Naugatuck Valley Council of Governments

Hazard Mitigation Plan Update

2021 – 2026

Municipal Annex
for

BRISTOL, CT

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Bristol, CT 06010
MMI #3211-29

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1.0 INTRODUCTION

1.1 Purpose of Annex

This Hazard Mitigation Plan (HMP) annex provides 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 Naugatuck Valley Council of Governments (NVCOG) Multi-Jurisdictional Hazard Mitigation Plan. This annex is designed to supplement the information presented in the Multi-Jurisdictional HMP with more specific local detail, 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.

1.2 Planning Process

A meeting was held with Bristol representatives on October 16, 2020 for the purposes of initial data collection and review of necessary updates for this document. The meeting was convened by the HMP local coordinator, Ray Rogozinski.

Additional input was provided at the two regional municipal staff workshops, held on November 18, 2020, and February 3, 2021.

Public input collected at public workshops and through an online survey have also informed development of this HMP update.

1.3 Physical Setting

The City of Bristol is situated in the west central section of the former CCRPA region, with Burlington to the north, Plainville to the east, Southington to the south, and Plymouth to the west. Other neighboring communities include Farmington to the northeast and Wolcott to the southwest.

Elevation in Bristol ranges from approximately 190 to 980 feet. Most of the land area in Bristol drains to the Pequabuck River, a tributary to the Farmington River. Some of the southern portion of the city eventually drains to the Quinnipiac River, while the southwest portion of the city eventually drains to the Naugatuck River. A small portion of the northeast corner drains directly to the Farmington River. Aside from the Pequabuck River, other major streams in Bristol include Coppermine Brook, Freeman Hill Brook, and Polkville Brook.

The city contains several distinct sections, including Chippens Hill, Edgewood, and Forestville. Bristol serves as a transportation nexus for outlying towns in the region—Plymouth and Burlington—connecting State

Route 72, State Route 6, and State Route 69 with Interstate Highway 84. While the community traditionally is home to manufacturing and industry, the City of Bristol has made continued efforts to diversify its economic activities by preserving and repurposing its richly historic building stock to attract new local businesses. Bristol's major businesses and industries include entertainment, manufacturing, and health care. Top employers include ESPN (3,400 employees), and Bristol Hospital (1,750 employees).

An active segment of the Hartford, Providence and Fishkill Railroad is operated by Pan Am Southern for freight between New Britain and Waterbury. The city is relatively built-out, with most recent commercial and industrial development occurring on properties that have previously been developed. A small amount of residential development and redevelopment is also occurring.

Natural hazard risks to the City of Bristol are unique. This is due to the unique stock of assets the city possesses, including local and state routes and highways, rail lines, medical facilities, historical sites, business and employment centers, schools, elderly populations, building and building content value, police, and fire departments. Each hazard will impact these assets to a different extent. The impacts of flooding are local and can be anticipated with some measurement of certainty; snow storms impact the entire region and are considered annual events; and a tornado can have severe impacts on a very local level and are basically unpredictable. The breadth of these impacts make it necessary to inventory all community assets and, where possible, identify if they lie in a high risk area.

1.4 Land Cover

Table 1-1 summarizes 2015 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. According to this data, about 34% of Bristol is forested and approximately 44% is developed.

Table 1-1: 2015 Land Cover by Area

Land Cover	Area (acres)	Percent of Community
Developed	7,562.8	44.05%
Turf & Grass	2,338.7	13.62%
Other Grass	365.3	2.13%
Agricultural Field	536.2	3.12%
Deciduous Forest	5,405.4	31.48%
Coniferous Forest	298.1	1.74%
Water	274.4	1.60%
Non-Forested Wetland	7.6	0.04%
Forested Wetland	102.7	0.60%
Tidal Wetland	0.0	0.00%
Barren	197.5	1.15%
Utility Row	79.9	0.47%
Total	**17,169**	**100%**

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

1.5 Geology

Geology is important to the occurrence and relative effects of natural hazards such as floods and earthquakes. Thus, it is important to understand the geologic setting and variation of bedrock and surficial formations in Bristol.

1.6 Drainage Basins and Hydrology

Water from the City drains into two of the state's major watershed basins: the Connecticut and the South Central Coast. On route to its final destination in Long Island Sound, water may navigate any of five regional and 23 sub-regional basins that reach from Massachusetts nearly all the way to Connecticut's shoreline.

1.7 Climate and Climate Change

In Bristol, the summers are warm and wet, the winters are freezing, and it is partly cloudy year round. Over the course of the year, the temperature typically varies from 19°F to 82°F and is rarely below 4°F or above 89°F.

The warm season lasts for 3.5 months, from May 30 to September 16, with an average daily high temperature above 72°F. The hottest day of the year is July 21, with an average high of 82°F and low of 63°F. The cold season lasts for 3.3 months, from December 2 to March 12, with an average daily high temperature below 43°F. The coldest day of the year is January 30, with an average low of 19°F and high of 34°F.

The wetter season lasts 3.5 months, from May 4 to August 20, with a greater than 29% chance of a given day being a wet day. The chance of a wet day peaks at 37% on May 31. The drier season lasts 8.5 months, from August 20 to May 4. The smallest chance of a wet day is 22% on January 29.

The most rain falls during the 31 days centered around June 5, with an average total accumulation of 3.9 inches. The snowy period of the year lasts for 5.6 months, from October 29 to April 16, 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 1.2 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_2 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 10% annual-chance storm in Hartford County is 4.7 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 10% annual-chance storm in Bristol as 5.04 inches.

The NOAA Atlas 14, released on September 30, 2015 puts the 24-hour rainfall amount for a 10% annual-chance storm in Bristol at 5.72 inches.

These precipitation amounts, and more details, are summarized in Table 1-2, below.

Table 1-2: 24-Hour Rainfall Amounts by Annual-Chance Occurrence

Source	24-Hour Rainfall Amount (inches) by Annual-Chance Occurrence		
	10%	4%	1%
Technical Paper No. 40	4.7	5.5	6.9
NRCC	5.0	6.4	9.0
NOAA Atlas 14	5.7	7.1	9.1

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 Bristol can expect the 24-hour rainfall amount for a 10% annual-chance storm to be around 5.1 to 6.2 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).

1.8 Development Trends

The 2010 U.S. Census reported a population in Bristol of 60,218 individuals. U.S. Census Bureau estimates for 2019 show a population around 59,359 individuals, a decrease from 2010 of 1.4%. The Connecticut

State Data Center predicts that population will decrease by 11.2% through 2025 to an estimated population of 10,219 individuals.

According to the Connecticut Data Collaborative, the number of annual housing permits in Bristol remained steady over the last decade. The number of permits issued in 2010 and 2011 was 37 and 21, respectively, while 37 permits were issued in 2016, and 42 permits were issued in 2017. On average, 44 housing permits were issued each year in Bristol between 2010 and 2017.

According to the U.S. Census Bureau, the overall number of housing units in Bristol dropped by approximately 1.8-percent between 2010 and 2019, from 27,011 units in 2010 to 26,546 units in 2019. In 2019, the housing stock was made up of approximately 59% single-unit structures, 11% two-unit structures, 29% multi-unit structures, and 1% mobile-homes or other types of structures.

According to the Connecticut Office of Policy and Management, Bristol's 2019 Total Equalized Net Grand List was valued at $3,999,000,000. The equalized net grand list is an estimate of the market value of all taxable property in the municipality, and gives some indication of the value of property at risk in the event of a major natural disaster.

Additional information can be found in the 2019 Connecticut Economic Resource Center profile for Bristol, included as Appendix C.

As development in the City increases, the magnitude of the damage caused by the disasters also increases. Total damages increase for two reasons. First, because there are more homes, businesses, and other assets in a given area, more homes, businesses and assets are affected by the disaster. Second, impermeable surface is linked to more severe and rapid flooding events. Continued development has caused the percentage of impermeable surface area within the City to increase. Therefore when heavy rain events hit the City the resulting storm water quickly flows through storm drains and across parking lots and lawns, into brooks and rivers leading to a higher peak elevation flood surge. This phenomenon, created by development, has increased the damages associated with severe weather conditions.

The additional development associated with the potential population increases in the City over the coming years is likely to be concentrated in areas with more net developable land. Net developable land represents the currently undeveloped land that is available for development (e.g. does not have conservation easements) and not hampered by build-out constraints (such as wetlands, stream buffers, floodplain areas, water bodies, protected open space, and areas with prohibitive slopes).

One concern raised by continuing a-centric development pattern is its impact on natural systems, particularly hydrologic systems. Due to its geographic location and topographic variability, actions taken in the City has the potential to impact areas that are quite distant, and actions in upstream communities have the potential to impact downstream communities.

Historic development patterns in the City favored sites near bodies of waters. Rivers provided power for mills and factories, transportation of people and goods, and water for irrigation of agricultural fields. While development along these rivers provided economic and aesthetic benefits, many have been polluted and their uses are considered restricted by the Connecticut Department of Energy and Environmental Protection (DEEP) per its 2014 *Integrated Water Quality Report*. Within the City the Pequabuck is rated as impaired for

habitat for fish, other aquatic life and wildlife, and recreation from headwaters to its confluence with the Farmington River.

The concentration of development next to bodies of water, rivers in particular, also introduced increased risk of flooding and erosion. Flooding from the Pequabuck River already has dramatic impacts on the City. Nearby waterways periodically overrun their banks, rendering roads impassable and flooding homes and businesses. Catastrophic flood events punctuate the region's historical record and have left indelible marks on the natural and built environment.

In the 2015 Plan of Conservation and Development, the city projects to have an older, but fairly stable population by 2030. In order to support the needs of its residents in the future, Bristol has indicated a desire to develop land to diversify its business and affordable housing offerings. Resident surveys conducted in 2014 found a preference for "greener" development policies that align with the preservation of natural, geological, and cultural resources and continue to manage activities in environmentally sensitive areas, in particular, wetlands and ridgelines. To this end, recent updates to the City's zoning and subdivision regulations include requirements for land to be set aside for open space purposes.

Development in Bristol has continued, although not at an accelerated pace. A selection of notable development projects is included below:

- A few 10-20 lot subdivisions have been constructed in recent years.
- There have been many redevelopment projects, both residential and commercial.
- A new elderly housing development was constructed.
- A new high-rise senior housing development was constructed (reportedly, the building needs a generator).
- An assisted living facility is under construction in the downtown area.

Summary

Recent development in Bristol has been located outside of high hazard risk areas, and has not significantly increased natural hazard vulnerability in the community. Overall, development trends in Bristol are not expected to increase natural hazard risks over the next five years.

1.9 Historic and Cultural Resources

Historic and cultural resources include sites, structures, and objects that are significant in history, architecture, archaeology, engineering, and culture. These resources grow economies and enhance 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 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.

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 Bristol near flood sources may be damaged during flooding or other hazard events.

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.

1.10 Social Vulnerability Index

By evaluating local social vulnerabilities, a community can identify populations that may be more vulnerable to natural hazards, and implement actions to better respond to the needs of those populations. The Center for Disease Control and Prevention (CDC) uses 15 factors extracted from census data to calculate a Social Vulnerability Index (SVI) for communities. The SVI factors fall into four categories:

- socioeconomic status
- household composition and disability
- minority status and language
- housing type and transportation

Bristol is considered to have a Moderate to High level of social vulnerability, with a higher vulnerability scores for the SVI categories of Household Composition & Disability, and Socioeconomic Status. In other words, particular challenges in Bristol may include the presence of residents who need additional assistance during a disaster event due to disabilities or mobility limitations, and a lack of access to financial resources.

2.0 MUNICIPAL CAPABILITIES

2.1 Governmental Structure and Capabilities

The City of Bristol is professionally managed by staff assisting a full-time Mayor. The Police and Court complex includes the Emergency Operations Center. The Police Department is comprised of approximately 125 full-time police officers, and additional emergency dispatch personnel and support staff. Fire protection is provided by a full-service fire department with five engine companies and one tower company.

