Draft – Hazard Mitigation Plan

2024 Update – For Public Review

Town of Acton

472 Main Street, Acton, Massachusetts

Prepared by:

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SLR Project No.: 149.14458.00007

August 8, 2024

Acknowledgements and Credits

This plan was prepared for the Town of Acton by SLR International under the direction of the Massachusetts Emergency Management Agency (MEMA). The plan was funded by the Federal Emergency Management Agency's (FEMA) Pre-Disaster Mitigation (PDM) Grant Program.

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1.0 Executive Summary

Hazard Mitigation planning is a proactive effort to identify actions that can be taken to reduce the dangers to life and property from natural hazard events. In the communities of the Boston region of Massachusetts, hazard mitigation planning tends to focus most on flooding, the most likely natural hazard to impact these communities. The Federal Disaster Mitigation Act of 2000 requires all municipalities that wish to be eligible to receive FEMA funding for hazard mitigation grants, to adopt a local multi-hazard mitigation plan and update this plan in five-year intervals.

1.1 Planning Process

Planning for the Hazard Mitigation Plan update was led by the Acton Local Hazard Mitigation Planning Team (LHMPT), composed of Acton Town staff and officials, Acton Water District representatives, and community members from Green Acton. This team met on February 28, 2024 and discussed how natural hazards impact the Town, goals for addressing these impacts, updates to the Town's mitigation capabilities, and new or revised hazard mitigation measures to include in the updated plan.

Public participation is important for improving awareness of the potential impacts of natural hazards and to build support for the actions the Town takes to mitigate them. The Town's LHMPT invited the community to two public engagement events: an open house at Town Hall on May 15, 2024, and a booth at the Acton Climate Festival on June 8, 2024. Additionally, the draft plan update was posted on the Town's website for public review and a webinar was hosted to provide an overview of the Draft Plan and solicit input via Zoom. Key town stakeholders and neighboring communities were notified and invited to review the draft plan and submit comments.

1.2 Risk Assessment

The Acton HMP assesses the potential impacts to the Town from flooding, high wind events, winter storms, geologic hazards, extreme temperatures, drought, and brushfire. The LHMPT identified 98 Critical Facilities, as listed in Table 4-38 and shown on the map in Section 4.9.

Loss Estimates were developed using data from the National Center for Environmental Information (NCEI), the FEMA National Risk Index, FEMA Public Assistance Reimbursements, and other sources including reported damages by Acton officials.

1.3 Hazard Mitigation Goals

The Acton LHMPT reviewed the nine hazard mitigation goals listed in the previous edition of the HMP at the February 2024 meeting. Through revision and discussion of those goals, the following 12 hazard mitigation goals for the current HMP were developed:

GOAL 1

- Prevent and reduce loss of life, injury, public health impacts, and quality of life impacts resulting from natural and human-caused hazards.

GOAL 2

- Prevent disruptions to public services, including utility services, municipal operations, and social services, from natural and human-caused hazards.

GOAL 3

- Promote equity and environmental justice priorities throughout hazard mitigation and resilience efforts, including risk assessment and identification and implementation of mitigation measures.

GOAL 4

- Coordinate between multiple local, state, and federal initiatives, and build public-private partnerships, to secure funding for hazard mitigation projects.

GOAL 5

- Integrate hazard mitigation planning across municipal departments, committees, and boards; the planning documents that guide them; and the budgeting and capital improvement processes of each.

GOAL 6

- Consider the connection of different hazards and stresses to promote activities with co-benefits across hazard mitigation, water and air quality, conservation and preservation, climate and resilience, and other municipal priorities.

GOAL 7

- Prevent and reduce damage to property, infrastructure, and natural, cultural, economic, and social resources from all hazards.

GOAL 8

- Work with stakeholders including Acton residents, businesses, institutions, developers, community-based organizations, land trusts, representatives of vulnerable populations, and non-profits to develop and implement hazard mitigation plan.

GOAL 9

- Work with surrounding communities and state, regional, and federal agencies to promote regional cooperation and solutions for hazards affecting multiple communities.

GOAL 10

- Ensure that future development meets, or exceeds when feasible, federal, state, and local standards for preventing and reducing hazard impacts; explore and advance local development standards that will further reduce hazard risks in the future.

