2-1**

## 2.1.2 Land Use

Bridgewater is a rural municipality characterized by low density population and limited rural commercial uses. In general, land use in Bridgewater consists predominantly of residential and open space areas. Commercial uses are limited and are concentrated in the center of the Town. Much of Bridgewater consists of steep slopes, rock outcroppings and wetlands which severely impact development potential.

According to the 2012 Plan of Conservation and Development (POCD), the Town of Bridgewater consists of approximately 11,109 acres, most of which is dedicated to residential use. An estimate of permitted land uses is shown in Table 2-2.

**Table 2-2: Permitted Land Use**

Permitted Land Use	Acres
Commercial/Industrial Zone	65.64
Town Green Zone	294.77
RR2 (2-acre zone)	772.40
RR3 (3-acre zone)	5,978.99
RR4 (4-acre zone)	3,024.34
Total Residential Zones	9,775.73

*Source: 2012 Bridgewater Plan of Conservation and Development*

According to the POCD, "from the total residentially zoned lands, an estimated 448 acres are unprotected and 4,581 PA490 properties are temporarily protected, for a total of 5,029 acres that are potentially available for development. This land area constitutes approximately one-half of the Town and must be the focus of all future development considerations and preservation efforts."

The POCD also notes that open spaces, which cover over 2,200 acres, are managed by four conservancies: the Bridgewater Land Trust, The Nature Conservancy Sunny Valley Preserve, Weantinoge, and the Audubon Society. According to the town land records, approximately 2,246 acres of open space are owned by exempt organizations as shown in Table 2-3.

**Table 2-3: Total Land Owned by Exempt Organizations**

Organizations	Number of Acres
Audubon Society	83
Bridgewater Land Trust	187
Connecticut Light & Power	265
First Light Hydro Generation	71
Nature Conservancy	1,442
Roxbury Land Trust	2
Weantinogue Heritage	196
<b>Total</b>	<b>2,246</b>

*Source: 2012 Bridgewater Plan of Conservation and Development*

Table 2-4 summarizes 2006 land cover data which was derived from satellite imagery. Areas shown as turf and grass are maintained grasses such as residential and commercial lawns or golf courses. Development is generally spread throughout the community and not particularly

concentrated in any one area. According to this data, approximately 64% of Bridgewater is forested and approximately 7.8% is developed.

**Table 2-4: Land Cover by Area**

Land Cover	Area within Town (acres)	Percent of Community
Deciduous Forest	5,886	53.0%
Developed	865	7.8%
Turf & Grass	401	3.6%
Coniferous Forest	1092	9.8%
Water	639	5.8%
Barren	10	0.1%
Agricultural Field	1987	17.9%
Forested Wetland	102	0.9%
Other Grasses	106	1.0%
Non-forested Wetland	4	0.0%
Utility (Forest)	17	0.2%
Tidal Wetland	0	0.0%
<b>Total</b>	<b>11,109</b>	<b>100%</b>

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

### 2.1.3 Climate and Climate Change

Over the course of the year, the temperature in Bridgewater typically varies from 18°F to 82°F and is rarely below 3°F or above 89°F. The warm season lasts from May 29 to September 15, with an average daily high temperature above 72°F. The hottest day of the year is July 20, with an average high of 82°F and low of 63°F. The cold season lasts from December 1 to March 10, with an average daily high temperature below 44°F. The coldest day of the year is January 29, with an average low of 18°F and high of 34°F.

Precipitation falls throughout the year in Bridgewater. The wetter season lasts from April 9 to August 20, with a greater than 30% chance of a given day being a wet day. The chance of a wet day peaks at 37% on May 29. The smallest chance of a wet day is 22% on January 29.

The most rain falls during the 31 days centered around June 4, with an average total accumulation of 4.0 inches. The least rain falls around January 24, with an average total accumulation of 1.6 inches.

The snowy period of the year lasts from October 30 to April 14, with a sliding 31-day liquid-equivalent snowfall of at least 0.1 inches. The most snow falls during the 31 days centered around January 25, with an average total liquid-equivalent accumulation of 1.1 inches.

Climate data was sourced from Weather Spark based on analysis of the years 1980 to 2016.

#### *Climate Change*

Climate change projections for Connecticut were sourced from the 2019 Connecticut Physical Climate Science Assessment Report, which was developed by the University of Connecticut (UConn) Atmospheric Sciences Group, commissioned by the Connecticut Institute for Resilience

and Climate Adaptation (CIRCA) with funding from the Department of Energy and Environmental Protection (DEEP). All projections are based on the IPCC high CO<sub>2</sub> emission scenario (RCP8.5).

### Temperature

Annual temperatures have been increasing throughout Connecticut and is projected to continue to do so in the future. By mid-century, average annual temperature is projected to increase by 5°F. Seasonal average temperatures are also expected to rise, with the greatest increase (6°F) experienced in summer (June to August). The number of nights over which temperature remains above 68°F will quadruple from 10 days per year to more than 40 days, and the number of extremely hot days will increase from above 4 a year to 48 per year.

### Precipitation

Rainfall data in "Technical Paper No. 40" by the U.S. Weather Bureau (now the National Weather Service) (Hershfield, 1961) dates from the years 1938 through 1958. According to these data, the 24-hour rainfall amount for a 50% annual-chance storm in Litchfield County is 3.2 inches.

The continued increase in precipitation only heightens the need for hazard mitigation planning as the occurrence of floods may change in accordance with the greater precipitation.

The Northeast Regional Climate Center (NRCC) has partnered with the Natural Resources Conservation Service (NRCS) to provide a consistent, current regional analysis of rainfall extremes (<http://precip.eas.cornell.edu/>). In 2020 this dataset listed the 24-hour rainfall amount for a 50% annual-chance storm in Bridgewater as 3.34 inches.

The NOAA Atlas 14, released on September 30, 2015 puts the 24-hour rainfall amount for a 50% annual-chance annual storm in Bridgewater at 3.46 inches.

These precipitation amounts, and more details, are summarized in Table 2-5, below.

**Table 2-5: 24-Hour Rainfall Amounts by Annual-Chance Occurrence**

Source	24-Hour Rainfall Amount (inches) by Annual-Chance Occurrence		
	50%	4%	1%
<b>Technical Paper No. 40</b>	3.2	5.5	7.0
<b>NRCC</b>	3.34	6.21	8.76
<b>NOAA Atlas 14</b>	3.46	6.74	8.68

Annual precipitation has been increasing statewide and is projected to continue to increase. By mid-century, annual precipitation is projected to increase by 8.5%, with the greatest increase (13.4%) occurring in the winter months. Extreme precipitation events are projected to increase in both frequency and magnitude. Based on this increase and the precipitation figures above, by 2050 Bridgewater can expect the 24-hour rainfall amount for a 50% annual-chance storm to be around 3.5 to 3.7 inches or greater.

Despite overall increases in precipitation, drought risk is projected to increase, especially during summer, due to changing precipitation patterns and projected increases in potential evapotranspiration (plants taking up more water in hotter temperatures and longer growing seasons).

## 2.1.4 Drainage Basins and Hydrology

Bridgewater is divided in two sub-regional drainage basins: Housatonic River and Shepaug River.

### *Housatonic River*

The Housatonic River drains an area of 1,948 square miles from Pittsfield, Massachusetts to Milford, Connecticut where it empties into Long Island Sound. The river flows a total of 134 miles from its upper reach to the sound. Once into the lower Housatonic Valley region, the river breaks to the southeast flowing through New Milford and cutting between Bridgewater, Southbury, and Newtown. The main channel of the Housatonic is lined with 1% annual chance storm floodplains that extend on either side of the river with areas that further extend making up the 0.2% annual chance floodplains. The entirety of the section of the Housatonic River that borders Bridgewater is impounded by the Shepaug Dam to form the western branch of Lake Lillinonah. Significant tributaries to the Housatonic in Bridgewater include Clapboard Oak Brook and Wewaka Brook.

### *Shepaug River*

Originating at the Shepaug Reservoir, the Shepaug River flows directly south creating the lower eastern boarder of Bridgewater. The Shepaug Reservoir is held back by the Shepaug River Dam, which is classified as a high hazard dam, such that the entirety of the section of the Shepaug River that borders Bridgewater is impounded. The Shepaug River continues to meander south through Washington and Roxbury with input from many streams and rivers including Bantam River, Bee Brook, Mallory Brook and other tributaries. Significant tributaries to the Shepaug in Bridgewater include Hop Brook and Second Hill Brook. The River flows through the eastern portion of Bridgewater before entering the Housatonic River. The entire river from start to finish is bordered by 100-year floodplains generally widening as the channel gets closer to the mouth.

## 2.2 Society, Culture, and Government

### 2.2.1 Population and Demographic Setting

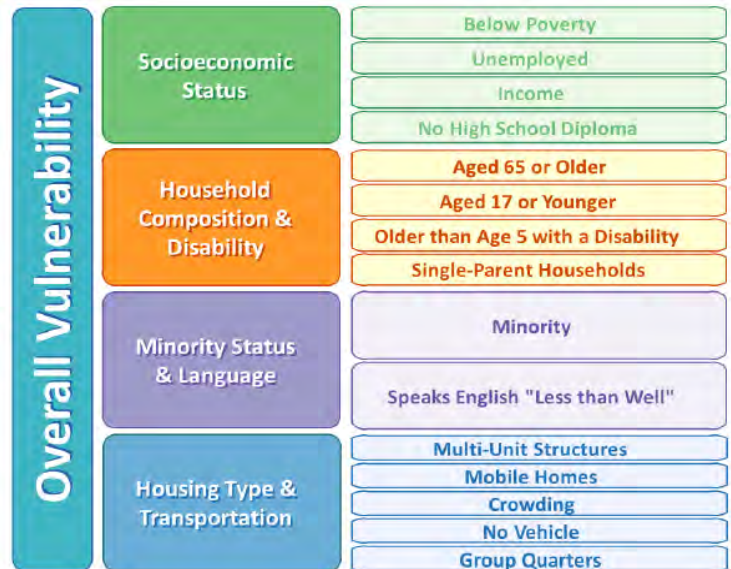
According to the 2010 U.S. Census, Bridgewater had a population of 1,727 with 109 persons per square mile. The Census American Community Survey (ACS) 2018 5-year summary estimated the Bridgewater population to be 1,706 between 2014 and 2018. The Connecticut State Data Center predicts that population in Bridgewater will continue to decrease in the future, with the population in 2040 projected to be 937.

According to the 2012 Plan of Conservation and Development population in Bridgewater has declined 5.3% since the 2000 census and “this recent population decline reflects the recession, decreased in-migration due to limited employment opportunities in surrounding areas and rising costs for land and housing. It also indicates some out-migration as residents moved and the inevitably higher death rate among older residents.”

One important aspect of natural hazard mitigation planning is to identify a community’s demographic trends in relation to natural hazards. The Center for Disease Control and Prevention (CDC) Social Vulnerability Index (SVI) is used to identify vulnerable populations in Bridgewater. The SVI uses census data to identify populations within the town that may be more vulnerable to

natural hazards. As a result of this analysis, the town is identified to have a certain level of overall social vulnerability with a rank of 0 to 1; 1 being the most vulnerable and 0 being the least.

To determine social vulnerability, the CDC incorporates 15 factors into the overall SVI calculation under four categories, or themes: socioeconomic status, household composition and disability, minority status and language, and housing type and transportation. Figure 2-2 represents the breakdown of the SVI process. These themes and their ranking are based on census statistics. By evaluating these factors and determining a level of social vulnerability, a community can identify specific needs for before, during, and after an event. Such needs may include sheltering capacity, evacuation routes, or to decide how many emergency personnel may be required to respond after an event.



**Figure 2-2: The CDC SVI Index Factors. Graphic:**  
[svi.cdc.com](http://svi.cdc.com)

The Town of Bridgewater is considered to have a low level of vulnerability, with their most vulnerable social aspect being the housing type and transportation, which is only ranked marginally more vulnerable than the least vulnerable population with socioeconomic vulnerabilities. Appendix B explores the SVI for Bridgewater in more depth, including maps showing overall vulnerability, and theme vulnerability.