The 2015 POCD includes a discussion of 1% annual chance and 0.2% annual chance floodplains and steep slopes and the need to avoid building in unsafe areas. The POCD anticipates the future adoption of low-impact development policies to mitigate the impacts of stormwater runoff on flooding and natural resources.

Select regulations have been updated by the City to help promote low-impact development. Specifically, regulations were updated to ensure compliance with the MS4 program. Additional regulations changes are needed to further encourage low-impact development.

The City's floodplain management ordinance requires one foot of freeboard for new development or substantial improvement. This is consistent with DEEP's model ordinance and the State building code. The City is considering increasing the requirement to two feet of freeboard.

2.2 Infrastructure

Transportation

The primary transportation routes into and out of the City are Route 6 and Route 72 traveling east-west, and route 69 and 229 running north-south. The city has many municipal roads essential to travel between communities, including Hill Street, Jerome Avenue, Washington Street, Willis Street, and more.

Bristol is served by the CTtransit bus system.

Utilities

Public water in Bristol is provided by the Bristol Water Department, as well as a handful of small Community Water Systems and Non-Community Public Water Systems. Sewer is collected and treated by the Bristol Sewer Department and treated at the Bristol Wastewater Treatment Plant.

Eversource is the primary electricity provider in Bristol. Natural gas service is provided by Eversource.

According to geoISP (geoISP.com), there are 2 DSL Providers, 1 Cable Internet providers, 3 Fiber Internet (FTTH) providers, and 0 Fixed Wireless (WISP) providers in Bristol, CT. There are also 4 Mobile Broadband (cellular) providers with service available in Bristol.

2.3 Critical Facilities and Emergency Response

Bristol has identified several critical facilities throughout the City, as summarized on Table 2-1 below.

Table 2-1: Critical Facilities

Facility	Address or Location	Comment	Emergency Power	Shelter	SFHA
Bristol Hospital	41 Brewster Road	Care Facility	✓		
Bristol Hospital Em. Medical Services	371 Terryville Avenue	Care Facility			
Bristol-Burlington Health Dept.	240 Stafford Avenue	Municipal			
Bristol Communication Towers	Various	Communication	✓		
Bristol Ham Radio Repeaters	Various	Communication			
Bristol City Hall	111 North Main Street	Municipal	✓		
Bristol Fire Dept. – Eng. Co. 1 / Tower Co. 1	181 North Main Street	Fire	✓		
Bristol Fire Dept. – Eng. Co. 2	151 Hill Street	Fire	✓		
Bristol Fire Dept. – Eng. Co. 3	75 Church Avenue	Fire	✓		
Bristol Fire Dept. – Eng. Co. 4	18 Vincent P. Kelly Road	Fire	✓		
Bristol Fire Dept. – Eng. Co. 5	285 Mix Street	Fire	✓		
Bristol Leaf Compost Facility	685 Lake Avenue	Municipal			
Municipal Facility / Police Department	131 North Main Street	EOC	✓		
Bristol Senior Community Center	240 Stafford Avenue	Community	✓	✓	
Bristol Transfer Station	Mount Vernon Road	Municipal			
Bristol Water Pumping Stations	Various	Utility	✓		
Bristol Wastewater Pumping Stations	Various	Utility	✓		
Bristol Wastewater Treatment Plant	75 Battisto Road	Utility			
Covanta Power Plant / Resource Recovery	170 Enterprise Drive	Utility			
Bristol Central High School	480 Wolcott Street	School			
Bristol Early Childhood Center	240 Stafford Avenue	School			
Bristol Eastern High School	632 King Street	School			
Bristol Technical Education Center	431 Minor Road	School			
Chippens Hill Middle School	551 Peacedale Street	School	✓	✓	
Edgewood School	345 Mix Street	School			
Ellen P. Hubbell School	90 West Washington Street	School			
Greene-Hills School	718 Pine Street	School			
Ivy Drive School	160 Ivy Drive	School			
Mountain View School	71 Vera Road	School			
Northeast School	530 Stevens Street	School			
South Side School	21 Tuttle Road	School			
St. Joseph School	335 Center Street	School			
St. Matthew's School	33 Welch Drive	School			
St. Paul Catholic High School	1001 Stafford Avenue	School			
Stafford Elementary School	212 Louisiana Avenue	School			
Tunxis Community College – Bristol	430 North Main Street	School			
West Bristol School	500 Clark Avenue	School			
Hess Station	34 Farmington Avenue	Fuel	✓		
Mobil On the Run	330 Middle Street	Fuel	Yes		
Crown Oil Co. Inc.	347 Riverside Avenue	Fuel	Yes		

Emergency Response Capabilities

The City of Bristol has a variety of emergency operation procedures in place to respond to the effects of natural hazards. In addition to maintaining an Emergency Operations Plan (updated annually) and an Emergency Operations Center, the City maintains shelters, has identified warming/charging stations, and has identified a variety of resources to assist with response to natural hazard events. The City maintains a training program for its emergency personnel and maintains extensive information regarding preparedness on its website.

All of the local fire stations have generators, but the generators at two of the stations are greater than 10 years old and are believed to be appropriate for updating. In particular, the generator at Station 5 is only large enough to provide minimal power to the facility and an upgrade is desired. The City of Bristol installed a new generator at the Police Station in 2015 with funding provided by a FEMA grant. The generator at City Hall needs to be upgraded as it can only power the lowest floor of the building where Public Works and Engineering is located. All water and sewer pumping stations have been recently outfitted with backup power supplies. The City has relatively remote installations supplying the communications to municipal and emergency services. These installations have generators but several are greater than 10 years old. The City would like to acquire a portable generator to provide additional redundancy to the existing backup power supplies. Bristol Hospital also has generators for backup power supply.

School evacuation plans are maintained by the Board of Education. Each school has another school to which students can be relocated. However, the City does not have a formal evacuation plan for hazards such as flooding. Evacuations are planned for on a case-by-case basis.

Sheltering Capabilities

The Senior Center has been designated as the primary care shelter. The Senior Center's current generator can power approximately two-thirds to three-fourths of the building. This is sufficient to meet sheltering needs.

Chippens Hill Middle School is the backup shelter. In 2015, the Middle School's generator was not responding well. A second generator was purchased for the shelter as a backup.

Bristol acquires shelter supplies whenever possible, and all shelters have been recently restocked with cots and blankets. Bristol residents may also use the regional shelter in Plainville. The City recognizes that most residents choose to shelter in place if possible, and recommends that residents stock five days of supplies.

Communications

The City utilizes the statewide CT Alerts emergency notification system when residents need to be informed about a natural hazard event. Residents are encouraged to use CT Alerts for emergency notification. The City is considering performing a registration drive to encourage residents to sign up for the service. The City also has a signup page on its website for residents to be contacted by text or email regarding a variety of City programs including receiving emergency alerts.

The FEMA Student Tools for Emergency Planning (STEP) program began in May 2015 for local fifth graders. This program teaches students how to prepare for emergencies.

3.0 FLOODING

3.1 Existing Capabilities

The City of Bristol has in place codes and ordinances to reduce the risks to public health and property posed by flooding. These regulations primarily limit any activities on floodplains that would increase flood heights and velocities, or reduce or alter naturally occurring floodplains and water catchment areas, but also stipulate the use of flood-resistant materials, floodproofing, and requirements for the elevation of the lowest floor and on-site water storage. All new buildings constructed since the city joined the NFIP have not been allowed to have their first floor below the base flood elevation, and the City adopted a one-foot freeboard requirement as part of its 2008 floodplain management ordinance update. The City Engineer is the NFIP Coordinator with assistance from the Environmental Engineer.

The City defines floodplains, hereafter special flood hazard areas, off of the Federal Flood Insurance Rate Maps identified in FEMA's Flood Insurance Study. Table 3-1 includes a brief description of how the City of Bristol is addressing flood risk in its most important planning documents. Approximately 2,700 housing units and buildings in the city are located within the 1% annual chance floodplain based on a 2014 risk assessment prepared for the Bristol Fire Department.

Table 3-1: City of Bristol Planning Documents

Document	Year	Lead	Recommendation for Natural Hazard Mitigation
Plan of Conservation & Development (POCD)	2015	Planning and Zoning Commission	In the 2015 Plan of Conservation and Development, the City of Bristol emphasizes new strategies to mark a change in thinking about how to prevent flooding and address storm water runoff. Bristol has identified policies that promote sustainability and resiliency to preserve and enhance the preparedness of the community to meet future emergencies and challenges. The new approach is to institute policies that favor low-impact development (LID), where properties and public land have the capacity to absorb the rainwater and vegetation removes pollutants from runoff. The POCD stresses a need to discourage development that negatively affects wetlands and watercourses, particularly along the Pequabuck River.
Flood Damage Prevention Ordinance	2008	Flood and Erosion Commission	These regulations fulfill the requirement for participation in the National Flood Insurance Program (NFIP). The regulations apply to all special flood hazard areas identified by the Federal Emergency Management Agency (FEMA) in its Flood Insurance Study (FIS). The municipal Ordinance acknowledges that special flood hazard areas are afflicted by repetitive periodic inundation, "which may result in loss of life and property, health and safety hazards, disruption of commerce and governmental services, extraordinary public expenditures for flood protection and relief, and impairment of the tax base, all of which adversely affect the public health, safety and general welfare." The ordinance requires one foot of freeboard for all new construction or substantial improvement.

Document	Year	Lead	Recommendation for Natural Hazard Mitigation
Zoning Regulations	2013	Planning and Zoning Commission	The Zoning Regulations include securing safety from flood and other dangers in their statement of intent. They also include an open space development zone. This zone accommodates alternative forms of residential development that cluster development on smaller lots in order to preserve larger tracts of open land. Among the expressed purposes of the open space development zone is the protection of "natural drainage ways and flood water detention and retention areas."
Subdivision Regulations	2013	Planning and Zoning Commission	Subdivisions shall be reviewed to ensure proposals will be reasonably safe from flooding. This ordinance stipulates that subdivisions address the need to avoid damage related to flooding by ensuring that all utilities and facilities are located to minimize impact, that adequate drainage is provided, and that all subdivisions greater than 50 lots or 5 acres include elevations in their proposals. The Flood and Erosion Commission, as established by the City Council, shall hear and decide appeals and requests for variances from the requirements of the Flood Damage Prevention Ordinance.
Inland Wetlands and Watercourses Regulations	2009	Conservation Commission	Adopted Inland Wetlands and Watercourses Regulations of the City of Bristol 1973, amended 2009. Under Connecticut General Statutes all municipalities shall regulate activities on those wetlands and watercourses that lie within municipal borders. While these regulations are primarily for the protection of environmental and ecological assets, they do address impacts to safety and public health. The City of Bristol also publishes a Designated Inland Wetlands and Watercourses Map identifying all ponds, rivers, streams brooks and wetlands within the boundaries of the City.
Capital Improvement Plan (CIP)	2015	All Departments	Identifies the long-term municipal plans associated with funding equipment and infrastructure improvement. Specifically, Bristol will seek funding to Replace Obsolete Bridges, Storm Drainage Systems, and Culverts. The City widens spans and removes central piers whenever possible during bridge reconstruction projects.
Bristol-Plainville-Plymouth Pequabuck River Flooding Study	2015	Conservation Commission	The Bristol-Plainville-Plymouth Pequabuck River Flooding Study was made possible by a $200,000 grant from the Economic Development Administration. The study addresses flooding and the accompanying economic risks that have restrained development and recovery for the communities along the river following extensive flooding caused by rainfall during Hurricane Irene in 2011.