GOAL 11

- Conduct meaningful engagement and education with staff and members of the public about hazard mitigation using a diversity of resources and platforms.

GOAL 12

- Consider the impacts of climate change and incorporate climate and resiliency in hazard mitigation planning.

1.4 Hazard Mitigation Strategy

Acton's Hazard Mitigation Strategy centers on advancing mitigation actions in coordination with other municipal priorities and initiatives (such as the Municipal Vulnerability Preparedness project), and centering relationship-building and equity to foster sustainable and ongoing progress toward reducing hazard vulnerability. The HMP identifies a range of specific hazard mitigation actions that promote the goals listed above and emphasizes building on existing capabilities and past successes.

Acton recognizes that mitigating hazards will be an ongoing process as our understanding of natural hazards and the steps that can be taken to mitigate their damages changes over time. Global climate change and a variety of other factors impact the Town's vulnerability and in the future, and local officials will need to work together across municipal lines and with state and federal agencies to understand and address these changes. The Hazard Mitigation Strategy will be incorporated into the Town's other related plans and policies.

1.5 Major Changes to the Plan

Major changes made to the Acton HMP through the 2024 planning process are summarized below in Table 1-1.

Table 1-1: Major Updates from Previous Plan

Section	Reviews and Updates
Section 2: Introduction	Changes to FEMA grant operations, regulations, and Local Hazard Mitigation Plan guidance have been made in recent years; this information is updated. Recent federally-declared disasters and FEMA-funded projects in Acton are listed. The Community Profile has been updated based on new planning projects that have been completed, 2020 census data, and other new information.
Section 3: Planning Process and Public Participation	Details of the planning process and public participation efforts are updated. The planning process included one additional public participation opportunity, via the webinar, and the LHMPT included both staff and community members.
Section 4: Risk Assessment	Information about hazard extents and exposure has been updated. Changes in local hazard concerns have been noted. Available data about historical hazard impacts have been used to update annualized loss estimates for every hazard assessed in the plan. Land use and land cover information was updated based on more recent data, and recent and projected development trends were revised through discussion with the LHMPT. The LHMPT reviewed critical infrastructure to create an up-to-date list. Climate change effects on hazard exposure and risks were updated using new observations and projections the 2023 Massachusetts State Hazard Mitigation Plan.
Section 5: Goals	The HMP Hazard Mitigation Goals were reviewed by the LHMPT and members of the public, and underwent significant revision based on the community's priorities. The final list of Goals has been endorsed by the Acton LHMPT.
Section 6: Existing Mitigation Measures	The list of existing mitigation measures was updated to reflect current mitigation activities in the town.

Section	Reviews and Updates
Sections 7 and 8: Hazard Mitigation Strategy	Mitigation measures from the 2018 plan were reviewed and assessed as to whether they were completed, in progress, or carried forward with or without revision. Where appropriate, certain 2018 mitigation measures were reclassified as capabilities and relocated to the appropriate location in Section 6. The 2024 HMP hazard mitigation strategy reflects both new measures and measures carried forward from the 2018 plan. SLR prioritized mitigation measures using the FEMA STAPLEE approach; prioritization was reviewed and revised by the LHMPT.
Section 9: Plan Adoption & Maintenance	This section of the plan was updated with a new plan implementation review and five-year update process that will assist the Town in incorporating hazard mitigation issues into other Town planning and regulatory review processes and better prepare the Town for the next comprehensive plan update.

Acton made considerable progress implementing mitigation measures identified in the 2018 Hazard Mitigation Plan. Completed physical projects include removal of the River Street Dam and construction of a new fire station; improved regulatory capabilities include an amended Stormwater bylaw and increased education about outdoor fire regulations.

