

# HAZARD MITIGATION PLAN UPDATE

Town of Wilmington, Massachusetts

**JUNE 2021**

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**Town of Wilmington**

121 Glen Road

Wilmington, MA 01887



# HAZARD MITIGATION PLAN UPDATE

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June 2021

Town of Wilmington

121 Glen road

Wilmington, MA 01887

978-658-3311

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## Acknowledgements

The Town of Wilmington would like to thank the following people and organizations for supporting the development of this plan. This group was considered the Core Team throughout the planning process.

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## Local Adoption Resolution

*E1. Does the Plan include documentation that the Plan has been formally adopted by the governing body of the jurisdiction requesting approval?  
(Requirement §201.6(c)(5))*

**(Resolution included on the following page.)**

# Town of Wilmington, Hazard Mitigation Plan Update

## Town of Wilmington, Hazard Mitigation Plan Update

**TOWN OF WILMINGTON, MASSACHUSETTS  
BOARD OF SELECTMEN  
A RESOLUTION ADOPTING THE  
HAZARD MITIGATION PLAN UPDATE, JUNE 2021**

WHEREAS, the Town of Wilmington established a Committee to prepare the **HAZARD MITIGATION PLAN UPDATE, JUNE 2021**; and

WHEREAS, the Town of Wilmington participated in the development of the **HAZARD MITIGATION PLAN UPDATE, JUNE 2021**;

and WHEREAS, the **HAZARD MITIGATION PLAN UPDATE, JUNE 2021** contains several potential future projects to mitigate potential impacts from natural hazards in the Town of Wilmington, and

WHEREAS, a duly noticed public meeting was held by the Wilmington Board of Selectmen on 12/13/21 for the public and municipality to review prior to consideration of this resolution; and

WHEREAS, the Town of Wilmington authorizes responsible departments and/or agencies to execute their responsibilities demonstrated in the plan,

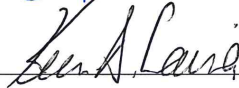
NOW, THEREFORE BE IT RESOLVED that the Town of Wilmington Board of Selectmen formally approves and adopts the **HAZARD MITIGATION PLAN UPDATE, JUNE 2021**, in accordance with M.G.L. c. 40.

ADOPTED AND SIGNED by the Wilmington Board of Selectmen on this December 13, 2021.

Lilia Maselli, Chairman



Kevin A. Caira, Member



Gregory B. Bendel, Member



Gary B. DePalma, Member



Judith L. O'Connell, Member



JUNE 2021

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## Record of Changes

This Hazard Mitigation Plan Update, May 2021 including Appendices, will be reviewed, and approved on a biannual basis by the Core Team and following any major disasters. All updates and revisions to the plan will be tracked and recorded in the following table. This process will ensure the most recent version of the plan is disseminated and implemented by the Town.

*Table 1. Summary of changes.*

| Date of Change | Entered By | Summary of Changes |
|----------------|------------|--------------------|
|                |            |                    |
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## Chapter 1. Introduction

The Federal Emergency Management Agency (FEMA) defines mitigation as “the effort to reduce loss of life and property by lessening the impact of disasters. Mitigation is taking actions now – before the next disaster – to reduce human and financial consequences later (analyzing risk, reducing risk, insuring against risk.)”<sup>1</sup>

“The purpose of mitigation planning is to identify policies and actions that can be implemented over the long term to reduce risk and future losses. Mitigation plans form the foundation for a community's long-term strategy to reduce disaster losses and break the cycle of disaster damage, reconstruction, and repeated damage. The planning process is as important as the plan itself. It creates a framework for risk-based decision making to reduce damages to lives, property, and the economy from future disasters.”<sup>2</sup>

“Disaster Mitigation Act (DMA) 2000 (Public Law 106-390)<sup>3</sup> provides the legal basis for FEMA mitigation planning requirements for State, local and Indian Tribal governments as a condition of mitigation grant assistance. DMA 2000 amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act by repealing the previous mitigation planning provisions and replacing them with a new set of requirements that emphasize the need for State, local, and Indian Tribal entities to closely coordinate mitigation planning and implementation efforts.”<sup>4</sup>

The Town of Wilmington, Massachusetts created this plan as part of an ongoing effort to reduce the negative impacts and costs from damages associated with natural hazards, such as nor’easters, floods, and hurricanes. This plan meets the requirements of the Disaster Mitigation Act 2000. More importantly, the plan was created to reduce loss of life, land, and property due to natural hazards that affect the Town of Wilmington. It is difficult to predict when natural hazards will impact the planning area, but it is accurate to say that they will. By implementing the mitigation actions listed in this plan, the impact of natural hazards will be lessened.

Local Mitigation Plans must be updated at least once every five years to remain eligible for FEMA hazard mitigation project grants. A local jurisdiction must review and revise its plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval within five (5) years to continue to be eligible for mitigation project grants. (44 CFR §201.6(d)(3))

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<sup>1</sup> What is Mitigation? (2014). Federal Emergency Management Agency. Retrieved January 2014 from <http://www.fema.gov/what-mitigation>

<sup>2</sup> Multi-Hazard Mitigation Planning. (2014). Federal Emergency Management Agency. Retrieved January 2014 from <http://www.fema.gov/multi-hazard-mitigation-planning>

<sup>3</sup> Disaster Mitigation Act of 2000, Pub. L. 106-390, as amended

<sup>4</sup> Disaster Mitigation Act of 2000. (2014). Federal Emergency Management Agency. Retrieved January 2014 from <http://www.fema.gov/media-library/assets/documents/4596?id=1935>

## Combined with Municipal Vulnerability Preparedness

The Town's previous Hazard Mitigation Plan was written in 2015 and adopted June 2016. This document serves as an update to that plan.

Another significant change was in the planning process; development of this plan was in conjunction with the Municipal Vulnerability Preparedness (MVP) program implemented by the Town. All aspects of the MVP program influenced development of this plan, including the Core Team, the Community Resilience Building Workshop, and the listening sessions. The Planning Process chapter details how the MVP program was incorporated.

## Purpose of the Plan

The purpose of the Local Hazard Mitigation Plan is to provide the Town of Wilmington (known throughout this document as *the planning area*) with a comprehensive examination of all natural hazards affecting the area, as well as a framework for informed decision-making regarding the selection of cost-effective mitigation actions. When implemented, these mitigation actions will reduce the Town's risk and vulnerability to natural hazards.

This plan is a result of a collaborative effort between the Town of Wilmington and the surrounding communities. Throughout the development of the plan, the Core Team consulted the public for input regarding identified goals, mitigation actions, risk assessment, and mitigation implementation strategy. The public included stakeholders to the Town, such as the Reading Municipal Light Department, the Ipswich River Watershed Association, the MVP Northeast Regional Coordinator, and the City of Woburn.

## Guiding principles for plan development

The Core Team adhered to the following guiding principles in the plan's development.<sup>5</sup>

- Focus on mitigation strategy as the plan's primary purpose. All other sections contribute to and inform the mitigation strategy and specific hazard mitigation actions.
- Process is as important as the plan itself. In mitigation planning, as with most other planning efforts, the plan is only as good as the process and people involved in its development. The plan should also serve as the documentation of the planning process.
- This is your community's plan. To have value, the plan must represent the current needs and values of the community and be useful to local officials and stakeholders. Develop the mitigation plan in a way that best serves your community's purpose and people.

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<sup>5</sup> Federal Emergency Management Agency. (2013). *Local Mitigation Planning Handbook*, p. I-2.

## Mitigation Goals

The Core Team identified the following list of hazards to profile. They are shown in order of climate change interaction for consistency with the State Hazard Mitigation and Climate Adaptation Plan.

*Table 2. Hazards considered.*

| Primary Climate Change Interactions    | Hazards   |
|--|---|
| Changes in Precipitation               | Flooding (including riverine and urban/stormwater related flooding, etc.)<br><br>Drought  |
| Rising Temperatures                    | Average/Extreme Temperatures<br><br>Wildfires<br><br>Invasive Species   |
| Extreme Weather                        | Hurricanes/Tropical Storms<br><br>Severe Winter Storm/Nor'easter<br><br>Tornadoes<br><br>Other Severe Weather (including severe thunderstorms, high winds, lightning, hail, etc.) |
| Non-Climate Influenced Hazards         | Earthquake  |
| Technological and Human Caused Hazards | Dam Failure   |

The hazard mitigation strategy is the culmination of work presented in the planning area profile, risk assessment, and capability assessment. It is also the result of multiple meetings and sustained public outreach. The Core Team developed the five goals shown below. The goals from the 2015 Hazard Mitigation Plan Update were revised to develop this current list. Information about the goal development process is in Chapter 6: Mitigation Strategy. These goals are considered “broad policy-type



statements”<sup>6</sup> that represent the long-term vision for mitigating risk to natural hazards in the Town of Wilmington.

1. Prevent and reduce the loss of life, property, and infrastructure from natural hazards.
2. Prioritize green solutions and environmental protection when implementing mitigation actions.
3. Build resilience to natural hazards through the integration of hazard mitigation and climate adaptation principles into Town plans and regulations and through collaboration with private, regional, state, and federal organizations.
4. Increase public awareness of natural hazard risks and mitigation activities through education and outreach.

## Plan Update and Changes

This plan serves as a total revision and update to the Town of Wilmington, Hazard Mitigation Plan Update from 2015.

*D1. Was the plan revised to reflect changes in development?  
(Requirement §201.6(d)(3))*

The 2015 Hazard Mitigation Plan Update was revised to reflect current buildings and infrastructure in the Town of Wilmington. The critical facility list was expanded to include a new water treatment facility, new sewer pumping stations and several communication towers. The critical facility list was also expanded to include the street address of all facilities and if the facility has a generator attached to it. This list is included in Chapter 4: Risk and Vulnerability Assessment. The Town of Wilmington had planned to build a new North Wilmington Fire Substation, but this project was not completed. The Town is actively researching potential locations for a new public safety substation in North Wilmington. Major culvert crossings along Route 62 are undersized and past their projected life expectancy. The Town applied for mitigation funds through the state’s 2020 Culvert Replacement Municipal Assistance (CRMA) grant program for funds to do a culvert replacement at the Route 62 bridge, but they did not receive an award. This area remains a problem and this updated plan includes two mitigation actions to address Route 62 over Martin’s Brook. Maintaining safe and adequate supplies of drinking water is a priority for the Town. Wilmington has an established water conservation program, and they continue to expand their water infrastructure. Finally, all the maps in the plan were redone to reflect the current built environment. Development changes in the Town have not changed the Town’s overall vulnerability to natural hazards. This plan is consistent with the previous hazard mitigation plan.

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<sup>6</sup> Federal Emergency Management Agency. (2013). *Local Mitigation Planning Handbook*, p. 6.

*D2. Was the plan revised to reflect progress in local mitigation efforts?  
(Requirement §201.6(d)(3))*

Chapter 6: Mitigation Strategy details the previously identified mitigation actions from the 2015 Hazard Mitigation Plan Update and their status in 2021. Each of these actions is listed as completed, in progress, or delayed. A description of the status is given. The Core Team used this information to determine if the actions should now be considered capabilities of the Town or if they should move forward into this new plan.

The current mitigation action list represents present and future needs for Wilmington. In addition, the public engagement process that included the development of the Core Team and the Community Resilience Building Workshop (CRB) led to the identification of mitigation actions that the community supports.

*D3. Was the plan revised to reflect changes in priorities?  
(Requirement §201.6(d)(3))*

The biggest change in priority since the 2015 Hazard Mitigation Plan Update is how the Town understands the current and potential impacts of climate change. Beyond understanding the impact of climate change, the Town wants to prioritize nature-based solutions and education and awareness programs as they address the risks posed by climate change.

## Authority and Assurances

The Town of Wilmington will continue to comply with all applicable Federal laws and regulations during the periods for which it receives grant funding, in compliance with 44 CFR 201.6. It will amend its plan whenever necessary to reflect changes in town, State or Federal laws and regulations, as required in 44 CFR 201.6.

The Core Team recognizes the following FEMA publications:

- Local Mitigation Planning Handbook (March 2013)
- Local Mitigation Plan Review Guide (October 2011)
- Demonstrating Good Practices Within Local Hazard Mitigation Plans (January 2017, FEMA Region 1)

## Plan Adoption

*E1. Does the Plan include documentation that the plan has been formally  
adopted by the governing body of the jurisdiction requesting approval?  
(Requirement §201.6(c)(5))*

The Town of Wilmington will adopt the Plan when it has received “approved-pending adoption” status from the Federal Emergency Management Agency (FEMA). The Certificate of Adoption is included on page 3.

### Document Overview

Below is a summary of the Hazard Mitigation Plan Update chapters, including appendices. The FEMA guidelines and requirements for each portion of this Plan are included in their respective chapters. The planning process closely adhered to FEMA guidelines and to the intent of those guidelines.

#### **Chapter 2: Planning Area Profile**

The Planning Area Profile chapter describes the Town of Wilmington completely, including history, population, government, and infrastructure.

#### **Chapter 3: Planning Process**

The Planning Process chapter documents the methodology and approach of the hazard mitigation planning process. The chapter summarizes the Core Team meetings, the public outreach process (including public meetings), and how the MVP process was incorporated. This chapter guides the reader through the process of generating this plan and reflects its open and inclusive public involvement process.

#### **Chapter 4: Risk Assessment**

The Risk Assessment identifies the natural hazard risks to the Town of Wilmington and its citizens. The risk assessment looks at current and future vulnerabilities based on development of structures and infrastructure. Included in this chapter is a list of critical facilities identified by the Core Team.

#### **Chapter 5: Capability Assessment**

The Capability Assessment looks at the Town’s ability to mitigate risk prior to and following disaster. This chapter is structured around the following four categories: planning and regulatory, administrative and technical, financial, and education and outreach. The chapter concludes with information regarding the National Flood Insurance Program.

#### **Chapter 6: Mitigation Strategy**

This chapter provides a blueprint for reducing losses identified in the Risk Assessment. The chapter presents the hazard mitigation goals and identifies mitigation actions in priority order. Each mitigation action includes essential details, such as Town lead, potential funding sources, and implementation timeframe.

## **Chapter 7: Plan Implementation and Maintenance**

The Plan Implementation and Maintenance establishes a system and mechanism for periodically monitoring, evaluating, and updating the Hazard Mitigation Plan. It also includes a plan for continuing public outreach and monitoring the implementation of the identified mitigation actions.

### **Appendices**

The Appendices includes documentation regarding the planning process, such as Core Team and public meeting presentations. In addition, resources supporting the capability assessment, mitigation strategy, and implementation plan are included.

## Chapter 2. Planning Area Profile

### Overview

The Town of Wilmington is a mixed residential, commercial, and industrial suburban community occupying 17.2 square miles in Northeastern Massachusetts. It is in Middlesex County, 16 miles north/northwest of Boston, and mostly within the watershed of the Ipswich River. Wilmington is bordered by Andover to the north; North Reading and Reading to the east; Woburn to the south; and Burlington, Billerica, and Tewksbury to the west.

The Town's location provides ready access to multiple transportation modes across the region. Principal highways servicing the Town are Interstate 93 and State Routes 38, 62, 125, and 129. Other major highways easily accessible from the Town include Interstate Routes 95 and 495, US Route 3, and State Route 128. Two commuter rails operated by the Keolis and owned by Massachusetts Bay Transportation Authority (MBTA) include stops in Wilmington and help connect it to Boston and other communities in the region. Figure 1 shows the general location of Wilmington in the Northeast and Figure 2 shows a basemap of the planning area included within the Town's jurisdictional boundaries.

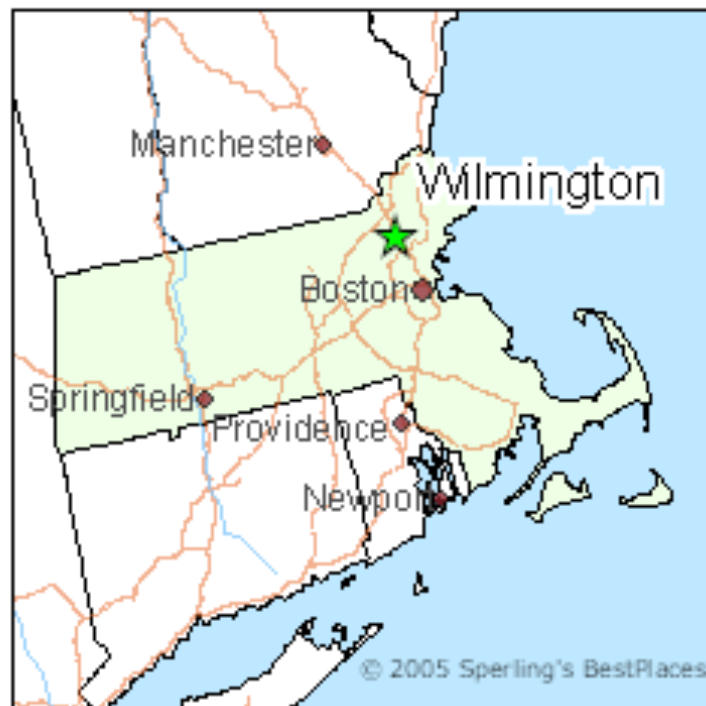


Figure 1. Wilmington, MA Location.

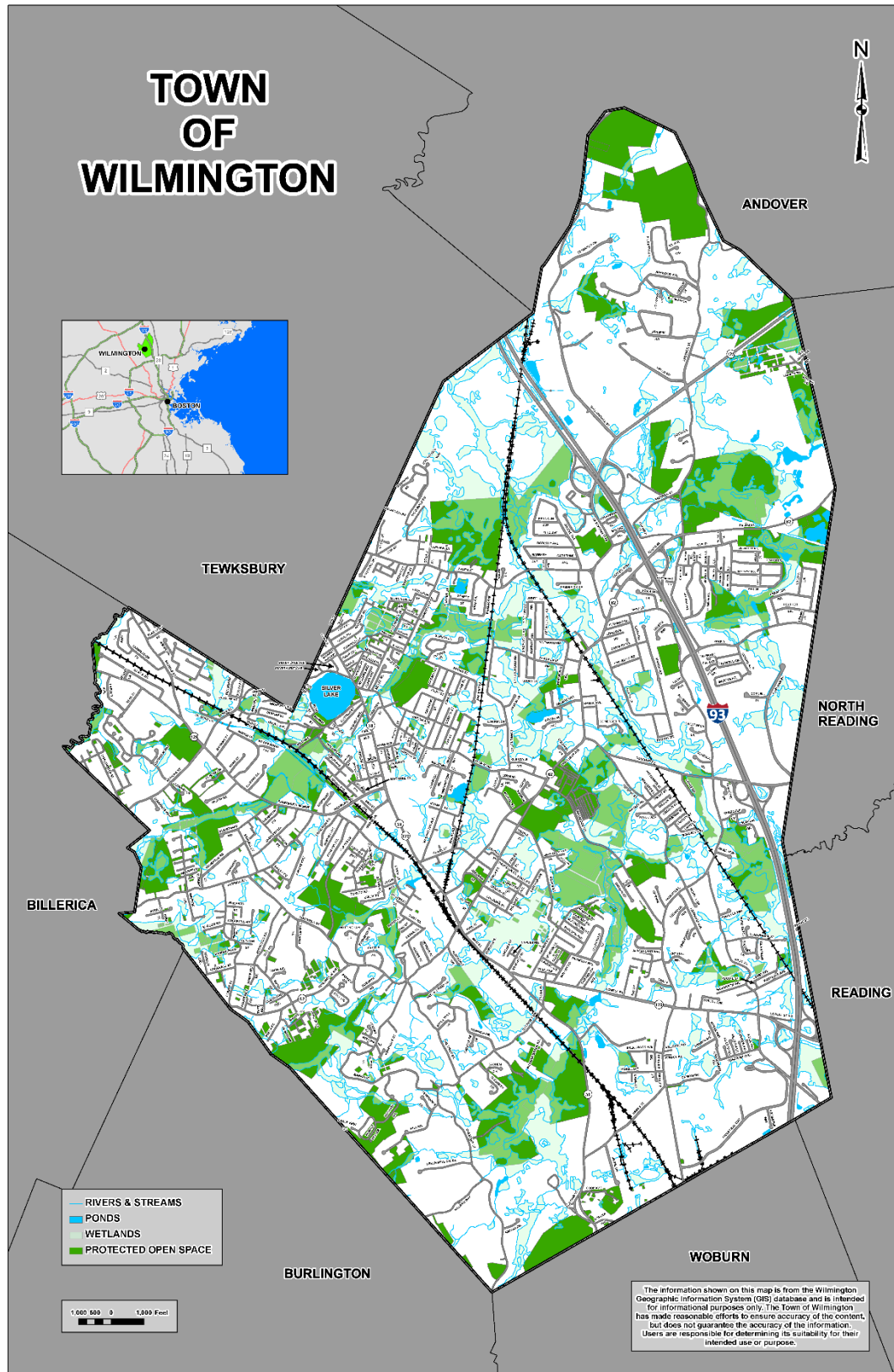


Figure 2. Wilmington Basemap.

## History

Wilmington was officially incorporated as a Town in the Commonwealth of Massachusetts on September 25, 1730. This action by the state legislature was in response to years of petitions from residents of the area who were requesting that a more local meeting house be built in isolated territories locally identified with names such as Goshen, the Land of Nod, Ladder-Pole, and Lebanon. By 1733 the Town of Wilmington was well established, and the desired meeting house was in place.

The earliest settlers in the area are believed to have arrived around 1665, establishing farms in this remote part of eastern Massachusetts known originally as Charlestown. The community's early agricultural economy broadened to include a sawmill established in 1702 by Daniel Snow. For many decades thereafter, Wilmington remained a small, rural town. In the 1770's, Wilmington citizens played a part in the founding of our nation, with local men participating in the struggle for independence that became known as the American Revolution. After the war, the Town continued to be mostly a farming community, populated by descendants of the Town's founders.

In the early nineteenth century, many residents were experiencing some commercial success by cultivating hops and cranberries, as well as promoting the perfections of the locally discovered Baldwin apple. In addition, the Town's first serious industry beyond farming was established around this time when Joseph Bond arrived in Town and established a cracker factory that flourished for more than half a century. Although hop farming seems to have fallen out of favor early in the nineteenth century, the cracker factory continued in operation until 1864 when an unfortunate fire destroyed the company's bake houses, as well as the local church, which was located across the street from the factory.

Shortly after the Bond Cracker Factory was destroyed and the business relocated to Boston, Franklin Perry established a tannery about a mile away on the same road. The tannery became Wilmington's next big employer and operated well into the twentieth century. But throughout the nineteenth century, Wilmington was becoming less isolated and less strictly rural as improvements in transportation made the Town much more accessible to outsiders. First, the Middlesex Canal, followed soon thereafter by the installation of railroads, allowed people and goods to travel more freely than thought possible in an earlier era. By the end of the nineteenth century, several train lines brought residents of the city out to the country in Wilmington, where people could enjoy fresh air, fresh food, country living and Silver Lake. In fact, improved transportation options were an especially significant boon to Wilmington's Silver Lake, for the same train tracks that could bring people to the lake for recreation could also transport harvested ice back to the city where it was greatly valued in food preservation.

As the Town grew, it adopted the institutions of successful towns. New churches were established, as well as a district school system which grew into the school department the Town enjoys today. The Town established a library which existed in various Town buildings until 1969 when today's library building was built. Rudimentary police and fire services were professionalized in the early twentieth century shortly after the Town adopted an image of the legendary Whitefield Elm Tree – site of a

mythical sermon preached by the fiery evangelist, George Whitefield – to serve as the focal point of the official Town seal.

With a population well under 1,000 people until the 1880's, the twentieth century brought a dramatic surge in residents to the area. When Interstate 93 cut through the Town in the late 1950's, the industrial boom that had begun earlier in the decade led to the Town's population more than doubling in less than twenty years. Farmland was sold. Some of that land became suburban housing, but much of the land, especially that most accessible to the highways, was developed into industrial parks and a wide variety of businesses began operating in the area. No longer were people coming to Wilmington to farm – many of them were buying a suburban home and taking desk jobs in the Town or commuting to Boston via train or highway. New schools were in constant demand as the baby boom in Wilmington was well under way. It was not until the dawning of the twenty-first century that Wilmington's school capacity was in line with the Town's student population.<sup>7</sup>

### Wilmington Today

Today, the Town of Wilmington, with a population estimate to be a little over 23,000, is a vibrant bedroom community with an abundance of strong municipal services. In addition to the police, fire, library and school departments, the Town supports an active senior center, a recreation department, veteran's services, a Town museum and all the other services that keep a town viable. The trains still take commuters to Boston and Silver Lake still offers recreational opportunities, although the lake is now a quiet neighborhood of residential homes and not a vacation mecca. The Town's sense of community is particularly evident at its renowned annual Fun on the Fourth carnival and fireworks celebration leading up to the 4th of July holiday. Satisfied residents were further pleased in 2010, when BusinessWeek magazine declared Wilmington one of the most affordable suburbs in Massachusetts.<sup>8</sup>

### Town Government

The Town of Wilmington is governed by an elected five-member Board of Selectmen, with the support of an appointed Town Manager (Chief Administrative Officer). It is served by many departments with full-time staff in addition to numerous supportive local boards, commissions, and committees. The Town still operates under the Open Town Meeting format whereby every registered voter is entitled to gather at stated times to conduct the business of the Town.

The "Mission Statement for the Town of Wilmington" is as follows:

"The Town of Wilmington, as a municipal corporation, exists in order to deliver a wide range of municipal services to those who live, work or own property within the borders of Wilmington; and in order to make this community a good place to

<sup>7</sup> History narrative based on information provided on the Town's website at:

<https://www.wilmingtonma.gov/wilmington-massachusetts>

<sup>8</sup> Ibid.



live, to work, and to raise and educate a family, those services must be responsive to the needs of the people. They must be effective and efficient. Principles of honesty, fairness, dependability, and compassion must govern the actions of the officials and the employees of the Town. Those who work for the Town as employees or as members of boards, committees and commissions are recognized as its most important resource and the key to its success in serving the people of Wilmington."

– Endorsed by the Board of Selectmen May 22, 1989

## Population and Housing

According to the latest estimates provided by the U.S. Census Bureau (2019), Wilmington's total population is 23,377 which equates to a current population density of nearly 1,400 people per square mile. This represents a growth rate of 4.5% since the 2010 Census, slightly less than the state average growth rate of 5.3%. In 2018 there were an estimated 8,073 year-round housing units, with an average household size of 2.9 people. Figure 3 provides some additional relevant demographic and housing statistics for Wilmington as reported by the U.S. Census Bureau.

### Demographic Statistics

- Median age is 42.1
- 5.4% are under age 5
- 21.5% are under age 18
- 16.4% are over age 65
- 10.9% have a disability
- 11.9% speak a language other than English at home
- 0.5% have no health insurance coverage
- 72.3% are in the civilian labor force
- Per capita income is \$49,605
- Median household income is \$143,076
- 2.9% are below the poverty level

### Housing Statistics

- Number of housing units = 8,073
- Median value = \$474,800
- Average household size = 2.9 people
- 85.8% of housing units are owner-occupied
- Units built before 1970 = 50%

*Figure 3. Wilmington Characteristics from U.S. Census Bureau.<sup>9</sup>*

<sup>9</sup> U.S. Census Bureau, 2019 American Community Survey 5-Year Estimates.

## Infrastructure

### *Transportation System*

Wilmington is very accessible by automobile and rail. There are four exits off Interstate 93, three state routes (62, 129, and 38, which connect with Route 128), and two MBTA commuter rail stations. There is major congestion along all these routes, and local traffic worsens when drivers seek alternate routes. Bus transit is limited to Route 38 through the Lowell Regional Transit Authority, and the MBTA provides The Ride, a paratransit service for the elderly and disabled. Biking and walking are not always feasible given the spread-out pattern of development, and main roads are not always conducive to walking or biking.

### *Water Supply System*

The Town's water distribution system consists of approximately 138 miles of water main, four groundwater wells, multiple pumping stations, two water treatment plants, three storage tanks, and 1,242 public fire hydrants. The Town also maintains interconnections with bordering towns and the MWRA. Serving approximately 99 percent of Wilmington residents, Wilmington's average water demand is about 2.2 million gallons per day.<sup>10</sup>

Ninety-five percent of Wilmington is served by municipal wells, and 5% of the population is served by private wells. According to a report prepared for the Town by IEP, Inc. in 1990, increases in impermeable surface area and groundwater withdrawals throughout the watershed have contributed to the low flow of the river during summer months. The IEP study also raised some doubts about the ability of the regional aquifer (shared by Wilmington, North Reading, and Reading) to support maximum daily yields during periods of extended drought. The study recommended that Wilmington protect areas recharging the wells of surrounding Towns. The Town of Wilmington took that step and incorporated all DEP approved Zone II areas in Town in the Aquifer Protection District (those areas of an aquifer which contributes water to a well under the most severe pumping and recharge conditions that can be realistically anticipated).<sup>11</sup>

To further advance the preservation of its drinking water resources, Wilmington has also established a water conservation program. This program, which combines the efforts of both residents and the Town, decreases the amount of water that is unnecessarily lost each day. In addition to improving the water infrastructure through capital improvements, the Water Department periodically completes a town-wide leak detection survey. By identifying and then repairing these leaks, the Town decreases the amount of unaccounted for water. Essentially, the amount of water being wasted is decreased.<sup>12</sup>

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<sup>10</sup> Town of Wilmington, Water & Sewer Division: <https://www.wilmingtonma.gov/water-sewer-division>

<sup>11</sup> Town of Wilmington, Open Space and Recreation Plan. July 2015. P. 18.

<sup>12</sup> Town of Wilmington, Water & Sewer Division: <https://www.wilmingtonma.gov/water-sewer-division/pages/water-conservation-program>

### *Sewer System*

Originally established in the 1950s, the Town's sewer system includes approximately 34 miles of main pipe, eleven pump stations, over 1,700 services and a septage receiving facility. Wastewater flow from Wilmington is carried to the MWRA's sewer system and ultimately reaches the MWRA Deer Island Treatment Facility at Boston Harbor.<sup>13</sup>

Eighty-two percent of Wilmington is served by on-site septic systems, and 18% is served by the MWRA. Improperly maintained septic systems can be a potential source of ground and surface water contamination. On the other hand, out of basin water transfer via an expanded sewer system could have an impact on the amount of ground water available in Wilmington and the Ipswich River Watershed because water recharge would be reduced. The Town's Comprehensive Water Resources Management Plan (CWRMP) covered this topic extensively, and the Town agreed to limit its sewer system expansion to designated areas of need.<sup>14</sup>

### *Public Facilities*

There are many public facilities in Wilmington that provide important services to residents and businesses across the community. These include but are not limited to Town Hall, the Public Safety Building, Department of Public Works sites (offices and garages), the Public Buildings Office, the School Administration Building (Roman House), Memorial Library, the Buzzell Senior Center, and South School (food pantry). The Town's school facilities include Wilmington High School, Wilmington Middle School, and the following lower grade schools: Boutwell School, North Intermediate School, Shawsheen School, West Intermediate School, Wildwood School, and Woburn Street School.

Many of the Town's public facilities and other community assets are critical in terms of emergency response and recovery. These critical facilities are identified and further described in Chapter 4: Risk and Vulnerability Assessment (see *Critical Facilities* section).

### *Natural and Cultural Resources*

Wilmington's natural landscape is characterized by rounded hills and relatively broad lowlands. Elevations generally range between 80 and 120 feet above mean sea level, with higher terrain and steeper slopes to the north overlooking Foster's Pond near the Andover Town line, and to the southwest along the border with Burlington. The highest point is 255 feet, site of the water tower in the Town Forest; the lowest elevation is 70 feet above mean sea level where the Ipswich River flows into Reading and North Reading just east of Route I- 93. Silver Lake is perhaps the Town's most recognizable natural feature, a natural great pond of 28 acres. This Great Pond is both an iconic landscape in Town as well as a popular recreational asset.<sup>15</sup>

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<sup>13</sup> Town of Wilmington, Water & Sewer Division: <https://www.wilmingtonma.gov/water-sewer-division>

<sup>14</sup> Town of Wilmington, Open Space and Recreation Plan. July 2015. P. 19.

<sup>15</sup> Town of Wilmington, Open Space and Recreation Plan. July 2015. P. 24.

While each are not specifically described here, Wilmington's natural resources include land, surface water, permanent and perennial wetlands, aquifers, wildlife habitat, open space and riparian corridors, and other ecologically sensitive areas. Wilmington is rich in water resources, as evidenced by the wetlands that cover an estimated 19% of the Town's total area. Wilmington's water resources that include an extensive hydrological system that includes streams, lakes, ponds, aquifers, vernal pools, and wetlands (see Figure 2). Eighty-one percent of the Town lies within the Ipswich River Watershed; 10.5% in the Shawsheen; and 8.5% in the Aberjona/Mystic River basin.

Although much of Wilmington is developed, natural vegetation continues to provide habitat for a variety of ecosystems and wildlife and to contribute to the scenic character of the Town. This includes forest land, public shade trees, agricultural land, and wetland vegetation. As much as 3,400 acres, or almost one-third of the Town is still forested with a mixture of conifers and hardwoods.<sup>16</sup> On the north side of Town, the 156-acre Town Forest is the largest conservation land in Wilmington and is one of the few areas of upland protected for passive recreation. The Forest contains the highest point in Town, with sweeping views toward Boston and surrounding communities.

The rich variety of wetland and upland habitats in Wilmington support many wildlife species that have disappeared from other communities in the Boston region. Some species that were displaced by development in the past are reappearing while others are in danger of losing their local breeding grounds as today's development encroaches on their habitats.<sup>17</sup> The Wilmington Conservation Commission continues to acquire conservation land for resource protection and habitat. The Town's Planning Board has also actively encouraged the use of conservation subdivisions, creating new public open space through private development.

Wilmington is also fortunate to have a very active Historical Commission and citizens interested in preserving and promoting the Town's history. Wilmington has five houses, five historic districts, and the Middlesex Canal listed on the National Register of Historic Places (NRHP) and several other homes and areas are eligible for listing. Houses listed include the Colonel Joshua Harnden Tavern (c. 1770), the West Schoolhouse (1895), the Boutell-Hawthorn House, the Butlers-Avery House, the Ephraim Buck House, and the West School House. Districts listed which encompasses many historic buildings, monuments and cemeteries are the West Centre Village District, Church Street Historic District, High Street Historic District, Gowing-Sheldon Historic District, and Buck's Corner Historic District.<sup>18</sup>

Wilmington's Town Museum at the Colonel Joshua Harnden Tavern is owned by the Town and is dedicated to preserving and presenting the history of Wilmington. Housed in an historic tavern, the museum is an excellent example of quality construction practices of the late 18th century. Exhibits are also on display in the adjacent late 19<sup>th</sup> century carriage house.<sup>19</sup>

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<sup>16</sup> Ibid. P. 43

<sup>17</sup> Ibid. P. 45.

<sup>18</sup> Ibid. P. 48.

<sup>19</sup> Town of Wilmington, Town Museum: <https://www.wilmingtonma.gov/town-museum>

## Land Use

Since Wilmington historically developed as a farming community, large sections of the Town's 17 square miles remained undeveloped well into 20th century. As land availability decreased and value increased, there has been greater pressure for infill development. Wilmington's proximity to transportation modes, allowing easy access to points throughout New England and to the state's capital city, with major technology, financial services medical and educational institutions, added to the significant growth pressures on the community.

Wilmington's early growth coincided with the conclusion of World War II when a strong demand for housing occurred. The completion of Interstate 93 in the early 60's and Interstate 495 in the late 60's spurred growth. A strong economy in the mid 1980's and 1990's accelerated development across much of eastern Massachusetts. As land and housing prices have increased inside Route 128, businesses and homebuyers have come to Wilmington in search of affordable property. Factors such as the ability to live in a suburban setting, to send children to good public schools and to experience a low crime rate have undoubtedly played a role in this migration.

Growth pressures have led to a significant reduction of open space in Wilmington. The consequence is less land available to satisfy the demands and needs of more people. For this reason, Wilmington has proactively administered new zoning regulations that permit higher densities at the Wilmington MBTA station and promote the preservation of open space through Conservation Design Subdivisions.<sup>20</sup>

Today, Wilmington is categorized by the Metropolitan Area Planning Council (MAPC) as an established suburb, characterized by owner-occupied single-family homes on lots less than one acre. Established suburbs contain scattered parcels of vacant developable land and new growth takes the form of infill and some redevelopment. Their population is relatively stable.<sup>21</sup> Figure 4 shows current land use classifications for Wilmington.

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<sup>20</sup> Town of Wilmington, Open Space and Recreation Plan. July 2015. P. 4.

<sup>21</sup> MAPC, Community Profile for Wilmington: <https://datacommon.mapc.org/profile/wilmington/demographics>

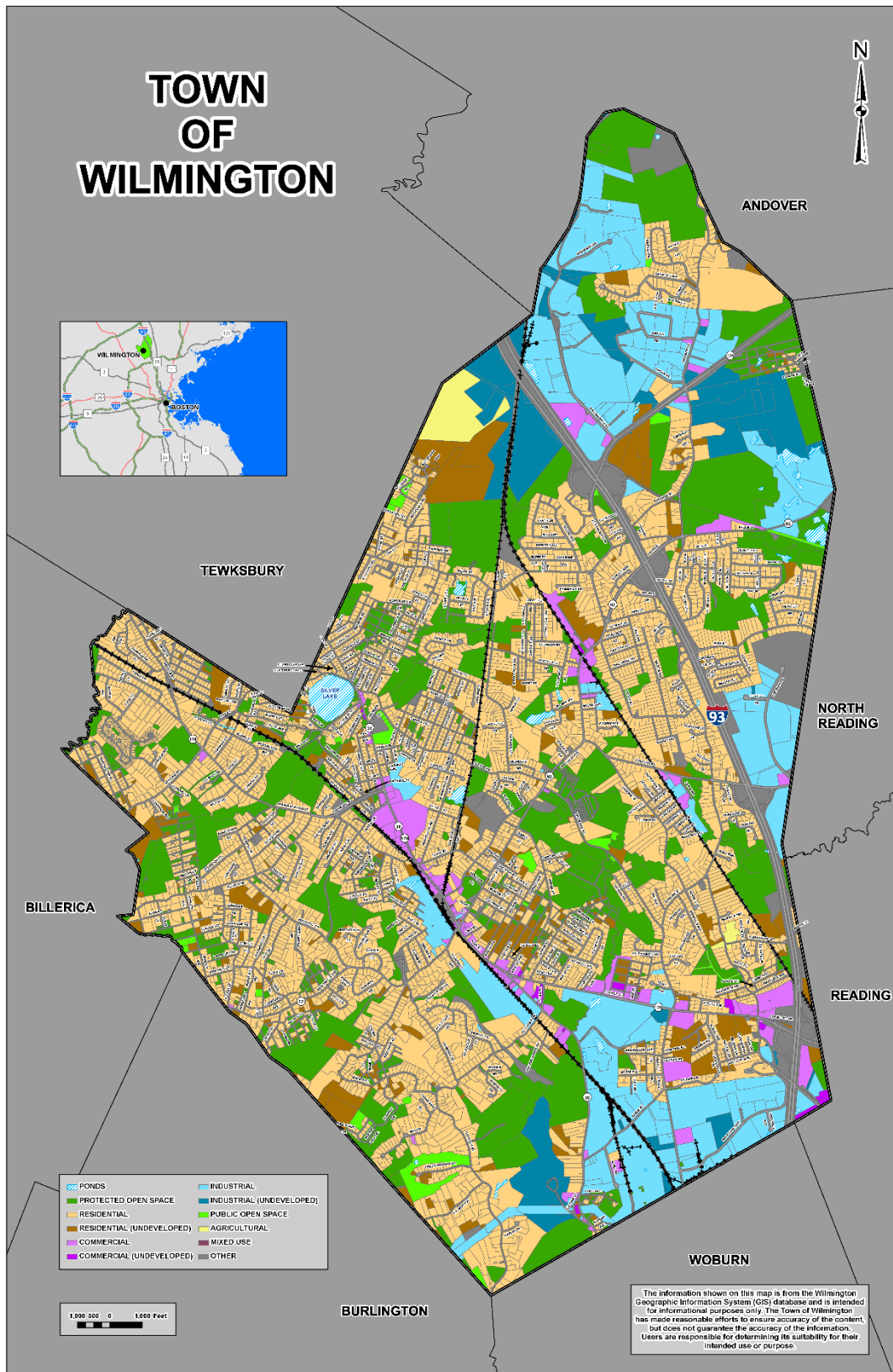


Figure 4. Wilmington's Current Land Use.



## Development Trends

Wilmington's original dispersed agricultural character has been replaced by more developed suburbia as transportation services have expanded and improved. This has resulted in increased population density. Although population growth has slowed, a buildout analysis performed in 2000 showed that the Town's zoning would allow over 1200 new residential lots. Development at full buildout would significantly reduce land available for active and passive recreation while increasing the demand for such amenities.<sup>22</sup> However per MAPC's most recent population and housing demand projections for Wilmington, the Town isn't expected to experience much growth or development in the coming decade.<sup>23</sup>

In recent years much of the development of commercial and industrial properties in Wilmington has been upgrading, expanding, or redeveloping the properties. There have been several transit-oriented developments near the train station. These have resulted in a mixture of residential and commercial uses on the same parcel in the Central Business District.

Much of the recent residential construction in Town has included Conservation Design Subdivisions, which have resulted in open space and trails being created, and comprehensive permits under Chapter 40B, which have resulted in affordable units, open space, and recreational amenities for the residents. A residential multifamily project with affordable housing was built with a walkway connecting it to the train station. The Town has reached 10% affordable housing. While it must ensure that affordable housing continues to be built, the 10% level means the Town can work closely with the developer so the plans reflect what the Town would like to see, not what a developer might want to force the Town to accept. Several houses have been built on lots that have been split on lots where an old house was torn down, or on lots with limitation such as ones that would not have supported septic systems before the regulations changed.<sup>24</sup>

The Town of Wilmington uses its Master Plan and other important policy documents (such as the Open Space and Recreation Plan, Affordable Housing Plan, and Community Development Plan) to understand, guide, and manage future growth and development. While these main policy tools are utilized by the Board of Selectmen, Planning Board, Conservation Commission, and other local decision-makers, the regulation of all new development is more directly administered and controlled through the Town's zoning bylaw, subdivision rules and regulations, wetlands regulations, and other laws governing land use.

Given its role in guiding the development of vacant land and reuse of developed land, zoning is the most important of these regulatory tools. Zoning has existed in Wilmington since 1934, undergoing a major change in 1955. These earlier zoning maps served as a "blueprint" for growth and development. As

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<sup>22</sup> Town of Wilmington, Open Space and Recreation Plan. July 2015. P. 18.

<sup>23</sup> MAPC, Population and Housing Demand Projections for Metro Boston, Regional Projections and Municipal Forecasts. Executive Summary. January 2014.

<sup>24</sup> Town of Wilmington, Open Space and Recreation Plan. July 2015. P. 19.

mentioned above, current zoning would allow about 1,200 additional single-family homes at full buildout. As the Town's Zoning Map (Figure 5) shows, zoning regulations have channeled commercial development along the main arteries in Town, with industrial districts near the I-93 interchanges.