Document	Year	Lead	Recommendation for Natural Hazard Mitigation
Community Emergency Response Team (CERT)	2015	Emergency Management	Bristol has a Community Emergency Response Team (CERT). CERT is composed of volunteers who received training in disaster preparedness and response. Using the training, CERT members are able to assist City personnel and support emergency response functions. For example, in Bristol CERT members are responsible for staffing the emergency shelter when it is activated. CERT members engage with the community to educate fellow residents about disaster preparedness. They also have a library of resources online that provides information about emergency situations. CERT has been an important resource to residents in the preparedness stage.
Local Emergency Operations Plan	2015	Emergency Management	These plans are meant to be applied during an emergency to maximize survival, give direction, integrate departments and expertise, define roles to departments and community leaders, and provide a basis for continued preparation. Specifically the plans identify City personnel and assign responsibilities to each department and its personnel during disasters and emergencies. As part of the plan, instructions are also outlined for activation of the emergency operations center.

Bristol has participated in the NFIP since 11/18/1981. The Flood Insurance Rate Map (FIRM) for the community was most recently updated in 05/16/2017. Bristol does not participate in the FEMA Community Rating System (CRS) program.

According to FEMA, there are 194 flood insurance policies in force in Bristol as of 6/30/2019 with an insurance value of $41,452,200.

The City works to improve culvert capacity wherever necessary, although information is not available regarding the condition of culverts on private property. The City has an annual inspection and maintenance (if needed) schedule for its bridges and culverts. The City is in the process of issuing a contract for sediment and obstruction removal of the Pequabuck River culvert in the downtown area. This will help increase capacity in the culvert.

All new construction is designed using the most recent NRCC rainfall return periods in accordance with December 2014 CT DOT guidance. The City has not evaluated all culverts in the community based on the new rainfall return periods. Drainage and flooding complaints are typically sent to the Mayor's office and routed to either the Fire Department or Public Works, depending on if it is an emergency. Usually Public Works will be involved in resolving any complaint.

The $13.5 million sanitary sewer overflow project identified in the initial Plan is essentially completed. The phased inflow and infiltration reduction project, a separate project, has also made progress.

The City has extensive experience applying for the FEMA grant programs related to the HMP but has not been successful at obtaining grants. Many potential projects in the City simply do not generate the benefit-cost ratio above 1.0 that is required to receive grant funding. City staff believe that a detailed discussion of how to meet this requirement is necessary to inform the regional part of the plan.

Flood Studies

The City of Bristol recently completed two major flood studies: the Copper Mine Brook Study and the Pequabuck River Study.

The Copper Mine Brook Study included the evaluation of many flood mitigation alternatives to reduce local and downstream flooding. Four projects were selected to be brought to permitting-level design. The Staples project and the Richards Court project have both been completed. The water company land floodplain storage area project has been abandoned due to cost-benefit issues. Recent projects to replace the Frederick Street Bridge and to make improvements along Stevens Street and Candy Lane, also came out of that study.

The Pequabuck River Study began in 2013 and has since been completed. This study (prepared by the engineering firm AECOM and paid for with the assistance of a grant from the State of Connecticut) examined the impact of the Pequabuck River on the communities of Plymouth, Bristol, and Plainville and identified measures to reduce the impact of flooding. The study includes major revisions to the hydrology and hydraulics originally used to generate the special flood hazard area for the Pequabuck River, and it is expected that the effective FIS and FIRMs for the three communities will be updated with the new information.

The Pequabuck River Study evaluated numerous alternatives for mitigating flooding, including the installation of flood control structures to detain flows, channelization of the river, construction of levees and floodwalls, sediment removal to enlarge the channel, removal of vegetation, enlargement of bridge crossings, removal of instream obstructions, individual floodproofing, acquisitions, and modifications of local ordinances. The following potential structural strategies and actions have been identified for Bristol:

- Joining the FEMA Community Rating System (CRS) program. The initial goal for Bristol would be to become rated Class 8 which would provide a 10% cost savings to residents with flood insurance.

- Implementing a floodproofing technical assistance program. AECOM estimates that there are 311 buildings within the 1% annual chance floodplain, and floodproofing could reduce the risk of regular flooding damage. City activities would include coordinating a citywide educational program on floodproofing, providing individual assistance to property owners to determine if they are eligible for Letters of Map Amendment (LOMAs) to reduce insurance rates, researching and maintaining a list of qualified vendors, and coordinating grant funding with FEMA and the State of Connecticut.

- Constructing an elevated floodwall at the Pequabuck River Culvert inlet headwall and wing walls. This downtown culvert has the capacity to convey the 1% annual chance flood, but no freeboard is available to mitigate the effect of debris blockages. This project would reduce the flooding potential of approximately 11 buildings.

- Implementing a predictive flood warning program specific to Bristol. This project involves re-activation of the USGS gaging station in Forestville, and coordination with the National Weather Service to incorporate the Forestville gage into the Advanced Hydrologic Prediction System to estimate flood elevations and potential flood inundation zones based on forecast precipitation.

Other non-structural mitigation measures are also identified, including updating this Plan, developing low-impact development guidance and adopting standards in conjunction with other watershed communities, updating the local floodplain management ordinance to meet current model ordinance requirements, and developing a Pequabuck River flood response plan to allow dam operators with gated spillways a chance to close or open spillways to mitigate the effect of flooding. These include adding a freeboard requirement of two feet for all new development and substantial improvement, and selective acquisitions of properties.

Other strategies and actions identified in the Pequabuck River Study will not be pursued. These include large-scale sediment removal from the river and excavating banks to increase conveyance. Both options are considered to be too costly, may have only a temporary benefit (for dredging), and are unlikely to be permitted by regulatory authorities.

Neither the Pequabuck River Study nor the Copper Mine Study identified any one project that would provide significant mitigation due to many topographical challenges. For example, modeled flood retention dams along Copper Mine Brook do not significantly reduce peak flows. These dams also carry high capital costs and a high permitting burden. Furthermore, some of the larger projects the City has conceptualized or designed have encountered resistance from property owners or from regulatory agencies. The City's focus is now primarily on mitigating individual properties.

New Capabilities and Completed Actions

Bristol continues to maintain its strong flood mitigation capabilities.

A number of Repetitive Loss Properties (RLPs) have been removed from the City's list.

The City of Bristol is applying to DEMHS/FEMA to obtain Flood Mitigation Assistance for the acquisition and demolition of flood prone properties at 164 Central St. and 65 Memorial Boulevard, in an effort to eliminate the community's most flood prone structures, to help ease localized flooding, and to create open space in these locations. At least one of these buildings is an RLP at risk from the Pequabuck River.

FEMA is remapping the Pequabuck River to generate updated FIRMs. City staff do not believe that there will be significant changes to the AE zones. However, there will reportedly be many additional A zones added to previously unmapped streams. The City has been conducting outreach regarding these changes and the potential need to purchase flood insurance.

Bristol has a robust bridge and culvert upgrade program. New bridges were recently installed on Louisiana Avenue, Memorial Boulevard, Downs Street, Jerome Avenue (over Freeman Brook), Mellen Street, and East Street. The bridge at Frederick Street was replaced with an increased opening size for the purposes of flood mitigation. Other bridges have also been upsized to help address nuisance flooding issues. Recent culvert upgrades have included the Wolcott Culvert (south of Witches Rock and Fall Mountain), the Divinity Street Culvert east of Peck Lane, the Lake Ave Culvert just north of the Town line, and the Field Street Culvert.

The City has updated regulations to encourage low-impact development to mitigate the effect of stormwater runoff as identified in the POCD. The City hopes to continue this progress in the coming years.

Summary

Bristol mitigates flood damages primarily through regulating development in floodprone areas, performing maintenance and upgrades of drainage infrastructure, and performing structural projects when appropriate.

City staff believe that existing ordinances do a good job of discouraging development in and near wetlands and in floodplains. Enforcement and outreach regarding floodplain activities is performed by Public Works and Engineering, with outreach typically occurring on a case-by-case basis.

The City's capability to mitigate flooding damage is considered to be effective at preventing damage to new development and substantial improvements. In general, the level of capability of the City of Bristol relative to all facets of flood mitigation has increased since the initial Plan. The recent studies have enabled the City to move towards mitigation projects that will reduce the impacts of flooding over the long-term. The City's participation in the MapMod program several years ago resulted in digital FIRMs for the community which make it easier to demonstrate floodplain boundaries to property owners.

3.2 Vulnerabilities and Risk Assessment

Flooding is a primary concern in the city with recurrent flooding occurring throughout the city and regular localized flooding occurring at known locations several times per year. The Pequabuck River snakes directly through the downtown, with a number of old buildings built straddling the watercourse. Copper Mine Brook, on the east side of Bristol, floods frequently as well.

A number of critical facilities in the City are inside the flood zone, such as two fire houses, and three schools. The areas of the city that are in or adjacent to flood zones tend to be heavily populated. For example, Bristol's downtown is adjacent to the Pequabuck River, which frequently floods.

Areas at risk of flooding are generally unchanged since the initial Plan. These include Coppermine Brook in the vicinity of Farmington Avenue and Stevens Street, the Pequabuck River in Forestville and downtown, and Broad Street (which continues to be a recurring flooding area).

The area of Frederick Street, at the confluence of Coppermine Brook and the Pequabuck River, has previously been prone to flooding from both Copper Mine Brook and the Pequabuck River, and City assistance was often needed to pump water back to the brook. Local residents on Frederick Street claimed that the cost of flood insurance has essentially doubled in the last 10 years as a result of the MapMod program and recent changes to flood insurance. At the location where Copper Mine Brook empties into the Pequabuck, an existing railroad bridge has long been believed to exacerbate flooding problems. The 3' high girders of the bridge act as a restricting dam, impounding water until the flow is sufficient to overtop the girders. This is a known problem, but high replacement costs and railroad ownership of the bridge have prevented the City from taking action and replacing it. This issue was evaluated during the Pequabuck River Study, with the preliminary findings suggesting that only a nearby pump station would benefit from replacement of the bridge. Therefore, mitigation activities specific to this railroad bridge are not anticipated to be pursued further. Nevertheless, completion of the Frederick Street bridge replacement is expected to reduce flooding in this area.

Members of the public have also claimed that there are several areas where private retention ponds are not properly designed or maintained. These overtop during large storms and overflow into streets, causing localized flooding and exacerbating storm drainage system overflows.

City staff report that there are 32 repetitive loss properties (RLP) in Bristol, down from 34 in 2015. According to FEMA, Bristol has twenty-six RLP. Of those, one is classified as Severe RLP. FEMA does not have a record of any of the RLPs in Bristol having been mitigated in the past.

Table 3-2: Repetitive Loss Properties in Bristol

Total	Residential	Non-Residential	Mitigated	SRL
26	19	7	0	1 Residential

City staff note that a number of RLPs have been removed from the list, though municipal officials were not immediately aware of which properties may have been removed. The City will work with CT DEEP and FEMA to update and validate the official RLP list.

Flood prone areas in the community today, as mapped by FEMA, are presented in Figure 3-1.

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SLR

99 REALTY DRIVE
CHESHIRE, CT 06410
203.271.1773

Flood Hazards in Bristol

NVCOG Hazard Mitigation Plan Update
Naugatuck Valley Council of Governments
47 Leavenworth Street, 3rd Floor
Waterbury, CT 06702

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Feet

DATE 6/15/2021

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FIG. 3-1

4.0 HURRICANES AND TROPICAL STORMS

4.1 Existing Capabilities

Flooding

Existing capabilities appropriate for flooding were discussed in Section 3.0. These include the ordinances, codes, and regulations that have been enacted to minimize flood damage. In addition, various structures exist to protect certain areas, including dam and local flood protection projects.

Wind

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 design wind speed for Bristol is 110 mph for a Category 1 event, 120 mph for a Category 2, and 130 mph for a Category 3, 4 or 5 hurricane event.

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. The American Society of Civil Engineers recommends that new buildings be designed to withstand this peak three-second gust.

The City of Bristol uses a variety of preparedness and response procedures to deal with the impacts of tropical storms and hurricanes. City departments have purchased sufficient supplies over the past few years to be prepared for the next major storm event. The City believes it has an adequate budget dedicated to tree maintenance. The City has a full tree crew and hires contractors for larger jobs. Much of the tree trimming in Bristol near power lines is conducted by Eversource Energy. A significant amount of trimming occurred in Bristol following the 2011 storms.