Top-priority actions included in this plan update are presented in the following graphic:

Mitigation Action
Explore opportunities to increase the frequency of drainage structure maintenance. Options may include increasing maintenance frequency at known-problem structures, establishing an "Adopt a Drain" program, or acquiring more efficient and effective maintenance equipment.
Complete GIS stormwater mapping and prepare for GIS work needed to comply with EPA stormwater regulations (MS4).
Develop a comprehensive program for stormwater management, including culvert and drainage upgrades.
Complete the River Street Dam removal and channel restoration project.
Establish an annual water conservation campaign to educate residents about conservation measures, encourage best practices to minimize water demand, and facilitate discussions around drought risk.
Conduct workshops and tabletop exercises with Acton Water District and Town departments to develop a clear plan during water resource emergencies, including droughts, contamination, or generally strained water supply.
Incorporate incentives and/or requirements into Zoning Regulations to promote the use of green or cool roofs, cooler paving products, Low Impact Development (LID), green infrastructure, and other cooling capacities and/or heat mitigation measures into new construction and development. Align with recommendation from 2022 Climate Action Plan to advocate for sustainable land management to protect local natural resources.
Establish an annual public outreach program, targeting vulnerable populations including senior residents, residents with health complications, renters, low-income residents, or those living with no air conditioning, to increase awareness of the dangers of extreme heat and promote the use of and access to cooling centers.
Upgrade communications for flexibility and reliability, including finishing fiber optics and exploring GETS cards.
Improve emergency communication, particularly related to power outages and with a focus on difficult to reach populations (isolated individuals, vulnerable populations, non-English speakers). Conduct engagement and workshops with vulnerable populations to address communication challenges.
Assess emergency shelter capabilities during extreme heat, winter storms, and other severe weather events and evaluate opportunities to improve capacities to better serve the community, specifically the most vulnerable populations.
Prioritize water resource protection from contamination and other natural hazards and support protection of green spaces near water table recharging areas as recommended in the 2022 Climate Action Plan.

Mitigation Action
Update subdivision regulations to allow cluster development "as-of-right".
Pursue partnering with solar developers to create community solar program options for Acton residents and provide a participation pathway for low-income residents, as recommended in the 2022 Climate Action Plan.
Coordinate with Eversource and the Department of Energy Resources to identify opportunities to increase grid resilience and reliability, encourage clean energy, improve utility electric rate structures to promote equity and the adoption of clean energy and low emission technologies, and monitor and advocate for policy changes needed to the Public Utilities Commissions, as recommended in the 2022 Climate Action Plan.
Establish an Emergency Response Protocol that includes wellness checks for senior residents, those relying on oxygen, and other vulnerable populations at an increased health risk during the event of a power outage.
Identify and pursue regional MVP Action Grant opportunities with nearby MVP 2.0 communities.

The Town of Acton will consider opportunities to align hazard mitigation actions with the Municipal Vulnerability Preparedness (MVP) 2.0 Plan, which was being completed during the same period. This includes integrating findings from the MVP process related to community-specific vulnerabilities and resilience priorities. In doing so, Town of Acton will be better prepared to pursue appropriate mitigation strategies and capabilities. This could be conducted as part of ongoing plan maintenance to be conducted by the Acton Hazard Mitigation Implementation Team, as described in Section 9 Plan Adoption and Maintenance.

2.0 Introduction

2.1 Planning Requirements Under the Federal Disaster Mitigation Act

The Federal Disaster Mitigation Act, passed in 2000, requires that municipalities must adopt a local multi-hazard mitigation plan, and update this plan in five-year intervals, to be eligible to receive FEMA funding for hazard mitigation grants. This planning requirement does not affect disaster assistance funding, which FEMA directs towards relief and recovery where a disaster has already occurred.

Federal hazard mitigation planning and grant programs are administered by the Federal Emergency Management Agency (FEMA) in collaboration with the states. These programs are administered in Massachusetts by the Massachusetts Emergency Management Agency (MEMA) in partnership with the Department of Conservation and Recreation (DCR).

The Town of Acton contracted SLR to assist the Town in updating its Hazard Mitigation Plan (HMP), developed to meet the individual requirements of the 2000 Disaster Mitigation Act for each community while listing regional concerns and hazards that impact the Town. The Town of Acton first adopted its HMP in 2010 and updated it most recently in 2018.