Under the Town's current zoning bylaw (revised up to and including the Annual Town Meeting of 2020), Wilmington is divided into the following classes of zoning districts:

**Residential Districts**

- Residence 10 (R10)
- Residence 20 (R20)
- Residence 60 (R60)
- Planned Residential Development (PRD)
- Over 55 Housing District (O55H)

**Business Districts**

- Neighborhood Business (NB)
- Neighborhood Mixed Use (NM)
- General Business (GB)
- Central Business (CB)

**Industrial Districts**

- General Industrial (GI)
- Highway Industrial (HI)
- Light Industrial/Office (LI/O)

**Conservancy Districts**

- Flood Plain (FP)

**Ground Water Protection District (GWPD)**



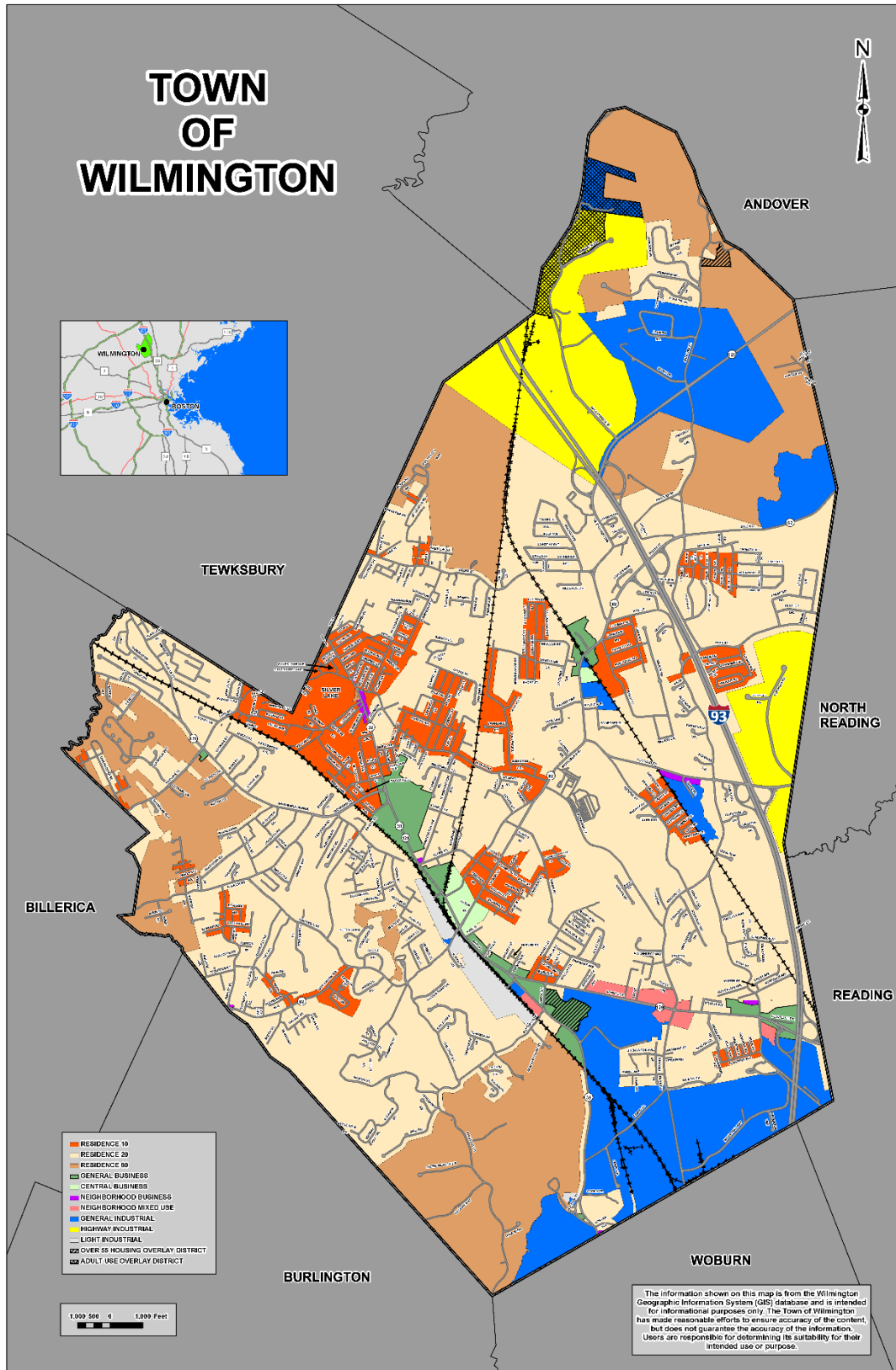


Figure 5. Wilmington's Zoning Map.

## Chapter 3. Planning Process

*A1. Does the Plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction?  
(Requirement §201.6(c)(1))*

The planning process was developed in full compliance with the current planning requirements of the Federal Emergency Management Agency (FEMA) per the following rules and regulations:

- Robert T. Stafford Disaster Relief and Emergency Assistance Act (Public Law 93-288), as amended by the Disaster Mitigation Act of 2000
- Code of Federal Regulations – Title 44, Chapter 1, Part 201 (§201.6: Local Mitigation Plans)
- Federal Emergency Management Agency *Local Mitigation Plan Review Guide* (dated October 1, 2011)

In addition, the plan was prepared with the suggestions found in the *Demonstrating Good Practices Within Local Hazard Mitigation Plans*, FEMA Region 1, January 2017.

The planning process for this updated mitigation plan took place in conjunction with the Town's Massachusetts Municipal Vulnerability Preparedness Program (MVP). Efforts were made to align the update with the MVP throughout the process. Paul Alunni, Town Engineer and Valerie Gingrich, Director of Planning and Conservation, co-led the mitigation planning effort as well as the MVP. With support from other Town staff, Paul and Valerie facilitated all activities related to the mitigation plan update, including meeting logistics, data gathering, and public outreach.

### Core Team

A Core Team was formed to lead the planning process. This team included Town employees as well as stakeholders. A list of Core Team members is shown in the list below. The Core Team met for a Kick-off Meeting on January 28, 2021. They identified stakeholders to invite to the February 12, 2021, and February 26, 2021, Community Resilience Building (CRB) workshops. They met again on March 11, 2021. During this meeting, the consulting team of Green International (MVP provider) and Jamie Caplan Consulting (mitigation planning lead) reviewed the goals and objectives of each project and identified next steps for each. They reviewed the process and purpose of updating the hazard mitigation plan and identified a preliminary list of hazards to review. The Core Team met for the final time on April 15, 2021, to review the risk assessment conclusions, the mitigation actions and the plan implementation and maintenance procedures. All meetings were held via Zoom due to the Covid-19 pandemic. Sign-in sheets for all meetings are included in the Appendix A.

- Paul Alunni, Town Engineer, [palunni@wilmingtonma.gov](mailto:palunni@wilmingtonma.gov)
- William Cavanaugh, Fire Chief, [wcavanaugh@wilmingtonma.gov](mailto:wcavanaugh@wilmingtonma.gov)
- Joseph Desmond, Police Chief, [jdesmond@wpd.org](mailto:jdesmond@wpd.org)

## Town of Wilmington Hazard Mitigation Plan Update

- Valerie Gingrich, Director of Planning & Conservation, [vgingrich@wilmingtonma.gov](mailto:vgingrich@wilmingtonma.gov)
- George Hooper, Public Buildings Superintendent, [ghooper@wilmingtonma.gov](mailto:ghooper@wilmingtonma.gov)
- Jeff Hull, Town Manager, [jhull@wilmingtonma.gov](mailto:jhull@wilmingtonma.gov)
- John Keeley, Resident, [Jbkeeley@gmail.com](mailto:Jbkeeley@gmail.com)
- Tony LaVerde, GIS Manager, [alaverde@wilmingtonma.gov](mailto:alaverde@wilmingtonma.gov)
- Joseph Lobao, Utility & Business Manager, [jlobao@wilmingtonma.gov](mailto:jlobao@wilmingtonma.gov)
- Cameron Lynch, Conservation Agent, [clynch@wilmingtonma.gov](mailto:clynch@wilmingtonma.gov)
- Jamie Magaldi, Operations Manager/Tree Warden, [jmagaldi@wilmingtonma.gov](mailto:jmagaldi@wilmingtonma.gov)
- Shelly Newhouse, Director of Public Health, [boh@wilmingtonma.gov](mailto:boh@wilmingtonma.gov)

In between Core Team meetings, the Core Team participated in identifying and refining the list of mitigation actions that were based on recommendations gathered from the CRB Workshop. The Core Team contributed data and information by completing several questionnaires related to Town capabilities, critical facilities, and the National Flood Insurance Program. They actively participated in the MVP process which occurred simultaneously.

The Core Team also participated in two public meetings, or listening sessions, one on March 23, 2021, and one on May 17, 2021. These were also attended via Zoom. Finally, the Core Team reviewed the Draft Hazard Mitigation Plan Update prior to sending it to the Massachusetts Emergency Management Agency (MEMA) for their review.

## Stakeholder Engagement

*A2. Does the Plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development as well as other interests to be involved in the planning process? (Requirement §201.6(b)(2))*

Most of the stakeholder engagement occurred through the MVP process and specifically the CRB workshop. The CRB workshop was held on consecutive weeks, February 12, 2021, and February 26, 2021. Each was approximately four hours. Community members chosen as key stakeholders were invited to the workshop. This was an opportunity for them to come together and prioritize resilience and climate adaptation actions. The CRB methodology is an “anywhere at any scale” format that draws on stakeholder’s wealth of information and experience to foster dialogue about the strengths and vulnerabilities within the town. Workshop participants interacted at both large and small group levels, using an iterative process to gather input, synthesize ideas across groups, and ultimately develop a set of priority resilience and adaptation actions. The Hazard Mitigation Plan was presented at each workshop, so participants understood that these projects were occurring simultaneously, and they were in effect participating in both projects.

The CRB workshop's central objectives were to:

- Define top local natural and climate-related hazards of concern
- Identify existing and future strengths and vulnerabilities
- Develop prioritized actions
- Identify immediate opportunities to collaboratively advance actions to increase resilience

The Core Team worked to invite participants and organize the workshop. The workshop was held on two consecutive weeks and sign-in sheets for each week are included in Appendix A.

The outcome of the CRB Workshop was compiled into the *Town of Wilmington Community Resilience Building Workshop Summary of Findings, May 2021*, by Green International. This summary includes a tremendous amount of information that was incorporated into this plan. Most significantly, the Core Team used the list of resilience recommendations as a starting place to develop mitigation actions. The current strengths and assets as well as categories of concerns and challenges portions of the Summary all contributed to the Capability Assessment and Risk Assessment. The thoroughness of the Summary of Findings enabled a streamlined mitigation planning process.

The Planning & Conservation Department is the primary department in Wilmington responsible for regulating development. They are actively supported by other town departments and professionals such as the Town Engineer, and the Public Buildings Superintendent. Ultimately the Board of Selectmen makes decisions about development with support from the Town Manager. Town registered voters participate via Open Town Meeting. In addition, the Metropolitan Area Planning Council (MAPC), works with the Town to regulate development in the region and support consistency with state agencies such as the Department of Conservation and Recreation and MassDOT.

### Public Outreach

*A3. Does the Plan document how the public was involved in the planning process during the drafting stage? (Requirement §201.6(b)(1))*

The Public Outreach Strategy was designed to involve the public in the mitigation planning process. The purpose of public outreach and stakeholder involvement was to:

- Generate public interest in mitigation planning
- Identify and accommodate special populations
- Solicit public input
- Engage local stakeholders
- Create opportunities for public and local stakeholders to be actively involved in the mitigation planning process



Figure 6. Public Meeting Announcement in Town Crier Newspaper.

The public outreach strategy included two Public Meetings/Listening Sessions, and an opportunity for the public to review the draft plan. Both meetings were hosted virtually due to the Covid-19 pandemic. Each meeting included a PowerPoint presentation and plenty of opportunity for questions and discussion. The Core Team participated in each meeting. The meetings were advertised by the Town by way of the Town website, the local newspaper and email invitation. Sign-in sheets and outreach materials for each meeting are included in the Appendix A. A copy of an article discussing the mitigation plan and the opportunity to participate in the first listening session is shown on the following page.

The first public meeting occurred on March 23, 2021, and focused primarily on the hazard mitigation plan, with an emphasis on identified hazards and critical assets. Participants gave feedback regarding what they have noticed in terms of climate change and how the Town can address these changes. Several people mentioned that winter storms now include more heavy wet snow because temperatures are warmer when it snows. This requires heavy equipment to move the snow. The Town has responded to Department of Public Works requests for capital planning to put money aside each year for the purchase of heavy equipment. This equipment also allows the Town to be ready to respond to other



hazards such as microbursts which would require heavy equipment to move downed trees. These comments were also noted in the financial capabilities section of Chapter 5 Capability Assessment.

Also mentioned during the first public meeting was the need for the Town to identify critical infrastructure including water, sewer, and drainage infrastructure so this data can be used to monitor a repair schedule and to communicate to first responders during an emergency.

The second public meeting occurred on May 17, 2021 and featured both the MVP Summary of Findings and the Hazard Mitigation Plan. This meeting focused on identified mitigation actions. A comment during this public meeting about the risk level for drought resulted in some discussion and ultimately a revision to move drought to a moderate level risk.

### *Review of Draft Plan*

The Town made the plan available for the Core Team to review it beginning May 7, 2021. The Core Team then made the plan available for two weeks for the public to review it. Comments regarding the plan were collected by Paul and Valerie and then incorporated by the consulting team. The Town advertised the opportunity to review the plan through online announcements and personal email announcements. Below is a list of outreach methods for plan review:

- Town's website
- Library's Facebook page
- Library's weekly email newsletter
- Sent to Library trustees and Friends Executive Board
- Sent to all contacts from the Director of Veterans Services
- Sent to all contacts from the Director of Elderly Services
- Posted on the Elderly Services Facebook page
- Announced in the newspaper
- Sent to the Headwaters Stream Team
- Sent to the Ipswich River Watershed Association
- Shared directly with surrounding cities and towns (North Reading, Burlington, Billerica, Tewksbury, Andover, and Reading)
- Hard copy available in the Town Engineer's office

During the review period, a comment from Ipswich River Headwaters Stream Team was received regarding drought impacts and the potential of over pumping wells. The Core Team considered these comments and made several revisions to the drought hazard that resulted in it moving to a level of moderate risk. This change is a terrific example of how mitigation planning includes both quantitative and qualitative analysis to determine level of risk.

## Review and Incorporation of Existing Studies

### *A4. Does the Plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement §201.6(b)(3))*

Many sources were used to develop this plan, including web-based resources, reports, and stakeholder engagement. Throughout the plan, these sources are cited within the text as footnotes. The Massachusetts Hazard Mitigation and Climate Adaptation Plan, as well as several Town of Wilmington plans, were reviewed for consistency. The goal was to develop a plan that would easily integrate with the key aspects of other plans in the Town and State. This section reviews how the content of several key plans and studies influenced the development of this plan.

#### *Town of Wilmington, Hazard Mitigation Plan Update 2015*

The Town of Wilmington's previous Hazard Mitigation Plan update was reviewed carefully for the development of this updated hazard mitigation plan. Emphasis was placed on review of the risk assessment, critical facilities identified, and the list of mitigation actions. All mitigation actions that were not implemented were considered for inclusion in this plan.

#### *Massachusetts Hazard Mitigation and Climate Adaptation Plan, 2018*

Consistency with the State Plan is not only required, but it also makes sense. The State Plan was used as a starting point for hazard identification and then for hazard analysis; details are included in the Risk Assessment. Of significance is the classification of natural hazards in terms of climate change interactions, changes in precipitation, rising temperatures, extreme weather, and non-climate influenced hazards. (<http://www.resilientma.org/data/documents>)

#### *Town of Wilmington Community Resilience Building Workshop Summary of Findings, May 2021*

Since the Town of Wilmington took on the mitigation planning process and the MVP program simultaneously, each project benefitted from the other. The outcome of the MVP program was the Summary of Findings. This document was used throughout the development of the mitigation plan to detail strengths and weaknesses of the town, to identify mitigation actions, and to engage stakeholders. The Summary of Findings is referenced frequently throughout the plan.

#### *Additional Town of Wilmington Plans Reviewed*

The following list of Town plans were also reviewed. Most important to the development of the Hazard Mitigation Plan Update was the Master Plan, dated September 2001. Although the Master Plan is twenty years old it included terrific background information regarding the Town including history, natural resources, cultural resources, and municipal facilities. The recommendations in each section of

the Master Plan included recommendations which were reviewed for relevancy toward development of the hazard mitigation actions. The other Town of Wilmington plans reviewed are listed below:

- Town of Wilmington Affordable Housing Plan for Planned Production Regulation, June 2004
- Town of Wilmington Community Development Plan, June 2004
- Town of Wilmington Master Plan, September 2001
- Town of Wilmington Open Space and Recreation Plan, July 2015
- Wilmington Town Forest Recreation & Management Plan, July 2004

The regulations in the Town of Wilmington Zoning articles were reviewed to inform the development of the mitigation actions.



## Chapter 4. Risk and Vulnerability Assessment

The risk assessment includes four parts: hazard identification, hazard profiles, asset inventory, and vulnerability analysis. The risk assessment is updated according to FEMA local hazard mitigation planning regulations as found in C.F.R. 44 201.6. Conducting a risk assessment is a way of asking and answering “what if ...” questions. For instance, what if the Town of Wilmington experiences a hurricane? The risk assessment answers questions regarding history, location, frequency, probability, and impact for each hazard. These answers are used toward developing a mitigation strategy. Gathering information for the risk assessment included historical research, conversations with stakeholders, and available hazard mapping. It also includes information gathered from the Town’s MVP Workshop and the Massachusetts State Hazard Mitigation and Climate Adaptation Plan (SHMCAP).<sup>25</sup>

### Hazard Identification

The first step in the risk assessment was to identify the hazards for study. All the categories of hazard risks from the Town of Wilmington’s previous (2015) hazard mitigation plan<sup>26</sup> are included in this update. All hazards except for landslide were deemed relevant as shown and explained in Table 3.

Table 3. Hazard Rationale

| 2015 Hazard Mitigation Plan   | 2021 Plan Update Rationale  |
|---|---|
| <b>Flood Related Hazards</b><br>- Flood<br><br>- Dam Failure  | Flood-related hazards remain a significant concern for Wilmington, as multiple areas continue to see recurrent flooding caused by heavy precipitation associated with severe weather events. The anticipated effects of climate change have the potential to exacerbate these flood related hazards. Although there are no state-regulated dams in Wilmington, there is high hazard dam in the neighboring Town of Burlington for which portions of Wilmington are in potential dam failure inundation zones. |
| <b>Wind Related Hazards</b><br>- Hurricanes and Tropical Storms<br>- Tornadoes<br><br>- Nor’easters<br><br>- Severe Thunderstorms | Wind-related hazard events continue to occur across the planning area, including large storms that can result in falling trees, widespread power outages, and other local impacts. The entire Town remains at risk to high wind events ranging from recurrent severe thunderstorms to occasional cyclonic storm events. Town staff have also noted an increasing frequency associated with tornado watches and warning for the area.  |

<sup>25</sup> Massachusetts State Hazard Mitigation and Climate Adaptation Plan. September 2018.

<sup>26</sup> Town of Wilmington Hazard Mitigation Plan Update. Massachusetts Area Planning Commission (MAPC). 2015.

| 2015 Hazard Mitigation Plan   | 2021 Plan Update Rationale  |
|---|---|
| <b>Winter Storms</b><br>- Heavy Snow and Blizzards<br><br>- Ice Storms  | Winter storm events are a very frequent occurrence for Wilmington, including damaging and disruptive impacts from heavy snow and blizzards as well as occasional nor'easters and ice storms. Per local records, the Town experienced 15 major winter storm events since the 2015 plan was completed.  |
| <b>Geologic Hazards</b><br>- Earthquake<br>- Landslide                  | Although not of great concern, the earthquake hazard remains a potential risk for the Town to consider in its mitigation planning efforts, particularly as it relates to older structures and unreinforced masonry buildings. Landslide is not considered a hazard of concern for Wilmington as noted in the 2015 risk assessment and based on the low frequency of occurrence and very limited potential impacts. Following further discussion and evaluation with the MVP/HMP Core Team it was determined that landslide would not be profiled in the 2021 plan update. |
| <b>Fire Related Hazards</b><br>- Brush Fires                            | Small brush fires remain a continuous threat for Wilmington but haven't grown to the size of destructive wildfires. The Fire Department responds to events throughout the year and especially during dry periods but effectively prevents rapid spread through their fire suppression efforts.  |
| <b>Other Natural Hazards</b><br>- Extreme Temperatures<br><br>- Drought | Extreme temperatures remain a town-wide concern for Wilmington, based primarily on the public health threats to more vulnerable populations. Extreme cold events are a frequent occurrence during winter and extreme heat events are considered an increasing hazard threat. Although drought emergencies have been an infrequent occurrence for the Town, both extreme heat and drought events are projected to become more frequent and severe in the future based on the anticipated effects of climate change.  |

The next step was to review the recently updated Massachusetts State Hazard Mitigation and Climate Adaptation Plan of September 2018. The list of hazards from the State Plan are included in Table 4, along with the rationale for including or excluding them in the Town of Wilmington's plan update.

Table 4. Rationale for Including Hazards Listed in the State Plan

| MA State Plan Hazards               | Town of Wilmington Rationale for Inclusion/Exclusion   |
|-------------------------------------|--|
| <b>Inland Flooding</b>              | Flooding is a significant concern for specific parts of Town, particularly for low-lying and developed areas in proximity to water bodies and wetlands. Inadequate stormwater systems (including undersized culverts) also remain an ongoing concern.  |
| <b>Drought</b>                      | Drought is a relatively low but potentially increasing risk to the region.   |
| <b>Landslide</b>                    | All of Wilmington has been classified by the State as having a low risk for landslides, and local officials did not identify any past events or significant issues related to landslides. As noted in Table 1 it was determined by the MVP/HMP Core Team that landslide would be excluded from the 2021 plan update.   |
| <b>Coastal Flooding</b>             | Not applicable to Wilmington as a non-coastal community.   |
| <b>Coastal Erosion</b>              |  |
| <b>Tsunami</b>                      |  |
| <b>Average/Extreme Temperatures</b> | Wilmington has experienced summer temperatures over 100 °F and numerous heat waves. Extreme temperatures remain a significant risk to vulnerable populations and are of increasing concern due to future climate change projections.   |
| <b>Wildfires</b>                    | Wildfires are not considered a major risk to Wilmington; however, there are some large areas of Wildland Urban Interface (WUI) throughout Town, including mostly intermix areas (where housing and vegetation intermingle). Several specific sites have also been identified as having the highest potential for brush fires based on past occurrences and their potential for dried vegetation growth. This, coupled with projected increases in extreme heat and dry climate conditions, suggest that future wildfire events are possible. |
| <b>Invasive Species</b>             | Among the more prevalent invasive species found in Wilmington are oriental bittersweet, glossy and common buckthorn, various honeysuckles, Japanese knotweed, multiflora rose, common reed, purple loosestrife, and Norway maple. Invasive species threaten  |

| MA State Plan Hazards   | Town of Wilmington Rationale for Inclusion/Exclusion  |
|---|---|
|   | the integrity of natural communities and may become a greater problem in the future because of climate change.  |
| <b>Hurricanes/Tropical Storms</b>   | Hurricanes and tropical storms have occurred in the past and continue to be a risk for the region.  |
| <b>Severe Winter Storm/Nor'easter</b>   | Severe winter storms are a risk to the Town every year.   |
| <b>Tornadoes</b>  | Tornadoes continue to be a low-probability but potentially high consequence event for the area.   |
| <b>Other Severe Weather (including strong wind and extreme precipitation)</b> | Wilmington has experienced large storms with high winds and extreme precipitation, including damaging ice and hailstorms. Severe weather is an increasing threat as future storms are projected to occur with more intensity due to climate change. |
| <b>Earthquake</b>   | Wilmington is considered to have a low risk to earthquakes; however, the consequences of a low-probability event could still result in moderate to significant impacts to the community.  |
| <b>Dam Failure</b>  | Although there are no state-regulated dams in Wilmington, there is high hazard dam in the neighboring Town of Burlington for which portions of Wilmington are in potential dam failure inundation zones.  |

For purposes of Wilmington's MVP Workshop, participants focused on the following top four climate-related natural hazards that were determined to be the greatest concerns for the community. These four hazards have already had demonstrated impacts on the Town, and as climate change progresses, these hazards are expected to have ever greater consequences for infrastructure and environment, as well as for various societal elements.

- Flooding
- High Winds / Tornadoes
- Extreme Winter Events / Nor'easters
- Extreme Summer Temperatures / Heat Waves / Drought

The Massachusetts State Hazard Mitigation and Climate Adaptation Plan grouped hazards according to primary climate change interactions. These categories are also consistent with the Commonwealth's Resilient Massachusetts Climate Change Clearinghouse website ([www.resilientma.org](http://www.resilientma.org)). To ensure consistency with the State Plan and to emphasize the impact of climate change on hazards, this plan

uses these four categories to group hazards. All hazards identified for the Town of Wilmington fit into one of these categories with the exceptions of earthquake, which is considered a non-climate induced hazard, and dam failure, which is considered a technological/human-caused hazard. The four categories and definitions are included in Table 5.

Table 5. Definitions of Climate Change Interactions

| Climate Change Interaction         | Definition   |
|------------------------------------|--|
| 1. <b>Changes in Precipitation</b> | Changes in the amount, frequency, and timing of precipitation—including both rainfall and snowfall—are occurring across the globe as temperatures rise and other climate patterns shift in response.   |
| 2. <b>Sea Level Rise</b>           | Climate change will drive rising sea levels, and rising seas will have wide-ranging impacts on communities, natural resources, and infrastructure along the Commonwealth’s 1,519 tidal shoreline miles. <i>*Not applicable for Wilmington</i>  |
| 3. <b>Rising Temperatures</b>      | Average global temperatures have risen steadily in the last 50 years, and scientists warn that the trend will continue unless greenhouse gas emissions are significantly reduced. The nine warmest years on record all occurred in the last 20 years (2017, 2016, 2015, 2014, 2013, 2010, 2009, 2005, and 1998), according to the U.S. National Oceanographic and Atmospheric Administration (NOAA). |
| 4. <b>Extreme Weather</b>          | Climate change is expected to increase extreme weather events across the globe as well as in Massachusetts. There is strong evidence that storms—from heavy downpours and blizzards to tropical cyclones and hurricanes—are becoming more intense and damaging and can lead to devastating impacts for residents across the state.   |

The final list of hazards for this plan is shown in the Table below, sorted according to climate change interaction. In addition to the hazards addressed earlier the Town has added *Infectious Disease* as a new hazard.

Table 6. Town of Wilmington Hazards

| Primary Climate Change Interactions  | Hazards   |
|--------------------------------------|---|
| Changes in Precipitation             | Flooding ( <i>including riverine and urban/stormwater related flooding, etc.</i> )<br><br>Drought   |
| Rising Temperatures                  | Average/Extreme Temperatures<br><br>Wildfires ( <i>including brush fires</i> )<br><br>Invasive Species<br><br>Infectious Disease  |
| Extreme Weather                      | Hurricanes/Tropical Storms<br><br>Severe Winter Storm/Nor'easter ( <i>including heavy snow, blizzards, and ice storms</i> )<br><br>Tornadoes<br><br>Other Severe Weather ( <i>including severe thunderstorms, high winds, lightning, hail, etc.</i> ) |
| Non-Climate Influenced Hazards       | Earthquake  |
| Technological / Human Caused Hazards | Dam Failure   |

## Hazard Profiles

The next step in the risk assessment process was to develop hazard profiles. These were developed to be consistent with Element B, Hazard Identification and Risk Assessment, from 44 C.F.R. 201.6.

*B1. Does the plan include a description of the type, location, and extent of all natural hazards that can affect each jurisdiction(s)? (requirement §201.6(c)(2)(i))*

*B2. Does the plan include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction? (requirement §201.6(c)(2)(i))*

*B3. Is there a description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction? (requirement §201.6(c)(2)(ii))*

The hazard profiles have been organized by primary climate change interaction and include the following sections: Hazard Description, Location, Extent, Previous Occurrences, Probability of Future Events and Changes Since the Previous Plan, and Impact on the Community and Vulnerability. Impacts of climate change were added to the end of each hazard section. A description of each of these analysis categories is provided in Table 7. Data for these sections comes from three primary sources: the 2015 Hazard Mitigation Plan Update as prepared by Metropolitan Area Planning Council (MAPC), the 2018 Massachusetts State Hazard Mitigation and Climate Adaptation Plan, and the Town of Wilmington's 2020 MVP planning process and findings. Supplemental data on previous hazard occurrences from NOAA's Storm Events Database and other official State or Federal datasets as cited throughout this chapter. Lastly, several Town of Wilmington employees and MVP/HMP Core Team members gathered and provided best available data in support of the hazard profiles.

*Table 7. Categories for Hazard Analysis*

| <b>Categories</b>   | <b>Definition</b>  |
|---|--|
| <b>Hazard Description</b>   | A basic description of each hazard.  |
| <b>Location</b>   | Location refers to the geographic areas within the planning area that are affected by the hazard. Some hazards affect the entire planning area universally, while others apply to a specific portion, such as a floodplain or area that is susceptible to wildfires. |
| <b>Extent</b>   | Extent describes the strength or magnitude of a hazard. Where appropriate, extent is described using an established scientific scale or measurement system. Other descriptions of extent include water depth, wind speed, and duration.                              |
| <b>Previous Occurrences</b>   | Previous hazard events that have occurred are described. Depending on the nature of the hazard, events listed may have occurred on a local or regional level.  |
| <b>Probability of Future Events and Changes Since the Previous Plan</b> | The likelihood of a future event for each natural hazard and any significant changes to probability since the previous plan are listed.  |

| Categories                                       | Definition   |
|--|--|
| <b>Impact on the Community and Vulnerability</b> | Described by stakeholders and inferred from data analysis. |

## Changes in Precipitation

### *Flooding*

#### Hazard Description

As during the 2015 hazard mitigation plan update, flooding was the most prevalent serious natural hazard identified by local officials in Wilmington. In summary, flooding in the Town is primarily a result of excessive precipitation and stormwater runoff overwhelming the capacity of natural and structured drainage systems to convey water, causing it to overflow the system. Flooding in Wilmington is caused by precipitation associated with severe rainstorms, thunderstorms, nor'easters, and hurricanes.<sup>27</sup>

As described in the Planning Area Profile (Chapter 2), the Town of Wilmington has an extensive system of water resources that includes streams, lakes, ponds, aquifers, vernal pools, and wetlands. The vast majority (81%) of the Town lies within the Ipswich River Watershed; with remaining areas nearly split between the Shawsheen and Aberjona/Mystic River basins. The principal streams of Wilmington are the Ipswich River and its tributaries. The Ipswich River (Mill Brook), Lubbers Brook, Sawmill Brook, Maple Meadow Brook, Patches' Pond Brook, and Cold Spring Brook flow from the Burlington town line to central and north-central Wilmington, converge, and continue eastward. In northeast Wilmington, several important springs feed the bogs of Nod Pond, which constitutes the major area of the Brown's Crossing well field. Martins Brook flows through this area from Martins Pond in North Reading and converges with the Ipswich River further downstream.<sup>28</sup>

Historically, excessive rainfall alone, or in combination with, snowmelt runoff has produced flooding in low-lying areas across Middlesex County.<sup>29</sup> Severe storms that include heavy amounts of rain can pose significant flooding threats to Wilmington regardless of the time of year. These may include three different types of storms as generally defined below.

- Continental storms are typically low-pressure systems that can be either slow- or fast-moving. These storms originate from the west and occur throughout the year.
- Coastal storms, also known as nor'easters, usually occur in late summer or early fall, and originate from the south. The most severe coastal storms—hurricanes—occasionally reach

<sup>27</sup> Town of Wilmington, Hazard Mitigation Plan Update. 2015. P. 23.

<sup>28</sup> Town of Wilmington, Open Space and Recreation Plan. July 2015. P. 32.

<sup>29</sup> Flood Insurance Study for Middlesex County. Federal Emergency Management Agency. July 2016. P. 24.



Massachusetts and generate very large amounts of rainfall. This was the case for Middlesex County in 1938, 1955, and 1958.

- Thunderstorms form on warm, humid summer days and cause locally significant rainfall, usually over the course of several hours. These storms can form quickly and are more difficult to predict than continental and coastal storms.

Flooding in Middlesex County may be caused or worsened by a number of other human-caused factors, including inadequate and deteriorated river channels, constricting culverts and bridges, inadequate storm drain discharge, increased development, topographic conditions, and undersized culverts.<sup>30</sup>

Previous flood events in Middlesex County indicate that flooding can occur during any season of the year. Most major floods have occurred during March or April and are usually the result of heavy spring rains and snowmelt or occasional ice jams. Floods occurring during mid to late summer are often associated with coastal storms moving up the Atlantic coastline, with more localized flooding caused by summer thunderstorms. While there have not been any recorded incidents in Wilmington, flooding may also occur from a dam breach or failure as discussed later in this chapter.

#### Location

Floodplains are delineated by the Federal Emergency Management Agency (FEMA) on the basis of topography, hydrology, and development characteristics of the area. Within Wilmington, there are many large areas considered to be special flood hazard areas as delineated by FEMA's Flood Insurance Rate Map (FIRM). These high-risk areas include what has been determined to be the 1 percent annual chance flood zone for Wilmington, commonly referred to as the 100-year floodplain. Figure 7 illustrates Wilmington's various flood hazard zones according to the Town's currently effective FIRM.<sup>31</sup> Full descriptions for these areas are provided in the *Extent* portion of this section. It is also worth noting that the latest FEMA Flood Insurance Study (FIS) and FIRM for Middlesex County is dated July 6, 2016; however, many of the hydrologic and hydraulic analyses completed for Wilmington were completed long before (in the 1980s and 1990s). Therefore, some of the data used to generate the currently effective FIRM is outdated and may not accurately depict current flood risks, nor does it depict anticipated future risks based on climate change, changes in development patterns, or other projected future conditions.

Wilmington has established a Floodplain District to prevent and mitigate the impacts of flooding. The Floodplain District is an overlay district that includes the entire 100-year floodplain as designated and mapped by FEMA. Because of Wilmington's many streams and predominantly low elevation, a large proportion of town lies within the floodplain district.<sup>32</sup> The Town's many wetland areas generally become inundated in the spring and during floods, retarding the magnitude and timing of peak

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<sup>30</sup> Flood Insurance Study for Middlesex County. Federal Emergency Management Agency. July 2016. P. 25.

<sup>31</sup> The Flood Insurance Study for Middlesex County. Federal Emergency Management Agency. July 2016.

<sup>32</sup> Town of Wilmington, Master Plan, September 2001. P. 37.

discharges. The water retention functions of wetlands also contribute to aquifer recharge, especially during drier years.<sup>33</sup>

While not a widespread problem in Wilmington, flooding certainly occurs in some parts of Town, particularly in areas where houses were built in or near wetlands. Many homeowners must deal with basement flooding during wet springs or in rainy spells. Maple Meadow Brook flows over Wildwood Street when the river is already high and a major rain occurs (including October 1996, June 1998, March 2001, May/June 2006, and March 2010), the Ipswich River flows over Canal Street and the parking lot along Main Street built in its floodway, and Lubbers Brook has flooded Concord Street. There also is periodic flooding in other parts of town as further noted below.<sup>34</sup>



Canal Street flooding in 2010. *Image courtesy of Town of Wilmington.*

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<sup>33</sup> Ibid. P. 98.

<sup>34</sup> Town of Wilmington, Open Space and Recreation Plan. July 2015. P. 52.

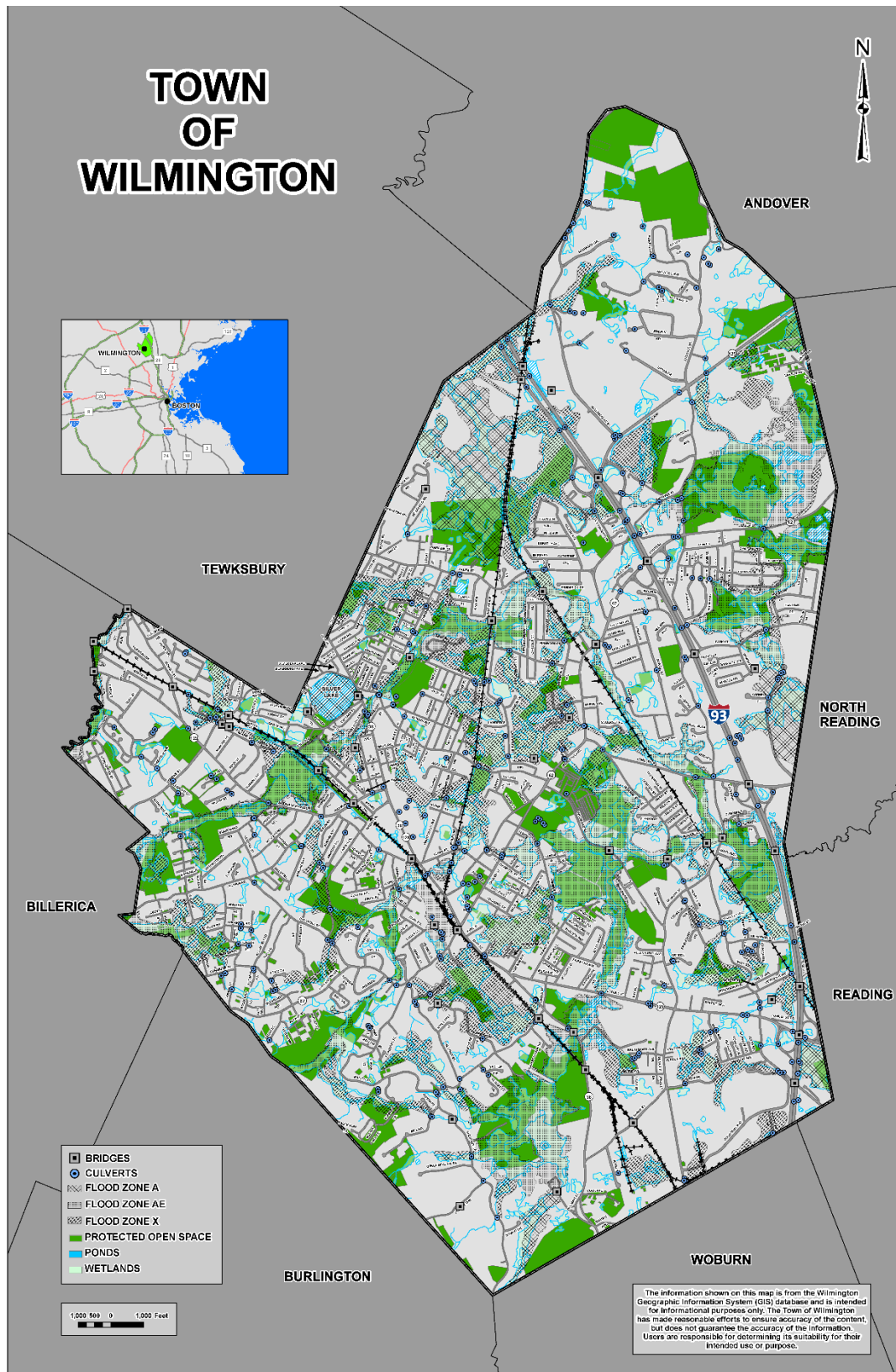


Figure 7. FEMA Flood Zone Map

Specific locations in Wilmington that have been identified in the past as subject to high-risk flood hazards include the areas listed below. All these areas do not necessarily coincide with the flood zones from the Town's effective FIRM maps. Some may be areas that flood due to inadequate drainage systems or other local conditions rather than location within a flood zone.<sup>35</sup>

- Wildwood Street/Meadow Brook: This area did not receive mitigation. Town staff indicated that this is a low-lying area that does flood during larger precipitation events, but that fire access is not impeded, and less than five homes are impacted. Culvert enlargement is not practical as the area is so low.
- Concord Street: Another low-lying road area noted in the 2008 Plan. Access to Route 93 is blocked when this road floods but is usually passable. Culvert replacement may be feasible with roadway grade elevation adjustment.
- Route 62: North Reading and Wilmington signed a memo of understanding in 2010 to mitigate this site but implementation has not occurred. Installing a larger culvert as planned would only move the problem to a downstream neighborhood.
- Lubbers Brook: Lubbers Brook is a slow-moving brook with a shallow slope. Due to its slope and sedimentation, it often overflows in heavy rains and impacts homes within its floodplain.
- Main Street: No action has been taken by MA DOT to remediate since 2008 report. The area is not flooding but poor culvert design has led to sink holes in Wilmington House of Pizza parking area.
- Butters Row: A collapsed culvert on Butters Row backs up and floods, impacting 6 houses. The Town has listed replacing the culvert in its FY 2015 Capital Improvements Plan and work was completed in August 2015.
- North Street: Flooding- undersized/ partially blocked storm drain line surcharges onto the street, impacting one garage. Has been cleaned but continues to flood. Very low-lying area with little drainage head; enlarging the culver would have little impact.



Concord Street flooding. *Image courtesy of Town of Wilmington.*

In addition, there were several specific vulnerabilities or geographic areas of concern identified by Wilmington's MVP workshop participants, including those roadways, bridges, and culverts that encounter flooding issues at low points and/or are caused by undersized or structurally failing drainage systems. These areas include the following specific locations or community assets, some of which overlap with the locations noted above:

- Martins Brook Bridge/Culvert @ Route 62 (Salem Street): The culvert is prone to clogging; much of the flooding at this site occurs upstream in North Reading, however this is a critical roadway

<sup>35</sup> Town of Wilmington, Hazard Mitigation Plan Update. 2015. P. 24-25.



of concern to the Town. As noted above, previous studies to enlarge the culvert showed that this would increase flooding downstream in Wilmington, but the culvert is still in need of repair/reconstruction as well as routine maintenance for drainage clearance. Workshop participants also noted that the pipe culvert on Benevento Companies' property contributes to flooding upstream into the Martin's Pond area (privately-owned 84" culvert for which the Town has little information on).

- Lubbers Brook Culvert @ Middlesex Avenue: This culvert is failing and in need of repair/reconstruction. The Town has been awarded a MassWorks grant from EEA to accomplish this work and is currently in the design phase.
- Route 38 Culvert at Maple Meadow Brook: The Town has been getting calls from residents on Main Street located upstream of the Route 38 culvert, with complaints of high water. The Town has investigated it and hasn't noted any beaver activity or culvert clogging, so it's suspected that this could be an undersized culvert (requires further investigation).
- The Town maintains a list of many other culverts of concern. Other high priority culverts identified by the MVP/HMP Core Team regarding flooding impacts include those single culvert structures at Ainsworth Road (privately-owned), Glen Road (at Lubbers Brook), and Forest Street.
- Browns Crossing (current DPW Administration Building at 115 Andover Street): The structure is indirectly impacted by flooding from Martins Brook, as the entire building has been surrounded by floodwaters during past events (2006, 2011) and only made accessible by boat. The main structure is in the floodplain and future flooding is an increasing concern as extreme precipitation events become more frequent and severe.
- Wildwood Street/Meadow Brook: It was noted that it floods here often (one of the first streets that floods during flash flood events), and there is an electrical substation near the culvert. The substation is owned by Reading Municipal Light Department (RMLD) which is currently looking for alternative locations for it to be relocated (estimating this will take 1-4 years).
- Nichols Street: It also noted that the Shawsheen River also floods frequently in this area.
- Concord Street: This is a low-lying road that spans a very wide wetland area. A large Town-owned culvert has essentially created a pinch point with adjacent wetland areas. The area has flooded in the past as noted above.