### 2.2.2 Development Trends

In the 1980s, Bridgewater saw a rise in the number of single-family homes constructed. However, around 2007 -2008 new construction mostly came to a standstill. Town personnel indicate that development is limited primarily to small-scale single-family home construction, and property redevelopment. There are currently no pending large development proposals.

The town encourages development of homes outside the floodplain, although recreational areas of lots may be within floodplains. Therefore, development tends to be outside of flood zones and other areas of natural hazard risk, and community vulnerabilities have not been increasing.

### 2.2.3 Governmental Structure

The Town of Bridgewater is governed by a Selectman-Town Meeting form of government in which legislative responsibilities are shared by the Board of Selectmen and the Town Meeting. The First Selectman serves as the chief executive.

In addition to Board of Selectmen and the Town Meeting, there are boards, commissions and committees providing input and direction to Town administrators. Also, Town departments



provide municipal services and day-to-day administration. Many of these commissions and departments play a role in hazard mitigation, including the Planning and Zoning Commission, Conservation & Inland Wetland Commission, the Building Official, the Land Use Office, the Fire Department, Emergency Management, and the Public Works Department.

#### 2.2.4 Historic and Cultural Resources

Historic and cultural resources include sites, structures, and objects that are significant in history, architecture, archaeology, engineering, and culture. Protection of these resources grows economies and enhances community character, and following a natural disaster they can help to reinforce neighborhood connections and reestablish a sense of community and normalcy. Consideration of these resources in this HMP is critical.

**Historic preservation planning** helps protect historic properties and cultural resources from demolition or alteration.

**Hazard mitigation planning** helps protect life and property from damage caused by natural and manmade hazards.

**Integrating** these two planning processes helps create safe and sustainable historic communities.

- Paraphrased from FEMA Report 386-6

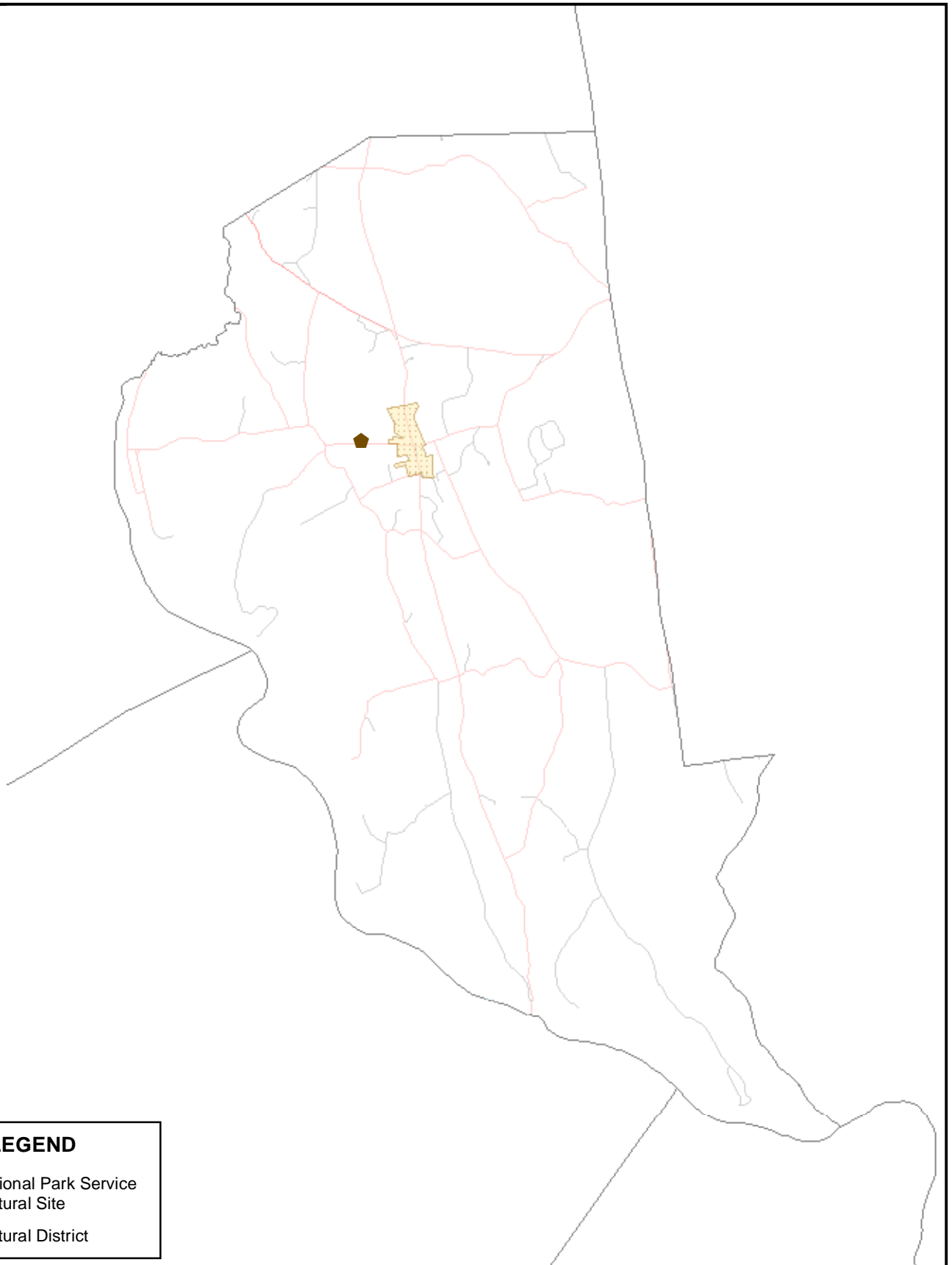
Historic resources in Bridgewater are concentrated within the Bridgewater Center Historic District. There are more than 60 historic buildings in the district, including the 1807 Congregation Church, St. Mark's Episcopal Church, the present and former town halls, a distinctive Queen Anne commercial block on the west side of South Main Street, and the 1929 Burnham School. Bridgewater historic resources also include the Peck House and the childhood home of William Burnham. See Figure 2-3 for a map of historic resources in Bethel.

Analysis of the State Historic Preservation Office (SHPO) database of historic resources shows that some of these resources are exposed to natural hazards, as shown in Table 2-6.

**Table 2-6: Number of Historic Assets Exposed to Different Hazards in Bridgewater**

Hazard	Count
Dam Failure	0
Earthquake	9
Flooding	-
1% Annual	0
0.2% Annual	0
Hurricane/Tropical Storm	9
Thunderstorm	9
Tornado	9
Winter Storm	9
Wildfire	8

Historic buildings and structures may be particularly susceptible to natural hazards because they were built prior to the establishment of more recent construction standards. Additionally, some of the structural integrity of these resources may have been degraded over the decades or centuries since their original construction. Structural retrofits and hazard mitigation methods may be challenging or restricted in cases where alteration of a resource will also diminish its cultural or historical aesthetic and value. Finally, miscommunications or lack of knowledge may lead to historic resources being damaged during the disaster recovery process.



**LEGEND**



National Park Service  
Cultural Site



Cultural District



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Historic Resources with Flood Zones and  
Dam Failure Inundation Areas

WestCOG Hazard Mitigation Plan

Town of Bridgewater

NPS: Cultural Resources CT DEEP: DFA FEMA: DFRIM & Q3



0 2,000 4,000  
Feet

SCALE 1" = 5,018'

DATE 1/6/2021

3101-22  
PROJ. NO.

**FIG. 2-3**



Steps to incorporate historical and cultural preservation into hazard mitigation planning include:

- Inventory and survey historic and cultural resources
- Implement appropriate mitigation measures for those resources
- Take steps to move portable resources, such as artwork or documents, to safe locations prior to the occurrence of a hazard, if possible
- Consider these resources in emergency operations plans to prevent accidental damages during recovery efforts

Specific actions to mitigate natural hazard risks to historic resources are listed at the end of this Annex.

## 2.3 Infrastructure

### 2.3.1 Transportation

The Town of Bridgewater has two state routes running through the community. Route 133 runs north to south, almost bisecting the town entirely, and route 67 runs east to west in the northern area of town. There are several smaller routes that are used as main thoroughways also.

The nearest highway to Bridgewater is Interstate 84 which is south of the town running through New Town, and Route 202 which runs north to south to the west of Bridgewater through New Milford.

### 2.3.2 Utilities

Bridgewater residents rely primarily on private wells for water supply, except for one small condominium complex in the northern area of town. There are presently no major public water suppliers with distribution lines in town

Eversource Energy is the primary electrical utility in town, and there are no natural gas providers in towns. Residents rely on electric, propane, or wood for fuel in Bridgewater.

## 2.4 Planning and Regulatory Capabilities

### 2.4.1 Review of Existing Local Plans

Bridgewater has a number of plans that are relevant to hazard mitigation. These are noted here:

- **Plan of Conservation and Development (POCD):** Bridgewater's most recent POCD was adopted in 2001. It does not explicitly address natural hazard concerns within the community, or include strategies that will mitigate risks from those hazards as the community continues to develop. This is an action to pursue during development of the next POCD Update.
- **Capital Improvement Plan (CIP):** Bridgewater maintains a CIP that is updated annually and lays out capital investments for a five-year period. The CIP often includes road, drainage, and other infrastructure improvement projects relevant to hazard mitigation.
- **Economic Development Plan:** Bridgewater is included within the Western Connecticut Economic Development Plan of 2017, developed by WestCOG. The plan aligns with the COG's other efforts to promote climate sustainability and resiliency in the region.
- **Emergency Operations Plan (EOP):** Bridgewater's EOP is reviewed annually and updated as needed. Dam failure Emergency Action Plans (EAPs) for dams with failure inundation zones that may impact Bridgewater, and for which EAPs are available, are on file locally.

- **Open Space:** Bridgewater does not maintain a stand-alone Open Space Plan; instead, open space planning is incorporated into the community's POCD.

## 2.4.2 Review of Regulatory Structures

Bridgewater regulates development through a number of regulations, codes, and ordinances. These are summarized below. More detailed information about how these regulations relate to specific natural hazards are described in Section 3.

- **Building Code:** Bridgewater enforces the Connecticut State Building Code locally.
- **Zoning Regulations:** Most recently updated in March 2018.
- **Inland Wetlands and Watercourses Regulations:** Most recently updated in October 2011.
- **Subdivision Regulations:** Most recently updated in April of 1997. Include provisions promoting control of stormwater runoff, installation of firefighting water sources, construction of adequate emergency access and egress, and burial of utilities.

## 2.5 Emergency Services, Critical Facilities, Sheltering, and Evacuation

Bridgewater has identified several critical facilities throughout the town. Table 2-7 and Figure 2-4 identify those critical facilities in Bridgewater. The Town considers its police, fire, governmental, and major transportation arteries to be its most important critical facilities since these are needed to ensure that emergencies are addressed while day-to-day management of Bridgewater continues.