New Capabilities and Completed Actions

Bristol continues to maintain its strong tropical cyclone mitigation capabilities.

Summary

Bristol mitigates hurricane and tropical storm damages through tree and limb maintenance, public alert and communications procedures, and enforcement of building code requirements related to high winds.

4.2 Vulnerabilities and Risk Assessment

Bristol faces a number of challenges due to tropical storms and hurricanes. The primary problem is dealing with the impact of downed trees which can interrupt power supply for many days and hinder egress through

neighborhoods. The potential for tree damage from high wind events is widespread throughout Bristol. This problem is made worse by Ash trees damaged by the Emerald Ash Borer. City staff believe that Bristol was less affected by the borer infestation than other communities. Secondary impacts are generally caused by heavy rainfall accompanying the storm.

All areas of Bristol are susceptible to tropical storms and hurricanes. Higher elevations may be at a greater risk because the speed of the wind may be greater. Areas in floodplains are at increased risk of tropical storm and hurricane damage due to any flooding that may accompany such an event. Bristol has two mobile home parks; one is Creekside Estates on Broad Street and the other is Riverside Park on Andrews Street. These mobile home parks contain structures that may be more susceptible to strong winds and are located adjacent to the Pequabuck River. As a result, both mobile home parks are prone to flood and wind damage.

Following Tropical Storm Irene in 2011, power was lost for approximately five days in Bristol, and with power restored to most areas within two days. A maximum of 7,479 customers were without power.

Tropical Storm Isaias

Tropical Storm Isaias in August 2020 brought widespread damage throughout Bristol, although some areas were hit harder than others. The City prepared an After Action Report describing the City's response to the event, which can be referenced to improve response to future events.

The City's key post-event concern was the breakdown in Eversource's Make Safe program. Although City staff were trained on the importance of this program, the Eversource community liaisons reportedly were unaware of the program or its necessity for responding to downed power lines. Due to the delay caused by Make Safe responders, the City lost 24-36 hours of cleanup time during which they could only barricade roads and dangerous downed powerlines. Once Eversource crews arrived in the City, the cleanup and response efforts were reportedly excellent. The cleanup crews went above and beyond to make restoration efforts. Ultimately, most power outages in Bristol only lasted three to four days.

The City's key follow-up concern is how to track their response efforts. When an event occurs, City staff generally do not consider potential regional implications that could lead to a federal disaster or emergency declaration. Instead, they are focused on the response measures necessary to restore the city. While this is to the benefit of residents and businesses, it is difficult for City staff to compile documentation regarding specific cleanup actions a week after an event when an emergency declaration is realized. For instance, Bristol used GPS tags on photos and general recollections of work performed to demonstrate the Isaias response. However, the City believes that some efforts were never formally tracked for federal reimbursement. Over the next five years, City staff want to improve their documentation process to seamlessly provide the required documentation for federal reimbursement programs. Although capital improvements such as GPS trackers for City vehicles could help with documentation, City staff do not believe that this would be a feasible expenditure solely to help with major events every few years.

City staff also identified a need for more mobile emergency light towers. For example, Public Works needed to borrow several of such towers from the Water Department to perform nighttime cleanup work following Tropical Strom Isaias.

5.0 SUMMER STORMS AND TORNADOES

5.1 Existing Capabilities

Warning is the primary method of existing mitigation for tornadoes and thunderstorm-related hazards. The NOAA National Weather Service issues watches and warnings when severe weather is likely to develop or has developed, respectively.

Aside from warnings, several other methods of mitigation for wind damage are employed in Bristol as explained in Section 4. In addition, the Connecticut State Building Code includes guidelines for the proper grounding of buildings and electrical boxes.

The strategies used to mitigate tornado and thunderstorm damage are similar to those used to mitigate damage from tropical storms and hurricanes. The City budget for tree maintenance is considered sufficient at this time. This is only for City properties and right-of-ways.

New Capabilities and Completed Actions

Bristol continues to maintain its summer storm mitigation capabilities. Its tree and limb removal procedures continue to be adequate, and it coordinates closely with Eversource on protecting power lines.

Summary

Bristol mitigates summer storm risks primarily through tree, limb, and debris management, emergency communications, and coordination with Eversource.

5.2 Vulnerabilities and Risk Assessment

Bristol faces regular challenges due to tornadoes and thunderstorms, although these events are typically less damaging than tropical storms or hurricanes. The primary problem is dealing with the impact of downed trees which can interrupt power supply and hinder egress through neighborhoods. Secondary impacts are generally caused by heavy rainfall accompanying the storm, and direct wind damage or lightning and hail damage to structures and vehicles.

All areas of Bristol are susceptible to tornadoes and thunderstorms. Higher elevations may be at a greater risk because the speed of the wind may be greater. Areas in floodplains are at increased risk of thunderstorm damage due to any flooding that may accompany such an event.

Severe storms, including tornadoes and straight-line winds, struck the region in May 2018, but did not directly impact Bristol. The tornado that touched down in Bristol in 2010 had a path approximately 1.73 miles long and caused an estimated $550,000 in damage. Most of the damage was to trees and power lines.

6.0 WINTER STORMS

6.1 Existing Capabilities

The City has a Winter Operations Plan that governs municipal response to winter storm events. The effect of recent winter storms has led the City to modify the plan, including adjustments to snow plowing priorities. Public Works maintains set plowing routes but they are not made public.

The City has 234 miles of local roads and several tens of miles of state roads. Removal of the ice and snow (and debris removal) for Bristol's city-owned roads is handled by a combination of staff and contractors. Most of the work is given to contractors, with several contractors having large equipment on standby for specialized needs. When the police requests assistance, the City will plow Route 6 if the Connecticut DOT is not able to clear the state road in a reasonable amount of time. In general, major thoroughfares and routes to the hospital are cleared first, followed by higher elevation areas. Minor roads have the lowest priority unless they are part of a route to a critical facility. There are some areas in the City where icing is of minor concern. These are mitigated through municipal treatment efforts.

Drifting snow is of concern in the higher elevations of the City. The Chippens Hill area, such as Perkins Street and Hill Street have occasional problems with drifting snow because they are open farmland. These are mitigated through additional municipal plowing efforts. When icing occurs, Public Works investigates and eventually installs a drainage system if necessary. City staff believe that there are very few areas where icing is a recurring issue.

The majority of roofs on City-owned buildings are flat, including the schools. The City has an informal program to review snow accumulation on City-owned roofs each winter, with clearing occurring when depths are sufficiently deep or wet. The City does not believe that it needs a formal snow load evaluation and removal program at this time.

The City has the usual trouble with tree limbs downed by snow and ice; these take out power lines, block roads, and can leave people without electricity, heat, or communication lines when they are already isolated. Following a microburst in the summer of 2011, the City was already working to build a better relationship with Eversource when the severe storms hit. Burying power lines would alleviate these problems, but is prohibitively expensive on a citywide basis. The city's subdivision regulations state that utility lines will be buried wherever feasible, but there are no current plans to bury older infrastructure. One member of the public suggested that the City should require the use of hardened poles (steel or concrete) moving forward similar to what is now required in Florida. This strategy allows wires to be restrung without having to replace a snapped pole.

New Capabilities and Completed Actions

Bristol continues to maintain its strong winter storm mitigation capabilities. In general, the level of capability of the City of Bristol relative to all facets of winter storm mitigation has slightly increased since the initial Plan with the introduction of the informal snow load evaluation procedures, the improved coordination between the City and Eversource, and the recent adjustments to Bristol's Winter Operations Plan.

Summary

Bristol mitigates snow damages through implementation of road and building clearing protocols, enforcement of the State Building Code, and through the mitigation measures previously discussed for high wind events. The City's capabilities are considered to be effective in regards to response to winter storms, although the City's capability to mitigate severe winter storm damage is limited to City facilities.

6.2 Vulnerabilities and Risk Assessment

Winter storms are among the greatest natural hazard concerns for the City of Bristol. Snow and ice removal can become quite expensive, exceeding municipal budgets. Ice and snow can make roads impassable and knock down tree limbs which in turn disrupts utility service. The combined effect can leave people stranded in their homes, potentially without heat or power.

All areas of Bristol are susceptible to winter storms. Higher elevations may be at a greater risk because the frequency of winter storm events is typically greater in such areas. Areas in floodplains are at increased risk of winter storm damage due to any flooding that may accompany a winter storm.

In the past, ice jams have not affected the City.

The January 2015 winter storm produced significant snowfall amounts in Bristol that required additional plowing effort. City staff did not report any specific damage caused by the storm.

Two relatively recent storms had a significant impact on the city. The first was Winter Storm Alfred in late October 2011, and the second was the blizzard of January 2013.

Debris removal was the largest impact from Winter Storm Alfred, although residents were left without heat for up to nine days. The Emergency Operations Center was open full time for three days while power was being restored. Businesses with refrigerated goods had substantial losses.

The January 2013 blizzard produced a significant amount of snow in Bristol. Snow removal was the primary financial impact, and the City needed two large loaders to remove it. The City expended its entire snow removal budget along with the contingency fund on that one event.

7.0 GEOLOGICAL HAZARDS

7.1 Existing Capabilities

Due to the very infrequent nature of damaging earthquakes, and the fact that earthquakes generally cannot be predicted, local land use policies in Bristol do not directly address earthquake damage. In the event that significant earthquake damage occurred, the City of Bristol would activate its Emergency Operations Plan and respond as appropriate.

New Capabilities and Completed Actions

Bristol continues to maintain its earthquake and landslide mitigation capabilities.

Summary

Bristol mitigates geological hazards through enforcement of zoning and subdivision regulations preventing development in higher risk areas. Other mitigation measures consist of general emergency response capabilities.

7.2 Vulnerabilities and Risk Assessment

Earthquake Vulnerabilities

Although low intensity earthquakes regularly occur in Connecticut, these earthquakes are not damaging and are generally imperceptible to residents. Stronger earthquakes have historically occurred in Connecticut which have the potential to cause critical levels of damage.

All areas of Bristol are susceptible to damages due to earthquakes. Property owners with structures that pre-date current building codes (particularly pre-1990 structures) are considered to be at increased risk of suffering earthquake damages, as well as structures built on sandy soils that could be prone to liquefaction.

8.0 DAM FAILURE

8.1 Existing Capabilities

The Dam Safety Section of the Connecticut DEEP Inland Water Resources Division is responsible for administration and enforcement of Connecticut's dam safety laws. Dam safety laws are codified in Sections 22a-401 through 22a-411 of the Connecticut General Statutes. The 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.

> 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.

Effective October 1, 2013, the owner of any high or significant hazard dam (Class B and C) must develop and implement an Emergency Action Plan (EAP). 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. The EAP must include inundation zone mapping, procedures for monitoring the structure during periods of heavy rainfall and runoff, and a system to alert local officials in the event of an emergency.

The CT DEEP also administers the Flood and Erosion Control Board (FECB) program, which can provide noncompetitive state funding for repair of municipality-owned dams. State statute Section 25-84 allows a municipality to form an FECB.

The Bristol Water Department owns several Class C (high hazard) and Class B (significant hazard) dams. All of the Class C dams reportedly have EAPs. The Water Department hired a consultant to perform dam inspections on a two-year / 5-year basis for its dams based on the inspection requirements of Connecticut DEEP. These dams are reportedly well-maintained and in fair or good condition.

The City has copies of EAPs prepared for other dams whose failure could affect Bristol; this information is maintained by the Emergency Management Director. The City has recently received copies of several EAPs for privately owned dams in the city. These EAPs have helped the City update its understanding of its potential vulnerabilities to dam failure.

The Bristol Storm Water Control Trust functions similar to a land trust but oversees 22 storm water control areas, holding ponds, detention ponds, dams, and other structures related to storm water in the city. Maintenance is performed by Public Works as authorized by the Trust and these areas are generally in good condition.