2.2 What is a Hazard Mitigation Plan?

Natural hazard mitigation planning is the process of determining how to systematically reduce or eliminate the loss of life and property damage resulting from natural hazards such as floods, earthquakes, and hurricanes. Hazard mitigation means to permanently reduce or alleviate the losses of life, injuries, and property resulting from natural hazards through long-term strategies. These long-term strategies include planning, policy changes, education programs, infrastructure projects, and other activities. Hazard mitigation planning follows a multi-step process that engages a range of stakeholders and considers past impacts to:

1. Define local natural hazards,
2. Assess vulnerabilities and risks to community infrastructure, property, and populations,
3. Review current mitigation measures and existing capabilities, and
4. Develop priority actions to mitigate risk.

2.3 Previous Federal/State Disasters

Since 1991, the Town of Acton has experienced 23 natural hazards that triggered federal or state disaster declarations since 1991. These are listed in Table 2-1 below. The majority of these events involved flooding, six were due to hurricanes or nor’easters, and six were due to severe winter weather.

Table 2-1: Previous Federal/State Disaster Declarations

Disaster Name or Hazard Type	Date of Event	Declared Counties
Hurricane Bob	August 1991	Barnstable, Bristol, Dukes, Essex, Hampden, Middlesex, Plymouth, Nantucket, Norfolk, Suffolk
Severe Coastal Storm No-Name Storm	October 1991	Barnstable, Bristol, Dukes, Essex, Middlesex, Plymouth, Nantucket, Norfolk
Blizzard	March 1993	Statewide
Blizzard	January 1996	Statewide
Windstorm	May 1996	Essex, Plymouth, Norfolk, Bristol
Severe Storms, Flood	October 1996	Essex, Middlesex, Norfolk, Plymouth, Suffolk
Heavy Rain, Flood	June 1998	Bristol, Essex, Middlesex, Norfolk, Suffolk, Plymouth, Worcester
Severe Storms, Flood	March 2001	Bristol, Essex, Middlesex, Norfolk, Suffolk, Plymouth, Worcester
Snowstorm	March 2001	Berkshire, Essex, Franklin, Hampshire, Middlesex, Norfolk, Worcester
Snowstorm	February 2003	Statewide
Snowstorm	December 2003	Barnstable, Berkshire, Bristol, Essex, Franklin, Hampden, Hampshire, Middlesex, Norfolk, Plymouth, Suffolk, Worcester
Flood	April 2004	Essex, Middlesex, Norfolk, Suffolk, Worcester
Blizzard	January 2005	Statewide
Hurricane Katrina	August 2005	Statewide
Severe Storms, Flood	October 2005	Statewide
Severe Storms, Flood	May 2006	Statewide
April Nor'easter	April 2007	Statewide
Severe Storms, Flood	December 2008	Berkshire, Bristol, Essex, Franklin, Hampden, Hampshire, Middlesex, Suffolk, and Worcester
Severe Storms, Flood	December 2008	Statewide
Severe Storms, Flood	March-April 2010	Bristol, Essex, Middlesex, Suffolk, Norfolk, Plymouth, Worcester
Severe Winter Storm, Snowstorm	January 2011	Berkshire, Essex, Hampden, Hampshire, Middlesex, Norfolk, Suffolk
Severe Winter Storm, Snowstorm, Flood	February 2013	Statewide
Severe Winter Storm, Snowstorm, Flood	April 2013	Statewide
Severe Winter Storm, Snowstorm, Flood	April 2015	Barnstable, Bristol, Dukes, Essex, Middlesex, Nantucket, Norfolk, Plymouth, Suffolk, Worcester
Severe Winter Storm, Snowstorm	March 2018	Essex, Middlesex, Norfolk, Suffolk, Worcester
Hurricane Lee	September 2023	Statewide

Source: 2023 ResilientMA SHMCAP and the FEMA database

2.4 FEMA-Funded Mitigation Projects

The Town of Acton has received funding from FEMA for four mitigation projects under the Hazard Mitigation Grant Program (HMGP) and the Pre-Disaster Mitigation Program (PDM).

These projects totaled nearly $100,000 with over $70,000 covered by FEMA grants and over $23,000 by local funding. The projects are summarized in Table 2-2 below.