**Table 2-7: Critical Facilities**

Facility	Address or Location	Comment	Emergency Power	Shelter	In 1% Chance Floodplain
<b>Senior Center</b>	132 Hut Hill Road	Emergency Operations Center (EOC) and the Primary Shelter	✓	✓	No
<b>Bridgewater Volunteer Fire Department</b>	100 Main Street South	Emergency Response	✓	✓	No
<b>Bridgewater Public Works Highway Garage</b>	324 Hut Hill Road	Emergency Assistance	✓		No
<b>The Village Store</b>	27 Main Street South	Emergency Supplies and back-up shelter	✓		No
<b>Bridgewater Police Department</b>	152 Hut Hill Road	Emergency Response			No
<b>Bridgewater Town Hall</b>	44 Main Street South	Secondary Shelter and Back-up EOC	✓		No
<b>Burnham Elementary School</b>	80 Main Street South	School			No
<b>Mobil Gas Station</b>	11 New Milford Road	Provides fuel for Emergency Response			No

LEGEND

Dams

◆

Unclassified

◆

AA

◆

A

◆

BB

Dam Failure Inundation Area

✱

Ambulance

Municipal

Police

School

Flood Zones

A
AE

0.2% Annual Chance Flood Hazard

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Critical Facilities with Flood Zones and Dam Failure Inundation Areas

WestCOG Hazard Mitigation Plan

Town of Bridgewater

NPS: Cultural Resources CT DEEP: DFA FEMA: DFRIM & Q3

N

0

2,000

4,000

Feet

SCALE	1" = 5,012'
DATE	7/29/2021
PROJ. NO.	3101-22

FIG. 2-4

### 2.5.1 Sheltering Capabilities

Emergency shelters are an important subset of critical facilities as they are needed in many emergency situations. There are three identified shelters in the town that are also considered critical facilities. The Senior Center on Hut Hill Road is the primary shelter for the town. The Fire Department on Main Street is considered the backup shelter. The Village Store on Main Street is considered a temporary warming shelter which provides wireless internet, phone service, and food. All three facilities have backup generators.

In case of a sustained power outage, it is anticipated that 10 to 20% of the population would relocate, although not all of those relocating would necessarily utilize the shelter facilities.

Bridgewater is part of the Region Twelve School District. Burnham Elementary School on Main Street is considered a critical facility. The elementary school needs a generator and once acquired it may serve as a shelter.

#### *Emergency Response Facilities*

The Emergency Management Director coordinates emergency preparedness in the Town of Bridgewater. The Town's Emergency Operations Center (EOC) is located in the Bridgewater Senior Center. The EOC's goal is to provide citizens with the highest level of emergency preparedness before, during, and after disasters or emergencies. The backup EOC is the Town Hall. The Town coordinates with all departments internally to develop plans, protocols, and procedures that assure the safety of Bridgewater's citizens. It also provides technical assistance to state and local emergency response agencies and public officials. The Town's EOP guides its response to emergencies arising from both natural and anthropogenic hazards.

Although the town has an EOC and backup EOC, the town administration is interested in construction of a new Police Station that would house a technologically-updated EOC. This is considered to be a long-range goal and is not included as an action in this plan.

The Town is interested in obtaining grants to acquire generators capable of providing power to the local Mobil gas station and other important or critical facilities. Although the town recognizes that the gas station is a privately owned, it is vital to residents in need of gas during severe storm events. For emergency personnel, the Public Works Highway Garage has 500 gallons of reserve gas stored at its location in time of emergencies. Acquisition of portable generators would greatly assist the town in providing emergency power when needed.

The town is also interested in pursuing funding to purchase new equipment to enhance emergency response capabilities through the Assistance to Firefighters grant program.

The Town's Public Works Department performs tree and shrub removal and trimming on Town-owned lands and rights-of-way. During emergencies and following storms, the Public Works Department responds to calls related to downed trees.

Road closures are a major concern to town officials. Main Street (Route 133) has occasionally been closed due to snow, ice, or fallen trees. In the past, municipal staff have reported that CT DOT and the electric utility do not address this area in an expeditious manner and road closures

can result in delayed response times for emergency personnel. Bridgewater staff notifies CT DOT when accumulation is building, and local Public Works staff will clear Route 133 during emergencies when absolutely necessary. CT DOT has performed maintenance and safety improvements to Route 133 in recent years, which are expected to reduce road closures due to drainage and debris issues.

#### *Emergency Communication Capabilities*

In Connecticut, the Department of Emergency Services and Public Protection (DESPP) has a regional focus. DESPP has divided Connecticut into five emergency planning regions and as part of this new view, the DEMHS subsection of DESPP has been partnering with HVCEO and other regional planning organizations to strengthen emergency response. Bridgewater is located in Region 5, consisting of 43 towns in western Connecticut.

The Town utilizes a program known as "CT Alert" to direct geographically specific emergency notification telephone calls into affected areas. The local radio station, WLAD is also utilized for notifications purposes. The town can send emails with emergency notifications, and the school system maintains a separate email notification system that can also be used.

## 3.0 HAZARD ASSESSMENT

### 3.1 FLOODING (COASTAL, INLAND, AND ICE JAMS)

#### 3.1.1 Setting

The potential for flooding is widespread in Bridgewater with the majority of major flood risk along established SFHAs. The areas impacted by overflow of river systems are generally limited to river corridors and floodplains. Indirect flooding that occurs outside floodplains and localized nuisance flooding along tributaries are also potential problems in the town. This type of flooding occurs particularly along roadways as a result of inadequate drainage and other factors. The frequency of flooding in Bridgewater is considered likely for any given year.

Bridgewater has experienced various degrees of flooding throughout its history. Melting snow combined with early spring rains has caused spring flooding. Flood events have also occurred in late summer to early autumn resulting from storms of tropical origin moving northeast along the Atlantic coast. Winter floods result from the occasional thaw, particularly during years of heavy snow or periods of rainfall on frozen ground. Other flood events have been caused by excessive rainfalls upon saturated soils, yielding greater than normal runoff.

A regulatory floodplain with AE designation has been mapped along the Housatonic River, Shepaug River, Wewaka Brook, Clapboard Brook and Hop Brook. Areas identified as providing flood storage are identified with A Zone designations, meaning they are regulated as floodplain, but flood elevations have not been established. Refer to Figure 2-4 for the areas of Bridgewater susceptible to flooding based on FEMA flood zones.

#### 3.1.2 Capabilities

##### *Floodplain Management, NFIP and CRS*

The Town has consistently participated in the NFIP since November 1, 1979 and intends to continue participation in the NFIP. SFHAs in Bridgewater are delineated on a Flood Insurance Rate Map (FIRM) and Flood Insurance Study (FIS). The FIRM delineates areas within Bridgewater that are vulnerable to flooding. The original FIS and FIRMs for flooding sources in the town were published in November 1, 1979; FEMA has not updated the local FIS or FIRM since that date.

The Town First Selectman is currently the NFIP administrator for the Town and oversees the enforcement of NFIP regulations. CT DEEP's model regulations were used to update flood damage prevention regulations as necessary. The degree of flood protection established by the variety of regulations in the Town exceeds the minimum reasonable for regulatory purposes under the NFIP because the town requires freeboard of one foot. The Town discourages new construction and substantial reconstruction within the 1% annual chance floodplain by raising concerns during the floodplain permit process. New development is strictly managed through the Town's land use process. The Town is not enrolled in the Community Rating System (CRS) program, as CRS is not considered to be a cost-effective program due to the small number of flood insurance policies in the town.

### *Ordinances, Regulations, and Plans*

Regulations, codes, and ordinances that apply to flood hazard mitigation in conjunction with and in addition to NFIP regulations include:

- ❑ **Zoning Regulations:** The Town of Bridgewater Zoning Regulations were most recently revised on March 15, 2018. The regulations have been enacted to “protect and promote the public health, safety, welfare, convenience, and property values; to lessen congestion in the streets; to secure safety from fire, panic, flood, environmental damage, and other dangers; to provide adequate light, air, and water, to prevent overcrowding of land; to avoid undue concentration of population; to facilitate adequate provisions for transportation, water, sewerage, schools, parks, and other public requirements; to preserve and protect the unique character of the Town of Bridgewater; to protect site and features of historic and archaeological significance; to conserve and protect existing and potential surface-water and groundwater drinking supplies, inland wetlands and watercourses, and other valuable natural resources; to prevent unnecessary soil erosion and sedimentation; and to provide adequate housing opportunities’ for all citizens of Bridgewater consistent with soil types, terrain, infrastructure capacity, and the rural character of the Town.” Section 5.09 states that all uses in floodprone areas shall conform to the terms of the Bridgewater Flood damage Prevention Ordinance, as amended.
- ❑ **Chapter 155 Flood Damage Prevention Ordinance:** The 1993 Ordinance is essentially the local version of the NFIP regulations and was enacted “to promote the public health, safety and general welfare and to minimize public and private losses due to flood conditions in specific areas by provisions designed to (1) restrict or prohibit uses which are dangerous to health, safety and property due to water or erosion hazards, or which result in damaging increases in erosion or in flood heights or velocities (2) require that uses vulnerable to floods, including facilities which serve those uses, be protected against flood damage at the time of initial construction (3) Control the alteration of natural floodplains, stream channels and natural protective barriers which are involved in the accommodation of flood waters (4) Control filling, grading, dredging and other development which may increase erosion or flood damage; and (5) Prevent or regulate the construction of flood barriers which will unnaturally divert flood waters or which may increase flood hazards to other lands.
  - Section 155.02 defines substantial improvement as “any combination repairs, reconstruction, alteration or improvements to a structure, taking place over a one-year period, in which the cumulative cost equals or exceeds 50% of the market value of the structure.
  - Section 155.05(1) states that residential, non-residential and substantial improvements located in Zones A1-30, AE and AH shall have the lowest floor, including basement, elevated at least to one foot above the base flood elevation.
  - Section 155.05(7)(a) prohibits encroachments within floodways unless certification by a registered professional engineer is provided demonstrating that encroachments shall not result in any (0.00) increase in flood levels during occurrence of the base flood discharge.

- Section 155.06 outlines the standards for subdivision proposals. Specifically, the following requirements shall apply in all special flood hazard areas (a) all subdivision proposals shall be consistent with the need to minimize flood damage; (b) all subdivision proposals shall have public utilities and facilities such as sewer, gas, electrical and water systems located and constructed to minimize flood damage; (c) all subdivision proposals shall have adequate drainage provided to reduce exposure to flood hazards and (d) in Zone A base flood elevation data shall be provided for subdivision proposals and other proposed developments (including manufactured home parks and subdivisions) which are five acres or 50 lots, whichever occurs first.
  
- ❑ **Wetlands and Watercourse Regulations.** The Bridgewater Inland Wetland and Watercourse Regulations were adopted in July 1998 and were most recently updated in October 2011. The purpose of the Regulations is to protect the quality of the inland wetlands and watercourses within the Town of Bridgewater by making provisions for the protection, preservation, maintenance, and use of inland wetlands and watercourses, including deterring and inhibiting the danger of flood and pollution.
  - Section 2.1 defines "Regulated Activity" as (a) any operation within or use of a wetland or watercourse involving removal or deposition of material, or any obstruction, construction, alteration or pollution, of such wetlands or watercourses; (b) any activity in a wetland, watercourse or buffer that involves excavating, mining, grading, filling, placing or removing earth materials (including pond spoils); constructing, installing or repairing buildings, septic systems or other man-made structures; clear cutting or grubbing land; storing petroleum based product in a storage container that is affixed to the ground or placed below the surface of the ground; disposing, treating, storing or managing hazardous wastes; Any activity located outside of a wetland, watercourse, or buffer area if the Commission determines that such activity is causing or is likely to cause the obstruction, alteration or pollution of a wetland or watercourse, provided that the Commission may make such determination only after providing an opportunity for a hearing, as well as at least ten days prior written notice of the hearing, to the owner of the land on which the activity is being conducted or is proposed to be conducted.
  - Section 6 states that no person may conduct or maintain a regulated activity without obtaining a permit. Section 7 outlines the permit application requirements.
  
- ❑ **Subdivision Regulations.** The Town's Subdivision Regulations, effective May 1997, establish minimum acceptable standards of street construction, regulate the layout and development of lots and streets, and outline measures to prevent degradation of potable water sources, control erosion and siltation, preserve adequate and convenient open spaces, and retain the natural features of the land.
  - Section 5.1 states that subdivisions shall be designed in a manner that avoids development within SFHAs, inland wetlands and watercourses, streambelt land areas, and public water supply watershed associated with the Shepaug River.