Actions Completed and New Capabilities

Bristol continues to maintain its capabilities for mitigating and responding to dam failure risks. The City still plans to remove the dam along the Pequabuck River near Middle Street / Route 72. However, removal of this dam will not provide a significant benefit for flood mitigation.

Summary

Bristol mitigates dam failure hazards primarily by supporting State Dam Safety Program efforts locally. The City's ability to mitigate dam failure is considered to be good for City-owned dams but limited for privately owned dams and dams owned by other municipalities (in these cases, preparation for emergency response is the primary goal).

8.2 Vulnerabilities and Risk Assessment

While flooding from a dam failure generally has a moderate geographic extent, the effects are potentially catastrophic. 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

As of 2020, there were 31 DEEP-inventoried dams within the City of Bristol. Three of these dams had a Significant or High Hazard Potential rating. These dams are listed in Table 8-1 and shown in Figure 8-1.

Table 8-1: DEEP-Inventoried Dams in Bristol

Number	Name	Class	Owner
1701	JACKLIN LAKE DAM	B	Private Club
1702	PAGE PARK POND DAM	B	Municipal
1703	CLAYTON MANUFACTURING DAM		
1704	BIRGE POND DAM	BB	Municipal
1705	BRISTOL BRASS aka MIDDLE STREET DAM	A	State Owned
1706	BRISTOL RESERVOIR #1 DAM	C	Municipal
1708	LOWER MALONE PONDPINE STREET	BB	State Owned
1709	INDIAN ROCK POND DAM	BB	Institution
1710	POLKVILLE BROOK DAM: MAPLE AVE	A	State Owned
1711	FIJOL POND DAM	A	Private
1712	GUZAUSKAS POND		Private
1713	VEEDER ROOT DAM		Private Corporation
1715	MEMORIAL PARK POND #1	A	Municipal
1716	MEMORIAL PARK POND #2	A	Municipal
1717	MALONES POND DAM	AA	Municipal
1718	POLKVILLE POND DAM		Private
1719	DUQUETTE'S DAM SCHRUB RD LOT #4		Private
1720	BRISTOL NURSERIES POND DAM	A	Private
1721	ROCKWELL PARK POND	A	Municipal
1722	HERSHMAN POND DAM		Municipal
1723	KENNETHS POND:LOT # 253A	A	Private
1724	SONSTROM POND		Private
1725	NOVA LAKE:TERRYVILLE AVE. LOT #28	BB	Municipal

Number	Name	Class	Owner
1726	P&B BUILDERS DAM		Municipal
1727	HILLTOP BASIN C DAM		Municipal
1728	WHITE'S BRIDGE DAM		Municipal
1729	WHITE'S BRIDGE		Municipal
1730	P&G BUILDERS INC DAM	A	Private
1731	SUNNYDALE ACRES DETENTION DAM		
1732	NORTH PARK ROAD DAM	AA	Municipal
1733	JACKLIN LAKE WILLIS STREET DIKE	BB	Private Club

The following table summarizes the status of EAPs for the higher-hazard potential dams in Bristol:

Table 8-2: EAP Status of Higher-Hazard Dams

Number	Name	Class	EAP Status	EAP Status Date
1701	JACKLIN LAKE DAM	B	Acceptance Letter Sent	9/7/2017
1702	PAGE PARK POND DAM	B	Updated EAP Not Received	1/22/2018
1706	BRISTOL RESERVOIR #1 DAM	C	Acceptance Letter Sent	8/23/2018

Bristol should work to ensure EAPs are up-to-date.

Only areas of Bristol that lie immediately downstream of dams, or near watercourses that are downstream of dams, are susceptible to dam failure. In many cases a breach could flood a similar area to the 1% annual chance or 0.2% annual chance flood; in some cases (particularly for high hazard dams) the impacted area could be much wider.

City staff were not aware of any concerns with privately-owned dams in Bristol. An earthen dam overtopped during Irene and washed-out Farrell Avenue, but this was an isolated incident that occurred during construction.

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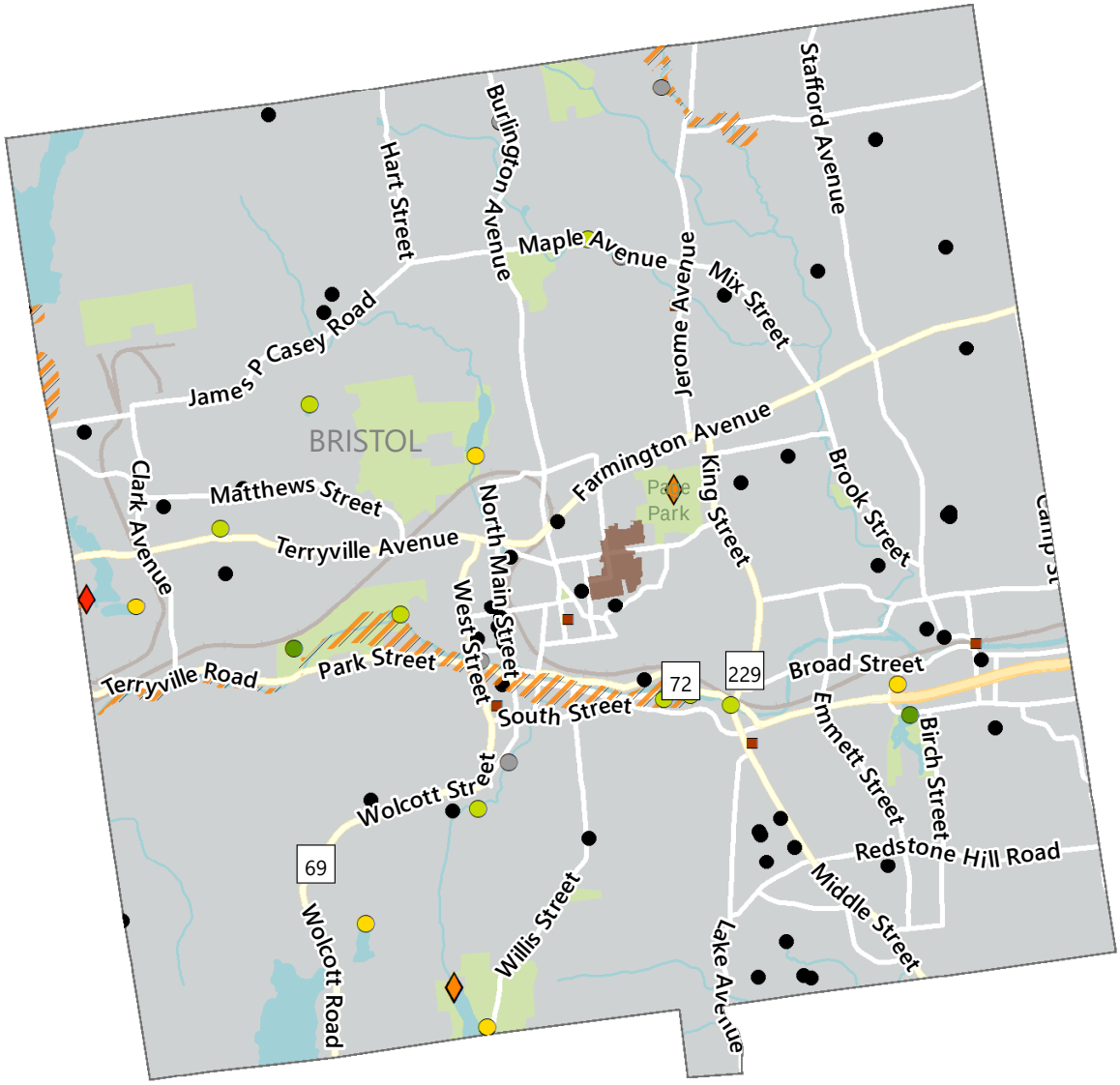

Dam Hazard Class

- Unclassified
- AA - Negligible Hazard
- A - Low Hazard
- BB - Moderate Hazard
- B - Significant Hazard
- C - High Hazard

Critical Facilities

- Critical Facilities

Historic Sites

- Historic Sites
- NR Historic Districts

SLR
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CHESHIRE, CT 06410
203.271.1773

Dam Failure Hazards in Bristol

NVCOG Hazard Mitigation Plan Update
Naugatuck Valley Council of Governments
47 Leavenworth Street, 3rd Floor
Waterbury, CT 06702

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FIG. 8-1

9.0 WILDFIRES

9.1 Existing Capabilities

The City maintains mutual aid agreements with all surrounding communities for fire protection. The City does not maintain any dry hydrants or cisterns. The public water system is generally relied upon to provide fire protection water. Some areas have been identified that have an insufficient number of hydrants. Tanker trucks are typically used when water is not immediately available. If necessary, the City would draft water from surface water sources. Section 7-17 of the municipal code presents the City's open burning requirements which were adopted as of December 14, 2010 and requires permits issued by the Fire Marshal or Fire Chief to conduct open burning for the control or destruction of pests, diseases, floodplain brush and debris, vegetation management, for the control of frost and the warming of livestock, or to abate an immediate fire hazard or abate a health hazard as determined by the local director of health. The burning of brush and leaves at residences is not allowed.

The Bristol Fire Department completed a "Community Risk Assessment for Bristol Fire Operations" in August 2014. The plan indicates that less than two wildfires or brush fires occur in Bristol each year, and the severity of these fires is low. No recommendations were provided for improving the City's ability to fight wildfires.

Ultimately, the City has experienced very few brush fires and when such fires occur, they can be accessed via pumper trucks. The City's capabilities are considered to be effective in regards to wildfire response, and the City does not believe it needs to participate in the Connecticut DEEP's Open Burning Program at this time.

The City primarily relies on regional and statewide measures for mitigating the impacts of drought such as the Connecticut Drought Management Plan. The municipal water department maintains an Emergency Contingency Plan that outlines the necessary response procedures when drought is impacting their sources of supply, including issuing voluntary and mandatory water conservation measures for customers when reservoir levels are sufficiently low. The City Water Department is a member of the Water Utility Coordinating Committee that reconvened in 2016 and discussed regional water supply issues and needs including ensuring that supply is available during periods of drought. The City Water Department has asked customers to undertake voluntary conservation measures due to drought in recent years

Actions Completed and New Capabilities

Bristol continues to maintain its capabilities for mitigating and responding to wildfire risks.

Summary

The City mitigates wildfire hazards by implementing the state's Open Burning Program locally, installing dry hydrants and firefighting-water sources in remote areas, and training its fire department to fight wildfires. The City relies on regional and statewide measures for mitigating drought impacts.

9.2 Vulnerabilities and Risk Assessment

Bristol does not typically experience wildfires; they are very rare in the city. When wildfires do occur, most are accidentally set, although some have been ignited by lightning or undetermined sources.