Roadway flooding on Glen Road. *Image courtesy of Town of Wilmington.*

Finally, it was also noted by Town staff that many of the Town's smaller culverts create some of the most common problems during flash floods. Not all of these are undersized but rather get clogged by debris and/or beaver activity. Two primary concerns include Wildwood Street and Philips Avenue (west of Silver Lake) which are typically the first two roadways to be inundated with floodwaters during flash flood events.

## Extent

The severity of a riverine flood event is typically determined by a combination of several major factors, including stream and river basin topography and physiography; precipitation and weather patterns; recent soil moisture conditions; the degree of vegetative clearing; and impervious surface. The periodic flooding of lands adjacent to rivers, streams, and shorelines (floodplains) is a natural and inevitable occurrence that can be expected to take place based upon established recurrence intervals. The recurrence interval of a flood is typically defined as the average time interval, in years, expected between a flood event of a particular magnitude and an equal or larger flood. Flood magnitude (spatial extent and depths) increases with increasing recurrence intervals.

Floodplain areas are delineated according to the frequency of the flood that is large enough to cover them. For example, the 10-year floodplain will be covered by the 10-year flood and the 100-year floodplain by the 100-year flood. A more appropriate way of expressing flood frequency is the percent chance of occurrence in any given year (annual probability). For example, the so-called "100-year flood" has a 1 percent chance of occurring in any given year, and the 500-year flood has a 0.2 percent chance of occurring in any given year. Statistically, the 1 percent annual chance flood has a 26 percent chance of occurring during a 30-year period, equal to the duration of many home mortgages. Contrary to what the term suggests, a "100-year flood" is not a flood that occurs only once every 100 years. A "100-year flood" can and often does occur in the same location multiple times in a century.

Special flood hazard areas identified on FEMA FIRMs (as shown as Zones A and AE in Figure 7) are defined as the areas that will be inundated by the flood event having a 1 percent chance of being equaled or exceeded in any given year. The 1-percent-annual-chance flood is also referred to as the base flood elevation (BFE) and is the national minimum standard for applying FEMA's NFIP regulations and mandatory flood insurance purchase requirements. Areas shown to be inundated by the 0.2-percent-annual-chance flood are considered moderate flood hazard areas, and areas outside of these areas are considered minimal flood hazard areas.

## Previous Occurrences

According to the State Hazard Mitigation and Climate Adaptation Plan, Middlesex County has had 14 federally declared flood-related disasters since 1954.<sup>36</sup> Most of this flooding occurred during severe storms during the fall, winter, and spring months.<sup>37</sup> Many additional flood events have occurred in the region but did not result in a federal disaster declaration.

Local data for previous flooding occurrences are not collected by the Town of Wilmington. The best available local data is for Middlesex County through the NOAA's Storm Events Database. Per NOAA's database records, Middlesex County experienced a total of 205 flood events which have caused an estimated \$57 million in property damages since 1996.<sup>38</sup> Notable events for the area include flooding

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<sup>36</sup> Massachusetts State Hazard Mitigation and Climate Adaptation Plan. September 2018. P. 4-9.

<sup>37</sup> Flood Insurance Study for Middlesex County. Federal Emergency Management Agency. July 2016. P. 29.

<sup>38</sup> NOAA's Storm Events Database: <https://www.ncdc.noaa.gov/stormevents/>

from severe storms in October 1996, June 1998, April 2001, April 2004, October 2005, May 2006, and March 2010. The May 2006 “Mother’s Day Flood” damaged 14,000 homes in 44 communities, including Middlesex County.

The March 2010 flood event was one the most severe in recent memory for Wilmington, after a total of nearly 15 inches of rainfall accumulation was recorded by the National Weather Service. One indication of the extent of flooding is the gage height at the nearest USGS streamflow gauging station, which is on the Ipswich River in South Middleton. The USGS gage height exceeded 8 feet on March 16, 2010 and exceeded 7 feet on March 31, 2010. Normal gage height in March is about 4 feet.<sup>39</sup> The Shawsheen River also exceeded flood stage by more than 3 feet during this event. Numerous streets in Wilmington were closed to through traffic after the Shawsheen went well over its banks, and the Town’s Fire Department pumped water out of several basements. Wilmington’s MBTA Commuter Rail Station was also flooded and closed for several days.<sup>40</sup>

Looking further back in time there have been numerous other flood events recorded for the region, though little data on impacts specific to Wilmington exist. The flood of August 1955 resulted from two hurricanes that arrived almost concurrently—Hurricane Connie, occurring between August 11 and 15; and Hurricane Diane occurring between August 17 and 20. As a result of these two storms, roads and bridges were overtopped, and residences and businesses were flooded. Further, significant recorded floods were those occurring in May 1850, December 1878, July 1891, July 1897, February and March 1900, November 1927, March 1936, July and September 1938, October 1942, October 1955, April 1960, March 1968, and January 1979.<sup>41</sup>

### Probability of Future Events and Changes Since the Previous Plan

Based on historical data and projected future conditions, flooding will remain a *likely* occurrence in Wilmington (between 10 and 90 percent annual probability). In addition to a changing climate which has already increased the frequency of heavy rainfall events, aging infrastructure—specifically antiquated pipes, storm drains and undersized or failing culverts—will continue to increase the probability and magnitude of flooding events. As precipitation events become more intense and less predictable, the Town’s older and undersized stormwater systems are expected to pose a greater threat of failure and flooding.

### Impact on the Community and Vulnerability

The most frequent and recurring problem associated with flood-related hazard events in Wilmington is roadway flooding, culvert backflows, and ponding issues in low-lying areas across Town. These problems result in road closures and erosion and sedimentation issues (affecting surface water runoff quality), along with similar localized impacts. Larger but less frequent storm events can result in the flooding of residential and commercial properties located in many of these same areas and older (pre-FIRM)

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<sup>39</sup> Town of Wilmington, Hazard Mitigation Plan Update. 2015. P. 25.

<sup>40</sup> Wilmington Town Crier. Wednesday, March 17, 2010. P. 16.

<sup>41</sup> Flood Insurance Study for Middlesex County. Federal Emergency Management Agency. July 2016. P. 24-25.

developments in the floodplain and/or along wetland areas or riparian buffers. Flooded basements remain an ongoing concern for many older structures located near existing water resources. In terms of Town-owned facilities, the current DPW Administration Building is an ongoing concern due to its proximity to Martins Brook and historical flood events that have made it inaccessible by vehicle due to roadway flooding. The Town experiences no issues with any flooding of sewer pump stations, and all have been identified as having backup generators and power on-site.

Historically Wilmington's extensive wetland system is credited with retaining storm flows and absorbing runoff. As the Town develops, and more land is rendered impervious, the natural hydrology of the area will be altered so that less water is recharged into the ground, thus causing higher flood water levels and more rapid runoff into Wilmington's brooks and streams. In addition, fragmentation of the wetlands will lessen their ability to store storm water, resulting in higher flood peaks and lower groundwater reserves. Wilmington Conservation Commission has required recharge for roof runoff for houses in subdivisions as well as in the buffer zone to wetlands for many years. More importantly, the Town is implementing a stormwater bylaw passed in 2009, which requires infiltration for disturbance for any project of 20,000 square feet as well as a residential footprint increase of 600 square feet in an effort to increase groundwater recharge and decrease flooding.<sup>42</sup> The stormwater bylaw was revised in 2020.

### Impacts of Climate Change

As noted in the previous (2015) hazard mitigation plan update, global climate change has the potential to exacerbate these issues over time with the potential for changing rainfall patterns leading to heavier storms.<sup>43</sup> Climate scientists predict that in the next few decades, climate change will increase the frequency and intensity of all storms. According to the Massachusetts Climate Change Projections Report released by the Commonwealth in 2018, the Ipswich Basin is expected to see nearly 3 additional days with precipitation over 1 inch by the 2050s.<sup>44</sup>

### Drought

#### Hazard Description

Droughts can vary widely in duration, severity, and local impact. They may have widespread social and economic significance that require the response of numerous parties, including water suppliers, firefighters, farmers, and residents. Droughts are often defined as periods of deficient precipitation. How this deficiency is experienced depends on factors such as land use change, the existence of dams, and water supply withdrawals or diversions. For example, impervious surfaces associated with development can exacerbate the effects of drought due to decreased groundwater recharge.<sup>45</sup>

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<sup>42</sup> Town of Wilmington, Open Space and Recreation Plan. July 2015. P. 52.

<sup>43</sup> Town of Wilmington, Hazard Mitigation Plan Update. 2015. P. 19.

<sup>44</sup> Massachusetts Climate Change Projections. Northeast Climate Adaptation Science Center at UMass-Amherst. Published by Massachusetts Executive Office of Energy and Environmental Affairs. March 2018. P. 109.

<sup>45</sup> Massachusetts State Hazard Mitigation and Climate Adaptation Plan. September 2018. P. 4-38.



Drought should be considered relative to some long-term average condition of balance between precipitation and evapotranspiration (i.e., evaporation + transpiration) in a particular area. It is also related to the timing and the effectiveness of the rains (i.e., rainfall intensity, number of rainfall events). Other climatic factors, such as high temperature, high wind, and low relative humidity, can significantly aggravate its severity.

The beginning of a drought is difficult to determine. Several weeks, months, or even years may pass before drought conditions become apparent. The first evidence of drought is usually seen in record low levels of rainfall, and the soil moisture becomes unusually low. The effects of a drought on streamflow and water levels in lakes and reservoirs may not be noticed for several weeks or months. Groundwater levels may not reflect drought conditions for a year or two later. The end of a drought can occur as gradually as it began. Dry periods can last for 10 years or more.

### Location

Drought is an atmospheric hazard that may impact all of Wilmington, particularly as it relates to public drinking water supplies (i.e., shortages in local and/or regional supplies that result in water emergencies, local use restrictions, etc.). Agricultural areas with working farms and related industries often experience the greatest localized impacts due to drought, however this is a limited area of concern in Wilmington. Though Wilmington was once populated with a number of farms, there is currently only one active working farm (Foley Farm, a 5.6-acre parcel in the eastern part of Town with a small self-serve produce stand). Sciarappa Farm, a 62.5-acre parcel that abuts the Town of Andover has been inactive in recent years.

### Extent

The extent and severity of impacts caused by drought will vary greatly among different land uses, and for residents is largely based on where they get their water supply. As further described in the Planning Area Profile (Chapter 2), ninety-five percent of Wilmington is served by municipal wells while 5% of the population is still served by private wells. In these areas, drought may lead to the failure of individual wells and there is a significant financial cost to replace these wells.

In terms of classifying the severity of drought conditions, the U.S. Drought Monitor categorizes drought on a D0-D4 scale as shown in Table 8.

Table 8. U.S. Drought Monitor<sup>46</sup>

| Classification | Category            | Description  |
|----------------|---------------------|--|
| <i>D0</i>      | Abnormally Dry      | Going into drought: short-term dryness slowing planting and growth of crops or pastures. Coming out of drought: some lingering water deficits; pastures or crops not fully recovered |
| <i>D1</i>      | Moderate Drought    | Some damage to crops, pastures; streams, reservoirs, or wells low, some water shortages developing or imminent; voluntary water-use restrictions requested                           |
| <i>D2</i>      | Severe Drought      | Crop or pasture losses likely; water shortages common; water restrictions imposed  |
| <i>D3</i>      | Extreme Drought     | Major crop/pasture losses; widespread water shortages or restrictions  |
| <i>D4</i>      | Exceptional Drought | Exceptional and widespread crop/pasture losses; shortages of water in reservoirs, streams, and wells creating water emergencies  |

### Previous Occurrences

The Town of Wilmington hasn't been severely impacted by historic drought conditions, as the area generally has enough precipitation to support the demands residents and businesses place on water. That said, Town staff have noted that past drought events have impacted their ability to pump water. For example, during recent dry periods the Town has experienced lower production rate at well sites.

Periods of significant drought are also not unheard of in Massachusetts, as the state has experienced multi-year drought periods in 1879-83, 1908-12, 1929-32, 1939-44, 1961-69, 1980-83, and 2016-2017. Several less-severe droughts occurred in 1999, 2001, 2002, 2007, 2008, 2010, and 2014. As recently as October 2020, most of Massachusetts was experiencing mild drought conditions due to over six months of below normal rainfall and above normal temperatures.

The most severe drought on record in the Northeast was during 1961-69. Water supplies and agriculture were affected because of the severity and long duration of the drought. Precipitation was less than average beginning in 1962 for eastern Massachusetts. During this drought, several communities

<sup>46</sup> <https://droughtmonitor.unl.edu/About/AbouttheData/DroughtClassification.aspx>

declared water supply emergencies. As a point of reference, Quabbin Reservoir, the major water source for the metropolitan Boston area, reached 45% of capacity in 1967.

More recently, notable times of water stress in eastern Massachusetts (including Wilmington) include 1999-2000, 2002, 2012, 2016-17, and 2020. During these events rivers, streams, lakes, and ponds were most affected as many ran at record low levels during the spring run-off season, and there were periods of very high fire danger. While soil moisture was well below normal, little to no monetary losses to the agricultural sector were recorded for the region. The 2016-2017 drought was the most significant drought in Massachusetts since the 1960s. In many parts of the state, USGS data for streamflow and groundwater reached new record low levels for several consecutive months. In total, between 2001 and 2017, the Town of Wilmington experienced between 15-21 weeks in Extreme Drought (D3) conditions.<sup>47</sup>

### Probability of Future Events and Changes Since the Previous Plan

Massachusetts is often considered a “water-rich” state. Under normal conditions, regions across the state annually receive between 40 and 50 inches of precipitation and the Commonwealth has never received a Presidential Disaster Declaration for a drought-related disaster. However, Massachusetts has and will continue to experience extended periods of dry weather, from single-season events to multi-year events. Based on the data summarized above on previous occurrences, drought will continue to be considered a **possible** occurrence in the planning area (between 1-10 percent probability in the next year, or at least one occurrence in the next 10 years). This probability determination is also consistent with statewide data on drought occurrences.

Drought is a normal, recurrent feature of climate, although many erroneously consider it a rare and random event. It occurs in all climatic zones across the northeast, but each drought will affect subregions differently. Historically, most droughts in Massachusetts have started with dry winters rather than dry summers. However, based on recent climate projections this trend may shift the probability of future events to summer and fall seasons, particularly for what are anticipated to be more frequent, short-term drought occurrences.

### Impact on the Community and Vulnerability

Drought remains a serious threat to Wilmington in terms of both water quantity and water quality issues. Severe droughts could create challenges for Wilmington’s local water supply by reducing surface water storage and the recharge of groundwater supplies. The Town has seen past drought events impact their ability to pump water for public supply, and Town staff have indicated that they anticipate future droughts will continue to affect all four of the Town’s active wells in terms of their production rates.

MVP workshop participants expressed concern for the other vulnerabilities created by pulling surface waters from the Ipswich River and other flow-stressed rivers. It was noted that the neighboring Town of North Reading just switched from drawing waters from the Ipswich to the Shawsheen River, in part due to resiliency concerns. A separate but related concern was expressed for the Town’s local streams

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<sup>47</sup> Massachusetts State Hazard Mitigation and Climate Adaptation Plan. September 2018. P. 4-43 – 4-45.

(especially Martins and Lubbers Brook), which are vulnerable to running dry during drought conditions which could lead to wells becoming dry and contaminated. Town staff stated that during the most recent drought (2020) the Town drew a historic amount of water from the Massachusetts Water Resource Authority supply (beyond the contractual limit) to meet public water supply demand for Wilmington.

Droughts can also lead to cascading hazard impacts. For example, more frequent droughts could potentially exacerbate the impacts of localized flood events by damaging vegetation that could otherwise help mitigate flooding and the impacts of streambank erosion. Droughts may also weaken tree root systems, making them more susceptible to toppling during high wind events. Lastly, droughts may increase the likelihood, frequency, and intensity of wildfire events.

### Impacts of Climate Change

It is anticipated that the effects of climate change will result in an increase in the frequency, duration, and intensity of short-term droughts. According to the 2011 Massachusetts Climate Change Adaptation Report, by the end of the century and under the high emissions scenario, the occurrence of droughts lasting one to three months could go up by as much as 75 percent over existing conditions. Also, per the downscaled climate projections for the Ipswich Basin as made available by the Massachusetts Executive Office of Energy and Environmental Affairs (EOEEA) in 2018, both summer and fall seasons are expected to continue to experience the highest number of consecutive dry days. Annually the region is expected to experience an increase of up to 3 days in consecutive dry days by the end of the century.<sup>48</sup>

### Rising Temperatures

#### *Average/Extreme Temperatures*

#### Hazard Description

There is no universal definition for extreme temperatures. The term is relative to the usual weather in the region based on climatic averages. Extreme heat for Massachusetts is usually defined as a period of three or more consecutive days above 90 degrees Fahrenheit (°F), but more generally as a prolonged period of excessively hot weather which may be accompanied by high humidity. Extreme cold is also considered relative to the normal climatic lows in a region.<sup>49</sup>

#### Location

Extreme temperatures present a uniform threat to Wilmington in terms of the Town's general exposure, with the potential to impact large regions of the state. According to NOAA, Massachusetts is made up of three climate divisions: Western, Central, and Coastal. Average annual temperatures vary slightly over the divisions, with annual average temperatures of around 46°F in the Western division (area labeled

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<sup>48</sup> Massachusetts Climate Change Projections. Northeast Climate Adaptation Science Center at UMass-Amherst. Published by Massachusetts Executive Office of Energy and Environmental Affairs. March 2018. P. 110.

<sup>49</sup> Massachusetts State Hazard Mitigation and Climate Adaptation Plan. September 2018. P. 4-143-144.

“1” in Figure 8), 49°F in the Central division (area labeled “2”), where Wilmington is located, and 50°F in the Coastal division (area labeled “3”).<sup>50</sup>

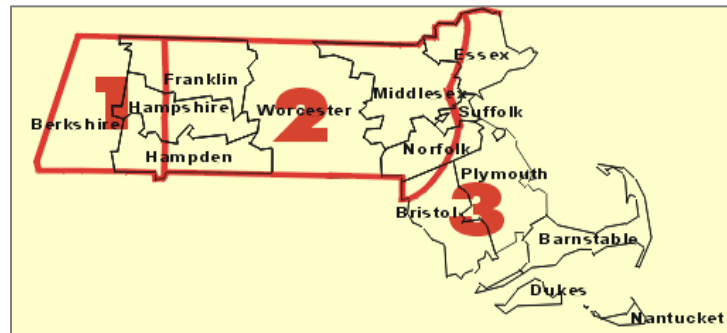


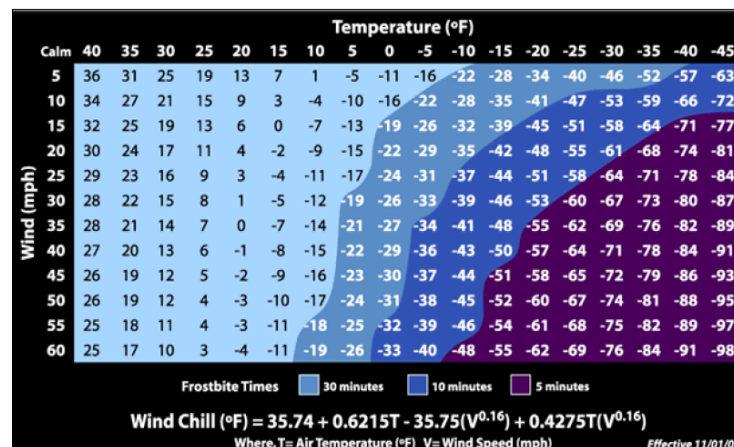
Figure 8. NOAA Climate Divisions

### Extent

According to the Massachusetts State Hazard Mitigation and Climate Adaptation Plan, extreme temperatures are relative to the region being studied. For Massachusetts, extreme heat is considered three or more consecutive days of temperatures above 90 degrees. Extreme cold is less well defined and relative to wind chill. On average, Massachusetts experiences the highest consecutive days of heat in July, and the lowest consecutive days of cold in January.

*Wind chill temperature* is the temperature people and animals feel when outside, and it is based on the rate of heat loss from exposed skin by the effects of wind and cold.

Figure 9 shows three shaded areas of frostbite danger. Each shaded area shows how long a person can be exposed before frostbite develops. In Massachusetts, a wind chill warning is issued by the National Weather Service (NWS) when the Wind Chill Temperature Index, based on sustained wind, is –25°F or lower for at least three hours.



<sup>50</sup> Massachusetts State Hazard Mitigation and Climate Adaptation Plan. September 2018. P. 4-149.

Figure 9. Wind Chill Temperature Index<sup>51</sup>

For extremely hot temperatures, the Heat Index Scale is used, which combines relative humidity with actual air temperature to determine risk to humans. The NWS issues a Heat Advisory when the Heat Index is forecast to reach 100-104 °F for two or more hours. The NWS issues an Excessive Heat Warning if the Heat Index is forecast to reach 105+ °F for two or more hours. Figure 10 indicates the relationship between heat index and relative humidity.

| Relative Humidity (%) |     | 80              | 82 | 84   | 86  | 88  | 90  | 92  | 94  | 96  | 98  | 100 | 102 | 104 | 106 | 108 | 110 |
|-----------------------|-----|-----------------|----|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                       | 40  | 80              | 81 | 83   | 85  | 88  | 91  | 94  | 97  | 101 | 105 | 109 | 114 | 119 | 124 | 130 | 136 |
|                       | 45  | 80              | 82 | 84   | 87  | 89  | 93  | 96  | 100 | 104 | 109 | 114 | 119 | 124 | 130 | 137 |     |
|                       | 50  | 81              | 83 | 85   | 88  | 91  | 95  | 99  | 103 | 108 | 113 | 118 | 124 | 131 | 137 |     |     |
|                       | 55  | 81              | 84 | 86   | 89  | 93  | 97  | 101 | 106 | 112 | 117 | 124 | 130 | 137 |     |     |     |
|                       | 60  | 82              | 84 | 88   | 91  | 95  | 100 | 105 | 110 | 116 | 123 | 129 | 137 |     |     |     |     |
|                       | 65  | 82              | 85 | 89   | 93  | 98  | 103 | 108 | 114 | 121 | 128 | 136 |     |     |     |     |     |
|                       | 70  | 83              | 86 | 90   | 95  | 100 | 105 | 112 | 119 | 126 | 134 |     |     |     |     |     |     |
|                       | 75  | 84              | 88 | 92   | 97  | 103 | 109 | 116 | 124 | 132 |     |     |     |     |     |     |     |
|                       | 80  | 84              | 89 | 94   | 100 | 106 | 113 | 121 | 129 |     |     |     |     |     |     |     |     |
|                       | 85  | 85              | 90 | 96   | 102 | 110 | 117 | 126 | 135 |     |     |     |     |     |     |     |     |
|                       | 90  | 86              | 91 | 98   | 105 | 113 | 122 | 131 |     |     |     |     |     |     |     |     |     |
|                       | 95  | 86              | 93 | 100  | 108 | 117 | 127 |     |     |     |     |     |     |     |     |     |     |
|                       | 100 | 87              | 95 | 103  | 112 | 121 | 132 |     |     |     |     |     |     |     |     |     |     |
| Category              |     | Heat Index      |    | Health Hazards   |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Extreme Danger        |     | 130 °F – Higher |    | Heat Stroke or Sunstroke is likely with continued exposure.  |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Danger                |     | 105 °F – 129 °F |    | Sunstroke, muscle cramps, and/or heat exhaustion possible with prolonged exposure and/or physical activity.  |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Extreme Caution       |     | 90 °F – 105 °F  |    | Sunstroke, muscle cramps, and/or heat exhaustions possible with prolonged exposure and/or physical activity. |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Caution               |     | 80 °F – 90 °F   |    | Fatigue possible with prolonged exposure and/or physical activity.   |     |     |     |     |     |     |     |     |     |     |     |     |     |

Figure 10. Heat Index<sup>52</sup>

## Previous Occurrences

According to the State Hazard Mitigation and Climate Adaptation Plan, there have been 33 extreme cold weather events in Massachusetts since 1994. Extreme cold/wind chill events were reported in February 2016 in many climate zones across the state, including Middlesex County where many locations reported wind chills between 25 and 35 degrees below zero. There have been 43 warm weather events since 1995. In 2012, Massachusetts temperatures broke 27 heat records in June. According to NOAA's Storm Events Database, Middlesex County most recently experienced excessive heat events in July 2010 and July 2013 (including heat index values above 105 degrees). The 2013 heat wave lasted four days resulted in one casualty in Middlesex County (City of Medford) when a 45-year-old postal worker died as a result of heat illness.

According to Town staff and MVP stakeholders, the Town of Wilmington has experienced increasing impacts from extreme heat events, including the need to more frequently open and extend hours for emergency cooling shelters for residents of all ages.

<sup>51</sup> Massachusetts State Hazard Mitigation and Climate Adaptation Plan. September 2018. P. 4-146.

<sup>52</sup> Massachusetts State Hazard Mitigation and Climate Adaptation Plan. September 2018. P. 4-147.

### Probability of Future Events and Changes Since the Previous Plan

Extreme temperatures are considered a **likely** future occurrence for Wilmington (between 10 and 90 percent annual probability). It is anticipated that the effects of climate change will result in an increase in the frequency, duration and intensity of extreme heat events, and a decrease in the frequency of extreme cold events. Heat waves are projected to become much more commonplace in a warmer future with potentially major implications for human health, particularly as it relates to more vulnerable populations such as children, seniors, lower income residents, and those already dealing with respiratory or other health problems.

### Impact on the Community and Vulnerability

Extreme temperatures place vulnerable populations at increased risk, such as children, seniors, lower income residents, and those already dealing with respiratory or other health problems. Wilmington's senior and aging population was cited as a particular concern for the Town to consider by the MVP/HMP Core Team. Fortunately, Wilmington's Department of Elderly Services is committed to continuously advocating, promoting, and providing services to Wilmington citizens aged 60 and over. These services contribute to the well-being of seniors in many ways including and beyond extreme temperature events and other local emergencies. The Town also operates multiple facilities that can open as emergency heating or cooling shelters when needed.

### Impacts of Climate Change

Climate change is known to increase incidences of extreme temperatures. Table 9 is taken from the Massachusetts Climate Change Projections Report released by EOEEA in 2018. The table shows that for the Ipswich Basin (where Wilmington is located) not only are the average temperatures increasing, but the total number of high heat days is increasing.<sup>53</sup>

Table 9. Average/Extreme Temperature Figures

| Merrimack Basin                    | Observed<br>Baseline<br>1971-<br>2000 | Projected Change<br>in 2030s | Projected<br>Change<br>in 2050s | Projected Change<br>in 2070s | Projected Change<br>in 2090s |
|------------------------------------|---------------------------------------|------------------------------|---------------------------------|------------------------------|------------------------------|
| Average Annual<br>Temperature (°F) | 49.5                                  | +2.1<br>to<br>+4.3           | +2.7<br>to<br>+6.2              | +3.3<br>to<br>+8.9           | +3.6<br>to<br>+10.8          |

<sup>53</sup> Massachusetts Climate Change Projections. Northeast Climate Adaptation Science Center at UMass-Amherst. Published by Massachusetts Executive Office of Energy and Environmental Affairs. March 2018. P. 105-107.

| Merrimack Basin   | Observed<br>Baseline<br>1971-<br>2000 | Projected Change<br>in 2030s | Projected<br>Change<br>in 2050s | Projected Change<br>in 2070s | Projected Change<br>in 2090s |
|---|---------------------------------------|------------------------------|---------------------------------|------------------------------|------------------------------|
| Annual Days with<br>Maximum<br>Temperature<br>over 90°F (Days)  | 7                                     | +6<br>to<br>+17              | +8<br>to<br>+31                 | +10<br>to<br>+50             | +12<br>to<br>+69             |
| Annual Days with<br>Minimum<br>Temperature<br>below 32°F (Days) | 130                                   | -12<br>to<br>-28             | -18<br>to<br>-42                | -21<br>to<br>-55             | -23<br>to<br>-66             |

## Wildfires

### Hazard Description

A wildfire can be defined as any non-structural fire in vegetative wildland that contains grass, shrub, leaf litter, and forested tree fuels. Wildfires in Massachusetts are caused by natural events, human activity, or prescribed fire. Wildfires often begin unnoticed but spread quickly, igniting brush, trees, and, potentially, homes.

The wildfire season in Massachusetts usually begins in late March and culminates in early June, corresponding with the driest live fuel moisture periods of the year. April is historically the month in which wildfire danger is the highest. Drought, snowpack level, and local weather conditions impact the length of the fire season.<sup>54</sup>

### Location

Wildfires are a natural part of the Massachusetts ecosystem. Increasingly, however, development is encroaching into isolated areas and wildfires present a danger to human life and manmade facilities. This trend is further validated by current wildfire hazard mapping data which show a large and increasing amount of Wildland-Urban Interface (WUI) zones across the state.

Figure 11 shows the location of WUI zones in Wilmington as mapped in 2010 by the SILVIS Laboratory at the University of Wisconsin and as included in the Massachusetts State Hazard Mitigation and Climate Adaptation Plan. These hazard areas include two types of WUI zones: intermix and interface. Intermix

<sup>54</sup> Massachusetts State Hazard Mitigation and Climate Adaptation Plan. September 2018. P. 4-171.



areas are described as areas where housing and vegetation intermingle (shown in orange in Figure 5); interface areas are described as areas with housing in the vicinity of contiguous wildland vegetation (shown in yellow in Figure 5).<sup>55</sup> As can be seen in the below figure, the majority of WUI zones as mapped for Wilmington are intermix areas both north and south of Town Center.

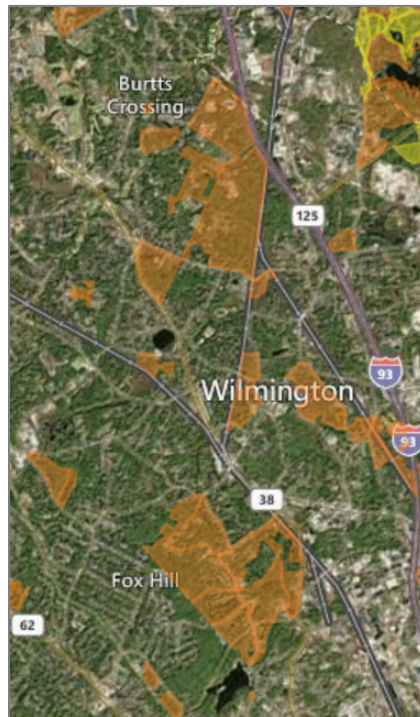


Figure 11. Wildland-Urban Interface (WUI) Map

The following areas of Town were identified as having the highest potential for wildfire and brush fire events based on past occurrences and their potential for the accumulation of dried vegetation growth:

- Wilmington Recycling Facility – Infrequent compost fires due to heat from composting; infrequent small brush fires caused by vandalism. The Town also uses this site for the temporary storage of vegetative debris, including following storm events, with an annual grinding and removal process (usually in April and prior to drier fire seasons). The debris is also stored on a stand-alone asphalt pad and not likely to spread to surrounding areas.
- Town Forest – Although the Town hasn't experienced significant fires in recent years, a major event lies in this general area. This is due to the combination of contiguous vegetation, limited accessibility for firefighting vehicles and equipment, and distance from the Town's lone fire station. Town Forest is in the northernmost jurisdictional limits of Wilmington and

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<sup>55</sup> Radeloff, V.C., R.B. Hammer, S.I. Stewart, J.S. Fried, S.S. Holcomb, and J.F. McKeefry. 2005. The Wildland Urban Interface in the United States. *Ecological Applications* 15: 799-805.

approximately 5 road miles from the Town's fire station in the central part of Town, so while there are other areas in Town that pose a threat, they are within a more reasonable response area timewise and have easier access for suppression.

- BMC Recycling Facility – Regional fire problem (located in neighboring Tewksbury): compost fires with limited access for fire vehicles.

### Extent

Wildfires can cause widespread damage to the areas they affect. They can spread very rapidly, depending on local wind speeds and be very difficult to get under control. Fires can last for several hours up to several days.

### Previous Occurrences

Several notable wildfires have occurred in Massachusetts history, although none has ever resulted in a FEMA disaster declaration. According to the previous plan and NOAA's Storm Events Database, there is no recorded history of damaging wildfire events in Middlesex County. However, according to the State Hazard Mitigation and Climate Adaptation Plan, wildfire risk for Middlesex County is considered high in many areas. Nearly 30% of the population in the county is considered to be in wildfire hazard areas.<sup>56</sup>

Although Wilmington has not experienced major wildfire events (or significant brush fires) in recent years, the Fire Department responds to approximately 75 brush fires annually. About 10 percent of these involve significant property damage but none have resulted in any deaths. Most fires are caused by careless disposal of cigarettes and by weather conditions such as lack of rainfall, winds, and lightning. Mulch beds were cited as common areas of ignition for previous occurrences.

### Probability of Future Events and Changes Since the Previous Plan

Wildfires (brush fires) will continue to be a **highly likely** occurrence in Wilmington (90-100 percent annual probability), though the magnitude and impact of most events will be contained due to early detection and fire suppression. The probability of future wildfire events is predicted to increase as the average numbers of dry days and those with extreme heat are projected to increase. The magnitude of future events will largely depend on weather, fuel conditions, and existing fire detection, control, and suppression capabilities.

### Impact on the Community and Vulnerability

Wilmington has several areas that have been delineated as having the highest risk of wildfires (shown as low density intermix in Figure 11), though the wildfire hazard presents a uniform risk throughout the community due to many developed areas abutting woodlands and other vegetated areas with a healthy tree canopy. Fortunately, the magnitude and impact of most wildfire events will be contained due to early detection and fire suppression. However, the potential for larger, destructive fires does exist for

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<sup>56</sup> Massachusetts State Hazard Mitigation and Climate Adaptation Plan. September 2018. P. 4-181.

Wilmington due to several factors including the availability of fuel, large concentrations of wood frame structures, and development within or alongside some heavily wooded areas of Town.

### Impacts of Climate Change

It is anticipated that the effects of climate change, including more frequent and prolonged drought conditions, will increase the frequency and intensity of wildfire events. Another related factor that is expected to increase the probability of future wildfire events is the introduction of disease, pests, and invasive plants that result in the dieback of mature tree species thus creating increased vegetative fuel loads in forested areas. In addition, lightning strikes may increase with climate change and can be responsible for igniting more wildfires.<sup>57</sup>

### Invasive Species

#### Hazard Description

Invasive species are defined as non-native species that cause or are likely to cause harm to ecosystems, economies, and/or public health (NISC 2006).<sup>58</sup> The Massachusetts Department of Agricultural Resources (DAR) recognizes sixty-nine (69) invasive species that are of particular concern in the Commonwealth. Massachusetts has a variety of laws and regulations in place that attempt to mitigate the impacts of these species. The Town of Wilmington also recognizes invasive species as one of the greatest threats to the integrity of natural communities, representing a direct threat to the survival of many indigenous species. For most species, eradication is possible only in the earliest stages of invasion.

#### Location

Like many communities statewide, Wilmington is home to a number of invasive plant species. These become a problem when they overgrow or outnumber native species, creating a monoculture and decreasing the diversity of species present. Invasive vegetation tends to spread quickly and thrive in disturbed conditions, outcompeting and displacing native species. Among the more prevalent invasive species in Wilmington are the oriental bittersweet, glossy and common buckthorn, various honeysuckles, Japanese knotweed, multiflora rose, common reed, purple loosestrife, and Norway maple. Some of these species can be found in hedgerows, along roadsides, in overgrown pastures and orchards, and in fallow fields in town. Purple loosestrife and phragmites, two non-native invasive species, have, unfortunately, taken root in many wetland areas throughout town.<sup>59</sup> The Town has also been managing European watermilfoil and curly leaf pondweed, both invasive species, in Silver Lake.<sup>60</sup>

#### Extent

Invasive species are a widespread problem throughout the state and may be monitored by observation. The State conducts surveillance to monitor the incidence of invasive species and has a variety of laws

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<sup>57</sup> Massachusetts State Hazard Mitigation and Climate Adaptation Plan. September 2018. P. 4-172.

<sup>58</sup> Massachusetts State Hazard Mitigation and Climate Adaptation Plan. September 2018. P. 4-188.

<sup>59</sup> Town of Wilmington, Open Space and Recreation Plan. July 2015. P. 36.

<sup>60</sup> Town of Wilmington, Open Space and Recreation Plan. July 2015. P. 53.

and regulations in place that attempt to mitigate their impacts. These impacts can range widely from general nuisance to causing severe harm and long-term ecological, economic, and social consequences if not properly managed or mitigated.

The Town of Wilmington has developed a five-year Vegetation Management Plan (VMP) to ensure compliance with state regulations for rights of way management (333 CMR 11) and for the control of hazard, detrimental, nuisance, and invasive vegetation in order to promote safe travel. The Town recently finished executing its first 5-year VMP (January 2014-December 2018) and is currently implementing its second 5-year term for the period of January 2020 through December 2024. The methods of vegetation management as proposed by the VMP include mechanical, chemical, cultural (good housekeeping techniques), and developmental control (through ongoing Community Development Technical Review Committee reviews of proposed site projects throughout Town). The number one priority of the plan is public safety. The VMP proposes an integrated approach whereby priority areas are identified for control, control methods are implemented in an environmentally responsible manner, and ongoing monitoring is performed to alter the treatment plans as needed.

### Previous Occurrences

Invasive species do not represent a singular event but rather an ongoing or emerging problem, so it is difficult to measure the frequency of occurrences. The Town undertook an invasive aquatic plant control program in 2009 to control a severe infestation of Eurasian watermilfoil. Curly-leaf pondweed was discovered in 2010.<sup>61</sup> Other more chronic infestations are managed on a continuous basis, including through the Town's VMP as described above.

### Probability of Future Events and Changes Since the Previous Plan

Invasive species were not considered in the previous regional mitigation plan or the Town's MVP planning process; however, they are expected to be an increasing problem in Wilmington and throughout the State due to a changing climate and projected increases in non-native plant and animal infestations. For this reason and based on the fact invasive species are an ongoing issue for the Town, this hazard has been assigned a probability of **highly likely** (90-100 percent annual probability).

Some of the biggest concerns for the Town include invasive insects, such as the Asian Longhorned Beetle (ALB) and the Emerald Ash Borer (EAB) which present a major threat to hardwood trees. There are currently no recorded or confirmed sightings of these insects in Wilmington, but they have been found in other nearby communities and their presence in Town is suspected. The Town works hard to ensure any infestation is properly contained, managed, and short lived. For example, the Department of Public Works conducts public outreach and education to help residents proactively scout for invasive tree predators and maintains an ALB/EAB tree survey database to ensure that no signs of either pest are present. Another concern shared during the MVP Workshop is the potential future presence of the Spotted Lanternfly that would affect street trees.

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<sup>61</sup> Town of Wilmington, Open Space and Recreation Plan. July 2015. P. 36.

### Impact on the Community and Vulnerability

The entire community is vulnerable to negative impacts of invasive species. Invasive species already pose a significant challenge and have serious long-term consequences for ecosystem health and resilience, and as described below these impacts are likely to increase in response to climate change. Warming temperatures will likely bring new invasive species to the area, as well increases in the presence of existing pests and related vector-borne diseases which pose serious threats to human health (covered in more detail under *Infectious Disease*). Invasive species will have an easier time gaining a foothold if the town's natural ecosystems are simultaneously weakened due to changes in climatic conditions. Invasive tree predators as described above can also create a cascading hazard by weakening trees that would then become more susceptible to damage and/or becoming hazardous to people and property during windstorm events.

### Impacts of Climate Change

Climate change is affecting flora and fauna as well as pests and disease vectors both through changing precipitation conditions and changing temperature conditions. Warmer, wetter conditions lead to increased mosquito populations, while the absence of sufficient periods of cold means that pest populations that would historically have been killed off or reduced are able to survive the winter and emerge in greater numbers the following season.

### *Infectious Disease*

#### Hazard Description

Public health risks, such as those presented by infectious diseases and vector-borne illnesses, are present within every community. An infectious disease is one that is caused by micro-organisms, such as bacteria, viruses, and parasites. A vector-borne illness is an infectious disease that is transmitted to humans by blood-feeding arthropods, including ticks, mosquitoes, and fleas, or in some cases by mammals (e.g., rabies). Infectious diseases cause illness, suffering and even death, and place an enormous financial burden on society.

Most infectious diseases are caused by pathogens that can be spread, directly or indirectly, from person to person. Such diseases may be seasonal (seasonal influenza) or result, in the case of new diseases, result in a global pandemic. Infectious disease dynamics depend on a range of factors, including land use, human behavior, climate, efficacy of healthcare services, population dynamics of vectors, population dynamics of intermediate hosts and the evolution of the pathogens themselves. Many of these diseases require continuous monitoring, as they present seasonal threats to the general population.

In Massachusetts, state public health officials rely on local boards of health, healthcare providers, laboratories, and other public health personnel to report the occurrence of notifiable diseases as required by law. An epidemic emerges when an infectious disease occurs suddenly in numbers that are more than normal expectancy. Infectious disease outbreaks put a strain on the healthcare system and may cause continuity issues for local businesses. These outbreak incidents are a danger to emergency

responders, healthcare providers, schools, and the public. This can include influenza (e.g., H1N1), pertussis, West Nile virus, and many other diseases. A pandemic is an epidemic that has spread over a large area, that is, it is prevalent throughout an entire country, continent, or the whole world. On March 11, 2020, the World Health Organization (WHO) officially declared the Coronavirus disease 2019 (COVID-19) outbreak a pandemic due to the global spread and severity of the disease. COVID-19 is a respiratory illness that can spread rapidly from person to person and is further described below under *Previous Occurrences*.

While major disease outbreaks are uncommon, public health emergencies can become stand-alone disasters that compound the threat of other natural hazards and exceed local and state capacity. There is precedent for federal assistance due to public health emergencies including West Nile Virus (2000), a mosquito-borne disease, for which a federal emergency declaration was made in New York and New Jersey, and the COVID-19 pandemic, which resulted in a major disaster declaration in all states, territories, and the District of Columbia.

### Location

Most of Wilmington is uniformly exposed to various types of infectious diseases with the most significant impacts felt by people (depending on specific characteristics of the disease), and potentially followed by direct or indirect impacts to the economy. People who spend more time outdoors during mosquito and tick seasons are more susceptible to vector activity, which is more likely in or adjacent to heavily wooded and wetland areas.

### Extent

The severity and extent of infectious disease is dependent on many various types and therefore difficult to classify given the range of potential impacts. COVID-19 has had the most significant impact on the community in recent history in terms of societal impacts and disruptions, however the severity and extent of infectious diseases will continue to vary widely.

### Previous Occurrences

The most significant occurrence of infectious disease for Wilmington (and currently most of the United States and the world) is that of COVID-19. COVID-19 is a highly contagious, viral upper-respiratory illness that was first detected in China in late 2019. The virus quickly spread throughout the world and has resulted in a global pandemic ongoing at the time of this plan. COVID-19 symptoms include cough, difficulty breathing, fever, muscle pain, and loss of taste or smell. Severe cases may result in death, especially in individuals over the age of 65 or with underlying medical conditions, such as diabetes, lung disease, asthma, obesity, or those who are immunocompromised. COVID-19 spreads from person to person through respiratory droplets in the air or on surfaces.<sup>62</sup>

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<sup>62</sup> Centers for Disease Control and Prevention: <https://www.cdc.gov/coronavirus/2019-ncov/faq.html>

As of March 19, 2021, there have been nearly 30 million cases of COVID-19 reported in the US, resulting in over 535,000 deaths.<sup>63</sup> In Massachusetts there have been nearly 575,000 confirmed cases reported with 16,426 deaths, and a total of 1,945 cases reported in Wilmington.<sup>64</sup> Data on confirmed or probable deaths for Wilmington residents is not available but the state has reported a total of 3,533 confirmed or probable deaths for Middlesex County.<sup>65</sup> As further described in the next section, the COVID-19 pandemic has the potential to continue to some degree over the next several years.