- Section 5.6 requires applicants to demonstrate compliance with the Town Flood Damage Prevention Ordinance.
  - Section 5.7 requires up to 15% on land within a proposed subdivision to be preserved for open space, park or playground use.
  - Section 7.1 outlines design standards and states that drainage systems shall provide for the prevention of flooding and soil erosion and protection of wetlands and watercourses.
- ❑ **Plan of Conservation and Development.** This 2012 document is the Town's vision statement for future development. It is updated every 10 years. The plan "strongly affirms the goals of preserving the rural character of the Town, protecting its natural resources, preserving farm and open land, and promoting community facilities and services." Specific recommendations regarding conservation and natural resources include but are not limited to the following:
- protection of surface and ground water
  - protection of flood plains, wetlands, streambelts and waterways
  - use of scenic easements and open space acquisition to protect environmental features as ridges and scenic vistas
  - discouragement of development in fragile environmental areas
  - use of environmental impact studies for major development or land use activity
  - encouragement of conservation and preservation efforts

The plan also outlines the following implementation measures:

- increasing open space requirements,
- developing buffer zone requirements for land adjacent to water
- developing an open space acquisition program
- inspecting septic systems near the lake and river

Overall, the intent of these plans and regulations is to promote the public health, safety, and general welfare and to minimize public and private losses due to flood conditions in specific areas of the Town of Bridgewater by the establishment of standards designed to:

- ❑ Protect human life and public health
- ❑ Minimize expenditure of money for costly flood control projects
- ❑ Minimize the need for rescue and relief efforts associated with flooding
- ❑ Minimize prolonged business interruptions
- ❑ Minimize damage to public facilities and utilities such as water and gas mains; electric, telephone, and sewer lines; and streets and bridges located in floodplains
- ❑ Maintain a stable tax base by providing for the sound use and development of floodprone areas in such a manner as to minimize flood blight areas
- ❑ Ensure that purchasers of property are notified of special flood hazards
- ❑ Ensure the continued eligibility of owners of property in Bridgewater for participation in the NFIP

### Drainage and Street Flooding

Drainage and flooding complaints are typically routed to the Fire Department; however, the number of complaints received is reportedly minimal. The Town Department of Public Works (DPW) is in charge of the maintenance of the town's drainage systems and performs clearing of bridges and culverts and other maintenance as needed. The Town uses these reports to identify potential problems and plan for maintenance and upgrades.

Culverts with known drainage issues are addressed on a case-by-case basis through system maintenance and/or upgrades as necessary. Minor repairs and replacements with larger pipe diameters have been completed; however, many culverts fall under the jurisdiction of CT DOT.

### *Communications*

The National Weather Service issues a flood watch or a flash flood watch for an area when conditions in or near the area are favorable for a flood or flash flood, respectively. A flash flood watch or flood watch does not necessarily mean that flooding will occur. The National Weather Service issues a flood warning or a flash flood warning for an area when parts of the area are either currently flooding, highly likely to flood, or when flooding is imminent.

The Departments of Fire and Emergency Services are responsible for monitoring local flood warnings. The Town can access the National Weather Service website at <http://www.weather.gov/> to obtain the latest flood watches and warnings before and during precipitation events.

The Town also receives regular weather updates through Division of Emergency Management and Homeland Security (DEMHS) Region 5 email alerts as well as watches and warnings through the National Weather Service.

Bridgewater subscribes to the State's CT Alert emergency notification system. A link to sign up for emergency notifications through the CT Alert system is posted on the Town website.

### *Actions Completed and New Capabilities*

Bridgewater continues to maintain and improve its flood mitigation capabilities. CT DOT has performed maintenance and safety improvements to Route 133 in recent years, which are expected to reduce road closures due to drainage issues.

## **3.1.3 Vulnerabilities and Risk Assessment**

Flooding can impact a variety of river corridors and cause severe damages in the Town of Bridgewater but most often occurs in the Housatonic River watershed. Flooding due to poor drainage and streambank erosion are other hazards in the town and can cause minor infrastructure damage and create nuisance flooding of yards and basements.

### *Vulnerability Analysis of Repetitive Loss Properties*

Based on correspondence with the State of Connecticut NFIP Coordinator at the Connecticut DEEP, no repetitive loss properties (RLPs) are located in Bridgewater.

### *Vulnerability Analysis of Critical Facilities*

The list of critical facilities provided by the Town was used with the parcel data to accurately locate each critical facility throughout the town. None of the critical facilities were found to lie within the 1% annual chance floodplain.

### *Vulnerability Analysis of Areas Along Watercourses*

According to town officials, significant damaging floods in Bridgewater are not common. The main sources of flood risk are Clapboard Oak Brook, Wewaka Brook, Hop Brook, Housatonic River and Shepaug River. Periodic flooding does occur along Clapboard Oak Brook, Wewaka Brook and Hop Brook. Known problem areas include:

#### **❑ Wewaka Brook**

- Portions of roadways are at risk of flooding during extreme events.
- A single-family home and mill adjacent to Route 133 has occasional flooding
- Flooding problems have occurred at its confluence with the Housatonic River.
- Flooding problems have occurred downstream of its confluence with Wewaka Brook Tributary and the Wewaka Road crossing.

- ❑ **Clapboard Oak Brook** – This brook has suffered severe erosion and scouring along its bank. DOT has reportedly contributed to heavy runoff with more impervious area and improvements being installed along Route 133 that did not take stormwater detention into account. The areas west of Route 133 have the potential for landslides due to the steep topography and erosion from runoff. The Brook has also experienced previous flooding problems at its confluence with the Housatonic River.

- ❑ Scouring and washouts around undersized culverts have occasionally occurred. For example, Town staff have noted that the Hemlock Road culverts may be undersized.

### *Vulnerability of Other Areas*

There are other areas around the town that suffer from street flooding due to undersized culverts. Scouring and washouts around undersized culverts have occasionally occurred.

## 3.2 DAM FAILURE

### 3.2.1 **Setting**

Dam failures can be triggered suddenly, with little or no warning, and often from other natural disasters such as floods and earthquakes. Dam failures often occur during flooding when the dam breaks under the additional force of floodwaters. In addition, a dam failure can cause a chain reaction where the sudden release of floodwaters causes the next dam downstream to fail. While flooding from a dam failure generally has a moderate geographic extent, the effects are potentially catastrophic. Fortunately, a major dam failure is considered only a possible hazard event in any given year.

The Connecticut DEEP administers the statewide Dam Safety Program and designates a classification to each state-inventoried dam based on its potential hazard.

- *Class AA*: negligible hazard potential
- *Class A*: low hazard potential
- *Class BB*: moderate hazard potential
- *Class B*: significant hazard potential
- *Class C*: high potential hazard

DEEP inventory documents 18 dams within Town limits. Additionally, high hazard dams located in surrounding municipalities have the potential to affect the Town of Bridgewater in a failure event.

### 3.2.2 **Capabilities**

The Dam Safety Section of the Connecticut DEEP Inland Water Resources Division is charged with the responsibility for administration and enforcement of Connecticut's dam safety laws. The existing statutes require that permits be obtained to construct, repair, or alter dams and that existing dams be inventoried and periodically inspected to assure that their continued operation does not constitute a hazard to life, health, or property.

Dams regulated by the Connecticut DEEP must be designed to pass the 1% annual chance rainfall event with one foot of freeboard, a factor of safety against overtopping.

Significant and high hazard dams are required to meet a design standard greater than the 1% annual chance rainfall event.

The dam safety requirements are codified in Sections 22a-401 through 22a-411 inclusive of the Connecticut General Statutes. Sections 22a-409-1 and 22a-409-2 of the Regulations of Connecticut State Agencies have been enacted and set requirements for the registration, classification, and inspection of dams. Dams must be inventoried by the owner with the Connecticut DEEP according to Connecticut Public Act 83-38.

Effective October 1, 2013, the owner of any high or significant hazard dam (Class B and C) must develop and implement an EAP after the Commissioner of DEEP adopts regulations. The EAP shall be updated every two years, and copies shall be filed with DEEP and the chief executive officer of any municipality that would potentially be affected in the event of an emergency. New regulations shall establish the requirements for such EAPs, including but not limited to (1) criteria and standards for inundation studies and inundation zone mapping; (2) procedures for monitoring the dam or structure during periods of heavy rainfall and runoff, including personnel

assignments and features of the dam to be inspected at given intervals during such periods; and (3) a formal notification system to alert appropriate local officials who are responsible for the warning and evacuation of residents in the inundation zone in the event of an emergency.

The CT DEEP also administers the Flood and Erosion Control Board program, which can provide noncompetitive state funding for repair of municipality-owned dams. Funding is limited by the State Bond Commission. State statute Section 25-84 allows municipalities to form Flood and Erosion Control Boards, but municipalities must take action to create the board within the context of the local government such as by revising the municipal charter. The Town's Planning and Zoning Commission is responsible for reviewing all development activities that occur within flood hazard or flood-prone areas.

The Town uses the CT Alert system for emergency notification. The dam failure inundation mapping discussed in the next section can be used to help streamline the geographic contact areas if the failure of a major dam is imminent.

#### *Actions Completed and New Capabilities*

Bridgewater's dam failure mitigation capabilities continue to be sufficient for the community.

The Paparazzo dam, a low hazard dam located on Clapboard Oak Brook, had repairs reportedly accomplished about eight years ago, and is inspected by the State's Dam Safety Division. It is no longer considered a significant risk to downstream areas.

### **3.2.3 Vulnerabilities and Risk Assessment**

As of 2013, there were 18 DEEP-inventoried dams within the Town of Bridgewater. These dams are summarized in Table 3-1. Dams and dam failure areas, where available, are shown in Figure 2-4.

**Table 3-1: Dams Registered with the DEEP in the Town of Bridgewater**

Number	Name	Class
1601	SKYLINE RIDGE ROAD POND DAM	BB
1602	WEWAKA BROOK DAM	A
1603	ORE POND DAM	Unclassified
1604	SARA POND DAM	A
1605	SHURICK DAM	A
1606	ISABELL DAM	A
1607	NUTMEG FARM DAM	A
1608	MARSH POND DAM	A
1609	YOUNG POND DAM	A
1610	SECOND HILL DAM	A
1611	KINSTLER POND DAM	A
1612	JOHNSONS POND DAM	BB
1613	PAPARAZZO DAM	A
1614	KIVIAT POND DAM	A
1615	ADESMAN POND DAM	AA
1616	SEGA POND DAM	Unclassified
1617	SHOOK POND DAM	AA

Number	Name	Class
1618	WEATHERLEY BROOK POND DAM	AA

The primary dam failure concern relates to high hazard (Class B and C) dams located in adjacent municipalities upstream of Bridgewater. Failure of these structures would have an impact on Bridgewater. This section primarily discusses the possible effects of failure of such dams. Failure of a Class C dam has a high potential for loss of life and extensive property and infrastructure damage.

#### *Class B and C Dams*

The western and southwest borders of Bridgewater are formed by watercourses. The Housatonic River forms the boundary between New Milford and Brookfield, and the Shepaug River forms the border with Southbury. Both of these watercourses have been modified by the construction of high hazard dams, and as such, failure of upstream structures has the potential to affect portions of Bridgewater.

The Rocky River Development consists of a series of dams used to impound water for hydroelectric power generation. It is a seasonal pumped storage facility located along the Housatonic River in New Milford. The powerhouse is located seven miles downstream of the Bulls Bridge Dam in New Milford. The structures are owned by First Light Power.

The main dam (Candlewood Lake Dam #9602) crosses the Rocky River approximately one mile upstream of its confluence with the Housatonic River and impounds Candlewood Lake. This is the upper reservoir of the development and has a surface area of 5,610 acres at normal maximum water levels with a contributing watershed of 40.4 square miles. Candlewood Lake has a maximum storage volume of 577,000 acre-feet. It is an earth-filled structure with a 952-foot-long core wall and a maximum height of 107 feet. The Canal Dike is an earthen embankment about 2500 feet in length, and 72 feet height, forming the north bank of the power canal to the intake structure. Three Lanesville Dikes were constructed at low points along the middle of the eastern shoreline of Candlewood Lake:

An EAP for the Candlewood Lake Dam was prepared in 2004 by Northeast Utilities Service Company for First Light Power. The plan addresses the requirements of FERC Project No. 2576 and includes Candlewood Lake Dam, Lake Candlewood Dike #2, North Lanesville Dike and Middle Lanesville Dike on Candlewood Lake. The EAP contains a Dam Breach Analysis for the main dam and dikes, and Inundation Maps for a "sunny day" failure and failure under 100-year flood conditions.