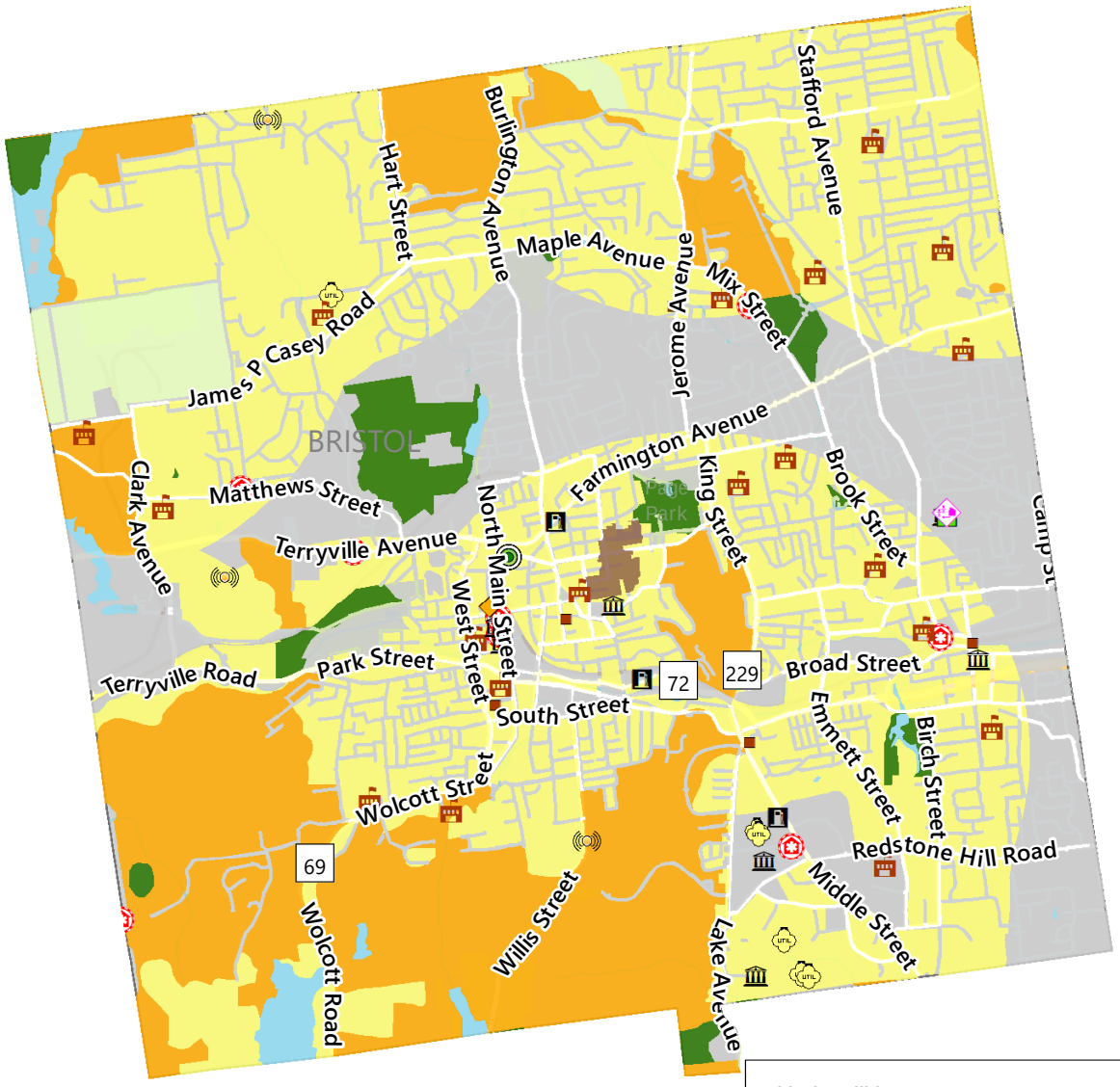
Less developed areas in Bristol are at the highest risk for a wildfire, particularly on the large contiguous forested areas adjacent to Willis Street. In addition, the area around Cedar Lake has water service but more hydrants are recommended for this area. The greatest areas of concern are the areas of city that do not have public water service. These areas are primarily in the southwestern corner of the city.

The approximately 8,042 acres of forests and undeveloped land in Bristol may be susceptible to drought conditions that make them more vulnerable to wildfires. The approximately 902 acres of agricultural fields and maintained grasses may be vulnerable to direct damage from drought conditions.

Only severe droughts would have the potential to cause damages in Bristol. The short-duration and moderate droughts that generally occur every few years are not a concern to City staff. All areas of Bristol are susceptible to drought. Property owners with private wells may have an increased risk of damage due to drought as lower groundwater levels could impact water supply wells.

Date Saved: 6/15/2021

Document Path: C:\Users\noahs\Documents\MMIArcGIS\Maps\NVCOG.mxd



SLR
99 REALTY DRIVE
CHESHIRE, CT 06410
203.271.1773

Wildfire Hazard in Bristol

NVCOG Hazard Mitigation Plan Update
Naugatuck Valley Council of Governments
47 Leavenworth Street, 3rd Floor
Waterbury, CT 06702

N

0 2,500 5,000
Feet

DATE 6/15/2021

141.3211.00029
PROJ. NO.

FIG. 9-1

10.0 MITIGATION STRATEGIES AND ACTIONS

10.1 Goals and Objectives

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

10.2 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.

Strategy	Description	Responsible Party	Status	Notes
BRL-1	Acquire generators to increase backup power capability for critical facilities	Emergency Management	Carry Forward with Revision	Significant progress has been made. For example, The Chippens Hill Middle School (backup shelter) generator was 20 years old in 2015 and failed to operate during a recent storm event. A second generator was added to this facility. City Hall – The generator continues to only power the lowest floor of building. Fire Stations – The generators at all of the Fire Stations need upgrades or replacements. The City still desires to purchase a portable generator.
BRL-2	Install additional fire hydrants in areas with insufficient spacing	Emergency Management	Carry Forward with Revision	There continue to be certain outlying areas near the urban-wildland interface at risk of wildfires where additional hydrants are needed – Cedar Lake is one such area.
BRL-3	Revise the subdivision / zoning code to include policies for low-impact development	Planning	Carry Forward with Revision	The goal is to reduce stormwater runoff and therefore flood levels. This was a recommendation of the 2015 POCD and the Pequabuck River Study. Significant progress has been made. The City updated some of its regulations to comply with the MS4 regulations, but more revisions are necessary to adopt true low-impact development regulations.

Strategy	Description	Responsible Party	Status	Notes
BRL-4	Construct an elevated floodwall at the Pequabuck River Culvert inlet headwall and wing walls	Public Works	Drop	This was a recommendation of the Pequabuck River Study to reduce the flooding potential to 11 nearby buildings. This is at the downtown culvert (North Main Street / Main Street). The City no longer plans to pursue a floodwall in this area. Instead, the City is presently pursuing a sediment and obstruction removal project in the conduit to increase capacity and is focusing on mitigation at individual properties.
BRL-5	Develop a Pequabuck River flood response plan to provide dam operators guidance on how to manage dams to mitigate the effect of downstream flooding	Public Works, Water Dept.	Carry Forward with Revision	Several dams in the Pequabuck River Watershed have outlet structures that can be controlled. A coordinated plan to reduce peak flows could mitigate flood damage in downstream communities. City staff have met with Bristol Water Department and New Britain Water Department regarding pre-storm releases, but a written plan is still needed.
BRL-6	Perform a registration drive to encourage signups for CT Alerts Emergency Notification System	Emergency Management	Carry forward	This was to include targeted mailings, such as in particularly vulnerable areas such as floodplains and dam failure inundation areas. This still needs to be done, as there has been more focus in recent years on the City's notification system. The City would like more information on how this could be accomplished, such as specific steps that could be taken as part of the action.
BRL-7	Increase outreach efforts regarding flood mitigation	Public Works	Complete	Members of the public requested more information regarding flood insurance, flood mitigation techniques, and ongoing City programs aimed at reducing flood damage in 2015. The Pequabuck River Study also identified the need for a floodproofing technical assistance program, including education regarding floodproofing, working with property owners to determine if they were eligible to apply for LOMAs to reduce insurance rates, identifying potential vendors, and coordinating grant funding. Presently, the City is doing outreach regarding these items related to the Pequabuck River remapping project, and more outreach is planned. There will be more A zones mapped in the city, although the AE zones are not expected to change significantly.

Strategy	Description	Responsible Party	Status	Notes
BRL-8	Implement a predictive flood warning program specific to Bristol	Public Works	Complete	This included having the USGS reactivate the Pequabuck River gaging station and coordinating with the National Weather Service to estimate potential flood elevations and inundation zones for a predicted storm event. The City presently pays approximately $15,000 per year to operate the gaging station. The City is interested in other potential options that may be less expensive.
BRL-9	Incorporate updated hazard mitigation plan information into community plan updates	Planning	Complete	This was already done for the POCD in 2015. City staff were not immediately aware of any other community plans that incorporated information from the Hazard Mitigation Plan.
BRL-10	Participate in the Water Utility Coordinating Committee process	Water Dept.	Complete	This was related to potential drought impacts. Bristol Water Department was an active member of the Western WUCC during the Coordinated Water System Planning process.
BRL-11	Ensure local officials have the most updated version of the Connecticut Drought Management Plan	Water Dept.	Complete	The most recent State Drought Plan was adopted 2018. This plan differs from (is more general than) the Water Dept.'s drought response plan. According to attendees, local officials were all provided a copy of this plan.
BRL-12	Join FEMA's Community Rating System at Class 8	Public Works	Carry Forward	This would provide a 10% discount on flood insurance for all policy holders in Bristol but would require staff time and resources. The City is still considering this and believes there may be more desire for this program following completion of the Pequabuck River remapping project.
BRL-13	Update the local floodplain management ordinance to meet current model ordinance requirements	City Council / Inland Wetlands	Complete	The State building code now requires freeboard, as does DEEP's model ordinance (both 2018). The Pequabuck River Study recommended increasing the freeboard requirement to two feet for new buildings and substantial improvements. City regulations are presently generally consistent with the model ordinance (one foot of freeboard), although two feet of freeboard is being considered. They also have a FECB that meets regularly.
BRL-14	Work with repetitive loss property owners to mitigate those properties upon request	Public Works	Capability	This is a capability because the City can work with property owners when requested within time and budget constraints. As an example, the City is presently working with one RLP owner on a potential acquisition project.

10.3 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.

10.4 Mitigation Strategies and Actions Implementation Table

The City proposed to initiate several new mitigation actions for the upcoming five years. These include:

- Remove sediment from the Pequabuck River Conduit to mitigate flood risk.
- Remove sediment from under the Frederick Street Bridge to mitigate the flood risk it poses.
- Complete a re-write of the City's Zoning Regulations to include Low Impact Development provisions and rules to meet MS4 compliance.
- Update the City's official Inland Wetlands Map.

Additionally, a number of actions from the previous planning period are being carried forward or replaced with revised actions. These are listed below.

Action BRL-01	
Take one of the following actions that will mitigate natural hazard risks while also meeting Sustainable CT objectives: 1. Disseminate a toolkit for pre-disaster business preparedness. 2. Revise regulations to promote Low Impact Development. 3. Include the goals of this Hazard Mitigation Plan, and at least three other sustainability concepts, in your next POCD update.	
Lead	Plan
Cost	$0 - $25,000
Funding	OB, CT DEEP, Sustainable CT
Timeframe	2022
Priority	High

Action BRL-02	
Remain engaged with FEMA and the State during the Farmington River Watershed flood map updates. Review draft maps and provide comments to FEMA.	
Lead	Plan, FS, NFIP Coordinator
Cost	$0 - $25,000
Funding	OB, FEMA Grant, CT DEEP
Timeframe	2022
Priority	High

Action BRL-03	
Contact the owners of Repetitive Loss Properties and nearby properties at risk to inquire about mitigation undertaken and suggest options for mitigating flooding in those areas. This should be accomplished with a letter directly mailed to each property owner.	
Lead	EM, Plan, FS
Cost	$0 - $25,000
Funding	OB
Timeframe	2022
Priority	High

Action BRL-04	
Work with CT DEEP to complete a formal validation of the Repetitive Loss Property list and update the mitigation status of each listed property.	
Lead	EM, Plan, FS
Cost	$0 - $25,000
Funding	OB, CT DEEP
Timeframe	2022
Priority	High

Action BRL-05	
Revise the subdivision / zoning code to include explicit policies for low-impact development, in order to reduce stormwater runoff and downstream flood levels.	
Lead	Planning
Cost	$0 - $25,000
Funding	OB, CT DEEP
Timeframe	2022
Priority	High

Action BRL-06	
Fully incorporate the provisions of the DEEP model flood regulations into the local flood damage prevention regulations (or ordinance), including but not limited to the required design flood elevations for the first floor, building electrical systems, and building mechanical systems.	
Lead	Plan, FS, NFIP Coordinator
Cost	$0 - $25,000
Funding	OB, FEMA Grant, CT DEEP
Timeframe	2022
Priority	Med