Table 2-2: FEMA-Funded Mitigation Projects

Grant	Project Title	Scope of Work	Total Cost	Federal Funding	Local Funding
HMGP 975-08	Ice House Pond	Install siltation control devices	$56,580	$42,435	$14,145
HMGP 914-10	Emergency Generators	Installation of two portable generators	$7,833	$5,875	$1,958
PDM 2005-13	Hazard Mitigation Planning	Development of first hazard mitigation plan	$12,000	$9,000	$3,000
PDM 19-09	Hazard Mitigation Planning	Update of first hazard mitigation plan	$18,000	$13,500	$4,500

Source: FEMA

2.5 Community Profile

Acton is located in Middlesex County and is bordered by Maynard, Stow, Boxborough, Littleton, Westford, Carlisle, Concord and Sudbury. Major roadways in Acton include Routes 2, 2A, 27, 111 and 119. A small segment of Route 62 runs through the southern tip of the town. Acton is served by the Fitchburg line of the MBTA Commuter Rail, with a station located in South Acton.

The Town is governed by a five-member Select Board and a Town Manager. The Town operates under the open town meeting format. The Town Manager, appointed by the Select Board, carries out the day-to-day governing functions of the Town.

The Acton Planning Department and the Acton Conservation Commission are the primary entities responsible for regulating development in town. Representatives of the Planning Department and the Conservation Commission participated in the HMP process as members of the Local Hazard Mitigation Planning Team.

The Town retains a connection to its historic settlement patterns with three village centers and aspects of rural landscapes with historic farms. The three villages are West Acton, South Acton and Acton Center. Like most communities in the larger region, Acton is faced with balancing pressures of growth and the desire to maintain its historic character. As described in the Open Space and Recreation Plan and Acton 2020 Plan, Acton has transitioned from a rural community to a bedroom suburb. Significant population growth and increase in housing stocks from 1960-1979 led to changes in the rural landscape, shifting towards a suburban community The Town's fabric and various neighborhoods are defined by a mix of retail and residential areas. The *2024-2031 Open Space and Recreation Plan* (OSRP) and the 2012 *Acton 2020 Comprehensive Community Plan* (Acton 2020) both include goals aimed at preserving the rural character of the Town, capturing community interest in and value of the rural history in Acton.

Commercial development is concentrated at the Nagog Office Park in North Acton. A significant employer, Insulet, opened its Global Headquarters and manufacturing facility in the Nagog Office Park in 2019.

According to the 2020 United States Census, an estimated 24,021 people live in Acton and there are 9,218 housing units. The median household income is $150,482. Table 2-3 provides statistics on potentially vulnerable populations in Acton based on the 2020 Census, the 2022 US Census Bureau American Community Survey (ACS) 5-year Estimates, and the Guides for Equitable and Actionable Resilience (GEAR) tool published by the Massachusetts Executive Office of Energy and Environmental Affairs (EEA).

Table 2-3: Acton Characteristics

Population = 24,021

- 4.5% are under age 5[1]
- 24.3% are under age 18[1]
- 16.1% are over age 65[2]
- Percent of the population living with a disability range from 6.8% to 10% across the census tracts[3]
- Percent of the households without vehicle access ranges from 2.1% to 9.8% across the census tracts[3]

Income and Poverty

- $150,482 median household income[2]
- 2.6% of the population lives in poverty[2]

Number of Housing Units = 9,218 (2020 Census)

- 38.2% are renter-occupied housing units[1]
- Predominant decade that housing units were built varied by census blocks, including two blocks in 1960-1969, two in 1970-1979, one in 1950-1959, and another in 2000-2009[3]

Source:

[1] 2020 US Census Bureau

[2] 2022 ACS 5-Year Estimates

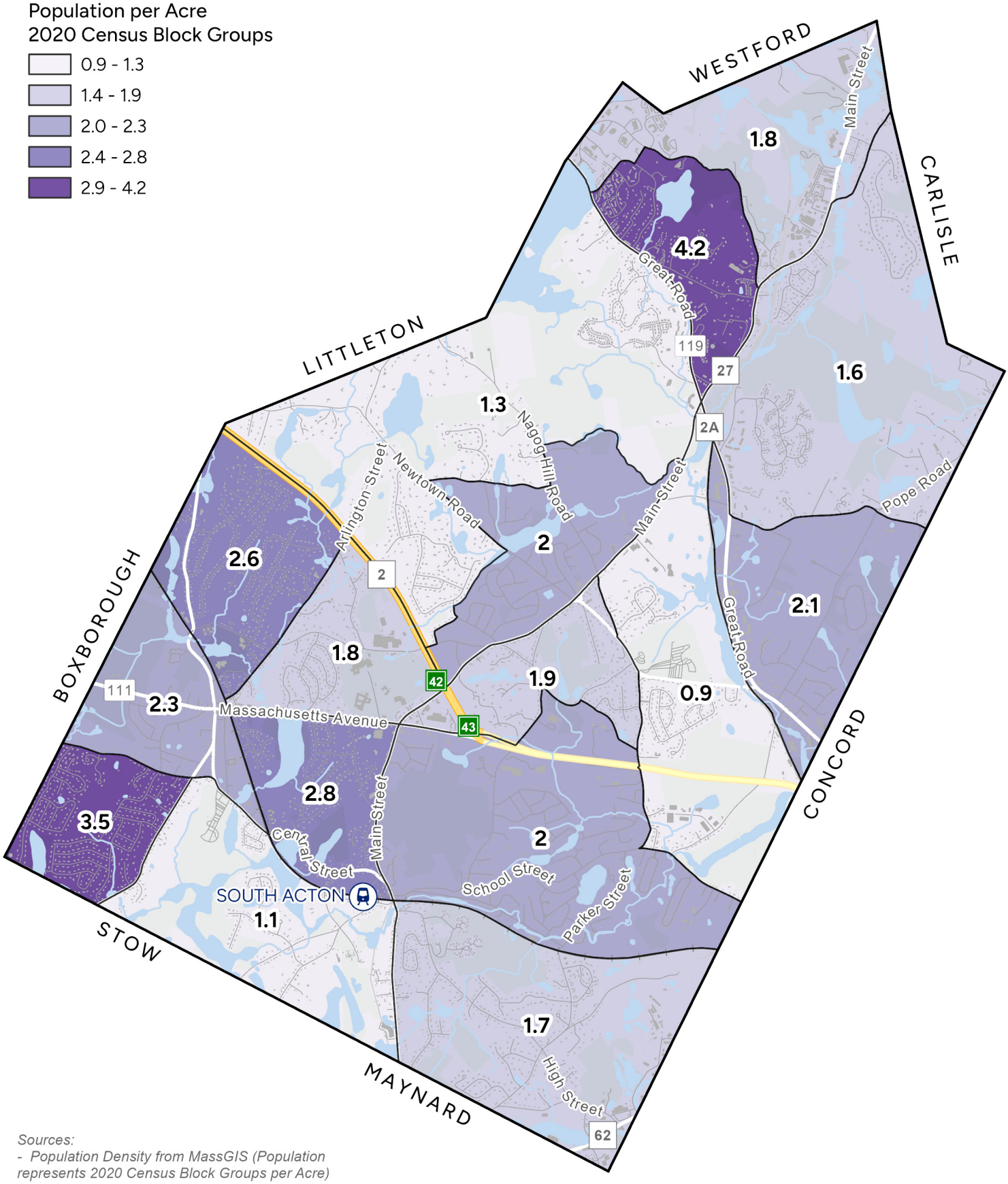
[3] EEA GEAR Tool

Important characteristics to keep in mind include:

- Acton serves as a small regional hub that draws people from nearby communities due to the retail services and restaurants and the presence of two important pieces of infrastructure for commuters – Route 2 and the MBTA commuter rail.
- Acton's small-town character and historic agricultural lands are still present, with a significant amount of open space preserved or in the process of acquisition.
- Acton is continuously growing and continues to face development, both residential and commercial.
- Acton relies solely on subsurface wells for drinking water and has a very active water district.