The EAP describes the thorough maintenance and monitoring schedule for all structures. This includes continuous staffing at the Rocky River Station; weekly inspections of the dikes; monthly weir and piezometer readings; and annual inspections by FERC representatives. Water levels in Candlewood Lake are monitored continuously by a signal transmitted via an underground cable. Tailrace levels in the Housatonic River are also monitored continuously via a mounted staff gage. Monitors have also been installed at weirs downstream of the Danbury Dike, Middle Lanesville Dike, the Main Dam, and the Canal Dike.

Inundation mapping developed in conjunction with the dam breach analysis indicates the limits of dam failure impacts extending downstream through Bridgewater along its entire western boundary. The flooding impacts also extend upstream along the Shepaug River on the town's southeast border with Southbury. Inundation areas include the length of Lake Lillinonah (Housatonic River), Lillinonah Lake Road North, the western end of Tappen Road, the State Route 133 crossing of the Housatonic River, and approximately 1,800 feet of Main Street north of the Housatonic River. The EAP specifies that representatives of the Rocky River Project are responsible for notifying Bridgewater government officials in the event of an emergency.

#### Other Dams

- The Johnsons Pond Dam, located on a northern branch of the Clapboard Oak Brook, is one of only two dams considered to have moderate hazard.

#### Beaver Dams

Finally, the Town of Bridgewater has expressed concern with the potential failure of beaver dams. Specifically, the 300-acre, Three Rivers Farm (where the Housatonic, Shepaug, and Pook rivers converge) called Promisek, in the southern tip of Bridgewater has a few beaver dams that could present minor problems should the dam breach.

### **3.3 HURRICANES AND TROPICAL STORMS**

#### **3.3.1 Setting**

Several types of hazards may be associated with tropical storms and hurricanes including heavy or tornado winds, heavy rains, and flooding. While only some of the areas of Bridgewater are susceptible to flooding damage caused by hurricanes, wind damage can occur anywhere in the town. Hurricanes, therefore, have the potential to affect any area within the Town of Bridgewater. A hurricane striking Bridgewater is considered a possible event each year and could cause critical damage to the town and its infrastructure.

Connecticut is located in FEMA Zone II regarding maximum expected wind speed. The maximum expected wind speed for a three-second gust is 160 mph. This wind speed could occur as a result of either a hurricane or a tornado in western Connecticut and southeastern New York.

Parts of tall and older trees may fall during heavy wind events, potentially damaging structures, utility lines, and vehicles.

#### **3.3.2 Capabilities**

Wind loading requirements are addressed through the state building code. The State Building Code has been amended several times in the past two decades. The 2005 Code was amended in 2009, 2011, and 2013. The code was then updated and amended in 2016, with the current code having been updated and effective as of October 1, 2018. The code specifies the design wind speed for construction in all the Connecticut municipalities. Effective October 1, 2018 the ultimate design wind speed for the Town of Bridgewater is 110 mph for a Category 1 event, 120 mph for a category 2, and 125 mph for a Category 3, 4 or 5 hurricane event.

Bridgewater maintains an aggressive tree and tree limb trimming program. The town Tree Warden is Bud Wright and the tree trimming budget is \$30,000 a year to subcontract trimming. The Tree Warden is aware of approximately ten to twelve dead trees in Bridgewater that must be addressed.

Eversource, the local electric utility, provides tree maintenance near its power lines. The utility has reportedly done an adequate job trimming trees.

During emergencies, the Town currently has three designated emergency shelters available for residents as discussed previously. During Tropical Storm Irene, the Town used the CT Alert system to notify all residents in the SFHA that they may evacuate and use one of the shelters. The Board of Education used its notification system to notify people on its list of emergency procedures. Prior to severe storm events, the Town ensures that warning/notification systems and communication equipment are working properly and prepares for the possible evacuation of impacted areas.

#### *Actions Completed and New Capabilities*

Bridgewater continues to maintain and improve its capabilities for severe wind mitigation. Local implementation of the State Building Code is one of its primary tools in this effort.



### 3.3.3 Vulnerabilities and Risk Assessment

The Town of Bridgewater is vulnerable to hurricane damage from wind and flooding and from any tornadoes accompanying the storm. In fact, most of the damage to the town from historical tropical cyclones has been due to the effects of flooding. Bridgewater town officials report that the large southerly and westerly exposures in the town create significant wind vulnerabilities.

Some critical facilities are more susceptible than others to flooding damage associated with hurricane rainfall. Such facilities susceptible to flooding were discussed in Section 3.5. Bridgewater's housing stock consists of historic buildings greater than 50 and sometimes 100 years old, relatively younger buildings built before 1990 when the building code changed to address wind damage, and relatively recent buildings that utilize the new code changes. Since most of the existing housing stock in the town predates the recent code changes, many structures are highly susceptible to roof and window damage from high winds.

As the Town of Bridgewater is not affected by storm surge, hurricane sheltering needs have not been calculated by the U.S. Army Corps of Engineers for the town. The Town determines sheltering need based upon areas damaged or needing to be evacuated within the town. During extended power outages, it is believed that only 10% to 20% of the affected population of the town will relocate while most will stay in their homes until power is restored. In the case of a major (Category Three or above) hurricane, it is likely that the Town will depend on state and federal aid to assist sheltering displaced populations until normalcy is restored.

### **3.4 SUMMER STORMS AND TORNADOES**

#### **3.4.1 Setting**

Heavy wind (including tornadoes and downbursts), lightning, heavy rain, hail, and flash floods are the primary hazards associated with summer storms. Like hurricanes and winter storms, summer storms and tornadoes have the potential to affect any area within the Town of Bridgewater. Because these types of storms and the hazards that result (flash flooding, wind, hail, and lightning) might have limited geographic extent, it is possible for a summer storm to harm one area within the town without harming another. The entire Town of Bridgewater is therefore susceptible to summer storms (including heavy rain, flash flooding, wind, hail, and lightning) and tornadoes.

Based on the historic record, it is considered highly likely that a summer storm that includes lightning will impact the Town of Bridgewater each year although lightning strikes have a limited effect. Strong winds and hail are considered likely to occur during such storms but also generally have limited effects. A tornado is considered a possible event in Litchfield County each year that could cause significant damage to a small area.

#### **3.4.2 Capabilities**

Warning is the primary method of existing mitigation for tornadoes and thunderstorm-related hazards. The NOAA National Weather Service (NWS) issues watches and warnings when severe weather is likely to develop or has developed, respectively. Emergency management personnel have specific actions they take under different NWS watches and warnings to prepare for summer storms and tornado impacts.

Aside from warnings, several other methods of mitigation for wind damage are employed in Bridgewater as explained in Section 0. In addition, the Connecticut State Building Code includes guidelines for the proper grounding of buildings and electrical boxes.

Eversource trims trees along powers lines. The town tree warden can remove dead and diseased trees in rights-of-way or Town land, working through the Public Works Department. Town-owned equipment is used except for complex situations, which would call for the use of a contractor.

Municipal responsibilities relative to summer storm and tornado mitigation and preparedness include:

- Developing and disseminating emergency public information and instructions concerning tornado, thunderstorm wind, lightning, and hail safety, especially guidance regarding in-home protection and evacuation procedures and locations of public shelters;
- Designating appropriate shelter space in the community that could potentially withstand lightning and tornado impact;
- Periodically testing and exercising tornado response plans; and
- Putting emergency personnel on standby at tornado "watch" stage.

For municipal property, the Town budget is generally adequate to handle summer storm damage.

#### *Actions Completed and New Capabilities*

Bridgewater continues to maintain and improve its capabilities for summer storm and tornado mitigation. Public alerts, tree trimming, and coordination with Eversource are its primary mitigation strategies.

### **3.4.3 Vulnerabilities and Risk Assessment**

The entire Town of Bridgewater is at relatively equal risk for experiencing damage from summer storms and tornadoes.

By virtue of its location in Litchfield County, the Town of Bridgewater has moderate to high potential to experience tornado damage. In general, thunderstorms and hailstorms in Connecticut are more frequent in the western and northern parts of the state and less frequent in the southern and eastern parts. Thunderstorms are expected to impact Bridgewater 20 to 30 days each year. The majority of these events do not cause any measurable damage. Although lightning is usually associated with thunderstorms, it can occur on almost any day. The likelihood of lightning strikes in the Bridgewater area is very high during any given thunderstorm although no one area of the town is at higher risk of lightning strikes. The risk of at least one hailstorm occurring in Bridgewater is considered moderate in any given year.

Most thunderstorm damage is caused by straight-line winds exceeding 100 mph. Straight-line winds occur as the first gust of a thunderstorm or from a downburst from a thunderstorm and have no associated rotation. The risk of downbursts occurring during such storms and damaging the Town of Bridgewater is believed to be low for any given year. All areas of the town are susceptible to damage from high winds although more building damage is expected in the town center while more tree damage is expected in the less densely populated areas.

Secondary damage from falling branches and trees is more common than direct wind damage to structures. Heavy winds can take down trees near power lines, leading to the start and spread of fires.

Brookfield has experienced damage from severe summer storms in the past. On June 9, 2012, intense winds accompanied with thunderstorms battered the town, causing power outages throughout town and many downed trees. On May 27, 2014, a severe thunderstorm with winds up to 100 mph caused down trees and flooded roads across Bridgewater and surrounding towns; approximately 98% of CL&P customers in Bridgewater were without power. On May 16 in 2018, a microburst hit the southern area of Bridgewater, causing serious damage to properties, taking out power, and blocking roads with tree debris.

NOAA states that climate change has the potential to increase the frequency and intensity of tornadoes, so it is possible that the pattern of occurrence in Connecticut could change in the future.

## 3.5 WINTER STORMS AND NOR'EASTERS

### 3.5.1 **Setting**

Winter events and the hazards that result (wind, snow, and ice) have widespread geographic extents, and have the potential to affect any area of the Town of Bridgewater. Due to its variable elevation, the Town can have higher amounts of snow in the outskirts of the town than in the town center. In general, winter storms are considered highly likely to occur each year (although major storms are less frequent), and the hazards that result (nor'easter winds, snow, and blizzard conditions) can potentially have a significant effect over a large area of the town.

Most winter weather events occur between December and March. Winter weather may include snow, sleet, freezing rain, and cold temperatures. Most deaths from winter storms are indirectly related to the storm, such as from traffic accidents on icy roads and hypothermia from prolonged exposure to cold. Damage to trees and tree limbs and the resultant downing of utility cables are a common effect of these types of events. Secondary effects include loss of power and heat, and flooding as a result of snowmelt.

### 3.5.2 **Capabilities**

Programs that are specific to winter storms are generally those related to preparing plows and sand and salt trucks, tree trimming to protect power lines, and other associated snow removal and response preparations. The Town budget is generally adequate to handle winter storm damage although the plowing budget is often depleted. The heavy snowfalls associated with the winter of 2010-2011 drained the Town's plowing budget and raised a high level of awareness of the danger that heavy snow poses to roofs.

The 2018 Connecticut Building Code specifies that a pressure of 35 pounds per square foot (psf) be used in Bridgewater as the base "ground snow load" for computing snow loading for different types of roofs.

The town owns five trucks for plowing and is responsible for 36 miles of town roads. The standard salt mixture is used for deicing. Priority is given to plowing egresses to critical facilities. Homeowners, private associations, and businesses are responsible for plowing their own driveways and roads.