Action BRL-07	
Increase Substantial Damage and Substantial Improvement lookback periods to two or more years.	
Lead	Plan, FS, NFIP Coordinator
Cost	$0 - $25,000
Funding	OB, FEMA Grant, CT DEEP
Timeframe	2022
Priority	Med

Action BRL-08	
Coordinate with CT SHPO to conduct outreach to owners of historic properties to educate them on methods of retrofitting historic properties to be more hazard-resilient while maintaining historic character.	
Lead	Plan, HC/HDC
Cost	$0 - $25,000
Funding	OB, CT SHPO
Timeframe	2022
Priority	Low

Action BRL-09	
Use the CT Toxics Users and Climate Resilience Map to identify toxic users located in hazard zones within your community. Contact those users to inform them about the CT DEEP small business chemical management initiative.	
Lead	EM, FS
Cost	$0 - $25,000
Funding	CT DEEP
Timeframe	2022
Priority	Low

Action BRL-10	
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 support the preparation of resiliency plans across the state.	
Lead	Plan, HC/HDC
Cost	$0 - $25,000
Funding	OB, CT SHPO
Timeframe	2022 – 2023
Priority	Low

Action BRL-11	
Join FEMA's Community Rating System at Class 8	
Lead	Public Works
Cost	$25,000 - $50,000
Funding	OB, CT DEEP
Timeframe	2022 – 2023
Priority	Med

Action BRL-12	
Update the City's official Inland Wetlands Map.	
Lead	Plan, IWWC
Cost	$25,000 - $50,000
Funding	OB, CT DEEP
Timeframe	2022 – 2023
Priority	Med

Action BRL-13	
Develop a coordinated Pequabuck River flood management plan to provide dam operators guidance on how to manage dams to reduce peak flows and mitigate downstream flooding. This action can build on meetings with Bristol Water Department and New Britain Water Department regarding pre-storm releases.	
Lead	Public Works, Water Dept.
Cost	$25,000 - $50,000
Funding	OB, CT DEEP
Timeframe	2022 – 2024
Priority	Med

Action BRL-14	
Complete a re-write of the City's Zoning Regulations to include Low Impact Development provisions and rules to meet MS4 compliance.	
Lead	Plan
Cost	$50,000 - $100,000
Funding	FEMA Grant, CT DEEP
Timeframe	2022 – 2024
Priority	Med

Action BRL-15	
Acquire more mobile emergency light towers.	
Lead	EM
Cost	$25,000 - $50,000
Funding	OB, CT DEMHS
Timeframe	2022 – 2024
Priority	Low

Action BRL-16	
Perform a registration drive to encourage signups for CT Alerts Emergency Notification System	
Lead	Emergency Management
Cost	$25,000 - $50,000
Funding	OB, CT DEMHS
Timeframe	2022 – 2024
Priority	Low

Action BRL-17	
Complete application to DEMHS/FEMA to obtain Flood Mitigation Assistance for the acquisition and demolition of flood prone properties at 164 Central St. and 65 Memorial Boulevard, in an effort to eliminate the community's most flood prone structures, to help ease localized flooding, and to create open space in these locations. At least one of these buildings is an RLP at risk from the Pequabuck River.	
Lead	Mayor, Grants Administrator
Cost	More than $500,000
Funding	FEMA Grant, CT DEMHS
Timeframe	2023 – 2025
Priority	High

Action BRL-18	
Install additional fire hydrants in areas with insufficient firefighting water resources; one such area is at Cedar Lake.	
Lead	Emergency Management
Cost	$100,000 - $500,000
Funding	CIP, FEMA Grant, FEMA AFG, CT DEEP
Timeframe	2023 – 2025
Priority	Low

Action BRL-19	
If a microgrid is determined to be feasible, design and construct a microgrid powered by a large fuel cell at "Centre Square" to power the government buildings on North Main Street (City Hall, Police Station, and Fire Department) and private developments located on Centre Square.	
Lead	EM, DPW
Cost	More than $1 million
Funding	CIP, FEMA Grant
Timeframe	2025 – 2027
Priority	Low

Action BRL-20	
If a microgrid is determined not to be feasible, upgrade or install an additional generator at City Hall in order to provide backup power to the entire building. Begin upgrading or replacing the backup generators at the Fire Station Headquarters.	
Lead	EM, DPW
Cost	More than $500,000
Funding	CIP, FEMA Grant
Timeframe	2025 – 2027
Priority	Low

Action BRL-21	
Begin upgrading or replacing backup generators at all City Fire Stations. Acquire a portable generator and a trailer for transportation.	
Lead	EM, DPW
Cost	More than $1 million
Funding	CIP, FEMA Grant
Timeframe	2026 – 2027
Priority	Low

Action BRL-22	
Remove sediment from the Pequabuck River Conduit to mitigate flood risk.	
Lead	DPW, IWWC
Cost	$50,000 - $100,000
Funding	OB, CIP
Timeframe	2026 – 2027
Priority	Low

Action BRL-23	
Remove sediment from under the Frederick Street Bridge to mitigate the flood risk it poses.	
Lead	DPW, IWWC
Cost	$50,000 - $100,000
Funding	OB, CIP
Timeframe	2026 – 2027
Priority	Low

APPENDIX A

STAPLEE MATRIX

#	Action Description	Regional Theme	Lead Department	Cost Estimate	Potential Funding Sources	Timeframe for Completion	Weighted STAPLEE Criteria														Total STAPLEE Score
							Benefits							Costs							
							Social	Technical (x2)	Administrative	Political	Legal	Economic (x2)	Environmental	Social	Technical (x2)	Administrative	Political	Legal	Economic (x2)	Environmental	
BRL-01	Take one of the following actions that will mitigate natural hazard risks while also meeting Sustainable CT objectives: 1. Disseminate a toolkit for pre-disaster business preparedness. 2. Revise regulations to promote Low Impact Development. 3. Include the goals of this Hazard Mitigation Plan, and at least three other sustainability concepts, in your next POCD update.	Sustainable CT	Plan	$0 - $25,000	OB, CT DEEP, Sustainable CT	2022	1	1	1	1	1	1	1	0	0	0	0	0	0	0	9
BRL-02	Remain engaged with FEMA and the State during the Farmington River Watershed flood map updates. Review draft maps and provide comments to FEMA.	Flood Map Updates	Plan, FS, NFIP Coordinator	$0 - $25,000	OB, FEMA Grant, CT DEEP	2022	1	1	1	0	1	0	1	0	0	0	-1	0	0	0	5
BRL-04	Work with CT DEEP to complete a formal validation of the Repetitive Loss Property list and update the mitigation status of each listed property.	RLP	EM, Plan, FS	$0 - $25,000	OB, CT DEEP	2022	1	1	1	0	1	1	0	0	0	0	0	0	0	0	7
BRL-05	Revise the subdivision / zoning code to include explicit policies for low-impact development, in order to reduce stormwater runoff and downstream flood levels.	Low Impact Development	Planning	$0 - $25,000	OB, CT DEEP	2022	0	1	1	1	1	1	1	0	0	0	0	0	0	0	8
BRL-06	Complete application to DEMHS/FEMA to obtain Flood Mitigation Assistance for the acquisition and demolition of flood prone properties at 164 Central St. and 65 Memorial Boulevard, in an effort to eliminate the community's most flood prone structures, to help ease localized flooding, and to create open space in these locations. At least one of these buildings is an RLP at risk from the Pequabuck River.	Acquisition & Open Space	Mayor, Grants Administrator	More than $500,000	FEMA Grant, CT DEMHS	2023 – 2025	1	1	1	0	1	1	1	-1	0	-1	0	0	-1	0	6
BRL-07	Fully incorporate the provisions of the DEEP model flood regulations into the local flood damage prevention regulations (or ordinance), including but not limited to the required design flood elevations for the first floor, building electrical systems, and building mechanical systems.	Flood Regulations	Plan, FS, NFIP Coordinator	$0 - $25,000	OB, FEMA Grant, CT DEEP	2022	1	1	1	0	1	0	1	0	0	0	-1	0	0	0	5
BRL-08	Increase Substantial Damage and Substantial Improvement lookback periods to two or more years.	Flood Regulations	Plan, FS, NFIP Coordinator	$0 - $25,000	OB, FEMA Grant, CT DEEP	2022	1	1	1	0	1	0	1	0	0	0	-1	0	0	0	5
BRL-09	Join FEMA's Community Rating System at Class 8	CRS	Public Works	$25,000 - $50,000	OB, CT DEEP	2022 – 2023	1	1	0	1	1	1	0	0	0	-1	0	0	0	0	6
BRL-10	Update the City's official Inland Wetlands Map.	Study	Plan, IWWC	$25,000 - $50,000	OB, CT DEEP	2022 – 2023	0	1	1	0	1	1	1	0	0	0	0	0	0	0	7
BRL-11	Complete a re-write of the City's Zoning Regulations to include Low Impact Development provisions and rules to meet MS4 compliance.	Low Impact Development	Plan	$50,000 - $100,000	FEMA Grant, CT DEEP	2022 – 2024	0	1	1	0	1	1	1	0	0	0	0	0	0	0	7
BRL-12	Develop a coordinated Pequabuck River flood management plan to provide dam operators guidance on how to manage dams to reduce peak flows and mitigate downstream flooding. This action can build on meetings with Bristol Water Department and New Britain Water Department regarding pre-storm releases.	Dam Safety	Public Works, Water Dept.	$25,000 - $50,000	OB, CT DEEP	2022 – 2024	0	1	1	1	1	1	0	0	0	0	0	0	0	-1	6.5
BRL-13	Coordinate with CT SHPO to conduct outreach to owners of historic properties to educate them on methods of retrofitting historic properties to be more hazard-resilient while maintaining historic character.	Historic & Cultural Resources	Plan, HC/HDC	$0 - $25,000	OB, CT SHPO	2022	1	0	1	1	0	1	0	0	0	0	0	0	0	0	5
BRL-14	Use the CT Toxics Users and Climate Resilience Map to identify toxic users located in hazard zones within your community. Contact those users to inform them about the CT DEEP small business chemical management initiative.	Small Business Chemicals	EM, FS	$0 - $25,000	CT DEEP	2022	1	0	1	0	1	1	1	0	0	0	0	0	0	0	6
BRL-15	Install additional fire hydrants in areas with insufficient firefighting water resources; one such area is at Cedar Lake.	Wildfire Risk Reduction	Emergency Management	$100,000 - $500,000	CIP, FEMA Grant, FEMA AFG, CT DEEP	2023 – 2025	0	1	0	0	1	1	1	0	0	0	0	0	0	0	6
BRL-16	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 support the preparation of resiliency plans across the state.	Historic & Cultural Resources	Plan, HC/HDC	$0 - $25,000	OB, CT SHPO	2022 – 2023	1	0	1	1	0	1	0	0	0	0	0	0	0	0	5
BRL-17	If a microgrid is determined to be feasible, design and construct a microgrid powered by a large fuel cell at "Centre Square" to power the government buildings on North Main Street (City Hall, Police Station, and Fire Department) and private developments located on Centre Square.	Backup Power	EM, DPW	More than $1 million	CIP, FEMA Grant	2025 – 2027	0.5	1	1	1	0	1	0	0	0	0	0	0	-1	-1	4.5

#	Action Description	Regional Theme	Lead Department	Cost Estimate	Potential Funding Sources	Timeframe for Completion	Weighted STAPLEE Criteria														Total STAPLEE Score
							Benefits							Costs							
							Social	Technical (x2)	Administrative	Political	Legal	Economic (x2)	Environmental	Social	Technical (x2)	Administrative	Political	Legal	Economic (x2)	Environmental	
BRL-18	Acquire more mobile emergency light towers.	Emergency Response, Alerts, & Communication	EM	$25,000 - $50,000	OB, CT DEMHS	2022 – 2024	1	0	1	1	1	0	0	0	0	-1	0	0	0	0	3.5