Pandemic influenza, considered to be a global outbreak, spread quickly around the world, and was observed in 1918, 1957, 1968, and in 2009 with the novel H1N1 strain. The 2009 H1N1 outbreak, though not considered a serious threat, still affected some residents in Massachusetts with nearly 2,000 confirmed cases and 33 deaths.<sup>66</sup> The great influenza epidemic of 1918 killed millions worldwide and would likely cause hundreds to thousands of deaths in Massachusetts should a similar outbreak occur today. It is anticipated that a more serious strain of the usual flu will occur some year and that vaccines might not be ready in time to combat rapid spread.

Vector-borne diseases continue to pose a significant threat to communities across Massachusetts. Black-legged (deer) ticks and dog ticks are found throughout Massachusetts and may spread different disease-causing germs when they bite people. The most common tick-borne diseases in Massachusetts are Lyme Disease, Babesiosis, and Anaplasmosis. Other diseases that are rare, but still occur, are Tularemia, Rocky Mountain spotted fever, *Borrelia miyamotoi*, and Powassan virus.<sup>67</sup> Mosquito-borne diseases are also a seasonal threat. West Nile Virus (WNV) and Eastern Equine Encephalitis (EEE or “Triple E”) are viruses that occur in Massachusetts and can cause illness ranging from a mild fever to more serious disease like encephalitis or meningitis. There are other diseases spread by mosquitoes that people may be exposed to when traveling in other regions of the world. These include Zika virus, Dengue fever, and Chikungunya.<sup>68</sup>

Massachusetts is typically not vulnerable to diseases such as HIV/AIDS, SARS, cholera, malaria, and resistant tuberculosis, though they are major disasters in some parts of the world. However, an incident that causes water supplies to become contaminated or result in people eating spoiled food could have significant health implications.

#### Probability of Future Events and Changes Since the Previous Plan

Probability of infectious disease in the planning area is extremely variable. Many public health risks occur seasonally and are ongoing, such as the common cold and influenza. Major disease outbreaks,

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<sup>63</sup> Centers for Disease Control and Prevention: <https://www.cdc.gov/coronavirus/2019-ncov/cases-updates/cases-in-us.html>

<sup>64</sup> Massachusetts Department of Public Health, COVID-19 Interactive Data Dashboard. Accessed on March 19, 2021: <https://www.mass.gov/info-details/covid-19-response-reporting#covid-19-interactive-data-dashboard->

<sup>65</sup> Ibid.

<sup>66</sup> Mass Public Health Blog: <http://blog.mass.gov/publichealth/>

<sup>67</sup> Massachusetts Department of Public Health, Tick-borne diseases: [www.mass.gov/tick-borne-diseases](http://www.mass.gov/tick-borne-diseases)

<sup>68</sup> Massachusetts Department of Public Health, Mosquito-borne diseases: [www.mass.gov/mosquito-borne-diseases](http://www.mass.gov/mosquito-borne-diseases)



such as the current COVID-19 pandemic, are much less common but can last for long periods. Based on the information available regarding occurrences of greatest concern, the infectious disease hazard has been assigned a probability of *likely* (10-90 percent annual chance) for Wilmington.

The COVID-19 pandemic has the potential to continue to some degree over the next several years, even as vaccines continue to be developed and distributed. To prevent the continued spread of COVID-19, many communities (including Wilmington) have used stay-at-home orders, in which residents must remain home except to utilize essential services, such as grocery stores and health care services. Many schools have closed, and workers have switched to teleworking. Business closures have also caused major economic losses in states and communities. The Town of Wilmington is continually updating community mitigation measures and guidance in close consultation with Massachusetts Department of Public Health and based on new information from the Centers for Disease Control (CDC).

It is anticipated that the effects of climate change will result in an increase in the probability and/or frequency of some infectious diseases. Those infectious diseases that are currently present in Massachusetts and which may be exacerbated by climate change are already exhibiting increased prevalence in New England. For example, with both temperature and precipitation expected to increase in Massachusetts, West Nile Virus mosquito vector activity will likely increase, as well as the vector's period of activity. Similarly, between 1964 and 2010, counts of Eastern Equine Encephalitis (EEE) have continued to rise in New England, though they remain constant in the southeastern states.

The United States is already seeing a significant increase in vector-borne infectious diseases. According to the CDC, the number of reported disease cases from mosquito, tick, and flea bites tripled from 2004 to 2016, and mosquito-borne disease epidemics are happening more frequently. Annual cases of Lyme disease have increased over the last decade, and with shrinking winters, the potential for infection through tick bite continues to grow.

Given increasing trends for global travel, several other diseases not typically observed in Massachusetts could continue to make their way back to the state through infected travelers. COVID-19 is the most recent and severe example of this threat. Another example is the Zika virus, transmitted from infected mosquitoes to humans, which received international attention during an outbreak in 2015 and persists today.

#### Impact on the Community and Vulnerability

All current and future populations in the planning area are considered at risk to infectious disease, though individual vulnerabilities will vary based on the type of disease as well as underlying health or exposure issues. For example, outdoor laborers and recreationalists are especially vulnerable to Lyme disease, as exposure to ticks is greater. Buildings and infrastructure assets are not typically impacted by disease outbreaks but may need to be sterilized or decontaminated in some cases. Economic impacts will also vary widely depending on the specific type of infectious disease. For example, as most recently demonstrated by COVID-19, health risks associated with epidemics or pandemics may result in



quarantining, stay-at-home orders, mandatory closures, or social distancing measures that cause business interruptions, lost tourism, job losses, and a variety of other social or economic impacts.

The degree to which communities are susceptible to or actively experience infectious diseases can also impact a community's vulnerability to natural hazards, as well as its ability to respond to disasters. For example, an infectious disease outbreak may complicate evacuations or/and mass sheltering required due to a natural hazard. Similarly, high incidents of chronic diseases may decrease mobility within a community, and natural hazards may reduce access to vital healthcare services needed by the ill or those with special medical needs.

One major concern for the Town of Wilmington is the potential impact of an infectious disease affecting its workforce and public services, and particularly for their first responders. These include emergency management, police, fire, and public works personnel who perform critical roles during emergencies. Even the temporary loss of these and other key staff due to a disease outbreak would cause major problems in terms of the Town's capability and readiness to respond during an emergency or community disaster. It is out of this concern that the Town continues to push for all their first responders, including public works staff, to be identified by the State as "essential workers" for purposes of prioritizing eligibility for Covid-19 vaccinations.

As it relates to vector-borne diseases, Wilmington is part of the Central Massachusetts Mosquito Control Project (CMMCP) which serves to reduce mosquito populations through surveillance, water management, biological and chemical controls. All these methods are performed in an environmentally sensitive manner to minimize potential effects on people, wildlife, and the environment. CMMCP's primary goal is to reduce mosquito exposure to the public, and the potential for disease transmission by mosquitoes, by utilizing proven, sound mosquito control techniques.

### Impacts of Climate Change

Climate change is expected to have complex effects on infectious diseases, causing some to increase, others to decrease, and many to shift their distributions. According to the World Health Organization (WHO), changes in infectious disease transmission patterns are a likely major consequence of climate change but we need to learn more about the underlying complex causal relationships and apply this information to the prediction of future impacts, using more complete, better validated, integrated, models.<sup>69</sup>

Among infectious diseases, water- and foodborne infectious diseases and vector-borne infectious diseases are among those likely to be most affected. As the Massachusetts climate begins to look more like the climate of the mid-Atlantic and southern states, it is seeing higher incidents of vector-borne diseases. 2018 marked the Commonwealth's highest ever incidence of West Nile Virus diagnosis, and 2019 marked the highest number of EEE cases in recent history (a time when many communities near Wilmington were classified by the State as having a "moderate" risk for EEE). Also, a recent Centers for

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<sup>69</sup> World Health Organization, Climate Change and Infectious Diseases:  
<https://www.who.int/globalchange/climate/en/chapter6.pdf>

Disease Control (CDC) report showed that vector-borne diseases tripled between 2004 and 2016, with approximately 75% of cases being related to tick-borne disease. These changes present a major public and animal health challenge in terms of education, prevention, and treatment.

### Extreme Weather

#### *Hurricanes/Tropical Storms*

##### Hazard Description

Hurricanes begin as tropical storms over the warm moist waters of the Atlantic Ocean, off the coast of West Africa, and over the Pacific Ocean near the equator. As the moisture evaporates, it rises until enormous amounts of heated, moist air are twisted high in the atmosphere. The winds begin to circle counterclockwise north of the equator or clockwise south of the equator. The center of the hurricane is called the eye.<sup>70</sup> Hurricanes are often associated with heavy rainfall and high sustained winds, but they can also spawn tornadoes that generally occur in thunderstorms embedded in rain bands well away from the center of the hurricane. Tornadoes can also occur near the eye wall.

Although heavy rains associated with hurricanes are considered to present the highest recurrent risk to Wilmington and the surrounding region, high winds are also a risk. Downed trees and tree limbs, blocked roads, and downed telephone and power lines can disrupt transportation routes and communication channels.

##### Location

Hurricanes are an atmospheric hazard and have the potential to impact the entire Town of Wilmington. It is likely that areas of the community along waterways such as Martins and Lubbers Brooks are more susceptible to damage due to the combination of both high winds and potential flooding, though all low-lying areas should be considered at risk for flooding from heavy rain and wind damage.

##### Extent

Hurricanes can range from 50 miles to 500 miles across; in 1980, Hurricane Allen stretched across the entire Gulf of Mexico. There are generally two source regions for storms that have the potential to strike New England: (1) off the Cape Verde Islands near the west coast of Africa, and (2) in the Bahamas. The Cape Verde storms tend to be very large in diameter, since they have a week or more to traverse the Atlantic Ocean and grow. The Bahamas storms tend to be smaller, but they can also be just as powerful, and their impact can reach New England in only a day or two. Most hurricanes that have made landfall in New England and impacted the Town of Wilmington were a Category 1. Hurricanes are measured by the Saffir-Simpson Wind Scale, shown in Table 10.<sup>71</sup>

*Table 10. Saffir-Simpson Wind Scale*

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<sup>70</sup> Massachusetts State Hazard Mitigation and Climate Adaptation Plan. September 2018. P. 4-204.

<sup>71</sup> <https://www.nhc.noaa.gov/aboutsshws.php>

| Category             | Sustained Winds   | Types of Damage Due to Hurricane Winds  |
|----------------------|---|---|
| <b>1</b>             | 74-95 mph<br>64-82 kt<br>119-153 km/h                       | <b>Very dangerous winds will produce some damage.</b> Well-constructed frame homes could have damage to roof, shingles, vinyl siding and gutters. Large branches of trees will snap, and shallowly rooted trees may be toppled. Extensive damage to power lines and poles will likely result in power outages that could last a few to several days.  |
| <b>2</b>             | 96-110 mph<br>83-95 kt<br>154-177 km/h                      | <b>Extremely dangerous winds will cause extensive damage.</b> Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.   |
| <b>3<br/>(major)</b> | 111-129 mph<br>96-112 kt<br>178-208 km/h                    | <b>Devastating damage will occur.</b> Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.  |
| <b>4<br/>(major)</b> | 130-156 mph<br>113-136 kt<br>209-251 km/h                   | <b>Catastrophic damage will occur.</b> Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted, and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months. |
| <b>5<br/>(major)</b> | 157 mph or higher<br>137 kt or higher<br>252 km/h or higher | <b>Catastrophic damage will occur.</b> A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.   |

#### Previous Occurrences

Since 1900, thirty-nine tropical systems have impacted New England. Twenty-five were hurricanes and 14 were tropical storms. Any tropical storm or hurricane is capable of bringing a combination of high winds, large storm surges and severe inland flooding along rivers and streams. Of the 24 hurricanes, nine made landfall along the southern New England coast. Of those nine hurricanes, seven of them were either of category 2 or 3 intensity based on the Saffir-Simpson hurricane scale. Though the primary threat to New England is during August and September, the region has been affected as early as June and as late as mid-October.<sup>72</sup>

<sup>72</sup> <http://nesec.org/hurricanes>

NOAA has kept records of hurricanes since 1851. From 1851 to 2020, 35 hurricane and tropical storm tracks have come within 75 miles of Wilmington. These storm events have included two (2) category 3 hurricanes (including a direct strike by an unnamed storm in 1869); four (4) category 2 hurricanes; seven (7) category 1 hurricanes; and 22 tropical storms. Figure 12 displays these historic tracks across the region.<sup>73</sup> The most damaging storms for Massachusetts made landfall and tracked to the west of Wilmington, including the Great Hurricane of 1938 and Hurricane Carol in 1954. The most recent hurricane to affect the region and the Town was Hurricane Irene in August 2011, which became a tropical storm as it passed over the region.

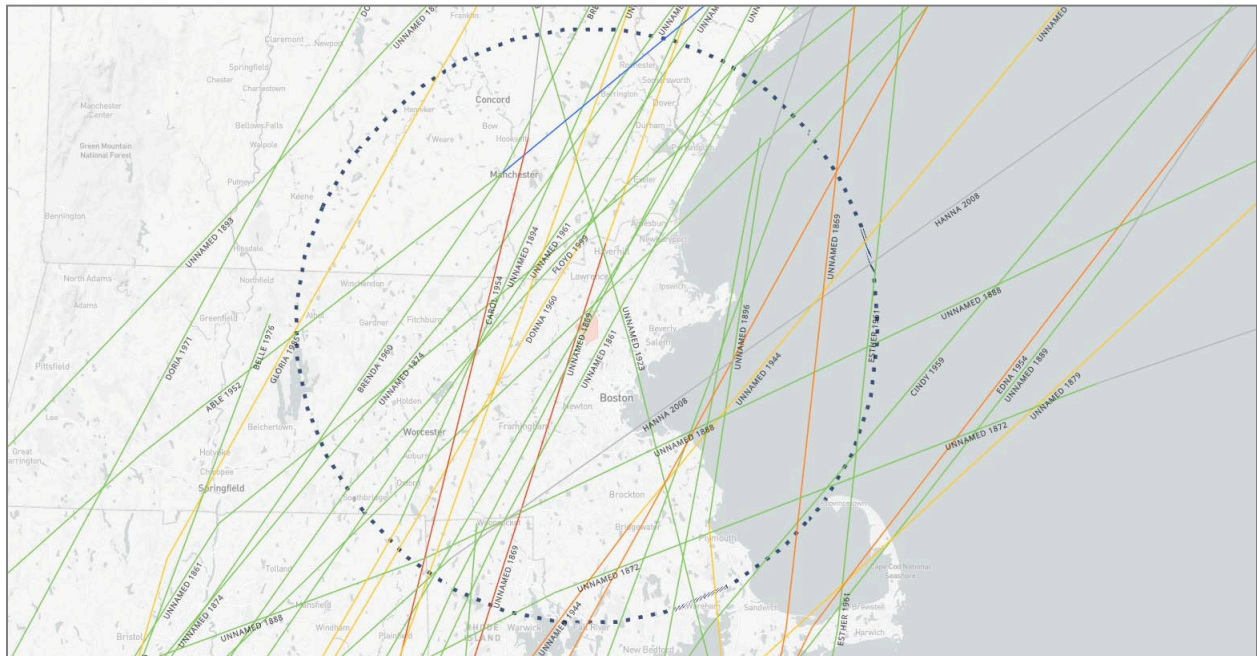


Figure 12. Historical Hurricane and Tropical Storm Tracks

### Probability of Future Events and Changes Since the Previous Plan

Hurricanes and tropical storms will continue to be a **likely** occurrence in Wilmington (10-90 percent annual probability). Based on historical event data, the annual probability of a hurricane or tropical storm coming within 75 miles of the planning area is 20 percent, though the chance of a major hurricane (Category 3-5) at landfall is much less. As illustrated above, over the last 168 years Wilmington has experienced a hurricane or tropical storm event approximately once every 5 years (not including tropical depressions or extratropical storms). For Wilmington, these events are generally limited to the months of August, September, and October, with some storms arriving in May, June, July, or November.

<sup>73</sup> <https://coast.noaa.gov/hurricanes>

### Impact on the Community and Vulnerability

While the coastal communities of southeastern Massachusetts generally take the brunt of hurricanes, flooding and winds can also affect areas much further inland. All of Wilmington is vulnerable to damages from hurricane winds and high levels of rainfall. Localized flooding of roads could significantly impact the Town and residents' ability to travel, and the community's power and communication infrastructure could be heavily impacted by severe winds. Widespread power outages during and following a major storm event is a key concern across multiple sectors in Town. Additionally, high winds could down trees, which could damage or indirectly affect many structures across Town due to the area's dense tree canopy.

Downed trees were cited as life/safety threat throughout Wilmington, especially for nighttime drivers who may not see trees that have fallen across roadways before the Town's public works crews can get to them. The Town's DPW facility and highway garage presents a key vulnerability of concern as downed trees across the one access road would severely impact the ability of crews to respond during storm events (with no way in or out for vehicles, no access to fuel tanks, etc.). Another location of concern as identified by MVP workshop participants included the Wilmington Housing Authority properties located on Deming Way, which has experienced downed trees during past storms. Downed trees along Deming Way could also have the potential to restrict access in and out of the area (only one way in and out), a critical concern for this more vulnerable population of the community (elderly and/or disabled persons of low income).



Downed trees and tree limbs blocked many local roadways following Tropical Storm Irene in 2011. *Image courtesy of Town of Wilmington.*

### Impacts of Climate Change

According to the State Hazard Mitigation and Climate Adaptation Plan, climate change is increasing extreme weather and rising temperatures, which produce warmer oceans and more energy for coastal storms. In addition, warmer air may hold more moisture, increasing the rate of rainfall.

### Severe Winter Storm/Nor'easter

#### Hazard Description

Winter storms are the most common and most familiar Massachusetts hazards which affect large geographical areas. Most winter storms in the Commonwealth cause more massive inconvenience than they do serious property damage, injuries, or deaths. However, periodically, a storm will occur which is a true disaster, necessitating intense, large-scale emergency response.

Severe winter storms can produce a wide variety of hazardous weather conditions, including heavy snow, ice, freezing rain, sleet, and extreme wind and cold. As defined by the National Weather Service, a

severe winter storm is one that results in four or more inches of snow over a twelve-hour period, or six or more inches over a twenty-four-hour period. The leading cause of death during severe winter storms is from an automobile or other transportation accidents. Exhaustion or heart attacks caused by overexertion are the second most likely cause of winter storm-related deaths. Wilmington, like the rest of the region, is at high risk for winter storms.

Nor'easters are low pressure, severe storm systems that affect the Mid-Atlantic and New England states primarily during winter months. They can form over land or water and are notorious for producing heavy snow, rain, and tremendous waves that crash onto Atlantic beaches, often causing beach erosion and structural damage. Wind gusts associated with these storms can exceed hurricane force in intensity, and when combined with snow result in blizzard conditions that form deep drifts capable of paralyzing a region. A nor'easter gets its name from the continuously strong northeasterly winds blowing in from the ocean ahead of the storm. A blizzard is defined as a storm with winds more than 35 miles per hour, with falling and blowing snow reducing visibility to less than ¼ mile for at least three hours.

### Location

The entire Town of Wilmington is equally at risk to severe winter storms. However, winter storms impact vulnerable populations more significantly, including seniors, lower-income residents, and the homeless.

### Extent

NOAA's National Centers for Environmental Information (NCEI) recently developed the Regional Snowfall Index (RSI) for significant snowstorms that impact the eastern two thirds of the U.S. The RSI ranks snowstorm impacts on a scale from 1 to 5, as shown in Table 11. RSI values are based on the spatial extent of the storm, the amount of snowfall, and the association of these elements with population and societal impacts. For mitigation planning purposes the maximum probable extent of a severe winter storm in Wilmington is a Category 5 on the RSI. The climate report from Best Places shows that Wilmington has an average of 53 inches of snowfall each year, nearly double the national average of 28 inches.<sup>74</sup>

Table 11. Regional Snowfall Index (RSI)

| Category | RSI Value | Description |
|----------|-----------|-------------|
| 1        | 1–3       | Notable     |
| 2        | 3–6       | Significant |
| 3        | 6–10      | Major       |

<sup>74</sup> <https://www.bestplaces.net/climate/city/massachusetts/wilmington>



| Category | RSI Value | Description |
|----------|-----------|-------------|
| 4        | 10–18     | Crippling   |
| 5        | 18.0+     | Extreme     |

There is no widely used scale to classify nor'easters. However, the classification scheme developed by Gregory A. Zielinski and presented in Table 12 is a useful index to categorize nor'easters (and other severe winter storms) by intensity.<sup>75</sup> It consists of a five-level hierarchy similar to the Saffir-Simpson Hurricane Wind Scale, with a category 1 storm being the least severe in terms of its intensity and a category 5 storm being the most severe. For mitigation planning purposes, the maximum probable extent of a nor'easter for Wilmington is an Intensity Index Category 4.

Table 12. Classification Scheme for Nor'easters

| Intensity Index Category | Maximum Snowfall Amounts | Maximum Snowfall Rate   | Potential Wind Speeds | Maximum Drifting Potential | Closings/Delays on Communities, Schools, and Travel     | Impact on Coastal and Maritime Interests | Nature of Disruption        |
|--------------------------|--------------------------|-------------------------|-----------------------|----------------------------|---|--|-----------------------------|
| 1                        | < 10 in.                 | Very low<br>< 1 in./hr  | Weak                  | Minor<br>< 20 in.          | Maybe minor (hours)                                     | Minor                                    | Minimal-<br>nuisance        |
| 2                        | 10-20+ in.               | Moderate<br>1+ in./hr   | Strong                | Moderate<br>3 ft.          | Maybe moderate (hours to a day common)                  | Minor to moderate                        | Nuisance-<br>inconvenience  |
| 3                        | 20-30+ in.               | High<br>2+ in./hr       | Gale force            | High<br>4-6+ ft.           | Possibly extensive/lengthy (several days possible)      | Moderate to severe                       | Inconvenience-<br>crippling |
| 4                        | 30-40+ in.               | Very High<br>2-3 in./hr | Gale force hurricane  | Very High<br>6-10+ ft.     | Probably extensive/lengthy (up to a week may be common) | Severe                                   | Crippling-<br>paralyzing    |

<sup>75</sup> Gregory A. Zielinski, Institute for Quaternary and Climate Studies, University of Maine.

| Intensity Index Category | Maximum Snowfall Amounts | Maximum Snowfall Rate   | Potential Wind Speeds | Maximum Drifting Potential | Closings/Delays on Communities, Schools, and Travel | Impact on Coastal and Maritime Interests | Nature of Disruption |
|--------------------------|--------------------------|-------------------------|-----------------------|----------------------------|---|--|----------------------|
| 5                        | 40-50+ in.               | Overwhelming > 3+ in.hr | Gale force hurricane  | Exceptional 10-15 ft.      | Extensive/lengthy (up to a week common)             | Extreme                                  | Paralyzing           |

### Previous Occurrences

Severe winter storms are a very frequent occurrence in Wilmington and the surrounding region. According to NOAA's Storm Events Database, Middlesex County experienced a total of 312 winter storm events since 1996 which have caused an estimated \$12.5 million in property damages, 2 fatalities, and 5 injuries. These events include those recorded as blizzard, ice storm, heavy snow, winter storm, and winter weather. Many additional municipal expenses are spent on snow removal and treatment of local roadways, sidewalks, and other rights of way. Of the 34 federally declared disasters or emergencies that have affected Middlesex County since 1953, 15 have been associated with severe winter storms.<sup>76</sup>



Snow removal is among the most costly impacts caused by severe winter storms.  
*Image courtesy of Town of Wilmington.*

The impacts to Wilmington from recent major winter storm events (since the last plan update) are detailed in Table 13 based on information provided by the Town's Public Works Department.

Table 13. Major Winter Storm Events Since 2015

| Event Date | Snowfall Amount | Description   |
|------------|-----------------|---|
| 12-16-2020 | 16"             | Large Nor'easter, with predictions of 12-18 inches widespread. Lightweight snow, but heavy winds and drifting. Schools, Town offices and trash canceled. Lack of contractors, breakdowns, & COVID-19 quarantines affecting operation. Most of the DPW Administrative office staff were all in quarantine. Schools decided to hold classes through remote learning the next day, so sidewalks were skipped until Friday morning. |

<sup>76</sup> FEMA Disaster Declarations Summary: <https://www.fema.gov/media-library/assets/documents/28318>



| Event Date | Snowfall Amount | Description   |
|------------|-----------------|---|
| 12-1-2019  | 10"             | A very difficult storm that started as dry snow, then compressed to about 7" after sleet and overnight freezing rain. School was canceled Monday 12-2-19. The 2nd portion of the storm is expected to arrive on Monday night with 2"-6" of additional snow in the forecast. Crews sent home at 1pm to rest before night storm.  |
| 3-4-2019   | 11.5"           | The storm was initially forecast as 6-10" of snow. The actual event produced 11.5" heavy wet snow. Temperatures are expected to freeze overnight and remain freezing for the rest of week. Schools were canceled the day before. Town Hall and Town offices had a 2-hour delay. Trash pick-up was on schedule.  |
| 1-19-2019  | 6.5"            | Originally predicted as a widespread 12" storm with ice, downgraded to 5-8" with sleet at end. Recorded snowfall of about 6.5", then a large amount of sleet on Sunday. Coincidentally, schools were already closed Monday due to MLK holiday. Roads iced up considerably. Crews worked Saturday 1/19 starting at 5pm salting, worked 24 shifts thru Sunday at 5pm. They then rested for the night and returned Monday (MLK day) were cleanup work continued from 6:30am to 3pm. Only 70% of sidewalks were completed. School was back in session on Tuesday. |
| 11-15-2018 | 8"              | 1 to 3" predicted, with rain. Received 8" of snow with 2" per hour snowfall rates early in the event. Snow was heavy due to rising temperatures and rain mixing in. Sidewalk plowing started around 4:30am. School opening was delayed 2 hours.   |
| 3-13-2018  | 31"             | A blizzard that was initially forecasted as a 10"-15" event. Snow fall rates were 1" to 3" per hour. School was cancelled for two days, and Town offices were closed for one day. Major snow bands dropped 24" of snow by 4am on 3/14/18. National Weather Service reported 31 uncompressed inches.   |
| 3-7-2018   | 10"             | A VERY difficult storm producing 10" of heavy wet snow. Possibly 100 trees down due to the weight of the precipitation. Schools were closed for the day. There were power outages throughout Town. Roads were impassable. Crews were pushing trees and limbs off the roadways with plows.   |
| 2-17-2018  | 7"              | Initially predicted as 3"-6" snow event which began Saturday night and ended at about 6am on Sunday. Plows finished up clearing the roadways by   |

| Event Date | Snowfall Amount | Description   |
|------------|-----------------|---|
|            |                 | 1pm Sunday. Even though melting temps were predicted, sidewalks plowed anyway.  |
| 1-4-2018   | 16.5"           | A Blizzard of 12"+ and strong 50 mph gusts in places. Schools and Town buildings were closed the night before. The storm produced 16.5" of snow and heavy wind gusts (no trees reported down as of 1/5/17 6am). School was called off on Thursday and Friday. Town offices were closed on Thursday. Sidewalks started with blowers 1/5/17 early morning. Crews W\worked until 1pm at which time they were relieved by contract (working over 24-hour shift). Full crew returned on Saturday at 6:30am and worked until 3pm. |
| 12-25-2017 | 6.5"            | Initially forecast as a 2" to 4" snow event with high winds at end. A heavy burst of snow at the end of event resulted in 6.5" of total snow received.  |
| 12-9-2017  | 6"              | Predicted as a 3"-6" event. Snow started to accumulate around 12pm, with the heaviest snow fall occurring between 6pm and 9pm.  |
| 3-14-2017  | 10"             | A blizzard with 50 mph gusts and 18" to 24" was predicted. The snow started at 6:30am. The storm produced 10" of extremely heavy Snow. The heavy snow ended by 7pm, with light snow starting again at 9pm which produce another dusting. Sidewalks started at 9pm, ended at 3am. Crews left at 3am (3:30 end time due to working through lunch). 407 tons of salt was used, which includes pre storm, post storm, and following day black ice salting on 3-15-17.   |
| 2-11-2017  | 16"             | A Nor'easter combined with a westerly front that was forecasted produce 12" to 18" of snow. This slow-moving storm system intensified overnight into Monday morning dropping an extremely heavy 8" of snow, followed by 3" additional inches of light snow. The 16" total includes 5" that fell from the westerly front the previous day. School was canceled and trash pickup was delayed one day. Town offices opened at the usual time on Monday 2-13-17. Heavy winds caused many trees to be coated in wet snow.        |
| 2-9-2017   | 12"             | Nor'easter with 10" to 15" predicted. Schools was canceled for the day, and Town Hall closed. A daytime event that started around 8am and ended around 8pm. Roads were Pre-treated at 8am, only 2" by 1pm, when the plows started clearing roadways. Plow crews ended around 1am. Highway crews and sidewalk crews worked through to next day. Total snow fall from   |

| Event Date | Snowfall Amount | Description  |
|------------|-----------------|--|
|            |                 | this event was about 12", with lots of blowing and drifting. The School Department decided to call for a delay the next morning, Friday 2-10-17.   |
| 2-5-2016   | 7"              | A 5" to 8" storm event was predicted. The storm started as rain at midnight and continued as such until roughly 6:30am, when it started to change over to wet snow. School was canceled in anticipation of a rough morning commute. Roads simply wet at 6:30am. accumulated fast, 8am-9am, many tree limbs down throughout Town. |

The most severe winter storm to ever strike New England was the Blizzard of 1888. The storm that occurred from March 11-14, 1888, deposited up to 50 inches of snow. The Blizzard of 1978, a classic nor'easter, dumped 24-36 inches of snow on the eastern part of the state and paralyzed the area for several days. The region experienced another major nor'easter in March 2001, when more than two feet of snow fell over a three-day period. Wind gusts to 64 miles per hour were reported in some areas, and the combination of heavy wet snow and high winds resulted in broken tree limbs that blocked roadways and downed power lines.

The winter of 2010-2011 produced some of the largest snowfall totals in the region and state's history, and included two blizzards, both occurring in January 2011. According to the National Weather Service, Boston received 80.1 inches of snow that winter, while the Northern Middlesex region received 79.6 inches. Less than a year later, an early season snowstorm in October 2011 (known as the Halloween Nor'easter) left 640,000 Massachusetts homes and residents without power. The storm produced a snow fall more than 30 inches in some parts of the state, and, due to the amount of foliage still on the trees, resulted in widespread power outages for up to seven days.

Since 1983, the most significant winter snowfall accumulations for the region occurred during the winter of 1995, when snowfall measurements in the City of Lowell reached 126.5 inches. Snowfall totals in Wilmington were similar, however the Town does not maintain its own records. The most recent ice storm in the region occurred in December 2008. The storm resulted in one fatality and left over one million people without power, some for as long as two weeks. Damage from the storm was measured in millions of dollars in property damage, lost business, and cleanup costs.

#### Probability of Future Events and Changes Since the Previous Plan

Severe winter storms will continue to be a **highly likely** occurrence in Wilmington (90-100 percent annual probability). Using history as a guide for the probability of future events, it can be assumed that Wilmington will be affected by numerous severe winter weather events each year (up to 10 or more). The highest risk of these storms occurs in January, with significant risk also occurring in December through March.

### Impact on the Community and Vulnerability

Wilmington's location in Middlesex County places it at a high risk for winter storms, including damaging Nor'easters that typically track up the East Coast with severe winds, heavy snow, and blizzard conditions. Severe winter storms and nor'easters pose multiple threats and impacts to Wilmington. Heavy snow or ice conditions can disrupt transportation and may impede the passage of emergency vehicles, and may also bring down trees and power lines, leading to large-scale power outages. Other impacts related to downed trees include those more thoroughly described for impacts associated with the Hurricane/Tropical Storms hazard. Heavy accumulations of seasonal snowfall can also lead to roof collapses across the community.



Downed trees caused power outages and blocked local roadways following a nor'easter in March 2018. *Image courtesy of Town of Wilmington.*

As expected, several public safety issues can arise during severe winter storms. Impassible streets are a challenge for emergency vehicles but also will affect residents and employers. Snow-covered sidewalks force people to walk in streets, which are already less safe due to snow, slush, puddles, and ice. Large piles of snow can block sight lines for drivers, particularly at intersections. Not all residents are able to clear their properties (including roofs), especially the elderly. In addition, when that snow melts, the potential for flooding increases and the refreezing of melting snow can cause dangerous roadway and sidewalk conditions.

Recovery from a severe winter storm poses several challenges. Prolonged curtailment of all forms of transportation can have significant adverse impacts for people stranded at home, preventing the delivery of critical services such as home heating fuel supplies or the ability to get to a local food store. Extended power outages, the cost of snow removal, repairing damages, and the loss of business can have severe economic impacts on local communities. The elderly and infirmed are populations of particular concern during these events.

### Impacts of Climate Change

It is anticipated that the effects of climate change will result in winters that are much shorter with fewer cold days and more precipitation, but less precipitation falling as snow and more as rain. This will result in reduced snowpack, earlier breakup of winter ice on lakes and rivers, and earlier spring snowmelt resulting in earlier peak river flows. Climate change is also expected to increase the amount of severe winter storms. This is due to "increased sea surface temperature in the Atlantic Ocean will cause air moving north over the ocean to hold more moisture. As a result, when these fronts meet cold air systems moving from the north, an even greater amount of snow than normal can be anticipated to fall in Massachusetts."<sup>77</sup>

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<sup>77</sup> Massachusetts State Hazard Mitigation and Climate Adaptation Plan. September 2018. P. 4-224.

## Tornadoes

### Hazard Description

A tornado is a narrow, violently rotating column of air that extends from the base of a cumulonimbus cloud to the ground. The observable aspect of a tornado is the rotating column of water droplets, with dust and debris caught in the column. Tornadoes are the most violent of all atmospheric storms.<sup>78</sup>

### Location

The location of tornado impact is totally unpredictable. Tornadoes are fierce phenomena which generate wind funnels of up to 200 mph or more, and usually occur in Massachusetts during June, July, and August. Worcester County and areas just to its west have been dubbed the “tornado alley” of the state, as most significant tornadoes in Massachusetts history have occurred in that region. Most tornadoes are a few dozen yards wide and touch down only briefly, but even small short-lived tornadoes can inflict tremendous damage. Highly destructive tornadoes may carve out a path over a mile wide and several miles long.

### Extent

The Enhanced Fujita Scale (EF-scale), shown in Table 14, is used to categorize the strength and magnitude of tornado events based on estimated wind speeds and related damage. This represents an update to the original Fujita Scale (F-scale) and has been widely used since February 2007. For mitigation planning purposes the maximum probable extent of a tornado in Wilmington is an EF-3.

Table 14. Enhanced Fujita Scale

| Rating | Wind Speed<br>(3 second gust) | Potential Damage  |
|--------|-------------------------------|---|
| EF-0   | 65–85 mph                     | Light – Causes some damage to siding and shingles.  |
| EF-1   | 86–110 mph                    | Moderate – Considerable roof damage. Winds can uproot trees and overturn singlewide mobile homes. Flagpoles bend. |
| EF-2   | 111–135 mph                   | Considerable – Most singlewide mobile homes destroyed. Permanent homes can shift off foundations.                 |
| EF-3   | 136–165 mph                   | Severe – Hardwood trees debarked. All but small portions of houses destroyed.                                     |
| EF-4   | 166–200 mph                   | Devastating – Complete destruction of well - built residences, large sections of school buildings.                |

<sup>78</sup> Massachusetts State Hazard Mitigation and Climate Adaptation Plan. September 2018. P. 4-242.

| Rating | Wind Speed<br>(3 second gust) | Potential Damage   |
|--------|-------------------------------|--|
| EF-5   | Over 200 mph                  | Incredible – Significant structural deformation of mid- and high-rise buildings. |

#### Previous Occurrences

Although Wilmington hasn’t experienced a confirmed tornado event, historical records indicate there have been numerous incidents across the surrounding region. According to NOAA’s Storm Events Database, Middlesex County experienced a total of 18 tornado events since 1950 which have caused 1 fatality, 6 injuries, and an estimated \$4.9 million in property damages. Prior to 2007, tornadoes were based on the Fujita Tornado Scale. During this period Middlesex County had 17 tornadoes classified as two (2) F0 events, nine (9) F1 events, four (4) F2 events, and (2) two F3 events. Beginning in 2007, tornadoes were rated based on the Enhanced Fujita Tornado Scale as described above. Since then, Middlesex County has had 1 recorded tornado event, which was classified as an EF-1 event.

One of the most significant historical tornado events in proximity to Wilmington occurred on September 29, 1974 when an F3 tornado struck neighboring Tewksbury. The storm resulted in no fatalities but caused 1 injury and an estimated \$250,000 in property damage. The exact path of the tornado was not documented by NOAA, but it reportedly started in the vicinity of Chandler Street and McKenzie Circle and ended near Lumber Lane, with a recorded maximum width of 33 yards.

#### Probability of Future Events and Changes Since the Previous Plan

According to the State Hazard Mitigation and Climate Adaptation Plan, Massachusetts experiences an average of 1.7 tornadoes per year. Tornadoes will continue to be a **possible** occurrence in Wilmington (1-10 percent annual probability), though it remains unlikely that very strong tornadoes (EF-3, EF-4, or EF-5) will strike the area. During the plan update process Town staff noted that there has seemingly been an uptick in the frequency of tornado watches in recent years for their forecast area.

#### Impact on the Community and Vulnerability

The damage caused by a tornado is a result of the high wind velocity and wind-blown debris, which is also often accompanied by lightning or large hail. Like other atmospheric hazards, the entire Town of Wilmington is uniformly exposed and susceptible to tornadoes. Thus, all populations are vulnerable, but especially those who are less mobile or capable to find adequate shelter. Tornadoes often develop so rapidly that little, if any, advance warning is possible making them a significant life/safety threat to people. This fact, coupled with how a major event could severely impact the Town’s ability to quickly respond (for example, due to downed trees or debris across roadways), makes tornadoes a significant low-probability / high-consequence hazard for Wilmington.

### Impacts of Climate Change

According to the State Hazard Mitigation and Climate Adaptation Plan, “future environmental changes may result in an increase in the frequency and intensity of severe thunderstorms, which can include tornadoes.”<sup>79</sup>

### *Other Severe Weather (strong winds/extreme precipitation)*

#### Hazard Description

Several frequent natural hazards in Massachusetts—particularly strong winds and extreme precipitation events—occur outside of notable storm events. This section discusses the nature and impacts of these and other severe weather hazards, such as lightning and hail, and the ways in which severe weather occurrences are likely to respond to a changing climate.<sup>80</sup>

#### Location

Each community in the Middlesex County region is at equal risk of being impacted by a severe thunderstorm and it is not possible to predict where damage from such a storm might occur. Major storm events have been a recurring threat to Wilmington throughout its history, from hurricanes bringing wind, intense precipitation, and localized flooding to winter storms delivering ice and snow. Notable historic events include impacts from the Great Hurricane of 1938, the most intense hurricane to ever strike Massachusetts. More recently, the Town has experienced increasing regular storms (severe thunderstorms and other high wind or heavy rainfall events) with greater intensity. More intense storms delivering higher volumes of precipitation in a single event are expected to put significant pressure on dams, culverts, and other drainage infrastructure, which were all designed to handle smaller storms with more consistent distributions of precipitation.

#### Extent

The National Weather Service considers a thunderstorm to be severe if it produces hail at least ¾ inch in diameter, has winds of 58 mph or higher, or has the potential to produce a tornado. Lightning accompanies all thunderstorms and can cause death, injury, and property damage. Straight-line winds can exceed 100 mph and are responsible for most thunderstorm wind damage. A downburst, a small area of rapidly descending air beneath a thunderstorm, can reach speeds equal to that of a strong tornado. In addition, hail can cause substantial damage to property and crops. Large hailstones can fall faster than 100 miles per hour and can be very costly in terms of economic losses.

An average thunderstorm is 15 miles across and lasts 30 minutes; severe thunderstorms can be much larger and longer. Southern New England typically experiences 10 to 15 days per year with severe thunderstorms. The amount of precipitation from a 100-year 24-hour storm event has increased from

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<sup>79</sup> Massachusetts State Hazard Mitigation and Climate Adaptation Plan. September 2018. P. 4-243.

<sup>80</sup> Massachusetts State Hazard Mitigation and Climate Adaptation Plan. September 2018. P. 4-253.



approximately 7 inches to 9 inches for Boston. Based on this fact, Wilmington may expect a similar increase.

#### Previous Occurrences

According to NOAA’s Storm Events Database, Middlesex County experienced a total of 1,179 severe weather events since 1950 which have caused 2 fatalities, 62 injuries, and an estimated \$11.3 million in property damage. These events include those recorded as high or strong wind, thunderstorm wind, heavy rain, or lightning as shown in Table 15.<sup>81</sup> Most of the wind-related casualties and recorded property damages were caused by downed trees or falling limbs and typical event impacts included power outages, road closures, and other relatively short-term disruptions. Lightning has been recorded as the cause for 1 fatality and 31 injuries across the county since 1996, in addition to nearly \$3 million in property damages. Although events classified as heavy rain resulted in no damages, these are separate from events classified by the NWS as “flood” or “flash flood” events which are more likely to have caused property damages (and are covered in this chapter under “Flooding”).



A large tree downed by high winds blocked access to the Avalon Oaks apartment complex in Wilmington on March 2, 2021. *Image courtesy of Wilmington Police Department.*

Table 15. Other Severe Weather Events for Middlesex County, 1950 – October 2020

| Event Type         | # of Events  | Fatalities | Injuries  | Property Damage     |
|--------------------|--------------|------------|-----------|---------------------|
| High / Strong Wind | 315          | 1          | 7         | \$3,957,000         |
| Thunderstorm Wind  | 507          | 0          | 24        | \$4,356,650         |
| Heavy Rain         | 112          | 0          | 0         | \$0                 |
| Lightning          | 58           | 1          | 31        | 2,901,600           |
| Hail               | 187          | 0          | 0         | \$75,250            |
| <b>Total</b>       | <b>1,179</b> | <b>2</b>   | <b>62</b> | <b>\$11,290,500</b> |

<sup>81</sup> NOAA’s Storm Events Database: <https://www.ncdc.noaa.gov/stormevents/>

### Probability of Future Events and Changes Since the Previous Plan

Severe storms comprising of thunderstorms, high winds, and hail will continue to be a **highly likely** occurrence for Wilmington (1-10 percent annual probability) with the potential to affect all areas of Town with increasing frequency and intensity. While these events may occur during any month, they are most likely to occur between May and August. In recent years there has been an observed shift in the type and timing of storms. Many storm events now encompass a mixture of rain, ice, and snow, making it more difficult to maintain safe, accessible roadways. Early season storms of wet, heavy snow when leaves were still on the trees have caused extensive damage to electrical infrastructure, leading to extended power outages.