Prior to a winter weather event, the Town ensures that all warning/notification and communications systems are ready and ensures that appropriate equipment and supplies, especially snow removal equipment, are in place and in good working order. In some known problem areas, prestorm treatment is applied to roadways to reduce the accumulation of snow. The Town also prepares for the possible evacuation and sheltering of some populations that could be impacted by the upcoming storm (especially the elderly and special needs persons).

#### *Actions Completed and New Capabilities*

Bridgewater continues to maintain and improve its capabilities for winter storm mitigation. Public alerts, tree trimming, and road plowing are its primary mitigation strategies.

### 3.5.3 Vulnerabilities and Risk Assessment

The entire Town of Bridgewater is at relatively equal risk for experiencing damage from winter storms although some areas (such as icing trouble spots and neighborhoods with a high concentration of flat roofs) are more susceptible. Many damages are relatively site specific and occur to private property, while repairs for power outages are often widespread.

Based on the historic record, Connecticut experiences at least one major nor'easter every four years, along with a variety of minor and moderate snow and ice storms that occur nearly every winter. Connecticut residents can expect at least two or more severe winter weather events per season, including heavy snowstorms, potential blizzards, nor'easters, and potential ice storms.

After a storm, snow piled on the sides of roadways can inhibit sight lines and reflect a blinding amount of sunlight. When coupled with slippery road conditions, poor sightlines and heavy glare create dangerous driving conditions. Stranded motorists, especially senior and/or handicapped citizens, are at particularly high risk of injury or death from exposure during a blizzard. The elderly population in Bridgewater, in particular, is susceptible to the impacts created by winter storms due to resource needs (heat, electricity loss, safe access to food, etc.).

The structures and utilities in the Town of Bridgewater are vulnerable to a variety of winter storm damage. Two barns collapsed in Bridgewater in January and February 2014. Tree limbs and some building structures may not be suited to withstand high wind and snow loads. Ice can damage or collapse power lines, render steep gradients impassable for motorists, undermine foundations, and cause "flood" damage from freezing water pipes in basements.

Town officials have indicated that the most vulnerable areas to snow drift are located along Town Line Road, Keeler Road, Curtis Road, Second Hill Road, Northrup Street, Rocky Hill Road and Hut Hill Road. In other areas, the effects are generally mitigated through municipal plowing efforts. Drifting snow is often a problem after a lot is cleared for a new home or new landscaping.

Icing causes difficult driving conditions on Route 133 since there is not a lot of sun exposure. The Town's standard of presalting has been helpful in controlling ice in these problem areas. During the public meeting for this plan development, it was noted that icing is also a concern on Second Hill Road as water seeps from the road bank and freezes as it crosses the road. This could potentially be addressed by installing new drainage along 200 feet of the roadway.

Recent climate change studies predict a shorter winter season for Connecticut (as much as two weeks) and less snow-covered days with a decreased overall snowpack. These models also predict that fewer, more intense precipitation events will occur with more precipitation falling as rain rather than snow. This trend suggests that future snowfalls will consist of heavier (denser) snow, and the potential for ice storms will increase. Such changes will have a large impact on how the state and its communities manage future winter storms and will affect the impact such storms have on the residents, roads, and utilities in the state.

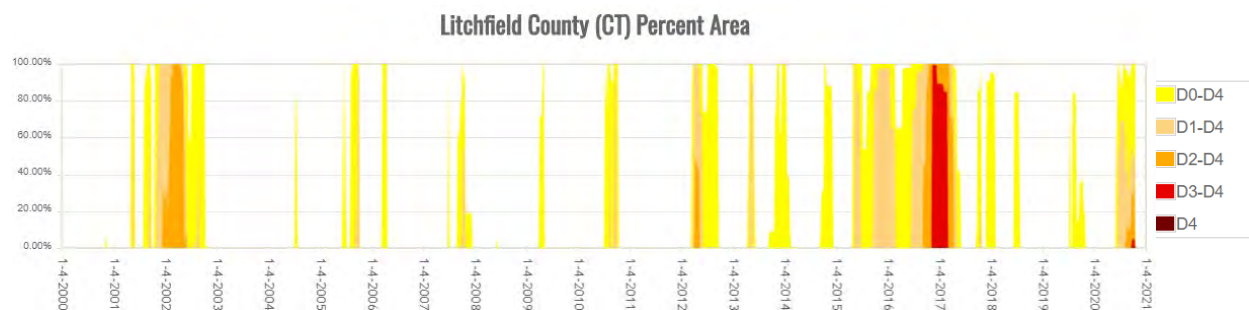
## 3.6 WILDFIRES AND DROUGHT

### 3.6.1 Setting

The ensuing discussion about wildfires is generally focused on the undeveloped wooded and shrubby areas of Bridgewater, along with low-density suburban type development found at the margins of these areas known as the wildland interface.

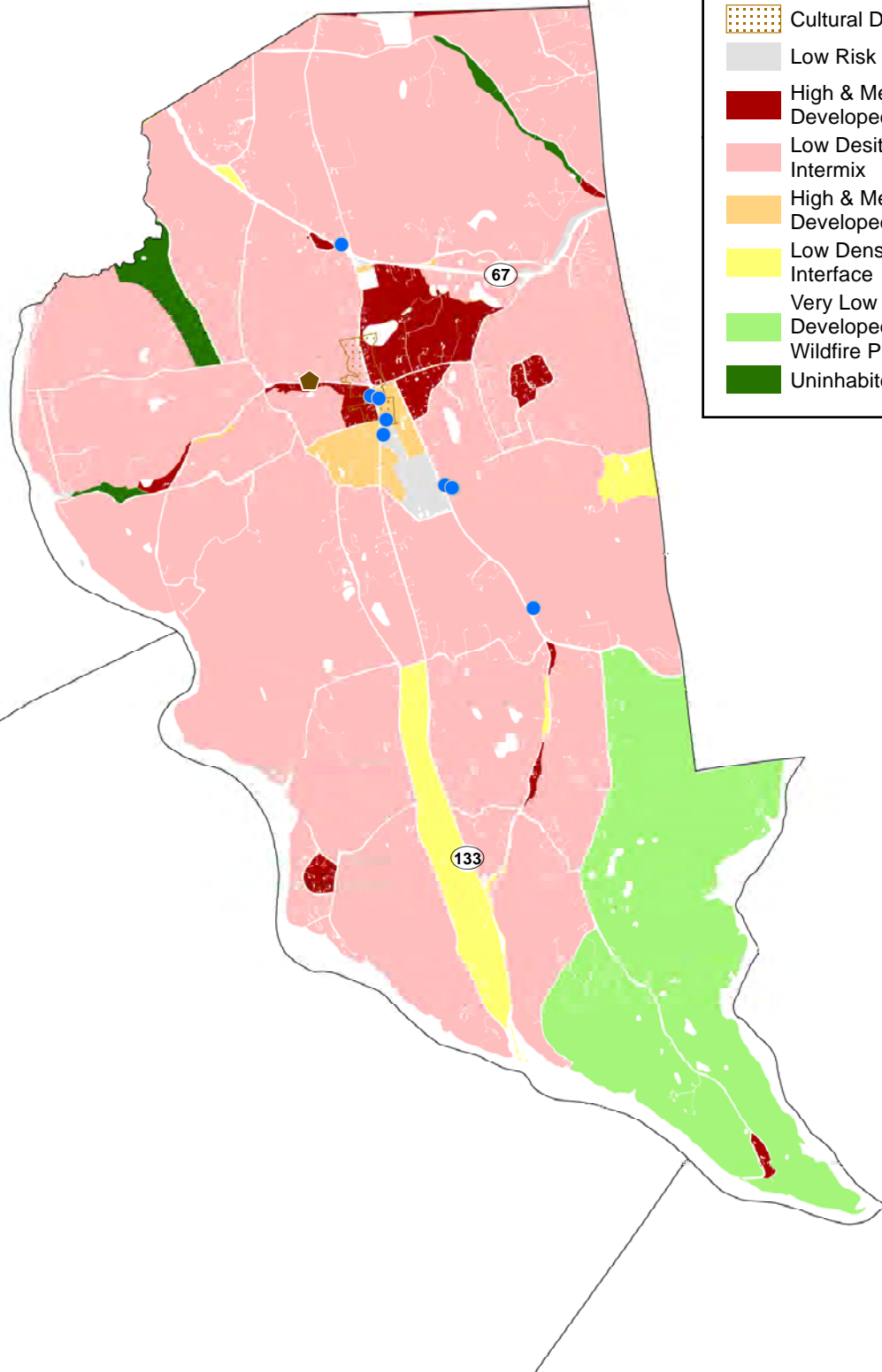
The Town of Bridgewater is generally considered a moderate risk area for small wildfires but a low risk area for large wildfires. Wildfires are of particular concern in outlying areas with poor access for fire-fighting equipment. Hazards associated with wildfires include property damage and loss of habitat. Wildfires of any type are considered a likely event each year but, when one occurs, it is generally contained to a small range with limited damage to non-forested areas.

In addition, Bridgewater, and Litchfield County overall, has experienced drought challenges over recent years. The U.S. Drought Monitor (USDM), which has been monitoring nationwide drought conditions since 2000, estimates that over the past two decades Connecticut experienced its longest drought of 46 weeks beginning June 21, 2016 and lasting until May 2, 2017. It was also estimated that the most intense period of this extended drought occurred the week of November 15, 2016, where approximately 44.5% of Connecticut lands were impacted. Figure 3-1 depicts the percent of Litchfield County experiencing drought conditions over time since 2000, where the warmer colors represent more advanced drought stages.



**Figure 3-1: USDM Drought Time Series for Litchfield County**

The 2019 Connecticut Natural Hazard Mitigation Plan assumes that the State of Connecticut has a medium probability of future drought events. This assumption is based on climate change projections anticipating hotter and wetter conditions in the near future. Climate forecasts often suggest that while precipitation may increase, the overall pattern will generally be higher intensity storms, with longer than average dry periods between events. The State Plan also identifies that Litchfield County accounts for roughly 20.19% of the state's total number of farms, with a market value of over \$46 million in product sold from these farms.



## Legend

- Critical Facilities
- ⬠ Cultural Site
- Cultural District
- Low Risk Wildfire Areas
- High & Med. Density Developed Intermix
- Low Density Developed Intermix
- High & Med. Density Developed Interface
- Low Density Developed Interface
- Very Low Density Developed and some Wildfire Prone Vegetated
- Uninhabited and Vegetated



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## Wildland-Urban Interface: Wildfire Risk Areas

WestCOG Hazard Mitigation Plan  
Town of Bridgewater

NPS: Cultural Resources  
Wildland-Urban Interface:USFA



0 2,000 4,000  
Feet

SCALE 1" = 5,011'

DATE 11/13/2020

3101-22  
PROJ. NO.

**FIG. 3-2**



### 3.6.2 Capabilities

According to town officials there are a few dry hydrants and a few ponds in town that are utilized for fire suppression. The Town has one all-terrain brush truck for fighting off-road fires and utilizes mutual aid agreements with all of its neighbors. Unlike the west coast of the United States where the fires are allowed to burn toward development and then stopped, the Bridgewater Fire Department goes to the fires whenever possible. This proactive approach is believed to be effective for controlling wildfires. Finally, the DEEP Forestry Division uses rainfall data from a variety of sources to compile forest fire probability forecasts. This allows the DEEP and the Town to monitor the drier areas of the state to be prepared for forest fire conditions.

Regulations regarding fire protection are outlined in the Subdivision Regulations. Specifically, Section 5.5 of the Subdivision Regulations states that “the Commission may, in its sole discretion, require, for fire protection, the construction of ponds, including dry hydrants, in any subdivision.” However, local regulations do not require fire protection in buildings. This is a concern if an affordable housing proposal is again presented to the town’s land use commissions. The town is interested in adding fire protection requirements to the Zoning Regulations.