POPULATION DENSITY

SLR



Sources:
- Population Density from MassGIS (Population represents 2020 Census Block Groups per Acre)

ACTON HAZARD MITIGATION PLAN

TOWN OF ACTON, MASSACHUSETTS

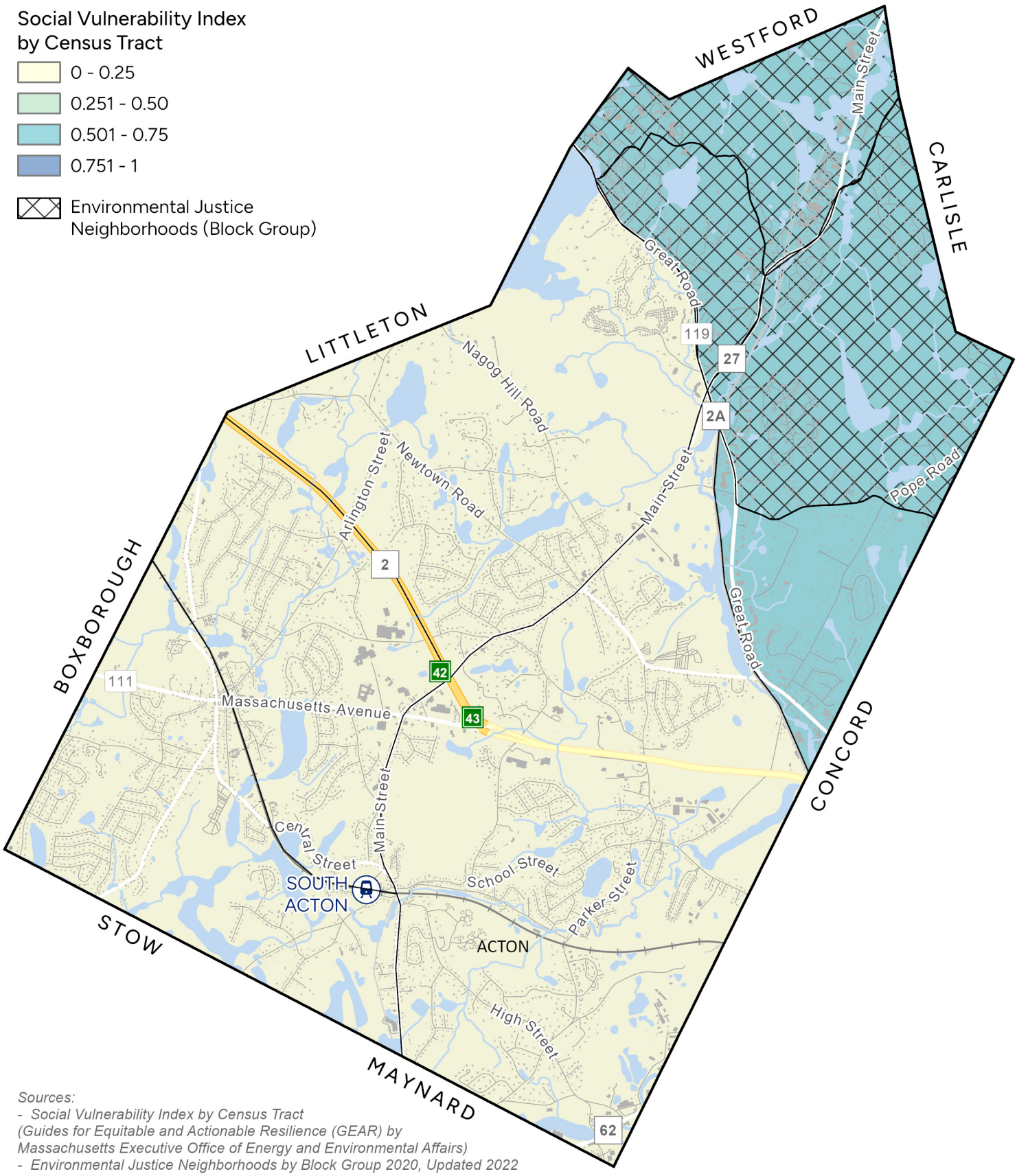
0 2,000 4,000 Feet

N

Date Saved: 7/26/2024

SOCIAL VULNERABILITY INDEX

SLR



Sources:
- *Social Vulnerability Index by Census Tract (Guides for Equitable and Actionable Resilience (GEAR) by Massachusetts Executive Office of Energy and Environmental Affairs)*
- *Environmental Justice Neighborhoods by Block Group 2020, Updated 2022 (Office of Environmental Justice & Equity (OEJE))*