### Impact on the Community and Vulnerability

As mentioned above, one of the greatest impacts resulting from severe weather in Wilmington is electrical power outages. During severe storms with strong winds, trees and tree branches often fall and break electric lines, causing widespread power outages for residents. Other direct and indirect impacts related to downed trees include those more thoroughly described for impacts associated with the Hurricane/Tropical Storms hazard (for example, closing roadways or blocking ingress/egress to developments or facilities with only one way in and out). In addition, storms that come with extreme precipitation are expected to put significant pressure on Wilmington's culverts, and other drainage infrastructure that were designed to handle smaller storms with more consistent distributions of precipitation. This problem manifests at points across the Town and is acute where the local drainage systems concentrate and discharge, and especially in those problem areas of concern as described in the Flooding section of this assessment.

### Impacts of Climate Change

According to NOAA, the effects of climate change on future severe weather events cannot be determined at the present time due to insufficient scientific evidence. However, multiple studies cite that the Northeast region of the US will continue experience more very heavy rainfall events which are often associated with severe thunderstorms and other extreme weather events. The Northeast has already experienced a larger increase in the intensity of rainfall events than any other region in the United States in the last fifty years, and this trend is expected to continue."<sup>82</sup>

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<sup>82</sup> Massachusetts State Hazard Mitigation and Climate Adaptation Plan. September 2018. P. 4-254.

## Non-Climate Influenced Hazards

### *Earthquake*

#### Hazard Description

An earthquake is a combination of different phenomena. An earthquake initiates with the sudden slip of rock on either side of a crack in the earth, called a fault. The sliding of the rock on the fault due to the rock slip radiates seismic waves in all directions. The seismic waves vibrate the ground surface and are experienced as earthquake ground shaking. Different kinds of seismic waves travel with different speeds and have different amplitudes or strengths. For this reason, even though the rock slip that initiates an earthquake might be over in a few or several seconds, the ground shaking radiated by a large earthquake slip on a fault can last many tens of seconds.<sup>83</sup>

#### Location

Because of the regional nature of the hazard, the entire community of Wilmington is equally susceptible to earthquakes. Unlike other areas of the country where earthquakes occur along known fault lines, earthquakes in the Northeast do not correlate with the many known faults that exist in the region. They occur in the middle of plates, far from the plate boundaries. Much of the research on earthquakes in the northeast has involved attempts to identify pre-existing faults and other geological features that may be susceptible to such stress, but this has proven to be quite difficult.

#### Extent

The magnitude and intensity of an earthquake is measured by the Richter Scale and the Modified Mercalli Intensity (MMI) scale, respectively. The Richter Magnitude Scale (shown in Table 16) measures the amount of seismic energy released by an earthquake, while the Modified Mercalli Intensity Scale (shown in

Table 17) describes the intensity of an earthquake based on its observed effects at a site where earthquake shaking is felt.<sup>84</sup> For mitigation planning purposes the maximum probable extent of an earthquake in Wilmington is a 6.5 on Richter Scale and Intensity VII on Modified Mercalli Intensity Scale.

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<sup>83</sup> <http://nsec.org/earthquakes-hazards>

<sup>84</sup> <http://nsec.org/earthquakes-hazards>

## Town of Wilmington Hazard Mitigation Plan Update

Table 16. Richter Scale

| Magnitude | Effects   |
|-----------|---|
| < 3.5     | Generally, not felt, but recorded.  |
| 3.5 - 5.4 | Often felt, but rarely causes damage.   |
| 5.4 - 6.0 | At most, slight damage to well-designed buildings. Can cause major damage to poorly constructed buildings over small regions. |
| 6.1 - 6.9 | Can be destructive in areas up to about 100 kilometers across where people live.  |
| 7.0 - 7.9 | Major earthquake. Can cause serious damage over larger areas.   |
| 8 or >    | Great earthquake. Can cause serious damage in areas several hundred kilometers across.  |

Table 17. Modified Mercalli Intensity Scale

| Scale | Intensity       | Description of Effects   | Corresponding<br>Richter Scale<br>Magnitude |
|-------|-----------------|--|---|
| I     | Instrumental    | Detected only on seismographs.                                 |   |
| II    | Feeble          | Some people feel it.   | < 4.2                                       |
| III   | Slight          | Felt by people resting; like a truck rumbling by.              |   |
| IV    | Moderate        | Felt by people walking.  |   |
| V     | Slightly Strong | Sleepers awake; church bells ring.                             | < 4.8                                       |
| VI    | Strong          | Trees sway; suspended objects swing; objects fall off shelves. | < 5.4                                       |

| Scale | Intensity       | Description of Effects  | Corresponding<br>Richter Scale<br>Magnitude |
|-------|-----------------|---|---|
| VII   | Very Strong     | Mild alarm; walls crack; plaster falls.   | < 6.1                                       |
| VIII  | Destructive     | Moving cars become uncontrollable; masonry fractures, poorly constructed buildings damaged.                             |   |
| IX    | Ruinous         | Some houses collapse; the ground cracks; pipes break open.  | < 6.9                                       |
| X     | Disastrous      | Ground cracks profusely; many buildings destroyed; liquefaction and landslides widespread.                              | < 7.3                                       |
| XI    | Very Disastrous | Most buildings and bridges collapse; roads, railways, pipes, and cables destroyed; general triggering of other hazards. | < 8.1                                       |
| XII   | Catastrophic    | Total destruction: trees fall; ground rises and falls in waves.   | > 8.1                                       |

### Previous Occurrences

Earthquakes occur on a regular basis in the Northeast US. According to the Weston Observatory Northeast Earthquake Catalog, more than 5,000 earthquakes have occurred in the region since 1638, including more than 1,500 earthquakes in New England and more than 350 with epicenters in Massachusetts. Generally, most earthquakes that occur in the Northeast US are small in magnitude and cause little to no damage, though ground shaking is felt across large areas due to the geologic composition and rock structure of the region. In terms of potential impacts, this makes the specific location of the epicenter in the Northeast less relevant than in other regions of the US.

Between 1924 and 2016, there were 105 earthquakes in the Northeast measuring a magnitude 4.5 or greater on the Richter scale. Out of these 104 earthquakes, 10 were centered within New England and the other 94 occurred within New York State and the Province of Quebec. Historically, moderately damaging earthquakes strike somewhere in the region every few decades, and smaller earthquakes are felt approximately twice per year. The largest known New England earthquakes occurred in 1638 (magnitude 6.5) in New Hampshire, and in 1755 (magnitude 5.8) offshore from Cape Ann northeast of

Boston. The most recent New England earthquake to cause moderate damage occurred in 1940 (magnitude 5.6) in central New Hampshire. Reported damages included toppled chimneys, cracked walls, broken water pipes, fallen plaster, and broken furniture.

Based on past records, the maximum experienced earthquake intensities on the Mercalli Scale in Northern Middlesex County have been in the range of VI (where there is damage to objects indoors, the tremor is felt by all people indoors and outdoors, movement is unsteady, moderately heavy furniture moves, and pictures fall off walls) to VII (where there is damage to architecture, the tremors are frightening, it is difficult to stand, cracks occur in chimneys and plaster, bricks may fall, and stream banks may cave in).

### Probability of Future Events and Changes Since the Previous Plan

Although New England has not experienced a damaging earthquake since 1755, seismologists state that a serious earthquake occurrence is possible. Based on the historic occurrences, which have been few and of limited severity, Wilmington should be considered to be at a moderate risk for earthquake damage in the future. Because the region's geologic faults zones do not correlate strongly to earthquake locations or aid in predication of occurrence, it is difficult to determine level of probability. However, Wilmington falls within a seismic zone with a peak ground acceleration value of 14-16%g, which is considered a moderate risk zone in terms of potential ground shaking and damage from such an event. This zone generally indicates that there is a 1 in 10 chance that in any given fifty-year period a potentially damaging earthquake will occur.

Earthquakes with a magnitude of 3.0 and greater will remain a **possible** occurrence for being felt in Wilmington, though based on historical data and existing seismic hazard maps, the Town is considered susceptible to only minor ground shaking and light damages (if any). Moderately damaging earthquakes are only expected to strike somewhere in the New England region every few decades.

### Impact on the Community and Vulnerability

The entire population of Massachusetts is potentially exposed to direct and indirect impacts from earthquakes. The degree of exposure depends on many factors, including the age and construction type of the structures where people live, work, and go to school, and the soil type these buildings are constructed on. Ground movement during an earthquake is seldom the direct cause of injury or death. Collapsing walls, falling objects, and flying glass cause most casualties. Buildings with foundations resting on unconsolidated landfill, old waterways, or other unstable soils are most at risk.

Most buildings and infrastructures in Massachusetts were constructed without specific earthquake-resistant design features. Massachusetts introduced earthquake design requirements into their building code in 1975 and improved building code for seismic reasons in the 1980s. However, these specifications apply only to new buildings or to extensively modified existing buildings. Buildings, bridges, water supply lines, electrical power lines and facilities built before the 1980s may not have been designed to withstand the forces of an earthquake. Seismic standards were upgraded in the 1997 revision of the State Building Code. Older buildings, including some historic properties, are most

vulnerable to earthquakes. If bridges or other key infrastructure assets were damaged by an earthquake, that could lead to travel challenges. Underground infrastructure, such as water, gas or electric, may also be negatively impacted by an earthquake.

The greatest damage in the Middlesex County region from an earthquake event is likely to occur where structures were designed prior to seismic standards being incorporated into the State Building Code. Such structures are scattered throughout the region. In addition, older structures in the region such as schools, hospitals, and fire stations, which are built of un-reinforced masonry and are particularly vulnerable to damage or collapse in the event of an earthquake.

Lastly, due to their potential widespread damage and disruption, earthquakes can greatly impact the region's economy, including loss of business functions, damage to inventories, relocation costs, wage losses, and rental losses due to the repair or replacement of buildings. According to the State Hazard Mitigation and Climate Adaptation Plan, in terms of vulnerabilities, residents may be displaced by earthquakes and some of those residents may require sheltering. Vulnerable populations tend to be the most susceptible to displacement; this may include those living at or below the poverty line and the elderly.

### Impacts of Climate Change

The effects of climate change will have no relation to the probability or magnitude of future earthquake events.

## Technological and Human Caused Hazards

### *Dam Failure*

#### Hazard Description

A dam failure is the structural collapse of a dam that releases the water being detained or stored behind it. Dam failures are usually the result of the age of the structure, inadequate spillway capacity, or structural damage caused by an earthquake or flood. Failures due to prolonged periods of rainfall can result in overtopping (the most common cause), and total failure occurs if internal erosion, overtopping, or damage results in a complete structural breach. Overtopping occurs when a dam's spillway capacity is exceeded and portions of the dam that are not designed to convey flow begin to pass water, erode away, and ultimately fail. Other potential causes of dam failure include design flaws, foundation failure, internal soil erosion, inadequate maintenance, or mis-operation.

#### Location

There are no significant or state-regulated dams in Wilmington. However, the Mill Pond Dam in neighboring Burlington is right across the Town line south of Wilmington (near the intersection of Chestnut and Winter Streets). The Mill Pond Dam is owned by the Town of Burlington and classified by the State's Office of Dam Safety as a High Hazard Dam where failure or improper operation may cause loss of life, property damage, and/or service interruptions as further described under the *Extent* portion



of this hazard profile. As described in the previous plan update, if the Mill Pond Dam on the Burlington Reservoir failed, water would likely flow into Wilmington. For more information on the potential areas of impact see below under *Impact on the Community and Vulnerability*. Figure 13 shows the center point location of the Mill Pond Dam in relation to the Town of Wilmington and nearby building footprints.<sup>85</sup>



Figure 13. Mill Pond Dam, Burlington

#### Extent

Dam breaches often lead to catastrophic consequences as the water ultimately rushes in a torrent downstream, flooding an area engineers refer to as an “inundation area.” The number of casualties and the amount of property damage depends on the timing of the warning provided to downstream residents, the number of people living or working in the inundation area, and the number of structures in the inundation area.

Dams in Massachusetts are assessed according to their risk to life and property. The State has three hazard classifications for dams:

- **High Hazard:** Dams located where failure or improper operation is likely to cause loss of life and serious damage to homes, industrial or commercial facilities, important public utilities, main highways, or railroads.

<sup>85</sup> Dam locations as derived from the Massachusetts Dams data layer provided by MassGIS. Accessed via Oliver at: [http://maps.massgis.state.ma.us/map\\_ol/oliver.php](http://maps.massgis.state.ma.us/map_ol/oliver.php)

- *Significant Hazard:* Dams located where failure or improper operation may cause loss of life and damage to homes, industrial or commercial facilities, secondary highways or railroads, or cause interruption of use or service of relatively important facilities.
- *Low Hazard:* Dams located where failure or improper operation may cause minimal property damage to others. Loss of life is not expected.

### Previous Occurrences

Upon a review of data available from the Massachusetts Office of Dam Safety, the National Performance of Dams Program (NPDP) at Stanford University, the Association of State Dam Safety Officials, and NOAA's Storm Events Database, there have been no recorded dam failures causing impacts in Wilmington. According to local Town staff and stakeholders, they are aware of the risk posed by the Mill Pond Dam in Burlington but have not experienced any impacts related to a dam failure or breach.

### Probability of Future Events and Changes Since the Previous Plan

Due to the low number of dams classified as Significant or High Hazard in proximity to Wilmington, in addition to current state regulations for dam safety (inspection and maintenance) programs, dam failure is considered an **unlikely** event for Wilmington (less than 1% annual probability).

While a rare and unlikely occurrence, High Hazard dams do represent a potentially disastrous hazard. The likelihood of dam failure increases if dams are not maintained. In Massachusetts, all jurisdictional-dam owners are responsible for inspecting and maintaining their dams in safe operating condition. This includes hiring a qualified engineer to inspect and report results every 2 years for High Hazard dams, every 5 years for Significant Hazard dams, and every 10 years for Low Hazard dams. Owners of High or Significant Hazard dams are also required to develop and annually update Emergency Action Plans (EAPs). For this reason, the probability of failure for state-regulated dams remains low.

### Impact on the Community and Vulnerability

The Emergency Action Plan for the Mill Pond Dam includes notification of the Wilmington Fire Department in the event of an emergency. Once that notification has been made, the Town of Wilmington is responsible for notifying residents. Any necessary evacuations are also the responsibility of the Town of Wilmington. The plan includes a Resident Evacuation/Notification Table which lists 17 residences on Main Street, 6 on Butters Row, 6 on Factory Street, one business on Eames Street and 27 residences on Chestnut Street.<sup>86</sup>

According to Town of Burlington staff, the more vulnerable locations to dam failure itself is the Burlington Water Treatment Plant (located at the base of the dam) and a residential neighborhood in Woburn.

### Climate Change Impact

It is anticipated that the effects of climate change will not increase the probability of dam failure events, though projected increases in the frequency of extreme precipitation events (as described in previous

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<sup>86</sup> Town of Wilmington, Hazard Mitigation Plan Update. 2015. P. 27-28.

sections) should continue to be considered in the regulation, construction, operation, and maintenance or repair of dam structures. As further explained in the State Hazard Mitigation and Climate Adaptation Plan, there are a number of ways in which climate change could alter the flow behavior of a river, causing conditions to deviate from what the dam was initially designed to handle. Therefore, although climate change will not increase the probability of catastrophic dam failure, it may increase the probability of design failures.<sup>87</sup>

## Critical Facilities

Critical facilities are considered structures or institutions necessary for the Town of Wilmington in terms of emergency response and recovery. These facilities must continue to operate during and following a disaster to reduce the severity of impacts and accelerate recovery. Critical facilities typically include airports, emergency operation centers (EOCs), fire stations, hospitals, police stations, schools, government buildings, and railroad stations. Table 18 lists critical facilities as identified by Town staff through the MVP and hazard mitigation planning processes. Figure 14 illustrates the location of Wilmington's identified critical facilities.

Table 18. Critical Facilities

| Name                         | Type           | Street Address    | Generator? (y/n) |
|------------------------------|----------------|-------------------|------------------|
| Sunbridge Nursing Home       | Nursing Home   | 750 Woburn St     |                  |
| Woodbriar Nursing Home       | Nursing Home   | 90 West St        |                  |
| Wilmington Housing Authority | Public Housing | 1 Deming Way      |                  |
| Wilmington Memorial Library  | Library        | 175 Middlesex Ave | No               |
| Wilmington High School       | School         | 159 Church St     | Yes              |
| North School                 | School         | 320 Salem Street  | No               |
| Middle School                | School         | 25 Carter Lane    | Yes              |
| West School                  | School         | 22 Carter Lane    | No               |
| Wildwood Street School       | School         | 182 Wildwood St   | No               |
| Woburn Street School         | School         | 227 Woburn St     | No               |
| Shawsheen Elementary School  | School         | 298 Shawsheen Ave | No               |

<sup>87</sup> Massachusetts State Hazard Mitigation and Climate Adaptation Plan. September 2018. P. 4-5.

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| Name  | Type                        | Street Address    | Generator? (y/n) |
|---|-----------------------------|-------------------|------------------|
| Boutwell School                             | School                      | 17 Boutwell St    | No               |
| Wilmington Public Safety                    | Fire and Police             | 1 Adelaide St     | Yes              |
| Wilmington Town Hall                        | Municipal Office            | 121 Glen Rd       | No               |
| Wilmington Department of Public Works       | Municipal Office            | 115 Andover St    | Yes              |
| Wilmington Senior Center                    | Senior Center               | 15 School St      | No               |
| Barrows Wellfield                           | Wellfield                   | 11 Sewell Rd      | Yes              |
| Butters Row Well (inactive)                 | Well #1                     | 54 Butters Row    | No               |
| Nassau Avenue Water Storage Tank            | Water Storage Tank          | Eagle Rd          | Yes              |
| Wilmington MBTA Station                     | Transportation Facility     | Middlesex Ave     |                  |
| North Wilmington MBTA Station               | Transportation Facility     | Main Street       |                  |
| Public Buildings Office                     | Municipal Office            | 30 Church St      | No               |
| Family Medical Center (Winchester Hospital) | Urgent Care                 | 500 Salem St      |                  |
| Public Safety Building (Police/Fire)        | Emergency Operations Center | 1 Adelaide St     | Yes              |
| Art Center                                  | Emergency Operations Center | 219 Middlesex Ave | No               |
| Brown's Crossing Pump Station               | Wellfield                   | 115 Andover St    | Yes              |
| Reading Municipal Light Sub Station         | Power Substation            | Wildwood St       | No               |
| E.H Sargent Water Treatment Plant           | Water Treatment Facility    |                   | Yes              |
| Research Drive Water Storage Tank           | Water Storage Tank          | Research Drive    | No               |
| Shawsheen River Estates Pump Station        | Sewer Pumping Station       | 3703 Pouliot Pl   | Yes              |

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| Name                               | Type                     | Street Address                | Generator? (y/n)  |
|------------------------------------|--------------------------|-------------------------------|---|
| Salem Street Sewer Pump Station    | Sewer Pumping Station    | 280 Salem St                  | Yes   |
| Town Park Septage Station          | Sewer Pumping Station    | Main Street                   | No  |
| Pilcher Drive Sewer Pump Station   | Sewer Pumping Station    | 1A Pilcher Drive              | Yes   |
| Industrial Way Sewer Pump Station  | Sewer Pumping Station    | 66 Industrial Way             | No<br>(connection available on site for portable generator) |
| Adelaide Street Sewer Pump Station | Sewer Pumping Station    | 1 Adelaide St                 | Yes   |
| Hillside Way Water Storage Tank    | Water Storage Tank       | 15 Hillside Way               | No  |
| Water Booster Station              | Water Booster Station    |                               |   |
| Salem Street Well                  | Well                     | 775 Salem St                  | Yes   |
| Police Firing Range                | Fire and Police          | 135 Andover St.               | Yes   |
| Butters Row WTP                    | Water Treatment Facility | 54 Butters Row                | Yes   |
| Shawsheen Avenue Well              | Wellfield                | 153 Shawsheen Ave             | Yes   |
| Windsor Place Sewer Pump Station   | Sewer Pumping Station    | 92 West St                    | Yes   |
| Avalon Oaks Sewer Pump Station     | Sewer Pumping Station    | 40 Ballardvale St             | Yes   |
| Lowell Street Sewer Pump Station   | Sewer Pumping Station    | 168 Lowell Street             | Yes   |
| N/A                                | Communication Tower      | 250 Ballardvale Street        |   |
| N/A                                | Communication Tower      | 375 (fmr. 377) Ballardvale St |   |
| N/A                                | Communication Tower      | 260 Fordham Road              |   |

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| Name | Type                | Street Address    | Generator? (y/n) |
|------|---------------------|-------------------|------------------|
| N/A  | Communication Tower | 65 Industrial Way |                  |
| N/A  | Communication Tower | 910 Main Street   |                  |
| N/A  | Communication Tower | 773 Salem Street  |                  |
| N/A  | Communication Tower | 26 Upton Drive    |                  |

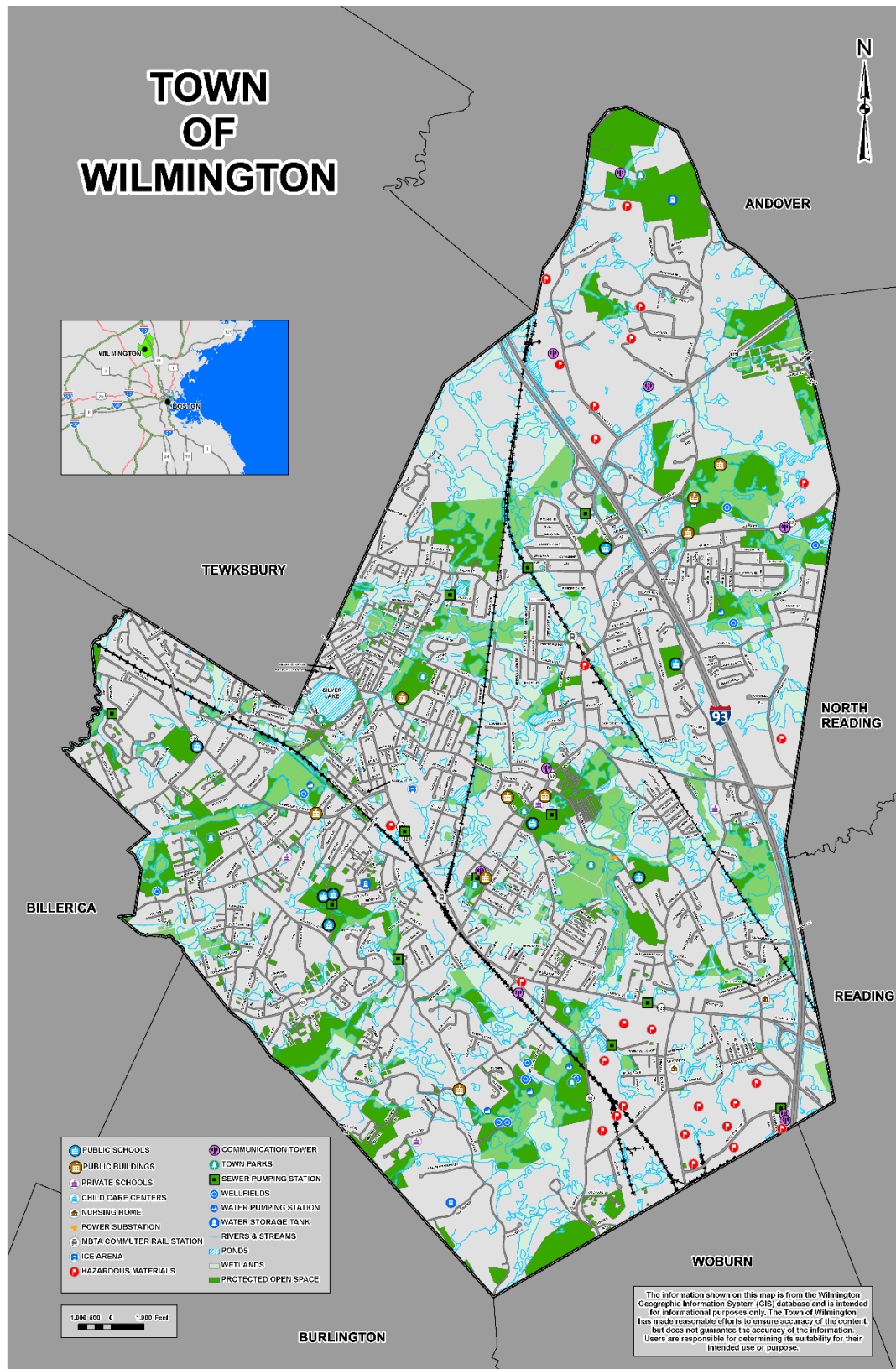


Figure 14. Critical Facilities Map



## Other Community Assets and Key Resources

In addition to the above listed critical facilities, there are many other community assets and key resources throughout the Town. These include those infrastructure elements and other public facilities described in Chapter 2 such as the local transportation network, utilities, water supply systems, stormwater infrastructure, and other facilities that provide important services to residents and businesses across the community. These also include Wilmington's natural, cultural, and historic resources that contribute to the Town's character and are important to continue preserving and protecting against the threat of natural hazards or other potential adverse impacts.

## National Flood Insurance Program Insured Structures

### *B4. Does the Plan address NFIP insured structures within the jurisdiction that have been repetitively damaged by floods? (Requirement §201.6(c)(2)(ii))*

According to FEMA records as of January 12, 2021, there are 66 active NFIP policies in Wilmington that provide approximately \$17.9 million in insurance coverage. Most of these policies (56) are single family structures, with the remaining 10 classified as non-residential structures. Twenty-seven of these insured structures are in FEMA-mapped special flood hazard areas while the remaining 39 are in areas classified as moderate to low risk of flooding. Total annual premiums for these properties are approximately \$102,000, and to date nearly \$169,000 in claims have been paid to NFIP policyholders under a total of 37 recorded losses (averaging less than \$5,000 per loss).

To further understand flood impact, including financial impact, information was gathered from the Massachusetts Department of Conservation and Recreation regarding repetitive loss properties. Repetitive loss properties are those for which two or more losses of at least \$1,000 each have been paid under the National Flood Insurance Program (NFIP) within any 10-year period since 1978.

According to FEMA records, there are four (4) repetitive loss structures in Wilmington. Wilmington's repetitive loss properties have a combined history of eight (8) recorded flood losses totaling approximately \$46,000 in claims paid. Per NFIP records only one of these repetitive loss properties is located in a FEMA-mapped special flood hazard area.

Severe repetitive loss properties are residential properties that have at least four NFIP payments over \$5,000 each and the cumulative amount of such claims exceeds \$20,000, or at least two separate claims payments with the cumulative amount exceeding the market value of the building. According to current NFIP records the Town of Wilmington has no severe repetitive loss properties located within its jurisdiction.

## Summary of Vulnerability

The Risk and Vulnerability Assessment completed for the Town of Wilmington includes both quantitative and qualitative information to help determine the potential impact of each identified hazard on community assets. This information provides significant findings that allow the MVP/HMP Core Team to prioritize hazard risks and proposed hazard mitigation strategies and actions.

To assist in this process, the MVP/HMP Team applied a “Priority Risk Index” (PRI). The PRI is a tool designed to (1) summarize relevant hazard profile information as included in this section; and (2) measure the degree of relative risk each hazard poses to the Town based on that information. The PRI was used to assist the MVP/HMP Core Team in ranking and prioritizing hazards based on a variety of characteristics including location, probability, potential impact, warning time, and duration.

The PRI results in numerical values that allow identified hazards to be ranked against one another – the higher the PRI value, the greater the hazard risk. PRI values are obtained by assigning varying degrees of risk to each of the five characteristics, or categories. Each degree of risk has been assigned an index value (1 to 4) and an agreed upon weighting factor, as summarized in Table 19.

To calculate the PRI value for a given hazard, the assigned index value for each category is multiplied by the weighting factor. The sum of all five categories equals the final PRI value, as demonstrated in the below equation:

### **PRI VALUE =**

$$(\text{LOCATION} \times .20) + (\text{PROBABILITY} \times .30) + (\text{POTENTIAL IMPACT} \times .30) + (\text{WARNING TIME} \times .10) + (\text{DURATION} \times .10)$$

According to the weighting scheme applied by the MVP/HMP, the highest possible PRI value is 4.0. Prior to being finalized, PRI values for each hazard were reviewed and accepted by the MVP/HMP Core Team.

*Table 19. Priority Risk Index (PRI)*

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| PRI Category       | Degree of Risk     |   |             | Assigned Weighting Factor |
|--------------------|--------------------|---|-------------|---------------------------|
|                    | Level              | Criteria  | Index Value |                           |
| Location           | Negligible         | Less than 1% of planning area affected  | 1           | 20%                       |
|                    | Small              | 1-10% of planning area affected   | 2           |                           |
|                    | Moderate           | 10-50% of planning area affected  | 3           |                           |
|                    | Large              | 50-100% of planning area affected   | 4           |                           |
| Probability        | Unlikely           | Less than 1% annual probability   | 1           | 30%                       |
|                    | Possible           | 1-10% annual probability  | 2           |                           |
|                    | Likely             | 10-90% annual probability   | 3           |                           |
|                    | Highly Likely      | 90-100% annual probability  | 4           |                           |
| Potential Impact * | Minor              | Very few injuries, if any. Only minor property damage and minimal disruption to quality of life. Partial or complete shutdown of critical facilities for less than one day.     | 1           | 30%                       |
|                    | Limited            | Minor injuries only. 10-25% of property in affected area damaged or destroyed. Complete shutdown of critical facilities for more than one day.                                  | 2           |                           |
|                    | Critical           | Multiple fatalities/injuries possible. More than 25% of property in affected area damaged or destroyed. Complete shutdown of critical facilities for more than one week.        | 3           |                           |
|                    | Catastrophic       | High number of fatalities/injuries possible. More than 50% of property in affected area damaged or destroyed. Complete shutdown of critical facilities for more than one month. | 4           |                           |
| Warning Time       | More than 24 hours |   | 1           | 10%                       |
|                    | 12 to 24 hours     |   | 2           |                           |
|                    | 6 to 12 hours      |   | 3           |                           |
|                    | Less than 6 hours  |   | 4           |                           |

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|          |                   |   |     |
|----------|-------------------|---|-----|
| Duration | Less than 6 hours | 1 | 10% |
|          | 6 to 24 hours     | 2 |     |
|          | 1 to 7 days       | 3 |     |
|          | More than 1 week  | 4 |     |

*\* Potential impact is based upon the estimated maximum probable extent (magnitude/severity) for each hazard based on historic events or future probability data, as shown in Table 20.*

Table 20. Maximum Probable Extent

| Hazard                         | Maximum Probable Extent   |
|--------------------------------|---|
| Flooding                       | 1 Percent Annual Chance Flood for all FEMA Special Flood Hazard Areas   |
| Drought                        | Drought Category D3 (Extreme Drought) as classified by the US Drought Monitor   |
| Average/Extreme Temperatures   | Cold: Wind Chill Temperature Index of –25°F or lower for at least three hours<br><br>Heat: Heat Index of 105+°F for two or more hours; or 3 consecutive days with a heat index exceeding 100°F" |
| Wildfires                      | 100+ acres burned along wildland-urban interface  |
| Invasive Species               | Chronic, uncontrolled invasives with consistent threats to ecosystems and/or human health   |
| Infectious Disease             | Pandemic (major disease outbreak with severe and life-threatening consequences) with confirmed cases in the Wilmington region   |
| Hurricanes/Tropical Storms     | Category 3 hurricane on Saffir-Simpson Hurricane Wind Scale   |
| Severe Winter Storm/Nor'easter | Category 5 on Regional Snowfall Index (RSI); or Intensity Index Category 4 on Classification Scheme for Nor'easters   |
| Tornadoes                      | EF-3 on the Enhanced Fujita Scale   |
| Other Severe Weather           | Winds gusts in excess of 70 miles per hour, hail measuring at least three-quarters of an inch in diameter, or rainfall exceeding the 10-year design storm event                                 |
| Earthquake                     | Intensity VII on Modified Mercalli Intensity Scale  |
| Dam Failure                    | Complete failure of a high hazard dam   |

Table 21 summarizes the degree of risk assigned for all identified hazards in the planning area based on the application of the PRI tool, along with the calculated PRI values. Please note that more detailed information on the specific locations, probabilities, vulnerabilities, and potential impacts for each hazard in the planning area are provided in each hazard-specific profile in this section. This detailed information was the basis for determining the overall summary of hazards as provided in Table 21.

*Table 21. Summary of Priority Risk Index (PRI) Results*

| Hazard                         | Category/Degree of Risk |               |                  |                    |                   | PRI Value |
|--------------------------------|-------------------------|---------------|------------------|--------------------|-------------------|-----------|
|                                | Location                | Probability   | Potential Impact | Warning Time       | Duration          |           |
| Flooding                       | Moderate                | Likely        | Critical         | 12 to 24 hours     | 1 to 7 days       | 2.9       |
| Drought                        | Large                   | Possible      | Limited          | More than 24 hours | More than 1 week  | 2.5       |
| Average/Extreme Temperatures   | Large                   | Likely        | Limited          | More than 24 hours | 1 to 7 days       | 2.7       |
| Wildfires                      | Small                   | Highly Likely | Minor            | Less than 6 hours  | 6 to 24 hours     | 2.5       |
| Invasive Species               | Moderate                | Highly Likely | Minor            | More than 24 hours | More than 1 week  | 2.6       |
| Infectious Disease             | Small                   | Likely        | Critical         | More than 24 hours | More than 1 week  | 2.7       |
| Hurricanes/Tropical Storms     | Large                   | Likely        | Critical         | More than 24 hours | 1 to 7 days       | 3.0       |
| Severe Winter Storm/Nor'easter | Large                   | Highly Likely | Limited          | More than 24 hours | 1 to 7 days       | 3.0       |
| Tornadoes                      | Small                   | Possible      | Catastrophic     | Less than 6 hours  | Less than 6 hours | 2.7       |
| Other Severe Weather           | Moderate                | Highly Likely | Limited          | 6 to 12 hours      | 6 to 24 hours     | 2.9       |
| Earthquake                     | Large                   | Possible      | Minor            | Less than 6 hours  | Less than 6 hours | 2.2       |
| Dam Failure                    | Small                   | Unlikely      | Critical         | Less than 6 hours  | Less than 6 hours | 2.1       |

The calculated PRI values were used by the MVP/HMP Core Team to classify and rank each hazard according to three defined risk levels (Low, Moderate, or High) as shown in Table 22. It should be noted that although some hazards are classified as posing “low” risk, their occurrence of varying or unprecedented magnitudes is still possible and they will continue to be evaluated by the MVP/HMP Core Team during future updates to this plan.

Table 22. Hazard Rankings Based on Priority Risk Index (PRI)

| Hazard Ranking  | Hazards   |
|-----------------|---|
| <b>High</b>     | Hurricanes/Tropical Storms<br>Severe Winter Storm/Nor’easter<br>Flooding<br>Other Severe Weather            |
| <b>Moderate</b> | Average/Extreme Temperatures<br>Tornadoes<br>Infectious Disease<br>Invasive Species<br>Drought<br>Wildfires |
| <b>Low</b>      | Earthquake<br>Dam Failure   |

The Town’s previous hazard mitigation plan (completed by MAPC in 2015) identified the community to be most at risk to flooding, hurricanes and tropical storms, severe winter storms/nor’easters, thunderstorms, and brush fires (based on frequency and severity classifications).<sup>88</sup> The updated risk rankings for Wilmington generally agree with the previous list though tornadoes are considered

<sup>88</sup> Town of Wilmington Hazard Mitigation Plan Update. MAPC. 2015. P. 18.



somewhat of a greater risk than previously assessed, and infectious disease and invasive species are introduced as moderate risk hazards. Earthquake, and dam failure remain relatively low risk hazards for Wilmington.

## Chapter 5. Capability Assessment

The purpose of the capability assessment is to identify the strengths and weaknesses of the town in terms of its ability to mitigate risks to natural hazards. The capability assessment looks at current proficiencies as well as any change in capabilities from the previous mitigation plan and serves as the foundation for designing an effective hazard mitigation strategy. It not only helps establish the goals for the mitigation plan but ensures that those goals are realistically achievable under local conditions. It also helps to identify how mitigation actions should be prioritized or implemented.

C1. Does the plan document each jurisdiction's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs? (Requirement §201.6(c)(3))

The capability assessment looks at the town's pre- and post-disaster hazard management capabilities which are organized according to the following four key types of capabilities:

1. **Planning and Regulatory Capabilities:** capabilities based on the jurisdiction's implementation of ordinances, policies, local laws, State statutes, and plans and programs that relate to managing growth and development.
2. **Administrative and Technical Capabilities:** capabilities associated with the jurisdiction's staff, skills, and tools that can be used for mitigation planning and implementation.
3. **Financial Capabilities:** the fiscal resources a jurisdiction has access to or is eligible to use to fund mitigation actions.
4. **Education and Outreach:** programs and methods already in place that could be used to implement mitigation activities and communicate hazard-related information.

Town leaders completed a questionnaire regarding capabilities. The questionnaire was based on the one in FEMA's *Local Mitigation Planning Handbook* and is broken into the four categories defined above. Additional information for the Capability Assessment was gathered from review of Town plans, the Community Resilience Building (CRB) Workshop and stakeholder engagement.

### Planning and Regulatory Capabilities

Planning and regulatory capabilities are the plans, policies, codes, and ordinances that prevent and reduce the impacts of hazards. The first step in the capability assessment was to gather and review existing plans to understand the town's current ability to mitigate risk. Information regarding current plans is included in the table below. Most of the plans include some information regarding risk reduction. The Town does not have a historic preservation plan or an economic development plan. The Town is considering developing a Continuity of Operations Plan.

Mentioned in the previous hazard mitigation plan were four studies<sup>89</sup> the Town took related to drainage issues:

1. Final Report: Planning for Growth in the Upper Ipswich River Watershed, June 2002.
2. Assessment of Habitat Fish Communities and Streamflow Requirements for Habitat Protection, Ipswich River, MA 1998-99 from USGS 2001.
3. A Precipitation-Runoff Model for Analysis of the Effects of Water Withdrawals on Streamflow, Ipswich River Basin, MA from USGS 2000
4. Flow Impairment Report on the Headwaters of the Ipswich River from Headwaters Stream Team (2000).

The Planning & Conservation Department manages the Zoning Bylaw, Stormwater Management Bylaw, Subdivision Rules and Regulations, and provides zoning maps. They also maintain the following conservation policies, a Conservation Commission Policy, a Wetlands Enforcement Bylaw, and a Tree and Vegetation Removal Policy. The Town adheres to Massachusetts Department of Environmental Protection (DEP) Wetlands Protection Act regulations. They also distribute salt restrictions and Snow Disposal Guidance from the DEP to commercial properties.

Table 23. Planning and Regulatory Capability documents

| Planning/Regulatory Tool         | Responsible Authority<br>Wilmington        | General Description and Effectiveness for<br>Hazard Risk Reduction Wilmington   |
|----------------------------------|--|---|
| <i>Plans</i>                     |  | <i>Does the plan address hazards? Does the plan identify projects to include in the mitigation strategy? Can the plan be used to implement mitigation actions?</i>  |
| Comprehensive/Master Plan (2001) | Planning & Conservation,<br>Planning Board | The Master Plan is from 2001. The Town does not have immediate plans to update it. The current Master Plan includes minimal information about flood control but does not emphasize risk reduction. Reliability of the water supply is included. |

<sup>89</sup> Town of Wilmington Hazard Mitigation Plan 2015 Update, p.86.

| Planning/Regulatory Tool                     | Responsible Authority<br>Wilmington                 | General Description and Effectiveness for<br>Hazard Risk Reduction Wilmington  |
|--|---|--|
| Open Space and Recreation Plan (OSRP) (2015) | Open Space Committee, and multiple Town departments | The OSRP includes a goal to create buffers along waterways. The Town has recently updated this plan and will send it to the state in July 2021. The update continues to have it focus on preserving open space and protecting the water supply and wetlands. |
| Hurricane/Emergency Plan                     | Fire Department                                     | This plan is kept current by the Fire Department and emphasizes response.  |
| Capital Improvements Plan                    | Town Manager and other departments                  | Yes, used to fund operation and infrastructure improvement actions (drainage improvements, waterworks, sewer works, snow removal equipment, etc.). This was used to secure heavy equipment included as a mitigation action in the previous plan.             |
| Emergency Operations Plan                    | DPW   | Fire and Emergency Action Plan pertaining to DPW Garage and fueling station.   |
| Transportation Plan                          | DPW and Private development                         | Town-wide Intersection Plan – addresses updating equipment and improving safety. Town also has a roadside spill response plan. Also just performed a Town-wide street inventory, Pavement Condition Index (PCI).   |

| <b>Planning/Regulatory Tool</b>                   | <b>Responsible Authority<br/>Wilmington</b>            | <b>General Description and Effectiveness for<br/>Hazard Risk Reduction Wilmington</b>   |
|---|--|---|
| Stormwater Management Plan                        | Planning Board,<br>Plan Dept.,<br>Engineering Division | Yes, Comprehensive Stormwater Bylaw and Regulations require attenuation of 100-year storm events for new development. Also, have a Stormwater Management Plan (water quality based but includes operations and maintenance for town owned facilities and infrastructure).                         |
| Wastewater Management Plan                        | DPW  | Rely on MA Water Resources Authority (MWRA) Regulations and Permitting. Town performed infiltration and inflow control analysis on system in 2021. Pump stations individually monitored by SAS 24-7.  |
| Forest Recreation & Management Plan (2004)        | Planning & Conservation                                | This plan calls for environmental education and outreach.   |
| <i>Building Code, Permitting, and Inspections</i> |  |   |
| Building Code                                     | No local code  | Use state level codes.  |
| Fire Department ISO Mitigation Ratings            | Fire Department  | Fire Department maintains ISO rating. ISO is the principal provider for insurance underwriting to the insurance industry in the US. Maintaining this rating allows property owners within the community to be able to receive the full benefit of available property insurance premium discounts. |

| Planning/Regulatory Tool  | Responsible Authority<br>Wilmington                                     | General Description and Effectiveness for<br>Hazard Risk Reduction Wilmington   |
|---|---|---|
| Site Plan Review Requirements   | Planning & Conservation,<br>Planning Board                              | Site Plan Review trips a Stormwater Management Permit (SMP).  |
| <i>Zoning and Development Regulations</i>   |   |   |
| Zoning Bylaws/Ordinances (2020)   | Building Inspector,<br>Planning Board,<br>Zoning Board of Appeals (ZBA) | Floodplain District (Section 6.2) prohibits development in floodway, requires preservation of flood storage and elevated access.  |
| Subdivision Regulations   | Planning & Conservation,<br>Planning Board                              | Trips SMP and requires delineation of resource areas.   |
| Floodplain Regulations  | Building Inspector,<br>ZBA, Conservation<br>(State Wetland Regulations) | Floodplain District (Section 6.2) prohibits development in floodway, requires preservation of flood storage, and elevated access. |
| Stormwater Management Regulations   | Planning & Conservation,<br>Planning Board                              | Requires attenuation of 100-year storm event for all new development projects.  |
| <p><i>Have you adopted new policies, plans, regulations, or reports, since the original plan, that could be incorporated into this plan? What has changed since the original plan?</i></p> <p>Updated stormwater bylaw and regulations that reflect the Municipal Separate Storm Sewer System (MS4) General Permit Updates from 2020. The Town has an MS4 plan.</p> <p>The Town has a Water Conservation Program managed by the Department of Public Works (DPW).</p> |   |   |

The Zoning bylaws include the following seven items as the purposes of the Flood Plain District.<sup>90</sup>

1. Ensure public safety through reducing the threats to life and personal injury.
2. Eliminate new hazards to emergency response officials.
3. Prevent the occurrence of public emergencies resulting from water quality, contamination, and pollution due to flooding.
4. Avoid the loss of utility services which if damaged by flooding would disrupt or shut down the utility network and impact regions of the community beyond the site of flooding.
5. Eliminate costs associated with the response and cleanup of flooding conditions.
6. Reduce damage to public and private property resulting from flooding waters.
7. Provide long term control over the extent of land subject to inundation by the base flood.