#### *Actions Completed and New Capabilities*

Bridgewater’s wildfire and drought mitigation capabilities continue to be sufficient, although there has not been a significant change in these capabilities since the previous HMP was adopted. Mitigation consists primarily of drought and wildfire condition monitoring, development of mutual aid agreements, and installation and maintenance of wildfire-fighting sources.

### 3.6.3 Vulnerabilities and Risk Assessment

Minor brush fires have occurred in Bridgewater over the years. In March 2017, fire departments from Bridgewater, Brookfield, New Milford, and Roxbury responded to a brush fire near Main Street South that burned around 20 acres.

The most common causes of wildfires are arson, lightning strikes, and fires started from downed trees hitting electrical lines. Thus, wildfires have the potential to occur anywhere and at any time in both undeveloped and lightly developed areas. The extensive forests and fields covering the state are prime locations for a wildfire. In many areas, structures and subdivisions are built abutting forest borders, creating areas of particular vulnerability.

Wildfires are more common in rural areas than in developed areas as most fires in populated areas are quickly noticed and contained. The likelihood of a severe wildfire developing is lessened by the vast network of water features in the state, which create natural breaks likely to stop the spread of a fire. During long periods of drought, these natural features may dry up, increasing the vulnerability of the state to wildfires.

According to the Connecticut DEEP, the overall forest fire risk in Connecticut is low due to several factors. First, the overall incidence of forest fires is very low (an average of 215 fires per year occurred in Connecticut from 2002 to 2010, which is a rate slightly higher than one per municipality per year). Secondly, as the wildfire/forest fire prone areas become fragmented due to development, the local fire departments have increased access to those neighborhoods for firefighting equipment. Third, the problematic interface areas such as driveways too narrow to



permit emergency vehicles are site specific. Finally, trained firefighters at the local and state level are readily available to fight fires in the state, and inter-municipal cooperation on such instances is common.

However, local risk is not necessarily the same as the overall statewide risk. Bridgewater town officials believe that the fuels are present in the forested parts of the town, and thus believe that the risk is present.

Most wildfires in Connecticut are relatively small. In the drought year of 1999, the average wildfire burned five acres in comparison to the two most extreme wildfires recorded since 1986 that burned 300 acres each. Given the availability of firefighting water in the town, including the use of nearby water bodies, it is believed that this average value for a drought year and the extreme value are applicable to the town as well.

Town officials have noted that the Zoning Regulations do not include fire protection elements or any specifications that require underground tanks or on-site standards for water storage. The town has also indicated that there are a number of “dry fuel” areas throughout town that are considered vulnerable to wildfires.

## 3.7 EARTHQUAKES AND LANDSLIDES

### 3.7.1 Setting

The entire Town of Bridgewater is susceptible to earthquake damage. However, even though earthquake damage has the potential to occur anywhere both in the town and in the northeastern United States, the effects may be felt differently in some areas based on the type of geology. In general, earthquakes are considered a hazard that may possibly occur but that may cause significant effects to a large area of the town.

### 3.7.2 Capabilities

The Connecticut Building Codes include design criteria for buildings specific to each municipality as adopted by the Building Officials and Code Administrators (BOCA). These include the seismic coefficients for building design in the Town of Bridgewater. The Town has adopted these codes for new construction, and they are enforced by the Building Official. Due to the infrequent nature of damaging earthquakes, land use policies in the Town do not directly address earthquake hazards. However, various documents do indirectly discuss areas susceptible to earthquake damage and regulations that help to minimize potential earthquake damage.

- ❑ **Zoning Regulations:** Section 5.06 outlines soil erosion and sediment control regulations. Section 7.02.03 outlines application requirements and states that applicants shall provide the location of natural features including but not limited to, rock outcroppings, slopes in excess of 15%, soil types, and forested areas on the lot.
- ❑ **Subdivision Regulations.** Section 2.2.9 requires that soil erosion and sediment control plans be developed for proposed projects.
- ❑ **Plan of Conservation and Development.** The 2012 plan recommends reviewing the definition of steep slopes and limiting residential development on steep slopes.

#### *Actions Completed and New Capabilities*

Earthquake mitigation capabilities have not significantly changed in Bridgewater in recent years, and are deemed to be sufficient given the low risk of a hazardous event.

### 3.7.3 Vulnerabilities and Risk Assessment

Some areas in Bridgewater are underlain by sand and gravel. Structures in these areas are at increased risk from earthquakes due to amplification of seismic energy and/or collapse. The best mitigation for future development in areas of sandy material may be application of the most stringent building codes or possibly the prohibition of new construction. However, many of these areas occur in floodplains associated with the various streams and rivers in Bridgewater, so they are already regulated. The areas that are not at increased risk during an earthquake due to unstable soils are those underlain by glacial till, which includes most of the town.

Areas of steep slopes can collapse during an earthquake, creating landslides. Seismic activity can also break utility lines such as water mains, electric and telephone lines, and stormwater management systems. Damage to utility lines can lead to fires, especially in electric and gas mains. Dam failure can also pose a significant threat to developed areas during an earthquake. For this Plan, dam failure has been addressed separately.

## 4.0 MITIGATION STRATEGIES AND ACTIONS

### 4.1 Goals and Objectives

Municipal goals and objectives have been made consistent regionally and are presented in the Multi-Jurisdictional Plan document.

### 4.2 Status of Mitigation Strategies and Actions from Previous HMP

The table below lists the mitigation actions developed in the previous HMP and the status of each. Actions to be carried forward are noted as such. Actions that have been institutionalized as capabilities are not carried forward.

#	Description	Responsible Party	Status	Notes
1	Pursue funding to acquire portable generators and acquire transfer switches to facilitate the use of portable generators when needed	EMD	Carry Forward	Town has not yet succeeded in securing a grant for portable generators. Carry Forward.
2	Pursue the steps needed to construct a combined Police Department/EOC with the capabilities of the nearby Danbury and new Fairfield EOCs including internet and communications capabilities.	EMD	Drop	This action is considered to be a low-priority, long-term goal for the Town to pursue through its capital improvement plan. It is not necessary for the HMP.
3	Work with CT DOT to ensure that safety improvements to Route 133 are consistent with the goals of this hazard mitigation plan.	EMD	Completed	Safety improvements have been completed
4	Utilize the CT Alert emergency notification system to its fullest capabilities	EMD	Capability	The Town encourages residents to participate in this program through links on its website.
5	Encourage residents to purchase and use NOAA weather radios with alarm features	EMD	Completed	Town has links to State and Federal Emergency Preparedness pages on its website; these pages identify individual actions for disaster preparedness.
6	Add pages to the town website dedicated to citizen education, evacuation routes and preparation for hazard events.	EMD	Completed	Town has information about hazard preparedness, including sheltering information and links to State and Federal sites, on the Emergency Management page of its website.
7	Consider updating the Town floodplain ordinances in order to put additional restrictions on floodplain development.	P&Z	Carry Forward with Revisions	Adding restrictions above NFIP and State requirements is not necessary for Bridgewater; however, ordinances should be updated to be consistent with the most recent Connecticut Building Code and DEEP model regulations.

#	Description	Responsible Party	Status	Notes
8	Require developers to demonstrate whether detention or retention of stormwater is the best option for reducing peak flows downstream of a project and provide a design for the appropriate alternative.	P&Z	Capability	Planning and Zoning Department require licensed engineers to determine appropriate methodology. There are currently no pending large development proposals.
9	Consider conducting a Wewaka Brook flood mitigation study to identify appropriate methods of reducing flood risk along the stream corridor.	PW	Carry Forward	This has been identified as a low priority by town officials, as the Brook has not flooded in recent years, and only a small number of properties are at risk in this area; therefore, the project has not yet been pursued. Carry forward.
10	Evaluate the small number of floodprone properties along Wewaka Brook to determine potential flood damage reduction methods for these properties.	PW	Drop	Town does not have the capacity to perform or finance such evaluations for private properties.
11	Provide technical assistance regarding floodproofing measures to interested residents. Pursue funding for home elevations should any residents become interested.	BD	Drop	Town does not have the capacity to provide technical assistance or proactively pursue such funding for private properties. Town can direct property owners to State and Federal resources if approached.
12	Compile a checklist that cross-references the bylaws, regulations, and codes related to flood damage prevention that may be applicable to a proposed project and make this list available to potential applicants.	P&Z	Drop	Town does not believe this action is necessary given the slow rate of development and its existing permit review process.
13	Develop an open space acquisition program as recommended in the POCD.	FS	Completed	Town has an Open Space Fund to assist with purchases on a case-by-case basis.
14	Develop buffer zone requirements for land adjacent to water as recommended in the POCD.	P&Z	Completed	This action is covered by the Town's Inland Wetlands and Watercourses regulations, amended in 2011.
15	Identify locations for stormwater detention/retention in the town center area and along Route 133 to reduce peak flows that cause flashy conditions and streambank erosion along Clapboard Oak Brook.	PW	Carry Forward	Action has not yet been completed due to limited funding and staff capabilities. Town will carry forward, and may explore possible locations for detention/retention that can occur on private property.
16	Pursue streambank stabilization improvements along Clapboard Oak Brook.	PW	Completed	Town has made recommendations to private property owners, and many have pursued stabilization improvements.

#	Description	Responsible Party	Status	Notes
17	Review culvert conveyances based on existing hydrology and Northeast Regional Climate Center guidance and develop a priority list of culverts for replacement.	PW	Drop	Town does not have capacity to perform a comprehensive review of culverts, and believes its current conveyance review and culvert upgrade protocols are sufficient.
18	Develop a plan to address dead trees throughout the town in an effort to minimize damage from falling trees.	PW	Capability	Town has a Tree Warden who is responsible for tree removal and maintenance within Town rights-of-way. Tree Warden is also working with private property owners to address trees on private property.
19	Work with CL&P to determine the feasibility of placing non-conducting steel cable above the power lines	PW	Drop	CL&P has been acquired by Eversource. Town coordinates with Eversource on powerline maintenance. Eversource implements mitigation measures as needed.
20	Encourage the use of structural techniques related to mitigation of wind damage in new residential and commercial structures to protect new buildings to a standard greater than the minimum building code requirements. Require such improvements for new municipal critical facilities.	BD, EMD	Drop	Town applies CT State Building Code Locally; this is considered sufficient.
21	Develop a plan to prioritize snow removal from the roof of critical facilities and other municipal buildings each winter. Ensure adequate funding is available in the Town budget for this purpose.	EMD	Capability	Town surveys snow loads and ice dams, and removes as necessary.
22	Work in rights of way to provide wind breaks and reduce drifting along town roads.	PW	Capability	Town requires some private properties to install snow fencing to prevent drifting, as necessary.
23	When permits are issued for clearing of properties, require mitigation by landowners to prevent snow drifts from affecting adjacent roads. Snow fencing and certain vegetation buffers may be effective to reduce drifts.	P&Z	Completed	This is done as needed following reviews and site-walks.
24	Install drainage improvements along Second Hill Road to reduce the potential for icing.	PW	Completed	Town has completed drainage improvements for some locations, and uses sand and salt to reduce icing as needed

#	Description	Responsible Party	Status	Notes
25	Work with the owners of the Paparazzo dam on Clapboard Oak Brook to develop an EAP for this dam despite its relatively low hazard classification, as the town is concerned with its condition and potential for failure.	FS	Drop	Town staff report that there is negligible risk downstream of this dam; State Dam Safety Division requires owners to complete inspections regularly.
26	File EOP's/EAP's with town departments and emergency personnel	EMD	Completed	This is completed as necessary.
27	Consider updating the Zoning Regulations to require the installation of fire protection sources in new developments.	P&Z	Completed	Fire protection sources are required in new developments based on recommendation of Fire Marshall
28	Revise and enhance the town's website concerning the local regulatory requirements concerning Open Burning	FD	Completed	Information is available on the Town website.
29	Pursue acquisition of additional municipal open space in SHFAs and set it aside for greenways, parks, etc.	FS	Drop	Town has a high percentage of open space – acquisition of additional open space is not currently necessary.
30	When replacing or upgrading culverts, work with CT DOT to incorporate findings of the climate change pilot study and work with HVA to incorporate findings of the stream crossing assessment training.	PW	Capability	Public Works Department works with licensed engineers when needed, and upsizes pipes and culverts as needed.
31	Consider preventing new residential development in areas prone to collapse. In particular the 2012 POCD recommends reviewing the definition of steep slopes and limiting residential development on steep slopes.	P&Z	Drop	This action is not considered a high priority, as development near steep slopes prone to collapse is not identified as a problem at this time.
32	Consider bracing vulnerable systems and assets inside critical facilities. This could help protect IT systems, important records and files.	EMD, PW	Carry Forward with Revisions	Action is replaced with an action to back up IT systems on the cloud and enable remote access of systems in case the physical systems are damaged or inaccessible during a natural disaster.
33	Include dam failure inundation areas in the CT Alert emergency contact database.	EMD	Capability	CT Alert database includes dam failure areas.
34	Consider the use of beaver deterrent devices such as beaver stops or beaver bafflers.	PW	Capability	Town utilizes a variety of beaver management strategies as needed.
35	The town should develop a list of "at risk" wildfire areas and consider a combination of all available methods of risk reduction, and then increase the availability of water sources in the town's high-risk areas.	FD	Capability	Fire Department is aware of at-risk areas, and is continually improving firefighting water sources.