APPENDIX B

RECORD OF MUNICIPAL ADOPTION

City of Bristol
Office of Town and City Clerk
111 North Main Street
Bristol, Connecticut
(860)584-6200

December 16, 2021

Mr. Raymond Rogozinski
Director Public Works
City Hall
111 North Main Street
Bristol, Connecticut 06010

Dear Mr. Rogozinski:

At a meeting of the City Council on December 14, 2021 the following Resolution was adopted:

WHEREAS, the City of Bristol has historically experienced severe damage from natural hazards and it continues to be vulnerable to the effects of those natural hazards profiled in the plan (e.g. *flooding, high wind, thunderstorms, winter storms, earthquakes, droughts, dam failure, and wildfires)*, resulting in loss of property and life, economic hardship, and threats to public health and safety; and
WHEREAS, the Bristol City Council approved the previous version of the Plan in 2016; and
WHEREAS, the City of Bristol and the Naugatuck Valley Council of Governments developed and received conditional approval from the Federal Emergency Management Agency (FEMA) for the Hazard Mitigation Plan Update, 2021-2026 under the requirements of 44 CFR 201.6; and
WHEREAS, public and committee meetings were held and public input was sought in 2020 and 2021 regarding the development and review of the Hazard Mitigation Plan Update, 2021-2026; and
WHEREAS, the Plan specifically addresses hazard mitigation strategies and Plan maintenance procedure for Bristol; and
WHEREAS, the Plan recommends several hazard mitigation actions/projects that will provide mitigation for specific natural hazards that impact Bristol, with the effect of protecting people and property from loss associated with those hazards; and
WHEREAS, adoption of this Plan will make Bristol eligible for funding to alleviate the impacts of future hazards; now therefore be it
RESOLVED by the City Council:

1. The Plan is hereby adopted as an official plan of the City of Bristol;
2. The respective officials identified in the mitigation strategy of the Plan are hereby directed to pursue implementation of the recommended actions assigned to them;

3. Future revisions and Plan maintenance required by 44 CFR 201.6 and FEMA are hereby adopted as a part of this resolution for a period of five (5) years from the date of this resolution.
4. An annual report on the progress of the implementation elements of the Plan shall be presented to the City Council.

To authorize the Mayor or Acting Mayor to sign any and all documents required for the Hazard Mitigation Plan Update, 2021-2026.

Very truly yours,

Therese Pac, MCTC, MMC
Town and City Clerk

Bristol
CONNECTICUT
All Heart ™

Department of Public Works | 860.584.6125

MEMORANDUM

DATE: December 6, 2021

TO: Mayor Jeffrey Caggiano
City Council

FROM: Raymond A. Rogozinski, P.E., Director of Public Works

RE: Regional Hazardous Mitigation Plan

The Board of Public Works received and reviewed the regional Hazard Mitigation Plan at its November 18, 2021 meeting prepared by SLR Engineering for the Naugatuck Valley Council of Governments. The plan includes a Municipal Annex that provides specific provision associated with the City of Bristol. A link to plan is provided below and includes both the Regional "Multi-Jurisdictional Document" and the "Municipal Annexes".

www.nvcogct.gov/hmp.

Based on a review and DPW staff recommendation of the referenced plan the Board of Public Works recommended the following City Council action:

> **Motion to approve the Regional Hazardous Mitigation Plan Update 2021-26 with Municipal Annex for Bristol prepared by NVCOG. Said approval shall authorize the Mayor to sign any and all documents required for approval. Resolution adopting said mitigation plan attached.**

In addition to serving as a planning document to prepare for disaster the Hazard Mitigation Plan is required to make the City eligible for grants administered by FEMA.

Please feel free to contact me with any question at 860-584-6113.

City of Bristol
Public Work Department
111 North Main Street
Bristol, CT 06010
www.bristolct.gov

Presented at Council Meeting
12/14/2021
Adopted
Ordered Filed
Referred to

RECEIVED
2021 DEC -7 AM 9:39
TOWN AND CITY CLERK
BRISTOL, CT

APPENDIX C

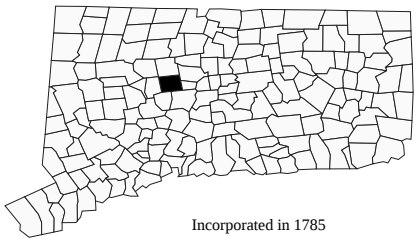
CERC City Profile 2019

Bristol, Connecticut

CERC Town Profile 2019 *Produced by Connecticut Data Collaborative*

Town Hall
111 North Main Street
Bristol, CT 06010
(860) 584-7612

Belongs To
Hartford County
LMA Hartford
Naugatuck Valley Planning Area



Incorporated in 1785

Demographics

Population

	Town	County	State
2000	60,062	857,183	3,405,565
2010	60,477	894,014	3,574,097
2013-2017	60,498	897,417	3,594,478
2020	59,535	925,492	3,604,591
'17 - '20 Growth / Yr	-0.5%	1.0%	0.1%

	Town	County	State
Land Area (sq. miles)	26	735	4,842
Pop./Sq. Mile (2013-2017)	2,291	1,221	742
Median Age (2013-2017)	40	40	41
Households (2013-2017)	24,789	348,871	1,361,755
Med. HH Inc. (2013-2017)	$64,586	$69,936	$73,781

	Town	State
Veterans (2013-2017)	3,513	180,111

Race/Ethnicity (2013-2017)

	Town	County	State
White Non-Hisp	46,467	560,997	2,446,049
Black Non-Hisp	2,377	114,711	350,820
Asian Non-Hisp	1,095	45,178	154,910
Native American Non-Hisp	59	1,338	5,201
Other/Multi-Race Non-Hisp	1,598	20,064	84,960
Hispanic or Latino	8,902	154,977	551,916

	Town	County	State
Poverty Rate (2013-2017)	10.4%	11.2%	10.1%

Educational Attainment (2013-2017)

	Town		State	
High School Graduate	15,175	35%	673,582	27%
Associates Degree	4,065	9%	188,481	8%
Bachelors or Higher	11,322	26%	953,199	38%

Age Distribution (2013-2017)

	0-4		5-14		15-24		25-44		45-64		65+		Total	
Town	2,931	5%	7,289	12%	7,344	12%	16,275	27%	17,069	28%	9,590	16%	60,498	100%
County	47,813	5%	108,578	12%	118,163	13%	226,627	25%	251,235	28%	145,001	16%	897,417	100%
State	186,188	5%	432,367	12%	495,626	14%	872,640	24%	1,031,900	29%	575,757	16%	3,594,478	100%

Economics

Business Profile (2018)

Sector	Units	Employment
Total - All Industries	1,336	22,345
23 - Construction	134	631
31-33 - Manufacturing	133	2,972
44-45 - Retail Trade	156	2,704
51 - Information	21	3,701
62 - Health Care and Social Assistance	154	4,097
Total Government	25	1,977

Top Five Grand List (2018)

	Amount
ESPN	$237,962,440
Connecticut Light & Power/Eversource	$63,343,420
Covanta	$33,986,610
Bristol Center LLC	$33,513,690
Bristol Sports Center	$25,297,930
Net Grand List (SFY 2016-2017)	$3,842,668,911

Major Employers (2018)

ESPN
Bristol Health
Amazon
City of Bristol
Faneuil

Education

2018-2019 School Year

	Grades	Enrollment
Bristol School District	PK-12	7956

Smarter Balanced Test Percent Above Goal (2017-2018)

	Grade 3		Grade 4		Grade 8	
	Town	State	Town	State	Town	State
Math	47.4%	53.8%	49.3%	51.3%	37.6%	43.0%
ELA	45.9%	53.1%	51.5%	54.9%	58.4%	56.1%

Pre-K Enrollment (PSIS)

	2018-2019
Bristol School District	308

Rate of Chronic Absenteeism (2017-2018)

	All
Connecticut	10.7%
Bristol School District	8.4%

4-Year Cohort Graduation Rate (2017-2018)

	All	Female	Male
Connecticut	88.3%	91.8%	85.1%
Bristol School District	86.3%	91.1%	81.8%

Public vs Private Enrollment (2013-2017)

	Town	County	State
Public	89.7%	89.4%	86.8%
Private	10.3%	10.6%	13.2%

Bristol, Connecticut

CERC Town Profile 2019

Connecticut Economic Resource Center

Government

Government Form: Mayor - Council

Total Revenue (2017)	$221,073,541	Total Expenditures (2017)	$204,391,730	Annual Debt Service (2017)	$8,657,539
Tax Revenue	$141,427,033	Education	$115,560,011	As % of Expenditures	4.2%
Non-tax Revenue	$79,646,508	Other	$88,831,719	Eq. Net Grand List (2017)	$5,566,370,035
Intergovernmental	$73,042,538	Total Indebtedness (2017)	$79,002,963	Per Capita	$92,429
Per Capita Tax (2017)	$2,337	As % of Expenditures	38.7%	As % of State Average	61.2%
As % of State Average	79.7%	Per Capita	$1,312	Moody's Bond Rating (2017)	Aa2
		As % of State Average	52.2%	Actual Mill Rate (2017)	36.03
				Equalized Mill Rate (2017)	25.28
				% of Net Grand List Com/Ind (2017)	18.5%

Housing/Real Estate

Housing Stock (2013-2017)

	Town	County	State
Total Units	26,862	377,840	1,507,711
% Single Unit (2013-2017)	55.5%	55.6%	59.2%
New Permits Auth (2017)	42	957	4,547
As % Existing Units	0.2%	0.3%	0.3%
Demolitions (2017)	8	509	1,403
Home Sales	NA	4,581	21,880
Median Price	$190,500	$235,300	$270,100
Built Pre-1950 share	28.5%	27.8%	29.3%
Owner Occupied Dwellings	16,130	225,378	906,798
As % Total Dwellings	65.1%	64.6%	66.6%
Subsidized Housing (2018)	3,606	52,368	167,879

Distribution of House Sales

	Town	County	State
Less than $100,000	NA	59	536
$100,000-$199,999	NA	1,524	5,237
$200,000-$299,999	NA	1,642	6,681
$300,000-$399,999	NA	721	3,863
$400,000 or More	NA	635	5,563

Rental (2013-2017)

	Town	County	State
Median Rent	$950	$1,044	$1,123
Cost-burdened Renters	48.7%	50.1%	52.3%

Labor Force

	Town	County	State
Residents Employed	31,702	459,939	1,827,070
Residents Unemployed	1,519	20,380	78,242
Unemployment Rate	4.6%	4.2%	4.1%
Self-Employed Rate	6.7%	7.7%	10.0%
Total Employers	1,336	28,871	122,067
Total Employed	22,345	510,814	1,673,867

Connecticut Commuters (2015)

Commuters Into Town From:		Town Residents Commuting To:	
Bristol, CT	7,457	Bristol, CT	7,457
Southington, CT	1,056	Hartford, CT	2,676
Plymouth, CT	929	Farmington, CT	2,567
New Britain, CT	913	Southington, CT	1,548
West Hartford, CT	790	New Britain, CT	1,429
Waterbury, CT	773	Plainville, CT	1,248
Plainville, CT	755	Waterbury, CT	1,029

Quality of Life

Crime Rates (per 100,000 residents) (2017)

	Town	State
Property	1,628	1,777
Violent	97	228

Disengaged Youth (2013-2017)

	Town	State
Female	9.5%	4.2%
Male	11.1%	5.6%

	Town
Library circulation per capita	4.19

Distance to Major Cities

	Miles
Hartford	14
Providence	79
New York City	87
Boston	109
Montreal	269

Residential Utilities

Electric Provider
Eversource Energy
(800) 286-2000

Gas Provider
Eversource Energy
(800) 989-0900

Water Provider
Municipal Provider
Local Contact

Cable Provider
Comcast Plainville
(800) 266-2278