Town officials completed the Safe Growth Survey. This is a survey designed to capture general information about how the town is positioned to grow safely relative to natural hazards. This survey instrument is designed to capture some general information for purposes of developing the *Wilmington Hazard Mitigation Plan Update*. It has been adapted from a technique recommended by the American Planning Association (APA) and FEMA to help evaluate the extent to which the Town of Wilmington is positioned to grow safely relative to its natural hazards. These hazards include but are not limited to hurricanes, floods, fires, winter storms and other severe weather systems.

The results of the Safe Growth Survey indicate that while some of Wilmington's plans include safe growth practices there is room for improvement by adding environmental incentives, expanding the building code for hazards, and revising subdivision regulations to prohibit division of land adjacent to natural hazard areas. Appendix B includes complete Safe Growth Survey results.

### Administrative and Technical Capabilities

The Town of Wilmington has the staff and technical ability to mitigate risk. The Town also participates in regional and local groups including the Ipswich Head Waters Stream Team, and the Ipswich River Watershed Association (IRWA).

The Planning & Conservation Department includes five staff people, a director, two senior clerks, an assistant planner, and a conservation agent. The department provides staff support and technical assistance to the Planning Board and Conservation Commission, which review development projects in Town. The department conducts general planning initiatives, including open space and recreation, affordable housing, transportation, hazard mitigation, and land use planning.

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<sup>90</sup> Wilmington Zoning Bylaw, p.33.



Table 24. Administrative and Technical Capabilities

| Administrative/Technical Resource             | Full-time (FT)/Part-time (PT)/Volunteer (V) | General Description and Effectiveness for Hazard Risk Reduction Wilmington  |
|---|---|---|
| <i>Administration</i>                         |   | <i>Describe capability. Is coordination effective?</i>  |
| Planning Board/Commission                     | V   | 5-member volunteer Board appointed by Town Manager. Have full time staff in Department of Planning & Conservation.  |
| Local Planning Team (for Mitigation Planning) | V   | Core Team   |
| Conservation Commission                       | V   | 7-member volunteer Commission appointed by Town Manager. Have full time staff in Department of Planning & Conservation.   |
| Mutual Aid Agreements                         | FT  | Fire Department maintains mutual aid agreements with all surrounding communities.   |
| <i>Staff</i>                                  |   | <i>Is staffing adequate to administer programs/enforce regulations? Is staff trained on hazards and mitigation? Is coordination between agencies and staff effective?</i> |
| Chief Building Official                       | F   | Building inspector is also Floodplain Administrator.  |

| <b>Administrative/Technical Resource</b>   | <b>Full-time (FT)/Part-time (PT)/Volunteer (V)</b> | <b>General Description and Effectiveness for Hazard Risk Reduction Wilmington</b>         |
|--|--|---|
| Floodplain Administrator   | F  | Building inspector is also Floodplain Administrator.                                      |
| Emergency Manager  | F (Fire Chief)                                     | Emergency manager is Fire Chief   |
| Community Planner  | F  |   |
| Civil Engineer   | F  |   |
| GIS Coordinator  | F  |   |
| <i>Technical</i>   |  | <i>Describe capability. Has capability been used to assess/mitigate risk in the past?</i> |
| Staff with knowledge of land development and land management practices             | F  |   |
| Staff trained in construction practices related to buildings and/or infrastructure | F  |   |
| Staff with an understanding of natural hazards and risk mitigation                 | F  |   |
| Hazards data and information   | F  | Full time GIS Coordinator   |

| <b>Administrative/Technical Resource</b>                                    | <b>Full-time (FT)/Part-time (PT)/Volunteer (V)</b> | <b>General Description and Effectiveness for Hazard Risk Reduction Wilmington</b>  |
|---|--|--|
| Warning systems/services (e.g., Reverse 911, outdoor warning signals, etc.) | F  | Reverse 911  |
| Other Resources?  | F  | Recognize DPW Staff as First Responders. <sup>91</sup> Wilmington had a flag raising ceremony on 6/19/2020 to officially recognize DPW crews as First Responders. They work collaboratively with Wilmington Police and Fire Departments. |

## Financial Capabilities

Financial capabilities include any and all funds collected for the use of hazard mitigation.

Table 25. Financial Capabilities

| <b>Financial Tool/Source</b> | <b>Accessible for Hazard Mitigation (Yes/No)</b> | <b>General Description and Effectiveness for Hazard Risk Reduction Wilmington</b><br><i>Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?</i> |
|------------------------------|--|---|
| General funds                | Y  | Drainage improvement projects, transportation projects, operations equipment, etc.  |

<sup>91</sup> [https://www.apwa.net/Images/Reporter/202008\\_ReporterOnline.pdf](https://www.apwa.net/Images/Reporter/202008_ReporterOnline.pdf), p.22.

| Financial Tool/Source                            | Accessible for Hazard Mitigation (Yes/No) | <b>General Description and Effectiveness for Hazard Risk Reduction Wilmington</b><br><br><i>Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?</i>   |
|--|---|---|
| Capital Improvement Program (CIP) funding        | Y   | Drainage improvement projects, transportation projects, operations equipment, etc. The benefit of capital improvement planning was mentioned in the first public meeting on March 23, 2021 as a benefit for Department of Public Works because it allows them to buy the heavy equipment, they need to mitigate risks to roadways and respond to disasters. |
| Special purpose taxes                            | N   | Betterments program is available for roadway improvements however hasn't been recently (last 20 years or so) used.  |
| Fees for water, sewer, gas, or electric services | Y   | Yes, water and sewer both have established individual enterprise funds that can be used if available and relevant.  |
| Stormwater utility fee                           | N   |   |
| Development impact fees                          | N   |   |
| FEMA Hazard Mitigation Assistance (HMA)          | Y   | Yes, for multiple events including severe winter storms.  |

| <b>Financial Tool/Source</b>  | <b>Accessible for Hazard Mitigation (Yes/No)</b> | <b>General Description and Effectiveness for Hazard Risk Reduction Wilmington</b><br><i>Has the funding resource been used in past and for what type of activities? Could the resource be used to fund future mitigation actions?</i> |
|---|--|---|
| Housing and Urban Development (HUD) Community Development Block Grant (CDBG)  | N  |   |
| Other federal funding programs  | State's Transportation Improvement Program (TIP) | Currently have 4 projects on the TIP; Woburn and Lowell Street intersection, Main Street Corridor, Route 38 bridge project, and Butters row bridge project.   |
| State funding programs  | MassWorks and TIP                                | Currently have a 2.9M dollar grant for sewer, culvert replacement, and roadway improvements along Middlesex Avenue.   |
| <b>Are there new funding sources to consider since the original plan was developed?</b> Bridge/Culvert Program and MVP. |  |   |

## Education and Outreach Capabilities

Education and outreach capabilities include emergency training, public outreach campaigns, and other school or business-related education programs focused on hazard mitigation. The Town hosts Earth Day events that include wetlands conservation and land conservation information.

Table 26. Education Capabilities

| Program/Organization   | Yes/No | <b>Description and Effectiveness for Hazard Risk Reduction Wilmington</b><br><br><i>Describe program/organization and how relates to disaster resilience and mitigation. Could the program/organization help implement future mitigation activities?</i> |
|--|--------|--|
| Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access, and functional needs populations, etc. | Y      |  |
| Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)                  | Y      | Information is posted to the Town's website related to water conservation, storm drains, water quality, etc. Also, informational inserts are distributed twice per year to all residents receiving water bills.  |

## National Flood Insurance Program Participation

C2. Does the Plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate?  
(Requirement §201.6(c)(3)(ii))

The Town of Wilmington is in good standing with the National Flood Insurance Program (NFIP). They entered the NFIP on 7/1/1974. The Flood Insurance Rate Map (FIRM) is from 7/6/2016 and a current FIRM study is listed as underway as of January 12, 2021. Al Spaulding, Building Inspector/Zoning Enforcement Officer is the Town's designated Floodplain Administrator. The Town participated in a CAV Workshop on 6/23/2020, and a GTA on 3/11/2020. The most recent CAV was 7/31/2003 and the CAC was 5/21/2015. The Town currently has 66 policies in force for a total of \$17,911,400.00 in insurance. Thirty-seven losses have been paid for a total of \$168,744.13. It's worth noting that when the previous hazard mitigation plan was written, the Town has 75 flood policies in place.

A pre-FIRM building is a building for which construction or substantial improvement occurred on or before December 31, 1974, or before the effective date of an initial Flood Insurance Rate Map (FIRM). A post-FIRM building is a building for which construction or substantial improvement occurred after December 31, 1974, or on or after the effective date of an initial FIRM, whichever is later.

Wilmington has four repetitive loss properties, that have received \$45,838.50 in payments.

The Town of Wilmington does not participate in the Community Rating System (CRS). The CRS is part of the NFIP. It is a voluntary program for recognizing and encouraging community floodplain management activities exceeding the minimum NFIP standards. Any community in full compliance with the minimum NFIP floodplain management requirements may apply to join the CRS. Flood insurance premium rates are discounted under the CRS program.

The Town's Floodplain District Section 6.2 in the Zoning Bylaws were updated in a 2016 Town Meeting to meet NFIP requirements. The preservation of floodplain storage and the regulation to have driveways outside of the floodplain are the two "higher standards" that Wilmington has to exceed NFIP requirements. In addition, the Town Engineer is the project manager for the MS4 Permit. This permit requires the town to administer an Operation and Maintenance Plan for the town's drainage system. The Town actively seeks funding for culvert replacements.

When asked about possible new actions related to NFIP compliance the town can use GIS platforms to manage and track FEMA requirements, Letter of Map Amendment (LOMA)s, and changes to floodplain boundaries. In addition, Town leaders checked the following boxes in the NFIP Program Survey as new ways to maintain NFIP compliance.

- Maintain digital FEMA elevation certificates for all construction in the floodplain.
- Evaluate permit application forms to determine possible modifications focused on flood hazard prevention.
- Establish a goal to have each plan reviewer and building inspector attend a related training periodically (for example, ASFPM's Annual National Conference, chapter conferences, webinars, etc.).
- Encourage or require certain local staff positions to obtain and maintain Certified Floodplain Manager (CFM) certification.
- Maintain a map of areas that flood frequently (e.g., areas where repetitive loss properties are located) and prioritize those areas for inspection immediately after the next flood. If outside FEMA special flood hazard areas, consider requiring existing NFIP regulatory standards (compliance with existing ordinance) through overlay zoning, etc.
- Conduct a review of other regulatory programs and planning tools, such as the comprehensive plan and zoning ordinance, and report on opportunities to improve consistency with the objectives of floodplain management.



- Maintain supplies of FEMA/NFIP materials to help property owners evaluate measures to reduce potential hazard damage. Make available in public buildings, local library, website, etc. and inform people who they can call to learn more information.

### Summary of Findings and Conclusions

The Town of Wilmington has risk-mitigating capacity, and, more importantly, is actively working to increase this capacity. The Town is in good standing with the NFIP and has the administrative and volunteer base to mitigate risks. Places the Town could increase their capacity by developing a wetlands specific bylaw and expanding the zoning bylaws to include strategies to combat heat islands.

## Chapter 6. Mitigation Strategy

The hazard mitigation strategy is the culmination of work presented in the planning area profile, risk assessment and capability assessment. It is also the result of multiple meetings and thorough public outreach. The work of the Core Team was essential in developing the mitigation goals and actions included in this chapter. As described in Chapter 3 Planning Process, the Core Team worked in a consistent, coordinated manner to identify and prioritize the goals and mitigation actions for this Plan.

### Mitigation Goals

*C3. Does the Plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement §201.6(c)(3)(i))*

Mitigation *goals* represent broad statements that are achieved through the implementation of more specific mitigation *actions*. These actions include both hazard mitigation policies (such as land use regulations) and hazard mitigation projects (such as structure or infrastructure projects). To develop goals for this Hazard Mitigation Plan Update the Core Team reviewed the previous plan's goal statements, the Municipal Vulnerability Preparedness (MVP) plan goal statements, and the goals of the State's Hazard Mitigation and Climate Adaptation Plan.

The Core Team developed six goal statements for the MVP plan. These are included below:

1. Complete the Community Resiliency building process to become a designated "MVP Community", eligible for MVP Action Grant funding to implement the priority actions identified through the planning process.
2. Update a Hazard Mitigation Plan (HMP) in conjunction with the MVP Plan.
3. Develop and prioritize action items/projects which will help prevent and reduce the loss of life, injury, public health impacts and property damages resulting from climate-related natural hazards.
4. Enhance local mitigation capabilities to ensure individual safety, reduce damage to public and private property and ensure continuity of emergency services considering climate change projections.
5. Increase cooperation and coordination among private entities, municipal stakeholders, State and Federal agencies and residents, including vulnerable populations, to ensure preparedness of all groups in the events of climate-related emergencies.
6. Increase awareness of the benefits of climate-related hazard mitigation efforts through outreach and education.

The 2016 Hazard Mitigation Plan Update included four goal statements shown below:

1. Prevent and reduce the loss of life, injury, public health impacts and property damages resulting from all identified natural hazards.

2. Build and enhance local mitigation capabilities to ensure individual safety, reduce damage to public and private property and ensure continuity of emergency services.
3. Increase cooperation and coordination among private entities, Town officials and Boards, State agencies and Federal agencies.
4. Increase awareness of the benefits of hazard mitigation through outreach and education.

The Core Team developed the four goal statements shown in the Figure below for this Hazard Mitigation Plan Update. All the concepts from the previous plan and the MVP are included. The new goal statements are also consistent with the State's. The new goal statements reflect the Town of Wilmington's priorities.

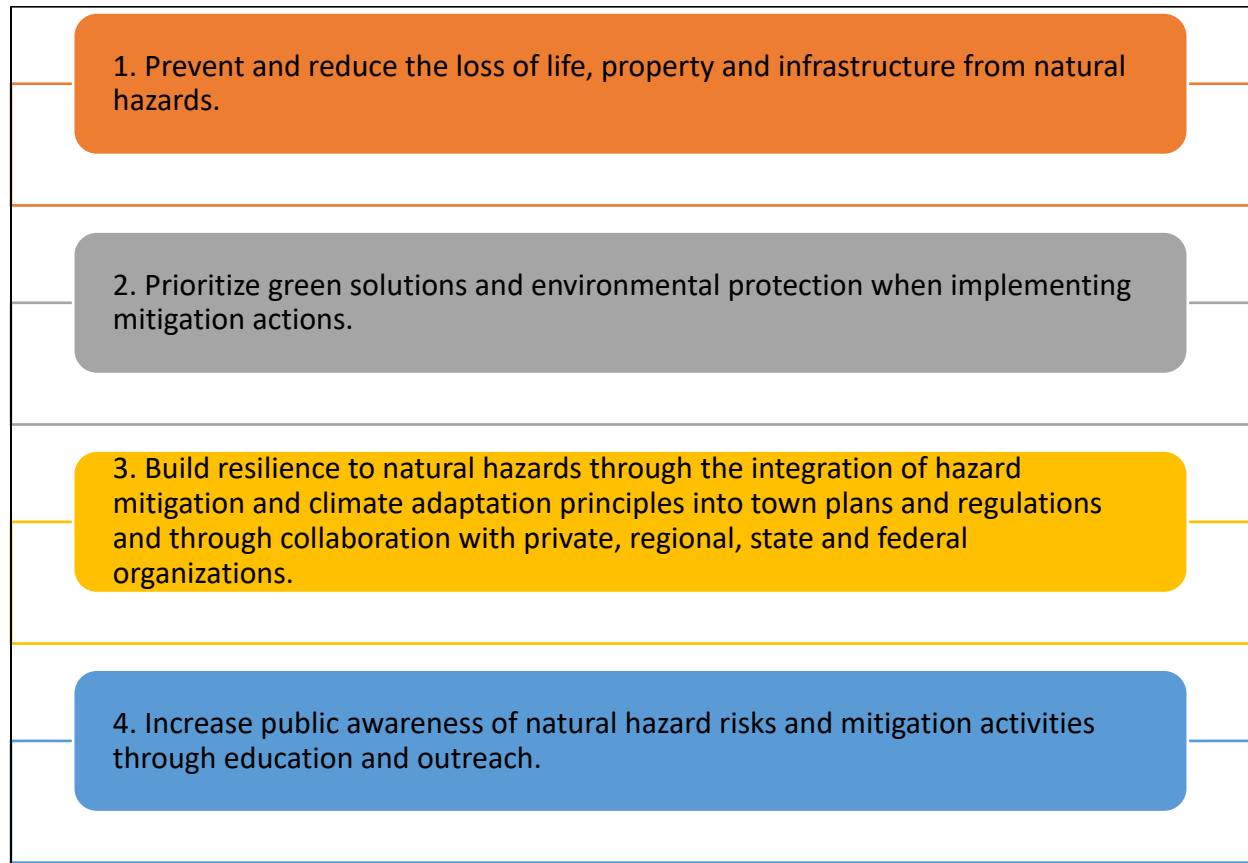


Figure 15. Goal Statements.

Green solutions and environmental protection are identified as priorities for the Town. The Town's biggest natural hazard concerns are hurricanes/tropical storms, severe winter storm/nor'easter, flooding, and other severe weather.

## Mitigation Actions

*C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement §201.6(c)(3)(ii))*

The Core Team reviewed the mitigation actions from the 2015 Hazard Mitigation Plan Update to identify completed actions and those needing revision. The following table shows the previous plan's 16 mitigation actions and the status of each. Some of the actions that were marked to "delayed" or "to be continued" and these were included in this plan in combination with other actions.

Table 27. 2015 Mitigation Action Status.

| Priority | Mitigation Action  | Current Status                | Description   |
|----------|--|-------------------------------|---|
| 1        | Massachusetts Avenue drainage improvement project.   | Completed                     | Eliminated localized roadway flooding along Mass Ave. and Brattle Street.   |
| 2        | Route 62 Bridge culvert replacement.   | Delayed                       | Town applied for mitigation funds with the State through the Culvert Replacement Municipal Assistance (CRMA) grant program (2020). Funding was not granted for the project. |
| 3        | Lubber's Brook flooding mitigation.  | Cancelled                     | The Town is not aware of a current need in this area.   |
| 4        | Update the Emergency Action Plan for the Burlington Reservoir Dam spillway area every two years. | N/A                           |   |
| 5        | Complete 2015 tree inventory and risk assessment.  | Completed and To be continued | Project grant funding exhausted.  |
| 6        | Acquire heavy-duty tow behind tree chipper.  | Completed                     |   |
| 7        | Construct North Wilmington Fire Substation.  | Delayed                       | The Town is actively researching potential parcels/locations for a new public safety substation in North Wilmington.  |

| Priority | Mitigation Action   | Current Status                     | Description  |
|----------|---|------------------------------------|--|
| 8        | Evaluate public buildings for ability to withstand snow loads; retrofit if needed to greatest degree feasible.                        | Completed                          | During winter months buildings are evaluated for integrity as needed.  |
| 9        | Acquire two heavy duty dump trucks with plow and sander.  | Completed                          |  |
| 10       | Determine which buildings may be most vulnerable to earthquake damage and conduct a structural assessment if needed.                  | Delayed                            | Not an immediate priority.   |
| 11       | Assess the vulnerability of roadways and utilities in high liquefaction susceptibility areas.   | Cancelled                          | The Town is not aware of a current need in this area.  |
| 12       | Site Design to increase tree plantings near buildings, increase the percentage of trees used in parking areas, and along public ways. | Partially Completed or In Progress | Ongoing through Community Development Technical Review Team (CDTR) and available tree planting funds and donations.                                  |
| 13       | Promote Green Building and Cool Roof designs.   | Partially Completed or In Progress | Green building and cool roofs are encouraged but not required. Analog Devices installed a partial green roof on their new Hub building.              |
| 14       | Assess placement of cooling centers at schools, senior center, and emergency shelters.  | Completed                          | The Town uses the senior center as a cooling center. They can use the Wilmington High School or Wilmington Middle School if necessary.               |
| 15       | Promote drought tolerant landscaping and site design measures.  | Partially Completed or In Progress | This was done as part of Yentile Farms Recreational Facility raingarden design, and is considered during volunteer projects and tree plantings, etc. |
| 16       | Incorporate climate resilience/adaptation components into the next Comprehensive Plan.  | Delayed                            | There are no immediate plans to update the Comprehensive Plan  |

### *Comprehensive range of mitigation actions*

The Core Team worked simultaneously on the Municipal Vulnerability Preparedness project and the development of the Hazard Mitigation Plan Update, for this reason the mitigation actions were developed for both projects. They initially reviewed the list of high-, medium- and low-priority recommendations from the Community Resilience Building (CRB) Workshop Summary of Findings. The Risk Matrix from the CRB Workshop is included in Appendix C. This matrix details how the mitigation actions were identified. They then considered actions from the previous plan to move forward and considered the full list of natural hazards and high hazard areas. They reviewed the risk assessment and capability assessment for areas of weakness and mitigation opportunity.

In addition to the suggestions from the CRB Workshop Summary of Findings, a comprehensive range of mitigation actions were considered. During each Core Team meeting, the group was educated on the possible range of mitigation actions. The Federal Emergency Management Agency's online *Mitigation Ideas* publication was shared, and the following list of example actions was shared electronically with the Core Team.

*Table 28. Types of Mitigation Actions.*

| Mitigation Action Category                   | Examples of Mitigation Actions   |
|--|--|
| <b>Local Plans and Regulations</b>           | <ul style="list-style-type: none"> <li>• Comprehensive plans</li> <li>• Land use ordinances</li> <li>• Subdivision regulations</li> <li>• Development review</li> <li>• Building codes and enforcement</li> <li>• NFIP Community Rating System</li> <li>• Capital improvement programs</li> <li>• Open space preservation</li> <li>• Stormwater management regulations and master plans</li> </ul> |
| <b>Structure and Infrastructure Projects</b> | <ul style="list-style-type: none"> <li>• Acquisitions and elevations of structures in flood-prone areas</li> <li>• Utility undergrounding</li> <li>• Structural retrofits</li> <li>• Floodwalls and retaining walls</li> <li>• Detention and retention structures</li> <li>• Culverts</li> </ul>   |

| Mitigation Action Category               | Examples of Mitigation Actions   |
|--|--|
| <b>Natural Systems Protection</b>        | <ul style="list-style-type: none"> <li>• Sediment and erosion control</li> <li>• Stream corridor restoration</li> <li>• Forest management</li> <li>• Conservation easements</li> <li>• Wetland restoration and preservation</li> </ul>   |
| <b>Education and Awareness Programs</b>  | <ul style="list-style-type: none"> <li>• Radio or television spots</li> <li>• Websites with maps and information</li> <li>• Real estate disclosure</li> <li>• Presentations to school groups or neighborhood organizations</li> <li>• Mailings to residents in hazard-prone areas</li> </ul>   |
| <b>Preparedness and Response Actions</b> | <ul style="list-style-type: none"> <li>• Creating mutual aid agreements with neighboring communities to meet emergency response needs</li> <li>• Purchasing radio communications equipment for the Fire Department</li> <li>• Developing procedures for notifying citizens of available shelter locations during and following an event</li> </ul> |

## Mitigation Action Plan

*C5. Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by each jurisdiction? (Requirement §201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii))*

An online Mitigation Action Tracker was developed for the Town to track the implementation of each mitigation action. The Mitigation Action Tracker is a Google Sheet with separate tabs showing pre-sorted actions and can sort the list of actions based on several criteria.

During the CRB Workshop, participants prioritized all identified actions by high, medium, or low for priority. Choices were made based on guidance in the *Community Resilience Building Workshop Guide*:

- Funding availability and terms
- Agreement on outstanding impacts from recent hazard events
- Necessity for advancing longer-term outcomes



- Contribution towards meeting existing local and regional planning objectives<sup>92</sup>

After each item was prioritized, workshop participants discussed and then agreed upon the highest-priority actions across the three profiles of infrastructure, society, and environment. These decisions were made based on “existing programs into which priority actions can be integrated easily or used to strengthen related actions with existing funding.”<sup>93</sup> The Core Team reviewed these lists and refined them to develop the current list of mitigation actions and their priority order.

The Core Team further refined the list of mitigation actions to include:

- Action Title
- Action Description
- Timeframe
- Responsible Department
- Potential Funding Sources
- Estimated Cost
  - High (over \$100,000)
  - Medium (\$20,000 - \$100,000)
  - Low (under \$20,000)
- Hazard(s) Addressed
- Critical Facility Protection
- Mitigation Strategy Category
- MVP Category

Below is a list of all mitigation actions sorted by priority. The highest-ranking actions are shown in red, the medium priority actions in orange, and the low priority actions in green. The Core Team and the Town Selectmen understand that mitigation actions may not be implemented in order of priority, they may be implemented in the order by which they receive funding.

Table 29. Hazard Mitigation Actions.

|                    |   |     |
|--------------------|---|-----|
| 1                  | Route 62 over Martins Brook Bridge/Culvert Replacement  |     |
| Action Description | Coordinate with North Reading on conducting an updated Hydrologic and Hydraulic (H&H) study for Replacement of the town-owned structurally failing culvert conveying Martins Brook under Route 62 and using climate change projections data for change in flow. |     |
|                    |   |     |
| High               | Responsible Department  | DPW |

<sup>92</sup> The Nature Conservancy. *Community Resilience Building Workshop Guide*. Retrieved from [https://docs.wixstatic.com/ugd/29a871\\_4840fc56c54f8b8064c264b9ec4bee.pdf](https://docs.wixstatic.com/ugd/29a871_4840fc56c54f8b8064c264b9ec4bee.pdf), p. 15.

<sup>93</sup> Ibid, 18.

|                    |  |   |
|--------------------|--|---|
|                    | Estimated Cost   | High  |
|                    | Potential Funding Sources  | MVP Grant, FEMA BRIC  |
|                    | Implementation Timeframe   | 2021-2026   |
|                    |  |   |
|                    | Critical Facility Protection   | No  |
|                    | Hazard(s) Addressed  | Flooding, Hurricanes, Severe Winter Storm, Other Severe Weather |
|                    | Mitigation Category  | Local Plans and Regulations                                     |
|                    | MVP Category   | Infrastructural   |
| 2                  | Route 62 over Martins Brook Bridge/Culvert Replacement   |   |
| Action Description | Coordinate with North Reading on Culvert Replacement project using the results of the H&H study.   |   |
|                    |  |   |
| High               | Responsible Department   | DPW   |
|                    | Estimated Cost   | High  |
|                    | Potential Funding Sources  | MVP Grant, FEMA BRIC  |
|                    | Implementation Timeframe   | 2022-2026   |
|                    |  |   |
|                    | Critical Facility Protection   | No  |
|                    | Hazard(s) Addressed  | Flooding, Hurricanes, Severe Winter Storm, Other Severe Weather |
|                    | Mitigation Category  | Structure and Infrastructure Projects                           |
|                    | MVP Category   | Infrastructural   |
| 3                  | Route 38 over Maple Meadow Brook Bridge/Culvert Flooding Source Investigation  |   |
| Action Description | Investigate flooding source upstream of the culvert by conducting an updated H&H study and develop mitigation project based on the H&H model for change in flow using projected climate change data. |   |
|                    |  |   |
| High               | Responsible Department   | DPW   |
|                    | Estimated Cost   | Medium  |
|                    | Potential Funding Sources  | MVP Grant, FEMA BRIC  |
|                    | Implementation Timeframe   | 2021-2026   |
|                    |  |   |

|                    |  |   |
|--------------------|--|---|
|                    | Critical Facility Protection   | No  |
|                    | Hazard(s) Addressed  | Flooding, Hurricanes, Severe Winter Storm, Other Severe Weather                               |
|                    | Mitigation Category  | Local Plans and Regulations   |
|                    | MVP Category   | Environmental   |
| <b>4</b>           | <b>Philips Avenue, Wildwood Street &amp; Other Small Culverts Evaluation for Potential Replacement</b>                               |   |
| Action Description | Conduct small culverts evaluation for replacement using an updated H&H model for change in flow using projected climate change data. |   |
| <b>High</b>        | Responsible Department   | DPW   |
|                    | Estimated Cost   | Medium  |
|                    | Potential Funding Sources  | MVP Grant, FEMA BRIC  |
|                    | Implementation Timeframe   | 2021-2031   |
|                    |  |   |
|                    | Critical Facility Protection   | No  |
|                    | Hazard(s) Addressed  | Flooding, Average/Extreme Temperatures, Hurricanes, Severe Winter Storm, Other Severe Weather |
|                    | Mitigation Category  | Structure and Infrastructure Projects   |
|                    | MVP Category   | Infrastructural   |
| <b>5</b>           | <b>Philips Avenue, Wildwood Street &amp; Other Small Culverts Evaluation for Potential Replacement</b>                               |   |
| Action Description | Develop projects for small culvert replacements using the study above, LID techniques and NbS when possible.                         |   |
| <b>High</b>        | Responsible Department   | DPW   |
|                    | Estimated Cost   | High  |
|                    | Potential Funding Sources  | MVP Grant, FEMA BRIC  |
|                    | Implementation Timeframe   | 2021-2036   |
|                    |  |   |
|                    | Critical Facility Protection   | No  |
|                    | Hazard(s) Addressed  | Flooding, Average/Extreme Temperatures, Hurricanes, Severe Winter Storm, Other Severe Weather |
|                    | Mitigation Category  | Structure and Infrastructure Projects   |
|                    |  |   |
|                    |  |   |

|                    |  |   |
|--------------------|--|---|
|                    | MVP Category   | Infrastructural   |
| <b>6</b>           | <b>Flood Source Mitigation at MBTA Railroad Culverts Project</b>   |   |
| Action Description | Develop and maintain a contact protocol with MBTA on flooding source and inventory of the culverts under the railroads and on ways to develop project(s) to address climate change data and resiliency of the MBTA facilities in Wilmington and the municipal surrounding areas.   |   |
| <b>High</b>        | Responsible Department   | DPW   |
|                    | Estimated Cost   | Low   |
|                    | Potential Funding Sources  | MBTA/ Town  |
|                    | Implementation Timeframe   | 2021-2026   |
|                    |  |   |
|                    | Critical Facility Protection   | Yes   |
|                    | Hazard(s) Addressed  | Flooding, Average/Extreme Temperatures, Hurricanes, Severe Winter Storm, Other Severe Weather |
|                    | Mitigation Category  | Local Plans and Regulations   |
|                    | MVP Category   | Societal  |
| <b>7</b>           | <b>Drainage System Improvements at Natural Low Points</b>  |   |
| Action Description | Investigate specific causes contributing to frequent flooding issues at the areas below and develop mitigation projects based on the discovery using LID, NbS and Green Infrastructure:<br><ul style="list-style-type: none"> <li>• Cranberry Bog area east of Cushing Drive</li> <li>• Middlesex Canal Aqueduct behind the Town Park</li> <li>• Area east/upstream of the Andover Street Culvert</li> </ul> |   |
| <b>High</b>        | Responsible Department   | DPW   |
|                    | Estimated Cost   | Medium  |
|                    | Potential Funding Sources  | MVP Grant, FEMA BRIC  |
|                    | Implementation Timeframe   | 2021-2031   |
|                    |  |   |
|                    | Critical Facility Protection   | Yes   |
|                    | Hazard(s) Addressed  | Flooding, Average/Extreme Temperatures, Hurricanes, Severe Winter Storm, Other Severe Weather |
|                    | Mitigation Category  | Local Plans and Regulations   |
|                    | MVP Category   | Environmental   |

|                    |  |   |
|--------------------|--|---|
| <b>8</b>           | <b>EJ &amp; Vulnerable Populations Assessment</b>  |   |
| Action Description | Assess the Town's population for potential vulnerable populations, including elderly, people with disabilities, families in need of financial assistance, etc. Develop coordination protocol between the Emergency Response Network and Housing Authority, Senior Center, Group Homes, etc. on various scenarios for climate-related emergency events in the future. |   |
| <b>High</b>        | Responsible Department   | ERN, Public Health                                      |
|                    | Estimated Cost   | Low   |
|                    | Potential Funding Sources  | Town  |
|                    | Implementation Timeframe   | 2021-2026   |
|                    |  |   |
|                    | Critical Facility Protection   | No  |
|                    | Hazard(s) Addressed  | All hazards   |
|                    | Mitigation Category  | Local Plans and Regulations                             |
|                    | MVP Category   | Societal  |
| <b>9</b>           | <b>Regulations &amp; Bylaws Updates</b>  |   |
| Action Description | Consider developing a Wetlands Bylaw to improve wetlands and vernal pool protection and incorporating Climate Change projection data.  |   |
| <b>High</b>        | Responsible Department   | Planning & Conservation                                 |
|                    | Estimated Cost   | Low   |
|                    | Potential Funding Sources  | MVP Grant   |
|                    | Implementation Timeframe   | 2021-2031   |
|                    |  |   |
|                    | Critical Facility Protection   | No  |
|                    | Hazard(s) Addressed  | Drought, Average/Extreme Temperatures, Invasive Species |
|                    | Mitigation Category  | Natural Systems Protection                              |
|                    | MVP Category   | Environmental   |
| <b>10</b>          | <b>Ipswich River Headwaters Improvement Projects</b>   |   |
| Action Description | Collaborate with the IRWA, DCR and adjacent towns that are part of the Headwaters community for the Ipswich River watershed to identify regional culvert projects using LID and NbS.   |   |

|                    |  |  |
|--------------------|--|--|
| High               | Responsible Department   | DPW and Planning   |
|                    | Estimated Cost   | Medium   |
|                    | Potential Funding Sources  | MVP Grant  |
|                    | Implementation Timeframe   | 2021-2036  |
|                    |  |  |
|                    | Critical Facility Protection   | No   |
|                    | Hazard(s) Addressed  | Flooding, Hurricanes, Severe Winter Storm, Other Severe Weather    |
|                    | Mitigation Category  | Structure and Infrastructure Projects                              |
|                    | MVP Category   | Infrastructural  |
| 11                 | Public Outreach  |  |
| Action Description | Develop public education materials for distribution to public (especially homeowners near protected wetland resource areas) and drought issues and/or program (i.e. high school environmental group project) on the importance and value of wetlands and vernal, and regulatory requirements for work within or adjacent to these areas. |  |
|                    |  |  |
| High               | Responsible Department   | Planning & Conservation, DPW                                       |
|                    | Estimated Cost   | Low  |
|                    | Potential Funding Sources  | MVP Grant, FEMA BRIC   |
|                    | Implementation Timeframe   | 2021-2026  |
|                    |  |  |
|                    | Critical Facility Protection   | No   |
|                    | Hazard(s) Addressed  | Flooding, Drought, Average/Extreme Temperatures, Invasive Species, |
|                    | Mitigation Category  | Education and Awareness Programs                                   |
|                    | MVP Category   | Societal   |
| 12                 | Public Outreach  |  |
| Action Description | Develop programs to improve communication and public outreach/participation about the Town's climate change adaptation efforts and related available resources for vulnerable population groups (elderly, people with disabilities, low-income residents, etc.).   |  |
|                    |  |  |
| High               | Responsible Department   | Planning & Conservation, DPW                                       |
|                    | Estimated Cost   | Low  |

|                    |  |   |
|--------------------|--|---|
|                    | Potential Funding Sources  | MVP Grant, FEMA BRIC  |
|                    | Implementation Timeframe   | 2021-2026   |
|                    |  |   |
|                    | Critical Facility Protection   | No  |
|                    | Hazard(s) Addressed  | All hazards   |
|                    | Mitigation Category  | Education and Awareness Programs                                |
|                    | MVP Category   | Societal  |
| 13                 | Glen Road over Lubber's Brook Culvert replacement Project  |   |
| Action Description | Culvert replacement using projected climate change data for change in flow to mitigate existing and future flooding, improve wildlife habitat crossing and incorporate NbS and LID techniques. |   |
|                    |  |   |
| Medium             | Responsible Department   | DPW and Planning  |
|                    | Estimated Cost   | High  |
|                    | Potential Funding Sources  | MVP Grant   |
|                    | Implementation Timeframe   | 2021-2031   |
|                    |  |   |
|                    | Critical Facility Protection   | No  |
|                    | Hazard(s) Addressed  | Flooding, Hurricanes, Severe Winter Storm, Other Severe Weather |
|                    | Mitigation Category  | Structure and Infrastructure Projects                           |
|                    | MVP Category   | Infrastructural   |
| 14                 | Andover Street over Unnamed Tributary to Martins Brook Project   |   |
| Action Description | Consider options for Andover Street culvert replacement incorporating stream crossing standards and NbS and coordinating with Ainsworth Road culvert owner.                                    |   |
|                    |  |   |
| Medium             | Responsible Department   | DPW and Planning  |
|                    | Estimated Cost   | High  |
|                    | Potential Funding Sources  | MVP Grant   |
|                    | Implementation Timeframe   | 2021-2036   |
|                    |  |   |
|                    | Critical Facility Protection   | No  |



|                    |  |   |
|--------------------|--|---|
|                    | Hazard(s) Addressed  | Flooding, Hurricanes, Severe Winter Storm, Other Severe Weather |
|                    | Mitigation Category  | Structure and Infrastructure Projects                           |
|                    | MVP Category   | Infrastructural   |
| <b>15</b>          | <b>Concord Street over Lubbers Brook Culvert Replacement</b>   |   |
| Action Description | Conduct an updated H&H study for the area and using climate change projections data for change in flow.  |   |
| <b>Medium</b>      | Responsible Department   | DPW   |
|                    | Estimated Cost   | Medium  |
|                    | Potential Funding Sources  | MVP Grant   |
|                    | Implementation Timeframe   | 2021-2026   |
|                    | Critical Facility Protection   | No  |
|                    | Hazard(s) Addressed  | Flooding, Hurricanes, Severe Winter Storm, Other Severe Weather |
|                    | Mitigation Category  | Structure and Infrastructure Projects                           |
|                    | MVP Category   | Infrastructural   |
|                    |  |   |
|                    |  |   |
| <b>16</b>          | <b>Concord Street over Lubbers Brook Culvert Replacement</b>   |   |
| Action Description | Culvert replacement using the above study to mitigate existing and future flooding, improve wildlife habitat crossing and incorporate NbS and LID techniques (may require elevating the existing roadway - low point). |   |
| <b>Medium</b>      | Responsible Department   | DPW   |
|                    | Estimated Cost   | High  |
|                    | Potential Funding Sources  | MVP Grant<br>FEMA BRIC  |
|                    | Implementation Timeframe   | 2021-2031   |
|                    | Critical Facility Protection   | No  |
|                    | Hazard(s) Addressed  | Flooding, Hurricanes, Severe Winter Storm, Other Severe Weather |
|                    | Mitigation Category  | Structure and Infrastructure Projects                           |
|                    | MVP Category   | Infrastructural   |
|                    |  |   |
|                    |  |   |

|                    |  |   |
|--------------------|--|---|
| <b>17</b>          | <b>Brown's Crossing Town Buildings Relocation Project</b>  |   |
| Action Description | Study options for relocation of the DPW building to a more central location in Town outside of a 100-year floodplain.  |   |
| <b>Medium</b>      | Responsible Department   | DPW and Planning  |
|                    | Estimated Cost   | Medium  |
|                    | Potential Funding Sources  | Town  |
|                    | Implementation Timeframe   | 2021-2026   |
|                    |  |   |
|                    | Critical Facility Protection   | Yes   |
|                    | Hazard(s) Addressed  | Flooding, Hurricanes, Severe Winter Storm, Other Severe Weather |
|                    | Mitigation Category  | Local Plans and Regulations                                     |
|                    | MVP Category   | Infrastructural   |
| <b>18</b>          | <b>Invasive Species Mitigation Project</b>   |   |
| Action Description | Complete mitigation plan addressing invasive species issue (removal and mitigation opportunities) & develop educational materials for residents and public (include all groups of invasive species, plants, insects, etc.) |   |
| <b>Medium</b>      | Responsible Department   | Conservation, Planning, DPW                                     |
|                    | Estimated Cost   | Medium  |
|                    | Potential Funding Sources  | Town  |
|                    | Implementation Timeframe   | 2021-2031   |
|                    |  |   |
|                    | Critical Facility Protection   | No  |
|                    | Hazard(s) Addressed  | Invasive Species  |
|                    | Mitigation Category  | Natural Systems Protection                                      |
|                    | MVP Category   | Environmental   |
| <b>19</b>          | <b>Tree Protection and Maintenance Projects</b>  |   |
| Action Description | Continue existing programs and increase tree planting in high profile areas as part of LID, NbS and Green Infrastructure community projects.   |   |
| <b>Low</b>         | Responsible Department   | Police, Fire, DPW   |

|                    |  |   |
|--------------------|--|---|
|                    | Estimated Cost   | Medium  |
|                    | Potential Funding Sources  | Town  |
|                    | Implementation Timeframe   | 2021-2026   |
|                    |  |   |
|                    | Critical Facility Protection   | No  |
|                    | Hazard(s) Addressed  | Drought, Average/Extreme Temperatures, Invasive Species, Hurricanes, Other Severe Weather |
|                    | Mitigation Category  | Natural Systems Protection  |
|                    | MVP Category   | Environmental   |
| <b>20</b>          | <b>Drought Tolerant Landscape Education</b>  |   |
| Action Description | Develop an outreach program to educate residents and business owners about the benefits of drought tolerant landscape, including which species of trees and shrubs to plant. |   |
| <b>Low</b>         | Responsible Department   | Planning & Conservation   |
|                    | Estimated Cost   | Low   |
|                    | Potential Funding Sources  | Town  |
|                    | Implementation Timeframe   | 2021-2026   |
|                    |  |   |
|                    | Critical Facility Protection   | No  |
|                    | Hazard(s) Addressed  | Drought, Average/Extreme Temperatures   |
|                    | Mitigation Category  | Education and Awareness Programs  |
|                    | MVP Category   | Environmental   |

## System to Integrate this Plan with other Planning Mechanisms

*C6. Does the Plan describe a process by which local governments will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement §201.6(c)(4)(ii))*

The joint leadership between Paul and Valerie in the development of this plan update illustrates the commitment the Town has placed on hazard mitigation. The joint leadership brought two departments together, Engineering and Planning and Conservation. Their leadership combined with Core Team

involvement will facilitate the effort of integrating this plan update and mitigation strategies into other plans developed in the Town. When the Town reviews the mitigation plan in January and July, they will discuss the integration of the plan in other planning mechanisms. It will be the responsibility of the co-leads to make sure this discussion occurs.

Several previous hazard mitigation actions have become capabilities for the Town, for instance setting aside capital improvement funds for hazard mitigation. The Town purchased several large pieces of equipment to assist with tree and snow removal.

The Board of Selectmen and the Town Manager will make this plan available to all Town departments and committees following its adoption. While the Town's Master Plan is old, the Town has a Capital Improvements Plan, Transportation Plan, Stormwater Management Plan and Emergency Operations Plan which all include mitigation plan principles. Site plan reviews require a Stormwater Management Permit (SMP) automatically involving the Planning & Conservation Planning Board, another way the Town integrates hazard mitigation into land use development. Subdivision regulations create a similar circumstance. All new development projects require attenuation of 100-year storm event.