### 4.3 Prioritization of Strategies and Actions

The STAPLEE method, described in the Multi-Jurisdictional document, was used to score mitigation activities. The STAPLEE matrix in Appendix A provides the total scores. Actions have been further prioritized based on implementation cost, project urgency, and municipal and public input. The strategies below are presented in priority order, with qualitative priority levels listed for each.

### 4.4 Mitigation Strategies and Actions Implementation Table

The Town proposed to initiate several new mitigation actions for the upcoming five years. Additionally, a number of actions from the previous planning period are being carried forward or replaced with revised actions. These are listed below.

Action BWR-01	
<b>Update Town Floodplain Ordinances to be consistent with the most recent Connecticut Building Code and DEEP model regulations.</b>	
Lead	P&Z
Cost	\$0 - \$25,000
Funding	Operating Budget
Timeframe	2023
Priority	Low

Action BWR-02	
<b>Increase Substantial Damage and Substantial Improvement lookback periods to two or more years.</b>	
Lead	Planning
Cost	\$0 - \$25,000
Funding	Operating Budget
Timeframe	2023
Priority	Low

Action BWR-03	
<b>Back up IT systems on the cloud and enable remote access of systems in case the physical systems are damaged or inaccessible during a natural disaster.</b>	
Lead	EMD, PW
Cost	\$25,000 - \$50,000
Funding	Operating Budget
Timeframe	2024
Priority	Med

Action BWR-04	
<b>Identify locations for stormwater detention/retention in the town center area and along Route 133 to reduce peak flows that cause flashy conditions and streambank erosion along Clapboard Oak Brook.</b>	
Lead	PW
Cost	\$25,000 - \$50,000
Funding	Capital Improvement Plan, FEMA Grant
Timeframe	2024
Priority	Med

Action BWR-05	
<b>Coordinate with CT SHPO to conduct historic resource surveys, focusing on areas within natural hazard risk zones (flood zones, wildfire hazard zones, steep slopes) to identify historic resources at risk and support the preparation of resiliency plans across the state.</b>	
Lead	Planning
Cost	\$25,000 - \$50,000
Funding	CT SHPO
Timeframe	2024
Priority	Low

Action BWR-06	
<b>Annually conduct an emergency operations exercise for a local terrorism, sabotage, or mass casualty event.</b>	
Lead	EMD
Cost	\$25,000 - \$50,000
Funding	Operating Budget
Timeframe	2024
Priority	Low

Action BWR-07	
<b>Conduct a Wewaka Brook flood mitigation study to identify appropriate methods of reducing flood risk along the stream corridor.</b>	
Lead	PW
Cost	\$50,000 - \$100,000
Funding	Operating Budget, Grant
Timeframe	2025
Priority	Med



Action BWR-08	
Pursue funding to acquire portable generators and acquire transfer switches to facilitate the use of portable generators when needed	
Lead	EMD
Cost	\$100,000 - \$500,000
Funding	Capital Improvement Plan, FEMA Grant, Other Grant
Timeframe	2026
Priority	Low



## **APPENDIX A**

### **Appendix A: STAPLEE Matrix**







## **APPENDIX B**

### **Appendix B: SVI Summary**





# **Town of Bridgewater**

## **Climate Vulnerability Assessment**

### **A Component of Sustainable CT Action 5.4**

The Town of Bridgewater, for this Climate Vulnerability Assessment (CVA) is considered a suburban inland town, resulting in various climate change vulnerabilities. Inland flooding, extreme heat, and winter storms may impact the community the most as many issues have been identified.

#### **Hazards**

##### ***Inland Flooding***

With FEMA flood zones in town, such as along the Housatonic River and the Shepaug River, there is continuously concern for riverine flooding. The large rivers, along with the smaller streams in town, pose a flood risk to adjacent properties whether it is a larger storm event, or a short intense rainstorm. With precipitation expected to increase due to climate change, flooding events may occur more frequently. Overall, flooding may continue, or become a larger issue with future shifts in precipitation.

##### ***Winter Storms***

Bridgewater is largely residential, with suburban development throughout the community. Suburban communities are often impacted by strong winter storms in several ways; power outage from downed trees, accessibility issues, and icing concerns. Anticipated shifts in winter precipitation may bring more freezing rain events, which can result in an increase of downed trees during a winter storm event. Downed trees can result in power outage, and lack of emergency access and egress.

##### ***Drought and Extreme Temperatures***

Most of the town relies on private wells for drinking water, with only two very small public water systems providing water in town. Therefore, impacts to water supply may be an issue to the town as temperatures rise in the near future, resulting in isolated issues with water scarcity. With increased temperatures, and high pumping levels, private wells may be impacted during times of drought.

In addition to private wells, many suburban communities have high levels of agricultural activity, whether it be crop production or livestock, these operations are heavily water dependent for healthy growing and revenue generation.

When considering these impacts from climate change, the primary vulnerabilities for the town of Greenwich include:

- Private well owners
- Emergency access
- Agricultural operations

#### **Secondary impacts**

##### ***Economic Impacts***

With areas vulnerable to isolation during flooding and winter storm events, the town faces an economic challenge of addressing the flooding concerns and increasing snow and debris removal capacity. There is also a potential economic impact to local businesses during flooding events, and heavy winter storms. Businesses may also incur expenses related to flood mitigation or clean-up efforts, or experience loss of income if there is no site access during a storm.

Winter storm snow removal or icing also presents financial responsibility to the town by way of roadway treatment. As precipitation events may increase during winter months, the town may seek to increase sand or salt stockpiles to account for increased icing events.

Private property owners who rely on private drinking water wells may also be impacted economically during droughts or periods of extreme heat. With increasing heat, typically comes increased water demand. This demand would be placed upon local aquifers, potentially resulting in the need for new well construction, or deepening of an existing well.

The many impacts of climate change can result in economic impacts to many citizens, business owners, and municipal budgets as the impacts can be felt on a town level, down to building level.

### **Social Impacts**

To identify social impacts to the town, the Center for Disease Control and Prevention (CDC) Social Vulnerability Index (SVI) was used to identify any vulnerable populations within the town. This index was developed to supplement a community's natural hazard preparation actions. To evaluate social vulnerability, the CDC incorporates 15 factors (Fig. 1) into the overall calculation under the categories, or themes, of: socioeconomic status, household composition and disability, minority status and language, and housing type and transportation. These themes and their ranking are based on census statistics. By evaluating these factors and determining a level of social vulnerability, a community can identify specific needs for before, during, and after an event. Such needs may include sheltering capacity, evacuation routes, or to decide how many emergency personnel may be required to respond after an event.

Each municipalities' census tracts were ranked for overall vulnerability, and theme vulnerability, in comparison to other Connecticut municipalities. This rank, 0 to 1, is based on the percentile rank among all tracts within the State of Connecticut. A value closer to 0 indicates a lower vulnerability, while a value closer to 1 indicates a higher vulnerability. Table 1 presents the overall vulnerability and theme rankings for Bridgewater.

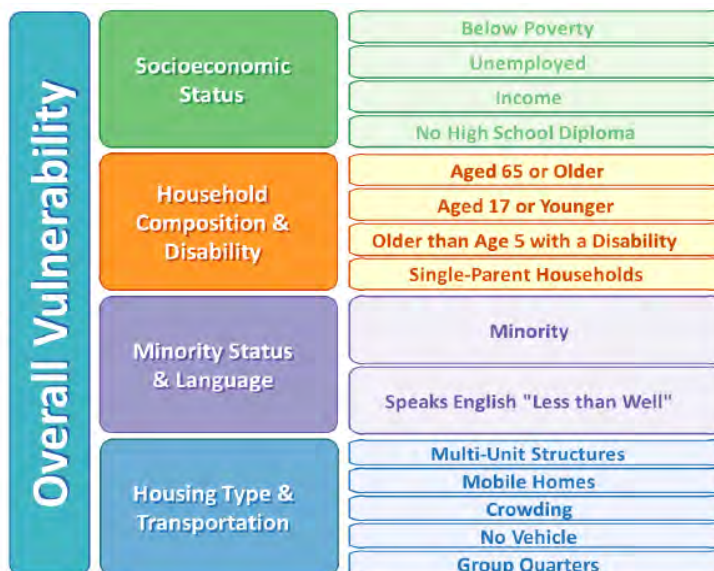


Figure 1: The CDC SVI Index Factors. Graphic: svi.cdc.com

Table 1: Bridgewater SVI Factor Rankings

	Overall SVI	Socioeconomic	Household Composition & Disability	Minority Status & Language	Housing Type & Transportation
<b>BRIDGEWATER</b>	.06	.11	.15	.14	.16

The Town of Bridgewater is considered to have a low level of vulnerability, with their most vulnerable social aspect being the housing type and transportation, which is only ranked marginally more vulnerable than the least vulnerable population with socioeconomic vulnerabilities.

These populations may be vulnerable to impacts from drought, flooding and storm events based on the geographic concentrations.

### ***Public Health Considerations***

Of the primary vulnerabilities identified, drought and flooding can potentially have public health repercussions. During hot summer months, or drought, if private wells were to be impacted, certain populations may find themselves without adequate drinking water supply, resulting in health problems. Also, when considering the environmental shifts occurring during drought periods, drinking water contamination may become an issue as aquifers become stressed due to excessive pumping.

Food scarcity is another consideration when discussing the impacts of drought and extreme temperatures. Agricultural operations that are impacted by water shortages may find that crop or livestock yields are below average, ultimately resulting in food scarcity concerns. Depending on the size of an operation, the impacts can be on a small or large scale.

Flooding also presents the concern of pollution into nearby water bodies as commercialized and impervious areas drain, they collect pollutants and excess sediment. Depending upon the drainage areas, this runoff can have environmental impacts in associated ecosystems, or public health impacts if water bodies are used for recreational activities.

### **Vulnerable Populations**

The SVI identified the presence of certain populations within the town that may be more vulnerable to climate change hazards. Communities, including Bridgewater, should pay special attention to elderly or disabled populations, linguistically challenged population, and those that may need evacuation assistance due to lack of transportation.

Some populations often need additional time for hazard response, so evacuation or preparation, and may find it more challenging to recover due to financial constraints or health concerns. These populations should be considered more vulnerable because emergency response and preparation may be more challenging, health issues may be of higher concern, and language barriers may exist when working to communicate with the community on risks, response, and recovery efforts.

In addition to the populations, it is important to identify the facilities that can provide different types of assistance to the populations, and others, during or after an event. These facilities, and their proximity to flood zones, can be found in Figure 2-4.