The Town of Wilmington has taken steps to implement findings from the 2015 Hazard Mitigation Plan into the recent development of their Municipal Vulnerability (MVP) Plan, Community Resilience Building Workshop Summary of Findings, and the draft of the 2021 Open Space & Recreation Plan. They have also incorporated the 2015 Hazard Mitigation Plan strategies into updates of planning and conservation regulations and bylaws such as the Zoning Bylaw updated in 2020 and the Conservation Commission Tree and Vegetation Removal Policy updated in 2019.

### Possible funding sources

All the mitigation actions included in this plan have identified one or more potential funding sources. The Core Team focused on projects eligible for MVP Grant funding and FEMA BRIC funding. Below is a list of some of the federal and state funding mechanisms to keep in mind when identifying or implementing mitigation actions.

#### *Federal Emergency Management Agency (FEMA) Mitigation Grants*

The Federal Emergency Management Agency (FEMA) makes grant funding available for a range of mitigation activities via several Hazard Mitigation Assistance (HMA) programs. These grant programs provide funding for eligible mitigation activities that reduce disaster losses and protect life and property from future disaster damages. They are not intended to fund repair, replacement, or deferred maintenance activities but are rather designed to assist in developing long-term, cost-effective improvements that will reduce risk to natural hazards.

- **Building Resilient Infrastructure and Communities (BRIC)**  
BRIC is a new FEMA hazard mitigation program designed to replace the agency's former HMA Pre-Disaster Mitigation (PDM) grant program, aiming to categorically shift the federal focus

away from reactive disaster spending and toward research-supported, proactive investment in community resilience. It is a result of recent amendments made to Section 203 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act) by Section 1234 of the Disaster Recovery Reform Act of 2018 (DRRA). BRIC will support states, local communities, tribes, and territories as they undertake hazard mitigation projects reducing the risks they face from natural hazards. The BRIC program's guiding principles are supporting communities through capability- and capacity-building; encouraging and enabling innovation; promoting partnerships; enabling large projects; maintaining flexibility; and providing consistency.

- **Hazard Mitigation Grant Program (HMGP)**

The HMGP is authorized under Section 404 of the Stafford Act. The HMGP provides grants to states, tribes, and local governments to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the HMGP is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster. A key purpose of the HMGP is to ensure that any opportunities to take critical mitigation measures to protect life and property from future disasters are not lost during the recovery and reconstruction process following a disaster. HMGP is typically available only in the months after a federal disaster declaration, as funding amounts are determined based on a percentage of the funds spent on FEMA's Public and Individual Assistance programs.

- **Flood Mitigation Assistance (FMA) Program**

The FMA program was created as part of the National Flood Insurance Reform Act (NFIRA) of 1994 (42 U.S.C. 4101) with the goal of reducing or eliminating claims under the NFIP. FEMA provides FMA funds to assist states and communities with implementing measures that reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insurable under the NFIP. The long-term goal of FMA is to reduce or eliminate claims under the NFIP through mitigation activities. One limitation of the FMA program is that it is generally used to provide mitigation for structures that are insured or located in Special Flood Hazard Areas (SFHAs) as mapped by FEMA. Federal funding for this nationally competitive grant program is generally an annual allocation (subject to Congressional appropriation) and eligibility is linked to a community's good standing in the NFIP.

### *Municipal Vulnerability Preparedness Action Grants<sup>94</sup>*

The MVP Action Grant offers financial resources to municipalities seeking to advance priority climate adaptation actions to address climate change impacts resulting from extreme weather, sea level rise, inland and coastal flooding, severe heat, and other climate impacts.

Responses to the RFR may be submitted by municipalities who have received designation from the Executive Office of Energy and Environmental Affairs (EEA) as a Climate Change Municipal Vulnerability Preparedness (MVP) Community, or "MVP Community." All projects are required to provide monthly

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<sup>94</sup> State of Massachusetts. *MVP Action Grant*. <https://www.mass.gov/service-details/mvp-action-grant>.

updates, project deliverables, a final project report, and a brief project summary communicating lessons learned. The municipality is also required to match 25% of total project cost using cash or in-kind contributions. All proposals must include the following:

- Completed application template
- Project budget and deliverables
- MVP yearly progress report describing any relevant work toward advancing community priorities since earning MVP designation
- Statement of match
- Letters of support from landowner (if applicable), partners, and the public

*Project types include:*

- **Detailed Vulnerability and Risk Assessment** – In-depth vulnerability or risk assessment of a particular sector, location, or other aspect of the municipality.
- **Public Education and Communication** – Projects that increase public understanding of climate change impacts within and beyond the community and foster effective partnerships to develop support.
- **Local Bylaws, Ordinances, Plans, and other Management Measures** – Projects to develop, amend, and implement local ordinances, bylaws, standards, plans, and other management measures to reduce risk and damages from extreme weather, heat, flooding, and other climate change impacts.
- **Redesigns and Retrofits** – Engineering and construction projects to redesign, plan, or retrofit vulnerable community facilities and infrastructure (e.g., wastewater treatment plants, culverts, and critical municipal roadways/evacuation routes) to function over the life of the infrastructure given projected climate change impacts.
- **Energy Resilience Strategies** — Projects that incorporate clean energy generation and that are paired with resilience enabling technology to maintain electrical and/or heating and cooling services at critical facilities.
- **Chemical Safety and Climate Vulnerabilities** — Projects that seek to engage the business and manufacturing community through assistance or training on identifying vulnerabilities to chemical releases due to severe weather events, reducing use of toxic or hazardous chemicals, outreach to improve operations and maintenance procedures to prevent chemical releases and accidents, outreach to improve emergency and contingency planning, and/or identifying existing contaminated sites that pose chemical dispersion risks during flood events.
- **Nature-Based Storm-Damage Protection, Drought Mitigation, Water Quality, and Water Infiltration Techniques** – Projects that utilize natural resources and pervious surfaces to manage coastal and inland flooding, erosion, and other storm damage, such as stormwater wetlands and bio-retention systems, and other Smart Growth and Low Impact Development techniques.
- **Nature-Based, Infrastructure and Technology Solutions to Reduce Vulnerability to Extreme Heat and Poor Air Quality** – Projects that utilize natural resources, vegetation, and increasing

pervious surface to reduce ambient temperatures, provide shade, increase evapotranspiration, improve local air quality, and otherwise provide cooling services within the municipality.

- ***Nature-Based Solutions to Reduce Vulnerability to other Climate Change Impacts*** – Nature-based projects that address other impacts of climate change such as extreme weather, damaging wind and power outages, and increased incidence of pests and vector-borne illnesses and other public health issues.
- ***Acquisition of Land to Achieve a Resiliency Objective*** — Land purchases are eligible for grant funding if the parcel has been identified through a climate vulnerability assessment as an appropriate location for a specific eligible adaptation activity to occur, such as accommodating an infrastructure or facility redesign or retrofit project, providing natural flood storage to reduce downstream flooding, or removal of pavement and planting of trees to reduce flooding and heat island effects.
- ***Ecological Restoration and Habitat Management to Increase Resiliency*** — Projects that repair or improve natural systems for community and ecosystem adaptation, such as right-sizing culverts, dam removal, restoration of coastal wetlands, etc.
- ***Subsidized Low Income Housing Resilience Strategies*** — Investments in resiliency measures for affordable housing to protect vulnerable populations that may not have the resources to recover from an extreme climate event.
- ***Mosquito Control Districts*** — Projects to reduce the risk to public health from mosquito-borne illness and to increase mosquito surveillance and control capacity by incentivizing municipalities not in an organized mosquito control project or district to form a new mosquito control district or join an existing mosquito control district. Also funding for municipalities currently in a mosquito control district for new or proactive mosquito control measures.

## Chapter 7. Plan Implementation and Maintenance

The Core Team will implement the mitigation strategy and specific mitigation actions outlined in this plan, and update and maintain the plan according to the guidelines below. The Core Team includes key stakeholders in the Town, who will use the plan's goals, as well as continued analysis of hazard risks and capabilities, to weigh the available resources against the costs and benefits for each mitigation action. The Town understands the value of this plan and its positive mitigation impact and intend to continue updating this plan and implementing the plan's strategies.

### Continued Public Participation

*A5. Is there discussion of how the community(ies) will continue public participation in the plan maintenance process? (Requirement §201.6(c)(4)(iii))*

Public participation is an integral component of the mitigation planning process and will continue to be essential as this plan is implemented and updated over time. Based on the high level of interest in the mitigation planning process and in the Municipal Vulnerability Preparedness project, Town residents and stakeholders are interested in mitigation. The Core Team included an education and outreach mitigation action designed to engage the public. The Town intends to involve the public throughout the five-year implementation of this plan, as well as in the reviewing and updating process. The Town Engineer and the Director of Planning & Conservation will take the lead in soliciting participation from the public. This participation will take multiple forms, including all of those outlined in the Planning Process Chapter of this plan. Efforts to involve the public include:

- Advertising on the Town's website, and via flyers and press release.
- Private sector representatives will join Town officials in implementing mitigation actions.
- Copies of this plan will remain on the Town's website, and a hard copy will be kept in the Planning & Conservation Director's office for public review. Updates to the plan will also be posted on the Town's website.
- The Town of Wilmington will continue to work with private industry, regional agencies, and adjacent communities as this plan is implemented.

### Method and Schedule for Keeping the Plan Current

*A6. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a 5-year cycle)? (Requirement §201.6(c)(4)(i))*

The Core Team and the Town of Wilmington recognize the importance of keeping the mitigation plan up to date. Keeping the plan current includes monitoring, evaluating, and updating the plan over a five-year



period, a process jointly led by the Town Engineer and the Director of Planning & Conservation. They have the support of the Core Team.

The Core Team has agreed to the following procedures.

- The overall responsibility for monitoring the implementation of the plan rests jointly with the Town Engineer and the Director of Planning & Conservation. Together they will maintain the Mitigation Action Tracker (a tool to record the status of all mitigation actions). They will send a reminder email with a link to the web-based Mitigation Action Tracker on a semi-annual basis to all Department Heads responsible for a mitigation action. They may also distribute the Mitigation Action Progress Worksheet (shown in Appendix D) for Department Heads who prefer a form over a spreadsheet.
- If the Town experiences a large-scale disaster, they will call a Core Team meeting to update the list of mitigation actions and review the order of priorities.
- The Core Team has agreed to meet on a semi-annual basis to review the implementation of the mitigation plan. The first meeting will take place in January; the second, in July.
  - At the first meeting (January 2022), the Core Team will review the effectiveness of the planning process, public and stakeholder engagement, risk analysis, and the mitigation strategy, including its implementation. It is recommended that the Core Team use the worksheet provided in Appendix D.
  - At each semi-annual meeting, the Core Team will review the plan's goal statements and mitigation action status. If necessary, the goal statements and mitigation actions may be revised to reflect current Town priorities. In addition, the Core Team will discuss methods for continuing to integrate the mitigation plan with other plans, processes, and projects in the Town.
  - They will prepare a one-page brief regarding the January Core Team meeting to share with the Selectmen and to post on the Town's website. The Core Team and the Town Engineer and the Director of Planning & Conservation recognize the value in keeping the public informed about the implementation and status of the mitigation plan.
- Core Team members will continue to participate in regional and state-based meetings to stay current with best risk-mitigation practices. Such meetings may include the Massachusetts Emergency Management Agency (MEMA), the Metropolitan Area Planning Council (MAPC), and the MA Department of Conservation and Recreation.

The Town of Wilmington agrees to update and adopt this mitigation plan on a five-year basis. The update will include a comprehensive review and planning process like the one used to develop this mitigation plan update. It will update the mitigation action list, current land use practices, collecting and reviewing best available data, reviewing the capability assessment, and engaging the public and stakeholders. This process will occur according to FEMA guidelines. The Core Team will seek funding for the development of the plan update a year before the plan expires. The plan update process gives the Town the chance to add and/or re-prioritize mitigation actions based on current risk, capabilities, and

## Town of Wilmington Hazard Mitigation Plan Update

public/stakeholder suggestions. The Town Engineer and the Director of Planning & Conservation will serve as the Project Managers for the update process.

### Responsible Parties for Plan Implementation and Maintenance

Paul Alunni, Town Engineer

Town of Wilmington  
121 Glen Road – Room 7  
Wilmington, MA 01887  
Phone: 978-658-4499

Valerie Gingrich, Director of Planning & Conservation

Town of Wilmington  
121 Glen Road – Room 7  
Wilmington, MA 01887  
Phone: 978-658-8238

For State resources, contact:

Massachusetts Emergency Management Agency:  
Address: 400 Worcester Road, Framingham, MA 01702-5399  
Phone: 508-820-2000 (MEMA Headquarters and Communications Center)  
or 978-328-1500 (MEMA Region 1 Office)  
Website: <https://www.mass.gov/orgs/massachusetts-emergency-management-agency>

For Federal resources, contact:

Federal Emergency Management Agency:  
Address: 99 High Street, Boston, MA 02110  
Phone: 877-336-2734  
Email: [fema-r1-info@fema.dhs.gov](mailto:fema-r1-info@fema.dhs.gov)  
Website: <https://www.fema.gov/region-i-ct-me-ma-nh-ri-vt>

## List of Acronyms

|          |  |
|----------|--|
| ALB      | Asian Longhorned Beetle                              |
| CDTR     | Community Development Technical Review Team          |
| CRS      | Community Rating System                              |
| CRMA     | Culvert Replacement Municipal Assistance             |
| CWRMP    | Comprehensive Water Resources Management Plan        |
| DPW      | Department of Public Works                           |
| DEP      | Department of Environmental Protection               |
| EAB      | Emerald Ash Borer                                    |
| ASFPMP   | Association of State Floodplain Managers             |
| BFE      | Base Flood Elevation                                 |
| BRIC     | Building Resilient Infrastructure and Communities    |
| CDBG     | Community Development Block Grant                    |
| CDC      | Centers for Disease Control                          |
| CFM      | Certified Floodplain Manager                         |
| CIP      | Capital Improvement Program                          |
| CMMCP    | Central Massachusetts Mosquito Control Project       |
| CRB      | Community Resilience Building                        |
| DMA      | Disaster Mitigation Act                              |
| DRRA     | Disaster Recovery Reform Act                         |
| EEA      | Energy and Environmental Affairs                     |
| EEE      | Eastern Equine Encephalitis                          |
| EF-scale | Enhanced Fujita Scale                                |
| EOC      | Emergency Operation Center                           |
| EOEEA    | Executive Office of Energy and Environmental Affairs |
| FEMA     | Federal Emergency Management Agency                  |
| FIRM     | Flood Insurance Rate Map                             |
| FIS      | Flood Insurance Study                                |
| FP       | Floodplain   |
| GWPD     | Ground Water Protection District                     |
| HMP      | Hazard Mitigation Plan                               |
| IRWA     | Ipswich River Watershed Association                  |
| LOMA     | Letter of Map Amendment                              |
| MAPC     | Metropolitan Area Planning Council                   |
| MWRA     | Massachusetts Water Resources Authority              |
| FMA      | Flood Mitigation Assistance                          |
| F-scale  | Fujita Scale   |
| FT       | Full-time  |
| FY       | Fiscal Year  |

## Town of Wilmington Hazard Mitigation Plan Update

|        |   |
|--------|---|
| HMA    | Hazard Mitigation Assistance                          |
| HMGP   | Hazard Mitigation Grant Program                       |
| HUD    | Housing and Urban Development                         |
| MBTA   | Massachusetts Bay Transportation Authority            |
| MEMA   | Massachusetts Emergency Management Agency             |
| MMI    | Modified Mercalli Intensity                           |
| MS4    | Small Municipal Separate Storm Sewer System           |
| MVP    | Municipal Vulnerability Preparedness                  |
| NCEI   | National Centers for Environmental Information        |
| NFIP   | National Flood Insurance Program                      |
| NFIRA  | National Flood Insurance Reform Act                   |
| NOAA   | National Oceanographic and Atmospheric Administration |
| NPDP   | National Performance of Dams Program                  |
| NWS    | National Weather Service                              |
| OSRP   | Open Space and Recreation Plan                        |
| PDM    | Pre-Disaster Mitigation                               |
| RSI    | Regional Snowfall Index                               |
| SFHA   | Special Flood Hazard Area                             |
| SHMCAP | State Hazard Mitigation and Climate Adaptation Plan   |
| USGS   | United States Geological Survey                       |
| WUI    | Wildland-Urban Interface                              |
| PCI    | Pavement Condition Index                              |
| WHO    | World Health Organization                             |
| SMP    | Stormwater Management Plan                            |
| ZBA    | Zoning Board of Appeals                               |
| VMP    | Vegetation Management Plan                            |

## Appendices

### Appendix A. Planning Process Supporting Materials

## Town of Wilmington Hazard Mitigation Plan Update

*Kick-off Meeting January 28, 2021*



### GREEN INTERNATIONAL AFFILIATES, INC.

239 LITTLETON ROAD, SUITE 3 WESTFORD, MA 01886

T: (978) 923-0400 | F: (978) 399-0033 | WWW.GREENINTL.COM

#### ATTENDANCE SHEET

**Project:** Wilmington MVP Core Team Meeting  
**Location:** Virtual Teams Meeting  
**Date:** Thursday, January 28, 2021 at 10:00 am

| Name                       | Representing   | Phone                              | Email  |
|----------------------------|--|------------------------------------|--|
| 1. Danielle Spicer         | Green International Affiliates, Inc., State Certified MVP Provider, P.E., CFM, LEED AP, ENV SP | 978-923-0400                       | <a href="mailto:dspicer@greenintl.com">dspicer@greenintl.com</a>                 |
| 2. Peter Richardson        | Green International Affiliates, Inc., State Certified MVP Providers, P.E., LEED AP, ENV SP     | 978-923-0400                       | <a href="mailto:prichardson@greenintl.com">prichardson@greenintl.com</a>         |
| 3. Oxana Fartushnaya       | Green International Affiliates, Inc., Environmental Scientist                                  | 978-923-0400                       | <a href="mailto:ofartushnaya@greenintl.com">ofartushnaya@greenintl.com</a>       |
| 4. Jamie Caplan            | Jamie Caplan Consulting LLC, State Certified MVP Provider, Mitigation Planning Lead            | p: 413-586-0867<br>c: 413-218-7310 | <a href="mailto:jamie@jamiecaplan.com">jamie@jamiecaplan.com</a>                 |
| 5. Darrin Punchard         | Principal, Punchard Consulting   | 617-777-2001                       | <a href="mailto:darrin@punchardconsulting.com">darrin@punchardconsulting.com</a> |
| 6. Valeria Gingrich        | Director of Planning & Conservation  | 978-658-8238                       | <a href="mailto:vingrich@wilmingtonma.gov">vingrich@wilmingtonma.gov</a>         |
| 7. Paul Alunni             | Town Engineer  | 978-658-4499                       | <a href="mailto:palunni@wilmingtonma.gov">palunni@wilmingtonma.gov</a>           |
| 8. Cameron Lynch           | Conservation Agent   | (978) 658-8238                     | <a href="mailto:clynch@wilmingtonma.gov">clynch@wilmingtonma.gov</a>             |
| 9. Chief William Cavanaugh | Wilmington Fire Chief  | (978) 658-3346                     | <a href="mailto:cavanaugh@wilmingtonma.gov">cavanaugh@wilmingtonma.gov</a>       |
| 10. George Hooper          | Public Buildings Superintendent  | (978) 658-3017                     | <a href="mailto:ghooper@wilmingtonma.gov">ghooper@wilmingtonma.gov</a>           |
| 11. Jamie Magaldi          | Operations Manager/Tree Warden, Public Works   | (978) 658-4481                     | <a href="mailto:jmagaldi@wilmingtonma.gov">jmagaldi@wilmingtonma.gov</a>         |
| 12. Joseph Lobao           | Utility & Business Manager, Public Works   | (978) 658-4481                     | <a href="mailto:jlobao@wilmingtonma.gov">jlobao@wilmingtonma.gov</a>             |
| 13. John Keeley            | Wilmington Resident  |                                    | <a href="mailto:jbkeeley@gmail.com">jbkeeley@gmail.com</a>                       |
| 14. Tony LaVerde           | GIS Manager, Engineering Division  | (978) 658-4499                     | <a href="mailto:alaverde@wilmingtonma.gov">alaverde@wilmingtonma.gov</a>         |

## Town of Wilmington Hazard Mitigation Plan Update

*Core Team Meeting, March 11, 2021*



### GREEN INTERNATIONAL AFFILIATES, INC.

239 LITTLETON ROAD, SUITE 3 WESTFORD, MA 01886

T: (978) 923-0400 | F: (978) 399-0033 | WWW.GREENINTL.COM

#### ATTENDANCE SHEET

**Project:** Wilmington HMP Core Team Meeting  
**Location:** Virtual Teams Meeting  
**Date:** Thursday, March 11, 2021 at 10:00 – 11:15 am

| Name                 | Representing   | Phone                              | Email  |
|----------------------|--|------------------------------------|--|
| 1. Danielle Spicer   | Green International Affiliates, Inc., State Certified MVP Provider, P.E., CFM, LEED AP, ENV SP | 978-923-0400                       | <a href="mailto:dspicer@greenintl.com">dspicer@greenintl.com</a>                 |
| 2. Peter Richardson  | Green International Affiliates, Inc., State Certified MVP Providers, P.E., LEED AP, ENV SP     | 978-923-0400                       | <a href="mailto:prichardson@greenintl.com">prichardson@greenintl.com</a>         |
| 3. Oxana Fartushnaya | Green International Affiliates, Inc., Environmental Scientist                                  | 978-923-0400                       | <a href="mailto:ofartushnaya@greenintl.com">ofartushnaya@greenintl.com</a>       |
| 4. Jamie Caplan      | Jamie Caplan Consulting LLC, State Certified MVP Provider, Mitigation Planning Lead            | p: 413-586-0867<br>c: 413-218-7310 | <a href="mailto:jamie@jamiecaplan.com">jamie@jamiecaplan.com</a>                 |
| 5. Darrin Punchard   | Principal, Punchard Consulting   | 617-777-2001                       | <a href="mailto:darrin@punchardconsulting.com">darrin@punchardconsulting.com</a> |
| 6. Valery Gingrich   | Director of Planning & Conservation  | 978-658-8238                       | <a href="mailto:vgingrich@wilmingtonma.gov">vgingrich@wilmingtonma.gov</a>       |
| 7. Paul Alunni       | Town Engineer  | 978-658-4499                       | <a href="mailto:palunni@wilmingtonma.gov">palunni@wilmingtonma.gov</a>           |
| 8. Cameron Lynch     | Conservation Agent   | (978) 658-8238                     | <a href="mailto:clynch@wilmingtonma.gov">clynch@wilmingtonma.gov</a>             |
| 9. George Hooper     | Public Buildings Superintendent  | (978) 658-3017                     | <a href="mailto:ghooper@wilmingtonma.gov">ghooper@wilmingtonma.gov</a>           |
| 10. Jamie Magaldi    | Operations Manager/Tree Warden, Public Works   | (978) 658-4481                     | <a href="mailto:jmagaldi@wilmingtonma.gov">jmagaldi@wilmingtonma.gov</a>         |
| 11. Joseph Lobao     | Utility & Business Manager, Public Works   | (978) 658-4481                     | <a href="mailto:jlobao@wilmingtonma.gov">jlobao@wilmingtonma.gov</a>             |
| 12. John Keeley      | Wilmington Resident  |                                    | <a href="mailto:Jbkeeley@gmail.com">Jbkeeley@gmail.com</a>                       |
| 13. Tony LaVerde     | GIS Manager, Engineering Division  | (978) 658-4499                     | <a href="mailto:alaverde@wilmingtonma.gov">alaverde@wilmingtonma.gov</a>         |

## Town of Wilmington Hazard Mitigation Plan Update

*Core Team Meeting, April 15, 2021*



### GREEN INTERNATIONAL AFFILIATES, INC.

239 LITTLETON ROAD, SUITE 3 WESTFORD, MA 01886

T: (978) 923-0400 | F: (978) 399-0033 | WWW.GREENINTL.COM

#### ATTENDANCE SHEET

**Project:** Wilmington HMP Core Team Meeting  
**Location:** Virtual Teams Meeting  
**Date:** Thursday, April 15, 2021 at 10:00 – 11:15 am

| Name                 | Representing  | Phone                              | Email  |
|----------------------|---|------------------------------------|--|
| 1. Jamie Caplan      | Jamie Caplan Consulting LLC,<br>State Certified MVP Provider,<br>Mitigation Planning Lead               | p: 413-586-0867<br>c: 413-218-7310 | <a href="mailto:jamie@jamiecaplan.com">jamie@jamiecaplan.com</a>                 |
| 2. Darrin Punchard   | Principal, Punchard<br>Consulting   | 617-777-2001                       | <a href="mailto:darrin@punchardconsulting.com">darrin@punchardconsulting.com</a> |
| 3. Danielle Spicer   | Green International Affiliates,<br>Inc., State Certified MVP<br>Provider, P.E., CFM, LEED AP,<br>ENV SP | 978-923-0400                       | <a href="mailto:dspicer@greenintl.com">dspicer@greenintl.com</a>                 |
| 4. Oxana Fartushnaya | Green International Affiliates,<br>Inc., Environmental Scientist  | 978-923-0400                       | <a href="mailto:ofartushnaya@greenintl.com">ofartushnaya@greenintl.com</a>       |
| 5. Valery Gingrich   | Director of Planning &<br>Conservation  | 978-658-8238                       | <a href="mailto:vgingrich@wilmingtonma.gov">vgingrich@wilmingtonma.gov</a>       |
| 6. Paul Alunni       | Town Engineer   | 978-658-4499                       | <a href="mailto:palunni@wilmingtonma.gov">palunni@wilmingtonma.gov</a>           |
| 7. Cameron Lynch     | Conservation Agent  | (978) 658-8238                     | <a href="mailto:clynch@wilmingtonma.gov">clynch@wilmingtonma.gov</a>             |
| 8. Jamie Magaldi     | Operations Manager/Tree<br>Warden, Public Works   | (978) 658-4481                     | <a href="mailto:jmagaldi@wilmingtonma.gov">jmagaldi@wilmingtonma.gov</a>         |
| 9. Joseph Lobao      | Utility & Business Manager,<br>Public Works   | (978) 658-4481                     | <a href="mailto:jlobao@wilmingtonma.gov">jlobao@wilmingtonma.gov</a>             |
| 10. Tony LaVerde     | GIS Manager, Engineering<br>Division  | (978) 658-4499                     | <a href="mailto:alaverde@wilmingtonma.gov">alaverde@wilmingtonma.gov</a>         |
| 11.                  |   |                                    |  |
| 12.                  |   |                                    |  |
| 13.                  |   |                                    |  |
| 14.                  |   |                                    |  |



## Town of Wilmington Hazard Mitigation Plan Update

### MVP Workshop Sessions 1 & 2



#### GREEN INTERNATIONAL AFFILIATES, INC.

239 LITTLETON ROAD, SUITE 3 WESTFORD, MA 01886

T: (978) 923-0400 | F: (978) 399-0033 | WWW.GREENINTL.COM

#### ATTENDANCE SHEET

**Project:** Wilmington MVP Workshop No. 1  
**Location:** Virtual – Microsoft Teams Meeting  
**Date:** Friday, February 12, 2021  
**Time:** 9 am - 1 pm

| Name                 | Representing   | Email  |
|----------------------|--|--|
| 1. Danielle Spicer   | Green International Affiliates, Inc.,<br>State Certified MVP Provider, P.E.,<br>CFM, LEED AP, ENV SP | <a href="mailto:dspicer@greenintl.com">dspicer@greenintl.com</a>           |
| 2. Peter Richardson  | Green International Affiliates, Inc.,<br>State Certified MVP Provider,<br>P.E., LEED AP, ENV SP      | <a href="mailto:prichardson@greenintl.com">prichardson@greenintl.com</a>   |
| 3. Oxana Fartushnaya | Green International Affiliates, Inc.,<br>Environmental Scientist                                     | <a href="mailto:ofartushnaya@greenintl.com">ofartushnaya@greenintl.com</a> |
| 4. Paul Alunni       | Wilmington Town Engineer   | <a href="mailto:palunni@wilmingtonma.gov">palunni@wilmingtonma.gov</a>     |
| 5. Joseph Labao      | Wilmington DPW, Business & Utility<br>Manager  | <a href="mailto:ilobao@wilmingtonma.gov">ilobao@wilmingtonma.gov</a>       |
| 6. John Keeley       | Wilmington Resident, Headwaters<br>Stream Team   | <a href="mailto:jbkeeley@gmail.com">jbkeeley@gmail.com</a>                 |
| 7. Jamie Magaldi     | Wilmington DPW Operations<br>Manager/Tree Warden, Public Works                                       | <a href="mailto:jmagaldi@wilmingtonma.gov">jmagaldi@wilmingtonma.gov</a>   |
| 8. Tom Ollila        | Wilmington Conservation<br>Commission and Reading Municipal<br>Light Dept                            | <a href="mailto:tollila@wilmingtonma.gov">tollila@wilmingtonma.gov</a>     |
| 9. Tony LaVerde      | Wilmington GIS Manager,<br>Engineering Division  | <a href="mailto:alaverde@wilmingtonma.gov">alaverde@wilmingtonma.gov</a>   |
| 10. Valerie Gingrich | Wilmington Director of Planning &<br>Conservation  | <a href="mailto:vgingrich@wilmingtonma.gov">vgingrich@wilmingtonma.gov</a> |
| 11. George Hooper    | Wilmington Public Buildings  | <a href="mailto:ghooper@wilmingtonma.gov">ghooper@wilmingtonma.gov</a>     |
| 12. Martha Stevenson | Stream Team  | <a href="mailto:mjkstevenson@hotmail.com">mjkstevenson@hotmail.com</a>     |
| 13. Patrick Lynch    | Environmental Planner, Ipswich River<br>Watershed Association  | <a href="mailto:plynch@ipswichriver.org">plynch@ipswichriver.org</a>       |
| 14. Stephanie Baima  | Wilmington Environmental<br>Restoration Committee  | <a href="mailto:stephaniebaima18@gmail.com">stephaniebaima18@gmail.com</a> |

## Town of Wilmington Hazard Mitigation Plan Update



### GREEN INTERNATIONAL AFFILIATES, INC.

239 LITTLETON ROAD, SUITE 3 WESTFORD, MA 01886

T: (978) 923-0400 | F: (978) 399-0033 | WWW.GREENINTL.COM

|                           |   |  |
|---------------------------|---|--|
| 15. Jeffrey Hull          | Wilmington Town Manager                             | <a href="mailto:jhull@wilmingtonma.gov">jhull@wilmingtonma.gov</a>           |
| 16. Cameron Lynch         | Wilmington Conservation Agent                       | <a href="mailto:clynch@wilmingtonma.gov">clynch@wilmingtonma.gov</a>         |
| 17. Suzanne Sullivan      | Stream Team   | <a href="mailto:swampy1060@gmail.com">swampy1060@gmail.com</a>               |
| 18. Mike McInnis          | Wilmington Conservation Commission                  | <a href="mailto:mmcinnis@wilmingtonma.gov">mmcinnis@wilmingtonma.gov</a>     |
| 19. Michelle Rowden (EEA) | EEA, MVP Northeast Regional Coordinator             | <a href="mailto:michelle.rowden@state.ma.us">michelle.rowden@state.ma.us</a> |
| 20. Daniel Orr            | City Planner with the City of Woburn (listening in) | <a href="mailto:dorr@cityofwoburn.com">dorr@cityofwoburn.com</a>             |
| 21.                       |   |  |
| 22.                       |   |  |
| 23.                       |   |  |
| 24.                       |   |  |

## Town of Wilmington Hazard Mitigation Plan Update



### GREEN INTERNATIONAL AFFILIATES, INC.

239 LITTLETON ROAD, SUITE 3 WESTFORD, MA 01886

T: (978) 923-0400 | F: (978) 399-0033 | WWW.GREENINTL.COM

#### ATTENDANCE SHEET

**Project:** Wilmington MVP Workshop No. 2  
**Location:** Virtual – Microsoft Teams Meeting  
**Date:** Friday, February 26, 2021  
**Time:** 9 am-1:00 pm

| Name                 | Representing   | Email  |
|----------------------|--|--|
| 1. Danielle Spicer   | Green International Affiliates, Inc.,<br>State Certified MVP Provider, P.E.,<br>CFM, LEED AP, ENV SP | <a href="mailto:dspicer@greenintl.com">dspicer@greenintl.com</a>           |
| 2. Peter Richardson  | Green International Affiliates, Inc.,<br>State Certified MVP Provider,<br>P.E., LEED AP, ENV SP      | <a href="mailto:prichardson@greenintl.com">prichardson@greenintl.com</a>   |
| 3. Oxana Fartushnaya | Green International Affiliates, Inc.,<br>Environmental Scientist                                     | <a href="mailto:ofartushnaya@greenintl.com">ofartushnaya@greenintl.com</a> |
| 4. Paul Alunni       | Wilmington Town Engineer   | <a href="mailto:palunni@wilmingtonma.gov">palunni@wilmingtonma.gov</a>     |
| 5. Joseph Labao      | Wilmington DPW, Business & Utility<br>Manager  | <a href="mailto:ilobao@wilmingtonma.gov">ilobao@wilmingtonma.gov</a>       |
| 6. John Keeley       | Wilmington Resident, Headwaters<br>Stream Team   | <a href="mailto:jbkeeley@gmail.com">jbkeeley@gmail.com</a>                 |
| 7. Jamie Magaldi     | Wilmington DPW Operations<br>Manager/Tree Warden, Public Works                                       | <a href="mailto:jmagaldi@wilmingtonma.gov">jmagaldi@wilmingtonma.gov</a>   |
| 8. Tom Ollila        | Wilmington Conservation<br>Commission and Reading Municipal<br>Light Dept                            | <a href="mailto:tollila@wilmingtonma.gov">tollila@wilmingtonma.gov</a>     |
| 9. Tony LaVerde      | Wilmington GIS Manager,<br>Engineering Division  | <a href="mailto:alaverde@wilmingtonma.gov">alaverde@wilmingtonma.gov</a>   |
| 10. Valerie Gingrich | Wilmington Director of Planning &<br>Conservation  | <a href="mailto:vgingrich@wilmingtonma.gov">vgingrich@wilmingtonma.gov</a> |
| 11. George Hooper    | Wilmington Public Buildings  | <a href="mailto:ghooper@wilmingtonma.gov">ghooper@wilmingtonma.gov</a>     |
| 12. Martha Stevenson | Stream Team  | <a href="mailto:mjkstevenson@hotmail.com">mjkstevenson@hotmail.com</a>     |
| 13. Patrick Lynch    | Environmental Planner, Ipswich River<br>Watershed Association  | <a href="mailto:plynch@ipswichriver.org">plynch@ipswichriver.org</a>       |
| 14. Stephanie Baima  | Wilmington Environmental<br>Restoration Committee  | <a href="mailto:stephaniebaima18@gmail.com">stephaniebaima18@gmail.com</a> |

## Town of Wilmington Hazard Mitigation Plan Update



### GREEN INTERNATIONAL AFFILIATES, INC.

239 LITTLETON ROAD, SUITE 3 WESTFORD, MA 01886

T: (978) 923-0400 | F: (978) 399-0033 | WWW.GREENINTL.COM

|                             |   |  |
|-----------------------------|---|--|
| 15. Cameron Lynch           | Wilmington Conservation Agent                       | <a href="mailto:clynch@wilmingtonma.gov">clynch@wilmingtonma.gov</a>         |
| 16. Suzanne Sullivan        | Stream Team   | <a href="mailto:swampy1060@gmail.com">swampy1060@gmail.com</a>               |
| 17. Michelle Rowden (EEA)   | EEA, MVP Northeast Regional Coordinator             | <a href="mailto:michelle.rowden@state.ma.us">michelle.rowden@state.ma.us</a> |
| 18. Daniel Orr              | City Planner with the City of Woburn (listening in) | <a href="mailto:dorr@cityofwoburn.com">dorr@cityofwoburn.com</a>             |
| 19. Chief William Cavanaugh | Wilmington Fire Department, Chief                   | <a href="mailto:cavanaugh@wilmingtonma.gov">cavanaugh@wilmingtonma.gov</a>   |
| 20. Don Pearson             | Wilmington Conservation Commission, Chair           | <a href="mailto:dpearson@wilmingtonma.gov">dpearson@wilmingtonma.gov</a>     |
| 21.                         |   |  |
| 22.                         |   |  |
| 23.                         |   |  |
| 24.                         |   |  |

*Listening Session, March 23, 2021*

**FOR IMMEDIATE RELEASE:**

**From the Office of the Town Manager**

**PRESS RELEASE**

**Town of Wilmington Invites the Public to a Virtual Meeting to  
Learn About the Hazard Mitigation Plan Update**

The Town of Wilmington is simultaneously developing two plans to identify and prioritize actions the Town can take to mitigate the impacts of natural hazards and climate change. Citizen participation in each project is essential.

A public meeting will be held on Tuesday, March 23, 2021 at 4pm via Microsoft Teams.

Join on your computer or mobile app

Click here to join the meeting [https://teams.microsoft.com/l/meetup-join/19%3ameeting\\_MjAyMjVhYzUtNjA4ZC00NWU2LWI4NmEtNTFmZTIkOWJmMDJj%40thread.v2/0?context=%7b%22Tid%22%3a%22ef871fc8-9e3c-47b4-8306-c92b5315f2c0%22%2c%22Oid%22%3a%22c03d143d-09b7-44f8-a08c-b747c8568404%22%7d](https://teams.microsoft.com/l/meetup-join/19%3ameeting_MjAyMjVhYzUtNjA4ZC00NWU2LWI4NmEtNTFmZTIkOWJmMDJj%40thread.v2/0?context=%7b%22Tid%22%3a%22ef871fc8-9e3c-47b4-8306-c92b5315f2c0%22%2c%22Oid%22%3a%22c03d143d-09b7-44f8-a08c-b747c8568404%22%7d)

Or call in (audio only) +1 857-702-2064, 8247900#

Phone Conference ID: 824 790 0#

At the meeting, the Town will present the process of developing the Hazard Mitigation Plan Update and request feedback from citizens regarding natural hazards and their impacts. The Town is updating the previously developed Hazard Mitigation Plan for approval by the Federal Emergency Management

Agency (FEMA). This plan will serve as an essential strategy for reducing current and future risks to natural hazards by identifying projects to minimize those risks.

At the meeting, you will have an opportunity to contribute your ideas for making the Town more resilient to natural hazards such as flooding, snowstorms, high winds and extreme temperatures. This plan is being developed by a Core Team of Town officials and local stakeholders. Jamie Caplan Consulting LLC, a Northampton, MA based firm, is leading this effort. FEMA approval, and Town adoption, of the Hazard Mitigation Plan Update allows the Town to apply for pre- and post-disaster hazard mitigation grant funds.

The Town recently completed a Community Resilience Building (CRB) Workshop as part of the Municipal Vulnerability Preparedness (MVP) planning process. This Workshop is part of a second plan the Town is developing with funding from the Massachusetts Executive Office of Energy and Environmental Affairs through an MVP Planning Grant. Green International is leading the MVP project. The Town will host a second public meeting on May 3, 2021 to share details regarding this project. Completion of the MVP plan results in MVP Certification, which allows certified communities access to additional state grants for projects related to climate change resiliency.

For questions regarding either project, please contact Valerie Gingrich, Director of Planning & Conservation, Town of Wilmington, phone: 978-658-8238 or email: [vgingrich@wilmingtonma.gov](mailto:vgingrich@wilmingtonma.gov).

## Town of Wilmington Hazard Mitigation Plan Update



### GREEN INTERNATIONAL AFFILIATES, INC.

239 LITTLETON ROAD, SUITE 3 WESTFORD, MA 01886

T: (978) 923-0400 | F: (978) 399-0033 | WWW.GREENINTL.COM

#### ATTENDANCE SHEET

**Project:** Wilmington HMP Listening Session

**Location:** Virtual Teams Meeting

**Date:** Tuesday, March 23, 2021 4:00 pm – 5 pm

| Name                 | Representing   | Email  |
|----------------------|--|--|
| 1. Jamie Caplan      | Jamie Caplan Consulting LLC, State Certified MVP Provider, Mitigation Planning Lead            | <a href="mailto:jamie@jamiecaplan.com">jamie@jamiecaplan.com</a>                 |
| 2. Danielle Spicer   | Green International Affiliates, Inc., State Certified MVP Provider, P.E., CFM, LEED AP, ENV SP | <a href="mailto:dspicer@greenintl.com">dspicer@greenintl.com</a>                 |
| 3. Peter Richardson  | Green International Affiliates, Inc., State Certified MVP Providers, P.E., LEED AP, ENV SP     | <a href="mailto:prichardson@greenintl.com">prichardson@greenintl.com</a>         |
| 4. Oxana Fartushnaya | Green International Affiliates, Inc., Environmental Scientist                                  | <a href="mailto:ofartushnaya@greenintl.com">ofartushnaya@greenintl.com</a>       |
| 5. Darrin Punchard   | Principal, Punchard Consulting   | <a href="mailto:darrin@punchardconsulting.com">darrin@punchardconsulting.com</a> |
| 6. Valerie Gingrich  | Director of Planning & Conservation  | <a href="mailto:vgingrich@wilmingtonma.gov">vgingrich@wilmingtonma.gov</a>       |
| 7. Paul Alunni       | Town Engineer  | <a href="mailto:palunni@wilmingtonma.gov">palunni@wilmingtonma.gov</a>           |
| 8. Cameron Lynch     | Conservation Agent   | <a href="mailto:clynch@wilmingtonma.gov">clynch@wilmingtonma.gov</a>             |
| 9. Jamie Magaldi     | Operations Manager/Tree Warden, Public Works   | <a href="mailto:jmagaldi@wilmingtonma.gov">jmagaldi@wilmingtonma.gov</a>         |
| 10. Joseph Lobao     | Utility & Business Manager, Public Works   | <a href="mailto:jlobao@wilmingtonma.gov">jlobao@wilmingtonma.gov</a>             |
| 11. John Keeley      | Wilmington Resident  | <a href="mailto:jbkeeley@gmail.com">jbkeeley@gmail.com</a>                       |
| 12. Tony LaVerde     | GIS Manager, Engineering Division  | <a href="mailto:alaverde@wilmingtonma.gov">alaverde@wilmingtonma.gov</a>         |
| 13. Patrick Lynch    | Environmental Planner, Ipswich River Watershed Association                                     | <a href="mailto:plynch@ipswichriver.org">plynch@ipswichriver.org</a>             |
| 14. Sierra Pelletier | Assistant Planner  | <a href="mailto:spelletier@wilmingtonma.gov">spelletier@wilmingtonma.gov</a>     |
| 15. Terri            | Guest  | Not provided   |
| 16. Ginny            | Guest  | Not provided   |
| 17. Arnie            | Guest  | Not provided   |

## Town of Wilmington Hazard Mitigation Plan Update

*Listening Session, June 7, 2021*

PRESS RELEASE  
For Immediate Release  
May 21, 2021

Contact: Valerie Gingrich  
Director of Planning & Conservation  
978-658-8238

### **Town of Wilmington Invites the Public to a Virtual Meeting to Learn About the Municipal Vulnerability Preparedness (MVP) Plan and Hazard Mitigation Plan Update June 7, 2021 4:00 PM**

The Town of Wilmington is simultaneously developing two plans to identify and prioritize actions the Town can take to mitigate the impacts of natural hazards and climate change. Citizen participation in each project is essential.

A public meeting will be held on Monday, June 7, 2021 at 4pm via Microsoft Teams.  
Join on your computer or mobile app.

Click here to join the meeting:

[https://teams.microsoft.com/l/meetup-join/19%3ameeting\\_OGFmNjYxMDgtOWUyOC00ZjkzLTgzNjgtOThhMTlkYTlxZig1%40thread.v2/0?context=%7b%22id%22%3a%22ef871fc8-9e3c-47b4-8306-c92b5315f2c0%22%2c%22oid%22%3a%22c03d143d-09b7-44f8-a08c-b747c8568404%22%7d](https://teams.microsoft.com/l/meetup-join/19%3ameeting_OGFmNjYxMDgtOWUyOC00ZjkzLTgzNjgtOThhMTlkYTlxZig1%40thread.v2/0?context=%7b%22id%22%3a%22ef871fc8-9e3c-47b4-8306-c92b5315f2c0%22%2c%22oid%22%3a%22c03d143d-09b7-44f8-a08c-b747c8568404%22%7d)

Or call in (audio only) +1 857-702-2064, 530249993#  
Phone Conference ID: 530 249 993#

At the meeting, the process of developing the Hazard Mitigation Plan Update and the development of the Municipal Vulnerable Preparedness (MVP) Plan will be discussed as well as requesting feedback from citizens regarding natural hazards and their impacts. The purpose of the MVP Plan is to identify natural hazards and associated vulnerabilities that have the greatest potential to impact the Town as a result of climate change and to develop mitigation strategies that will make the Town more resilient to potential climate change impacts. The Town is updating the previously developed Hazard Mitigation Plan for approval by the Federal Emergency Management Agency (FEMA). This plan will serve as an essential strategy for reducing current and future risks to natural hazards by identifying projects to minimize those risks.

At the meeting, you will have an opportunity to contribute your ideas for making the Town more resilient to natural hazards such as flooding, snowstorms, high winds and extreme temperatures. This plan is being developed by a Core Team of Town officials and local stakeholders. Danielle Spicer, P.E., from Green International Affiliates, and Jamie Caplan Consulting LLC, are leading this effort. MVP approval from the Executive Office of Energy and Environmental Affairs will allow the Town to apply for Action Grants for Town projects related to climate change resiliency. FEMA approval, and Town adoption, of the Hazard Mitigation Plan Update allows the Town to apply for pre- and post-disaster hazard mitigation grant funds.

The Town recently completed the Community Resilience Building (CRB) Workshops as part of the Municipal Vulnerability Preparedness (MVP) planning process. A draft version of the Town's MVP Plan and the HMP Plan are available on the Town's website for your review.



## Town of Wilmington Hazard Mitigation Plan Update

Click here to access the Draft MVP and Draft HMP plans: <https://www.wilmingtonma.gov/planning-conservation/pages/2021-draft-mvp-and-hmp-plans>

Both of these plans will be presented at the public listening session held virtually as noted above. More information about the MVP Grant program can be found at:  
<https://www.mass.gov/municipal-vulnerability-preparedness-mvp-program>

For questions regarding either project, please contact Valerie Gingrich, Director of Planning & Conservation, Town of Wilmington, phone: 978-658-8238 or email: [vgingrich@wilmingtonma.gov](mailto:vgingrich@wilmingtonma.gov)

## Town of Wilmington Hazard Mitigation Plan Update



### GREEN INTERNATIONAL AFFILIATES, INC.

239 LITTLETON ROAD, SUITE 3 WESTFORD, MA 01886

T: (978) 923-0400 | F: (978) 399-0033 | WWW.GREENINTL.COM

#### ATTENDANCE SHEET

**Project:** Wilmington MVP/HMP Listening Session

**Location:** Virtual Teams Meeting

**Date:** Monday, June 7, 2021 at 4:00-5:00 pm

| Name                 | Representing   | Email  |
|----------------------|--|--|
| 1. Danielle Spicer   | Green International Affiliates, Inc., State Certified MVP Provider, P.E., CFM, LEED AP, ENV SP | <a href="mailto:dspicer@greenintl.com">dspicer@greenintl.com</a>                 |
| 2. Oxana Fartushnaya | Green International Affiliates, Inc., Environmental Scientist                                  | <a href="mailto:ofartushnaya@greenintl.com">ofartushnaya@greenintl.com</a>       |
| 3. Jamie Caplan      | Jamie Caplan Consulting LLC, State Certified MVP Provider, Mitigation Planning Lead            | <a href="mailto:jamie@jamiecaplan.com">jamie@jamiecaplan.com</a>                 |
| 4. Darrin Punchard   | Principal, Punchard Consulting   | <a href="mailto:darrin@punchardconsulting.com">darrin@punchardconsulting.com</a> |
| 5. Jeffrey Hull      | Wilmington Town Manager  | <a href="mailto:jhull@wilmingtonma.gov">jhull@wilmingtonma.gov</a>               |
| 6. Paul Alunni       | Wilmington Town Engineer   | <a href="mailto:palunni@wilmingtonma.gov">palunni@wilmingtonma.gov</a>           |
| 7. Cameron Lynch     | Wilmington Conservation Agent  | <a href="mailto:clynch@wilmingtonma.gov">clynch@wilmingtonma.gov</a>             |
| 8. Don Pearson       | Wilmington Conservation Commission, Chair  | <a href="mailto:dpearson@wilmingtonma.gov">dpearson@wilmingtonma.gov</a>         |
| 9. Suzanne Sullivan  | Ipswich River Headwaters Stream Team   | <a href="mailto:swampy1060@gmail.com">swampy1060@gmail.com</a>                   |
| 10. Jamie Magaldi    | Operations Manager/Tree Warden, Public Works   | <a href="mailto:jmagaldi@wilmingtonma.gov">jmagaldi@wilmingtonma.gov</a>         |
| 11. Joseph Lobao     | Utility & Business Manager, Public Works   | <a href="mailto:jlobao@wilmingtonma.gov">jlobao@wilmingtonma.gov</a>             |
| 12. John Keeley      | Wilmington Resident  | <a href="mailto:jbkeeley@gmail.com">jbkeeley@gmail.com</a>                       |
| 13. Tony Laverde     | Wilmington GIS Manager, Engineering Division   | <a href="mailto:alaverde@wilmingtonma.gov">alaverde@wilmingtonma.gov</a>         |
| 14. Daniel Orr       | City Planner with the City of Woburn   | <a href="mailto:dorr@cityofwoburn.com">dorr@cityofwoburn.com</a>                 |
| 15. Stephanie Baima  | Wilmington Environmental Restoration Committee   | <a href="mailto:stephaniebaima18@gmail.com">stephaniebaima18@gmail.com</a>       |

## Appendix B: Capability Assessment Supporting Materials

### Safe Growth Survey Results

#### Town of Wilmington SAFE GROWTH SURVEY

This survey instrument is designed to capture some general information for purposes of developing the *Wilmington Hazard Mitigation Plan Update*. It has been adapted from a technique recommended by the American Planning Association (APA) and FEMA to help evaluate the extent to which the Town of Wilmington is positioned to grow safely relative to its natural hazards. These hazards include but are not limited to hurricanes, floods, fires, winter storms and other severe weather systems.

Please indicate how strongly you agree or disagree with the following statements as they relate to the Town's current plans, policies, and programs for guiding future community growth and development.

1 = Strongly Disagree    2 = Somewhat Disagree    3 = Neutral    4 = Somewhat Agree    5 = Strongly Agree

| GENERAL PLAN  |   |   |   |   |   |
|---|---|---|---|---|---|
| Land Use  |   |   |   |   |   |
| 1. The general plan includes a future land use map that clearly identifies natural hazard areas.<br>(Plan shows wetlands)                                       | 1 | 2 | 3 | 4 | 5 |
| 2. Current land use policies discourage development and/or redevelopment within natural hazard areas.<br>(Floodplain District, Conservation Subdivision Design) | 1 | 2 | 3 | 4 | 5 |
| 3. The general plan provides adequate space for expected future growth in areas located outside of natural hazard areas.  | 1 | 2 | 3 | 4 | 5 |
| Transportation  |   |   |   |   |   |
| 4. The transportation element limits access to natural hazard areas.  | 1 | 2 | 3 | 4 | 5 |
| 5. Transportation policy is used to guide future growth and development to safe locations.  | 1 | 2 | 3 | 4 | 5 |
| 6. Transportation systems are designed to function under disaster conditions (e.g., evacuation, mobility for fire/rescue apparatus, etc.).                      | 1 | 2 | 3 | 4 | 5 |
| Environmental Management  |   |   |   |   |   |
| 7. Environmental features that serve to protect development from hazards (e.g., wetlands, riparian buffers, etc.) are identified and mapped.                    | 1 | 2 | 3 | 4 | 5 |
| 8. Environmental policies encourage the preservation and restoration of protective ecosystems.  | 1 | 2 | 3 | 4 | 5 |

# Town of Wilmington Hazard Mitigation Plan Update

Safe Growth Survey  
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|  |           |
|--|-----------|
| 9. Environmental policies provide incentives to development that is located outside of protective ecosystems.  | 1 2 3 4 5 |
| <b>Public Safety</b>   |           |
| 10. The goals and policies of the general plan are related to and consistent with those in the Hazard Mitigation Plan.   | 1 2 3 4 5 |
| 11. Public safety is explicitly included in the plan's growth and development policies.  | 1 2 3 4 5 |
| 12. The monitoring and implementation section of the plan covers safe growth objectives.   | 1 2 3 4 5 |
| <b>ZONING ORDINANCE</b>  |           |
| 13. The zoning ordinance conforms to the general plan in terms of discouraging development and/or redevelopment within natural hazard areas. (Floodplain District and CSD) | 1 2 3 4 5 |
| 14. The ordinance contains natural hazard overlay zones that set conditions for land use within such zones. (Floodplain District)  | 1 2 3 4 5 |
| 15. Rezoning procedures recognize natural hazard areas as limits on zoning changes that allow greater intensity or density of use.   | 1 2 3 4 5 |
| 16. The ordinance prohibits development within, or filling of, wetlands (No), floodways (Yes), and floodplains (1:1).  | 1 2 3 4 5 |
| <b>SUBDIVISION REGULATIONS</b>   |           |
| 17. The subdivision regulations restrict the subdivision of land within or adjacent to natural hazard areas.   | 1 2 3 4 5 |
| 18. The regulations provide for conservation subdivisions or cluster subdivisions in order to conserve environmental resources.  | 1 2 3 4 5 |
| 19. The regulations allow density transfers where hazard areas exist.  | 1 2 3 4 5 |
| <b>CAPITAL IMPROVEMENT PROGRAM AND INFRASTRUCTURE POLICIES</b>   |           |
| 20. The capital improvement program limits expenditures on projects that would encourage development and/or redevelopment in areas vulnerable to natural hazards.          | 1 2 3 4 5 |

## Town of Wilmington Hazard Mitigation Plan Update

Safe Growth Survey

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|  |   |   |   |   |   |
|--|---|---|---|---|---|
| 21. Infrastructure policies limit the extension of existing facilities and services that would encourage development in areas vulnerable to natural hazards.                 | 1 | 2 | 3 | 4 | 5 |
| 22. The capital improvements program provides funding for hazard mitigation projects identified in the Hazard Mitigation Plan.   | 1 | 2 | 3 | 4 | 5 |
| <b>OTHER</b>   |   |   |   |   |   |
| 23. Small area or corridor plans recognize the need to avoid or mitigate natural hazards.  | 1 | 2 | 3 | 4 | 5 |
| 24. The building code contains provisions to strengthen or elevate new or substantially improved construction to withstand hazard forces.                                    | 1 | 2 | 3 | 4 | 5 |
| 25. Economic development and/or redevelopment strategies include provisions for mitigating natural hazards or otherwise enhancing social and economic resiliency to hazards. | 1 | 2 | 3 | 4 | 5 |

**Thank you for your assistance in completing this survey.**

Appendix C: Mitigation Strategy Supporting Materials

| Community Resilience Building Risk Matrix   |  |                          |                  | www.CommunityResilienceBuilding.org  |  |  |   |                                       |   |              |   |
|---|--|--------------------------|------------------|--|--|--|---|---------------------------------------|---|--------------|---|
| H-H-L priority for action over the Short or Long term (and Ongoing)   |  |                          |                  | Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.) |  |  |   |                                       |   |              |   |
| V = Vulnerability S = Strength  |  | Ownership                |                  | V or S   |  | Priority   |   | Time                                  |   | Notes        |   |
| Features  |  | Location                 |                  |  |  | Extreme Summer<br>Temperatures/Heat<br>Waves/Drought |   | Extreme Winter<br>Events/ Nor'easters |   | Action Items |   |
| Infrastructure  |  |                          |                  |  |  | High Winds/Tornadoes                                 |   | Flooding                              |   |              |   |
| 1. Culvert/Bridge Replacement/Reconstruction - incorporate NIS to improve wildlife crossing/habitat functions (check for historical issues, consider recreational aspects - kayaking, etc.); Hydraulic opening - research existing studies of how the opening will affect the downstream communities in Wilmington; design the replacement considering existing studies and CC projections. | (1) Route 62 (Martins Brook) Bridge/Culvert                                    | Rt 62 (Middlesex Ave.)   | Town             | V  |  |  |   |                                       | X | H            | S |
|   | (2) Glen Road (Lubber's Brook) Culvert   | Glen Rd                  | Town?            | V  |  |  |   |                                       | X | M            | S |
|   | (3) Route 62 (Lubber's Brook) Culvert  | Rt 62 (Middlesex Ave.)   | Town             | V  |  |  |   |                                       | X | H            | O |
|   | (4) Benevento's small stream culvert (84" culvert)                             | Benevento Hall Rd        | Private          | V  |  |  |   |                                       | X | M            | S |
|   | (5) Forest St (Lubbers Brook) Culvert  | Forest St                |                  | V  |  |  |   |                                       |   | L/M          | S |
|   | (6) Amsworth Rd and Andover St Culverts (Unnamed Tributaries to Martins Brook) | Andover St & Amsworth Rd | Private          | V  |  |  |   |                                       | X | M            | L |
|   | (7) Concord St Culvert   | Concord St               | Town             | V  |  |  |   |                                       | X | M            | S |
|   | (8) Rt 38 (Maple Meadow Brook) Bridge/Culvert                                  | Rt 62 (Middlesex Ave.)   | Town             | V  |  |  |   |                                       | X | H            | O |
|   | (9) Philips Ave (Lubbers Brook) Culverts (Smaller) + other small culverts      | Philips Ave              | Town             | V  |  |  |   | X                                     | X | H            | O |
|   | (10) Wildwood St (Maple Meadow Brook) Crossing                                 | Wildwood St              |                  | V  |  |  |   |                                       | X | M            | S |
|   | (11) Culverts under Railroads  | Townwide                 | MBTA             | V  |  |  |   |                                       |   | H            | O |
|   | (12) Burlington Reservoir Dam  | Mill Pond                | Burlington Owned | V  |  |  | X |                                       |   | N/A          | O |
|   | (13) New Public Safety Substation  | North Wilmington         | Town             | V  |  |  |   |                                       |   | H            | L |
|   | (14) Butters Row Water Treatment Plant   | Butters Row              | Town             | V  |  |  |   |                                       |   | L/M          | L |
|   | (15) Butters Row Area Towns Wells  | Butters Row area         | Town             | V  |  |  |   |                                       | X | L/M          | L |
|   | (16) Active Wellfields (4) & Water Pumping stations                            | Townwide                 | Town             | V/S  |  |  |   |                                       | X | H            | O |

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# Town of Wilmington Hazard Mitigation Plan Update

|  |  |                      |     |   |   |  |  |  |   |     |   |   |
|--|--|----------------------|-----|---|---|--|--|--|---|-----|---|---|
| (17) Brown's Crossing (current DPW bldg & other Town bldgs - garage, etc.)         | Brown's Crossing                             | Town                 | S/V | X |   |  |  |  |   | M   | L | Consider potential for moving the Town offices from this site within 10 years to other locations in the future (DPW building is a concern because of CC projections)  |
| (18) Sewer Pump Stations (11)  | Townwide                                     | Town                 | S   |   |   |  |  |  |   | N/A | O | Continue on-going maintenance   |
| (19) Electrical Substation (RMLD=Reading Municipal Light Dept)                     | MMB Park area                                | RMDL                 | V   | X |   |  |  |  |   | M   | O | Research options for relocation   |
| (20) Sand and Gravel Pit   | Rt 62 from Woburn St to N. Reading           | Benevento Companies? | V   | X |   |  |  |  |   | M   | O | Coordinate with N Reading on maintenance (immediate threat to Martins Brook); see #1 and Benevento's action items; look at enforcement orders   |
| (21) SW Infrastructure Items/drainage issues/low points                            | Townwide                                     | Town                 |     | X |   |  |  |  |   | H   | O | Research flooding causes in 3 areas (Cranberry Bog area east of Cushing Drive, Middlesex Canal Aqueduct behind the Town Park south of the Route 38/Butters Row intersection; and Area east/upstream of the Andover Street Culvert) and develop mitigation actions accordingly |
| (22) I-93 Bridges (4 exits & 6 overpasses)   | Along I-93 on the eastern side of Wilmington | State                | V   | X | X |  |  |  | X | H   | O | Continue maintaining the bridges and overpasses (water main going through them); coordinate for emergency events plan to shut off water supply going through; coordinate with MassDOT about WQ issues in nearby wells   |
| (23) MBTA Stations (2 -Wilmington-Lowell Line and North Wilmington-Haverhill Line) | Rt 38 (Main St) & Rt 62 (Meddlessex Ave)     | MBTA                 | S/V | X |   |  |  |  | X | M   | O | 1. Research options to promote and improve access to T stations (also Societal item) in coordination with MBTA;<br>2. Continue to facilitate with land owner to reconfigure the lots to improve access to T Station and parking   |
| (24) Above ground fuel storage tanks (2)   | DPW Garage                                   | DPW                  | V   |   | X |  |  |  |   | L/M | O | Continue implementation of control plans and maintenance - look downstream, consider emergency catastrophes (close to water supply areas)   |
| (25) Water Storage Tanks/Water Towers  | Hillside Way, Research Dr and Nausseau Ave   | Town                 | V/S |   | X |  |  |  | X | N/A |   | No actions  |
| <b>Societal</b>  |  |                      |     |   |   |  |  |  |   |     |   |   |
| (1) High School (Shelter)  | Church St                                    | Town                 | S   |   |   |  |  |  |   |     | O | Continue maintaining shelter buildings  |
| (1a) Senior Center (Shelter)   | School St                                    | Town                 | S/V |   |   |  |  |  |   | H   | O | Find the new space for addition to senior center to address future population growth  |
| (1) Wilmington Middle School (Shelter)   | Carter Lane                                  | Town                 | S   |   |   |  |  |  |   |     | O | Continue maintaining shelter buildings  |
| (2) Wilmington Housing Authority   | Demming Way                                  | State                | S/V | X |   |  |  |  |   | H   | O | No actions yet; may include in vulnerable populations assessment  |
| (3) Shriners Auditorium Bldg (potential additional shelter)                        | end of Fordham Rd                            | Private              | S   |   |   |  |  |  |   |     | O | Continue maintaining shelter buildings  |
| (4) St. Thomas-Villanova Hall (additional shelter)                                 | 126 Middlesex                                | Private              | S   |   |   |  |  |  |   |     | O | Continue maintaining shelter buildings  |
| (5) Knights of Columbus (potential additional shelter)                             | 112 Middlesex                                | Private              | S   |   |   |  |  |  |   | M   | S | Continue coordination with private entities to use the buildings as shelters (for all shelter items) - all shelters are equally accessible  |
| (6) Wilmington Food Pantry (South School)  | 142 Chestnut St                              | Town                 | S/V |   |   |  |  |  |   | H   | O | Continue to ensure adequate supply and funding of the food pantry program; maintain accessibility for emergency situations  |
| (7) MBTA Stations (2 -Wilmington-Lowell Line and North Wilmington-Haverhill Line)  | Rt 38 (Main St) & Rt 62 (Meddlessex Ave)     | MBTA                 | S/V | X |   |  |  |  | X | M   | O | 1. Research options to promote and improve access to T stations (also Infrastructural item) in coordination with MBTA;<br>2. Continue to facilitate with land owner to reconfigure the lots to improve access to T Station and parking  |



# Town of Wilmington Hazard Mitigation Plan Update

|  |  |      |  |     |   |  |  |  |   |     |     |  |
|--|--|------|--|-----|---|--|--|--|---|-----|-----|--|
| (7) Invasive Species   | Townwide   | Town |  | V   | X |  |  |  | X | M   | S/O | 1. Public Education - plants and insects;<br>2. Complete mitigation plan addressing invasive species issue (removal and mitigation opportunities)<br><u>Low salt routes are a function of the Con Com OOC's issued. Continue with low salt program.</u>  |
| (8) Salt Treatment along Roadways  | Townwide   | Town |  | S   |   |  |  |  |   | H   | O   |  |
| (9) Wildlife   | Townwide   | N/A  |  | S/V |   |  |  |  |   | N/A | O   |  |
| (10) Water Withdrawal/Overpumping of the Ipswich Basin headwaters                                      | Townwide   | Town |  | V   |   |  |  |  | X | H   | O   | 1. Continue monitoring and buying MWRA water to meet Town's demand<br>2. Research options to protect water supply during drought (prevent overpumping; assess conditions; include water conservation actions for this area; water supply is vulnerable for contamination)  |
| (11) Vernal Pools/NHESP areas  | Townwide   | N/A  |  | V   |   |  |  |  | X | M   | O   | 1. Public education on the importance and value of vernal pools as habitat is needed to be protected.<br>2. Look into public support for establishing a local bylaw & incorporate vernal pools into it.<br>3. Create educational materials to distribute the importance of vernal pools benefits of vernal pools.<br><u>Look into expanding the trail network and improving recreational values.</u> |
| (12) Town Forest   | North Wilmington   |      |  | S   |   |  |  |  |   |     |     | No action item - potentially work with the Town Museum as well as at the Salem Street culvert/bridge crossing to note the historical value of the Middlesex Aqueduct.  |
| (13) Town Park   | So. Main St  | Town |  | S/V |   |  |  |  |   | L   | O   | No Action - will be covered in open space plan - Action Items for athletic fields to improve access to municipal conservation parcels  |
| (14) Park Networks & Athletic fields   | Townwide   |      |  | S/V |   |  |  |  |   | L   | O   | Open space will address these items. Continue maintenance and timely update of the Town's OSRP. Find ways to improve recreational value of Twp Town's open space parcels.  |
| (15) Open Space - Conservation Areas/C/R   | Townwide   | Town |  | S   |   |  |  |  |   | L   | O   | 1. Continue coordination with the group on all on-going projects (also societal item) including climate resiliency efforts, recreational projects, culvert projects, etc.<br>2. ID & prioritize regional projects;<br>3. Coordinate through collaboration efforts (with IRWA and other organizations)  |
| (16) Water resources/stream corridors/GW aquifers/Environmental groups (Headwaters Stream Team & IRWA) | Reading, North Reading and Wilmington (Burlington Volunteer) | N/A  |  | S   |   |  |  |  |   | H   | O   |  |

## Appendix D: Plan Implementation and Maintenance Supporting Materials

### Plan Update Evaluation Worksheet

| Plan Section                 | Considerations  | Explanation |
|------------------------------|---|-------------|
| <b>Planning Process</b>      | <p>Should the town invite any additional stakeholders to participate in the planning process?</p> <p>What public outreach activities have occurred?</p> <p>How can public involvement be improved?</p>  |             |
| <b>Risk Assessment</b>       | <p>What disasters has the town, or the region experienced?</p> <p>Should the list of hazards be modified?</p> <p>Are new data sources, maps or studies available? If so, what have they revealed, and should the information be incorporated into the plan update?</p> <p>Has development in the region occurred and could it create or reduce risk?</p>  |             |
| <b>Capability Assessment</b> | <p>Has the town adopted new policies, plans, regulations, or reports that could be incorporated into this plan?</p> <p>Are there different or additional administrative, human, technical, and financial resources available for mitigation planning?</p> <p>Are there different or new education and outreach programs and resources available for mitigation activities?</p>  |             |
| <b>Mitigation Strategy</b>   | <p>Is the mitigation strategy being implemented as anticipated?</p> <p>Were the cost and timeline estimate accurate?</p> <p>Should new mitigation actions be added to the Action Plan?</p> <p>Should existing mitigation actions be revised or removed from the plan?</p> <p>Are there new obstacles that were not anticipated in the plan that will need to be considered in the next plan update?</p> <p>Are there new funding sources to consider?</p> |             |

| Plan Section               | Considerations  | Explanation |
|----------------------------|---|-------------|
|                            | Have elements of the plan been incorporated into other planning mechanisms? |             |
| <b>Implementation Plan</b> | Was the plan monitored and evaluated as anticipated?                        |             |
|                            | What are needed improvements to the plan implementation procedures?         |             |

*Mitigation Action Progress Worksheet*

| Mitigation Action Progress Worksheet                                 |                       |                                |                  |                 |
|--|-----------------------|--------------------------------|------------------|-----------------|
| <b>Progress Report Period</b>  | From Date             |                                | To Date          |                 |
| Action/Project Title   |                       |                                |                  |                 |
| Responsible Department   |                       |                                |                  |                 |
| Contact Name   |                       |                                |                  |                 |
| Contact Phone/Email  |                       |                                |                  |                 |
| Project Description  |                       |                                |                  |                 |
| Project Goal   |                       |                                |                  |                 |
| Project Objective  |                       |                                |                  |                 |
| Project Cost   |                       |                                |                  |                 |
| <b>Project Status</b>  |                       |                                |                  |                 |
| Date of Project Approval   | Date of Project Start | Anticipated Date of Completion | Project Canceled | Project Delayed |
| Explanation of Delay or Cost Overruns                                |                       |                                |                  |                 |
| <b>Project Report Summary</b>  |                       |                                |                  |                 |
| What was accomplished for this project during this reporting period? |                       |                                |                  |                 |
| What obstacles, problems, or delays did the project encounter?       |                       |                                |                  |                 |
| Plans for next reporting period.                                     |                       |                                |                  |                 |

# LOCAL MITIGATION PLAN REVIEW TOOL - APA

## Town of Wilmington, MA

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The *Local Mitigation Plan Review Tool* demonstrates how the Local Mitigation Plan meets the regulation in 44 CFR §201.6 and offers States and FEMA Mitigation Planners an opportunity to provide feedback to the community.

- The Regulation Checklist provides a summary of FEMA's evaluation of whether the Plan has addressed all requirements.
- The Plan Assessment identifies the plan's strengths as well as documents areas for future improvement.
- The Multi-jurisdiction Summary Sheet is an optional worksheet that can be used to document how each jurisdiction met the requirements of each Element of the Plan (Planning Process; Hazard Identification and Risk Assessment; Mitigation Strategy; Plan Review, Evaluation, and Implementation; and Plan Adoption).

The FEMA Mitigation Planner must reference this *Local Mitigation Plan Review Guide* when completing the *Local Mitigation Plan Review Tool*.

|   |   |  |
|---|---|--|
| <b>Jurisdiction:</b> Town of Wilmington   | <b>Title of Plan:</b> Hazard Mitigation Plan Update Town of Wilmington, Massachusetts | <b>Date of Plan:</b> June 2021   |
| <b>Single or Multi-jurisdiction plan?</b> Single jurisdiction   |   | <b>New Plan or Plan Update?</b> Update   |
| <b>Local Point of Contact:</b> Paul Alunni<br><b>Title:</b> Town Engineer<br><b>Local Point of Contact:</b> Valerie Gingrich<br><b>Title:</b> Director of Planning & Conservation<br><b>Agency/Address:</b> Town of Wilmington<br>121 Glen Road, Wilmington, MA 01887<br><b>Phone Number:</b> Paul 978-658-4499,<br>Valerie 978-658-8238<br><b>E-Mail:</b> <a href="mailto:palunni@wilmingtonma.gov">palunni@wilmingtonma.gov</a> and<br><a href="mailto:vingrich@wilmingtonma.gov">vingrich@wilmingtonma.gov</a> |   | <b>Regional Point of Contact:</b><br><b>Title:</b><br><b>Agency/Address:</b><br><br><b>Phone Number:</b><br><b>E-Mail:</b> |

|  |  |                          |
|--|--|--------------------------|
| <b>State Reviewer:</b><br>Jeffrey Zukowski | <b>Title:</b><br>Hazard Mitigation Planner | <b>Date:</b><br>9/21/21; |
|--|--|--------------------------|

|  |  |   |
|--|--|---|
| <b>FEMA Reviewer:</b><br>Jay Neiderbach<br>Brigitte Ndikum-Nyada | <b>Title:</b><br>FEMA Community Planner<br>Community Planner | <b>Date:</b><br>10/15/21-10/28/2021<br>10/28/2021-10/29/2021; |
| <b>Date Received in FEMA Region I</b>                            | 9/21/2021;   |   |
| <b>Plan Not Approved</b>   |  |   |
| <b>Plan Approvable Pending Adoption</b>                          | 10/29/2021   |   |
| <b>Plan Adopted</b>  |  |   |
| <b>Plan Approved</b>   |  |   |

## SECTION 1: REGULATION CHECKLIST

**INSTRUCTIONS:** The Regulation Checklist must be completed by FEMA. The purpose of the Checklist is to identify the location of relevant or applicable content in the Plan by Element/sub-element and to determine if each requirement has been 'Met' or 'Not Met.' The 'Required Revisions' summary at the bottom of each Element must be completed by FEMA to provide a clear explanation of the revisions that are required for plan approval. Required revisions must be explained for each plan sub-element that is 'Not Met.' Sub-elements should be referenced in each summary by using the appropriate numbers (A1, B3, etc.), where applicable. Requirements for each Element and sub-element are described in detail in this *Plan Review Guide* in Section 4, Regulation Checklist.

| 1. REGULATION CHECKLIST   |                                 | Location in Plan<br>(section and/or<br>page number) | Met | Not<br>Met |
|---|---------------------------------|---|-----|------------|
| Regulation (44 CFR 201.6 Local Mitigation Plans)  |                                 |   |     |            |
| ELEMENT A. PLANNING PROCESS   |                                 |   |     |            |
| A1. Does the Plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement §201.6(c)(1))  | pp. 30-34                       | X   |     |            |
| A2. Does the Plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development as well as other interests to be involved in the planning process? (Requirement §201.6(b)(2)) | pp. 31-32, Appendix A           | X   |     |            |
| A3. Does the Plan document how the public was involved in the planning process during the drafting stage? (Requirement §201.6(b)(1))  | pp. 32-34, Appendix A           | X   |     |            |
| A4. Does the Plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement §201.6(b)(3))  | pp. 35-36, citations throughout | X   |     |            |
| A5. Is there discussion of how the community(ies) will continue public participation in the plan maintenance process? (Requirement §201.6(c)(4)(iii))   | p. 140                          | X   |     |            |
| A6. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a 5-year cycle)? (Requirement §201.6(c)(4)(i))   | pp. 140-141, Appendix D         | X   |     |            |
| ELEMENT A: REQUIRED REVISIONS   |                                 |   |     |            |
| ELEMENT B. HAZARD IDENTIFICATION AND RISK ASSESSMENT  |                                 |   |     |            |
| B1. Does the Plan include a description of the type, location, and extent of all-natural hazards that can affect each jurisdiction(s)? (Requirement §201.6(c)(2)(i))  | pp. 36-91                       | X   |     |            |
| B2. Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction? (Requirement §201.6(c)(2)(ii))   | pp. 36-91                       | X   |     |            |

| 1. REGULATION CHECKLIST  |                    | Location in Plan<br>(section and/or<br>page number) | Met | Not<br>Met |
|--|--------------------|---|-----|------------|
| <b>Regulation</b> (44 CFR 201.6 Local Mitigation Plans)  |                    |   |     |            |
| B3. Is there a description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction? (Requirement §201.6(c)(2)(ii))  | pp. 43-104         | X   |     |            |
| B4. Does the Plan address NFIP insured structures within the jurisdiction that have been repetitively damaged by floods? (Requirement §201.6(c)(2)(ii))  | p. 98              | X   |     |            |
| <b>ELEMENT B: REQUIRED REVISIONS</b>   |                    |   |     |            |
| <b>ELEMENT C. MITIGATION STRATEGY</b>  |                    |   |     |            |
| C1. Does the plan document each jurisdiction's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs? (Requirement §201.6(c)(3))  | pp. 106-119        | X   |     |            |
| C2. Does the Plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement §201.6(c)(3)(ii))  | pp. 118-119        | X   |     |            |
| C3. Does the Plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement §201.6(c)(3)(i))   | p. 121             | X   |     |            |
| C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement §201.6(c)(3)(ii)) | pp. 124-135        | X   |     |            |
| C5. Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by each jurisdiction? (Requirement §201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii))                      | pp. 125-135        | X   |     |            |
| C6. Does the Plan describe a process by which local governments will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement §201.6(c)(4)(ii))                      | pp. 110, 135-136   | X   |     |            |
| <b>ELEMENT C: REQUIRED REVISIONS</b>   |                    |   |     |            |
| <b>ELEMENT D. PLAN REVIEW, EVALUATION, AND IMPLEMENTATION</b> (applicable to plan updates only)  |                    |   |     |            |
| D1. Was the plan revised to reflect changes in development? (Requirement §201.6(d)(3))   | p. 13              | X   |     |            |
| D2. Was the plan revised to reflect progress in local mitigation efforts? (Requirement §201.6(d)(3))   | pp. 13-14, 122-123 | X   |     |            |
| D3. Was the plan revised to reflect changes in priorities? (Requirement §201.6(d)(3))  | pp. 14, 104-105    | X   |     |            |
| <b>ELEMENT D: REQUIRED REVISIONS</b>   |                    |   |     |            |

| 1. REGULATION CHECKLIST   |      | Location in Plan<br>(section and/or<br>page number) | Met | Not<br>Met |
|---|------|---|-----|------------|
| <b>Regulation (44 CFR 201.6 Local Mitigation Plans)</b>   |      |   |     |            |
| <b>ELEMENT E. PLAN ADOPTION</b>   |      |   |     |            |
| E1. Does the Plan include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval? (Requirement §201.6(c)(5)) | p. 3 |   |     |            |
| E2. For multi-jurisdictional plans, has each jurisdiction requesting approval of the plan documented formal plan adoption? (Requirement §201.6(c)(5))                     |      |   |     |            |
| <b><u>ELEMENT E: REQUIRED REVISIONS</u></b>   |      |   |     |            |
| <b>ELEMENT F. ADDITIONAL STATE REQUIREMENTS (OPTIONAL FOR STATE REVIEWERS ONLY; NOT TO BE COMPLETED BY FEMA)</b>  |      |   |     |            |
| F1.   |      |   |     |            |
| F2.   |      |   |     |            |
| <b><u>ELEMENT F: REQUIRED REVISIONS</u></b>   |      |   |     |            |



## SECTION 2: PLAN ASSESSMENT

### A. Plan Strengths and Opportunities for Improvement

This section provides a discussion of the strengths of the plan document and identifies areas where these could be improved beyond minimum requirements.

#### Recommended Corrections:

- Page 85 describes the probability of severe storms as “highly likely... (1-10 percent annual probability).” Revise this to be consistent with the plan’s definition of “highly likely” as a 90-100 percent annual probability.

### Element A: Planning Process

#### **Strengths:**

- Having the Director of Planning and Conservation co-lead the planning process ensured other planning initiatives within the community were incorporated. Combining the development of the plan with the MVP Process allowed for a more comprehensive approach to both efforts.
- There is an excellent description of the public comments received and how these affected the plan’s content.
- The plan includes documentation of the timeline and schedule for how the plan will be maintained, including specific tasks to be accomplished.

#### **Opportunities for Improvement:**

- Consider having at least one public meeting at night to encourage more public participation.

### Element B: Hazard Identification and Risk Assessment

#### **Strengths:**

- The plan does an excellent job of identifying how the probability or severity of future hazard events may change in the future due to changes in climate, population, or land use.
- The plan identifies specific locations and infrastructure throughout the town that have been previously flooded, with an assessment of possible mitigation measures for each. This creates a strong link between risk and mitigation throughout the plan.
- A range of studies, plans, and data from a variety of sources were used to analyze each hazard.
- The plan addresses the effects a dam failure would have for a dam not located within the town.
- In addition to general scientific scales for extent, the plan also includes the maximum expected severity of each hazard locally. This creating a more realistic assessment of what kind of damages are likely to occur.

**Opportunities for Improvement:**

- None

**Element C: Mitigation Strategy****Strengths:**

- There is a detailed description of how priorities have changed from last plan, and how priorities from the MVP planning process were incorporated into this plan.
- The plan's goals and mitigation actions are integrated with other community planning efforts. This integration will encourage better implementation of the mitigation strategy.

**Opportunities for Improvement:**

- For mitigation actions with timelines that are longer than five years, consider including intermediate completion dates. Describing what is expected to occur by the next five-year update of the plan will help with future plan update and evaluation.
- If available, incorporate existing watershed studies into the risk assessment.

**Element D: Plan Update, Evaluation, and Implementation (Plan Updates Only)****Strengths:**

- The plan includes a description of how climate change has affected the community's overall priorities.

**Opportunities for Improvement:**

- **Looking ahead and planning for the next HMP update:** Continue to get specific when identifying all forms of changes in development whether its expansions or improvements to existing structures and infrastructure, changes in use, future development plans and policies, or just building permit increases and changes in population, and social justice and equity planning. Be sure these changes are always connected to whether it is increasing, decreasing, or have no effect on the Town's risk and/or vulnerability.
- Discuss the effect that recently completed mitigation work has had on reducing the community's risk.
- Expand on and describe how the mitigation strategy has helped to meet community's overhaul goals. Are the community's mitigation goals still valid?
- Expand and describe status of the community's existing mitigation related capabilities and how the community can improve upon them.
- In the next update, include a discussion on an approach to evaluating future climate conditions and its impacts on the community taking the following into account (i.e., expanding mitigation and making connection to equity, socio-economic, environmental, demographic, change in built environment etc.).
- Describe general land use changes in neighboring jurisdictions that may affect the community's risk.
- Consider including a discussion on how mitigation activities have increased the community's resilience and support other long-term community planning goals.

## B. Resources for Implementing Your Approved Plan

Refer to the [Massachusetts Integrated State Hazard Mitigation and Climate Action Plan](#), [Resilient MA Climate Clearinghouse](#), and State's [Climate Action Page](#) to learn about hazards relevant to Massachusetts and the State's efforts and action plan.

### Technical Assistance:

#### FEMA

- [FEMA Climate Change](#): Provides resources that address climate change.
- [FEMA Library](#): FEMA publications can be downloaded from the library website. These resources may be especially useful in public information and outreach programs. Topics include building and construction techniques, NFIP policies, and integrating historic preservation and cultural resource protection with mitigation.
- [FEMA RiskMAP](#): Technical assistance is available through RiskMAP to assist communities in identifying, selecting, and implementing activities to support mitigation planning and risk reduction. Attend RiskMAP discovery meetings that may be scheduled in the state, especially any in neighboring communities with shared watersheds boundaries.

#### Other Federal

- [EPA Resilience and Adaptation in New England \(RAINE\)](#): A collection of vulnerability, resilience and adaptation reports, plans, and webpages at the state, regional, and community levels. Communities can use the RAINE database to learn from nearby communities about building resiliency and adapting to climate change.
- [EPA Soak Up the Rain](#): Soak Up the Rain is a public outreach campaign focused on stormwater quality and flooding. The website contains helpful resources for public outreach and easy implementation projects for individuals and communities.
- [NOAA C-CAP Land Cover Atlas](#): This interactive mapping tool allows communities to see their land uses, how they have changed over time, and what impact those changes may be having on resilience.
- [NOAA Sea Grant](#): Sea Grant's mission is to provide integrated research, communication, education, extension and legal programs to coastal communities that lead to the responsible use of the nation's ocean, coastal and Great Lakes resources through informed personal, policy and management decisions. Examples of the resources available help communities plan, adapt, and recovery are the Community Resilience Map of Projects and the National Sea Grant Resilience Toolkit
- [NOAA Sea Level Rise Viewer](#) and [Union for Concerned Scientists Inundation Mapper](#): These interactive mapping tools help coastal communities understand how their hazard risks may be changing. The "Preparing for Impacts" section of the inundation mapper addresses policy responses to protect communities.
- [NOAA U.S. Climate Resilience Toolkit](#): This resource provides scientific tools, information, and expertise to help manage climate-related risks and improve resilience to extreme events. The "[Steps to Resilience](#)" tool may be especially helpful in mitigation planning and implementation.

#### State

- [Massachusetts Emergency Management Agency](#): The Massachusetts State Hazard Mitigation Officer (SHMO) and State Mitigation Planner(s) can provide guidance regarding grants, technical assistance, available publications, and training opportunities.
- Massachusetts Departments of [Conservation and Recreation](#) and [Environmental Protection](#) can provide technical assistance and resources to communities seeking to implement their hazard mitigation plans.

- <https://www.mass.gov/guides/floodplain-management> Massachusetts 2020 Model Floodplain Bylaws. <https://msc.fema.gov/portal>
- [MA Mapping Portal](#): Interactive mapping tool with downloadable data

#### **Not for Profit**

- [Kresge Foundation Online Library](#): Reports and documents on increasing urban resilience, among other topics.
- [Naturally Resilient Communities](#): A collaboration of organizations put together this guide to nature-based solutions and case studies so that communities can learn which nature-based solutions can work for them.
- [Rockefeller Foundation Resilient Cities](#): Helping cities, organizations, and communities better prepare for, respond to, and transform from disruption.

#### **Funding Sources:**

- [Massachusetts Coastal Resilience Grant Program](#): Funding for coastal communities to address coastal flooding, erosion, and sea level rise.
- [Massachusetts Municipal Vulnerability Preparedness](#) program: Provides support for communities to plan for climate change and resilience and implement priority projects.
- [Massachusetts Water Quality Grants](#): Clean water grants that can be used for river restoration or other kinds of hazard mitigation implementation projects.
- [Grants.gov](#): Lists of grant opportunities from federal agencies (HUD, DOT/FHWA, EPA, etc.) to support rural development, sustainable communities and smart growth, climate change and adaptation, historic preservation, risk analyses, wildfire mitigation, conservation, Federal Highways pilot projects, etc.
- [FEMA Hazard Mitigation Assistance](#) (HMA): FEMA's Hazard Mitigation Assistance provides funding for projects under the Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation (PDM), and Flood Mitigation Assistance (FMA). States, federally recognized tribes, local governments, and some not-for-profit organizations are eligible applicants.
- [GrantWatch](#): The website posts current foundation, local, state, and federal grants on one website, making it easy to consider a variety of sources for grants, guidance, and partnerships. Grants listed include The Partnership for Resilient Communities, the Institute for Sustainable Communities, the Rockefeller Foundation Resilience, The Nature Conservancy, The Kresge Climate-Resilient Initiative, the Threshold Foundation's Thriving Resilient Communities funding, the RAND Corporation, and ICLEI Local Governments for Sustainability.
- USDA [Natural Resource Conservation Service](#) (NRCS) and [Rural Development Grants](#): NRCS provides conservation technical assistance, financial assistance, and conservation innovation grants. USDA Rural Development operates over fifty financial assistance programs for a variety of rural applications.