ACTON HAZARD MITIGATION PLAN

TOWN OF ACTON, MASSACHUSETTS

0 2,000 4,000 Feet

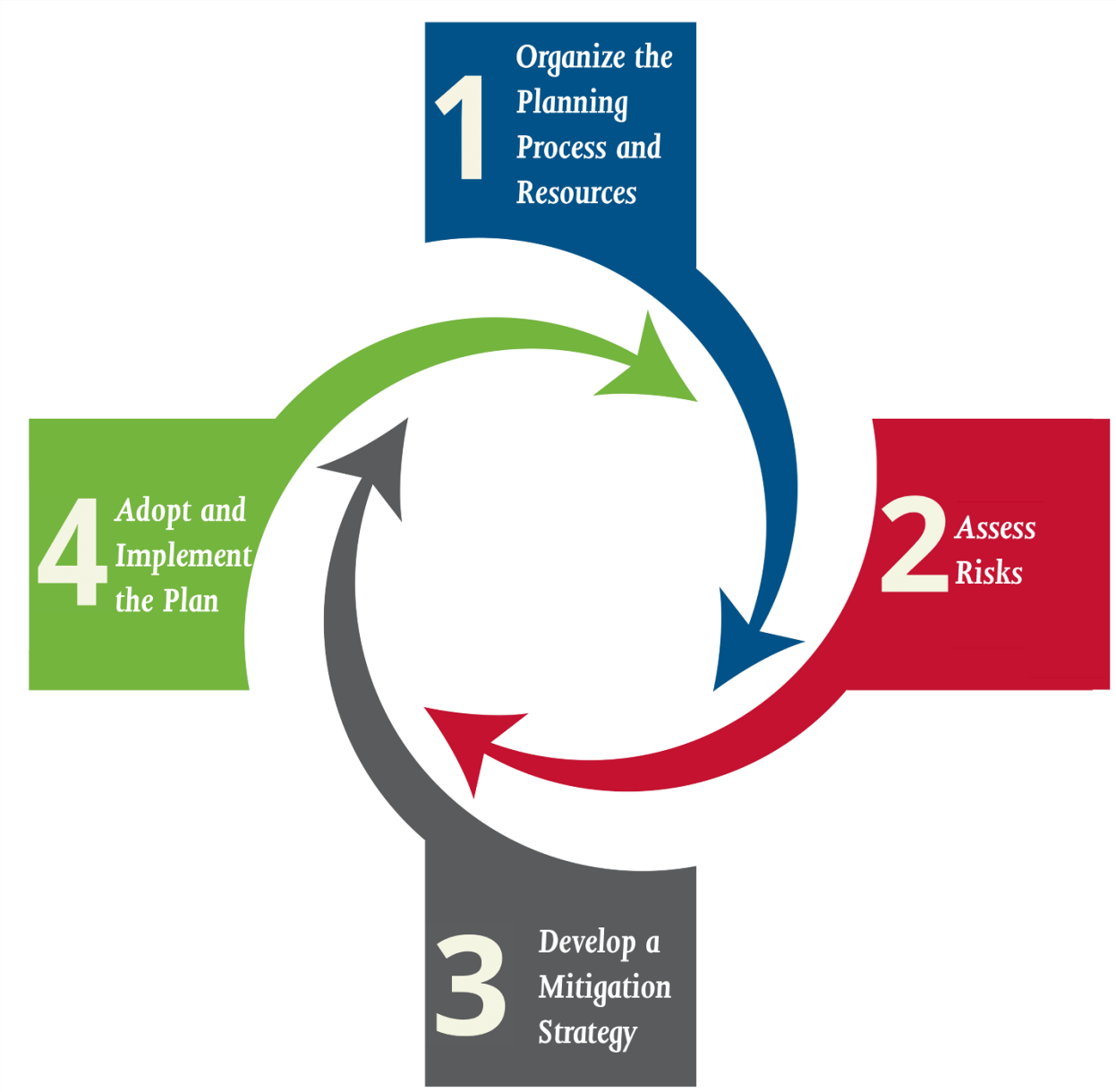
N

Date Saved: 8/1/2024

3.0 Planning Process and Public Participation

The process for updating the Acton HMP reflects the four-step planning process presented in FEMA Local Mitigation Planning Handbook, effective May 2023, as illustrated below.

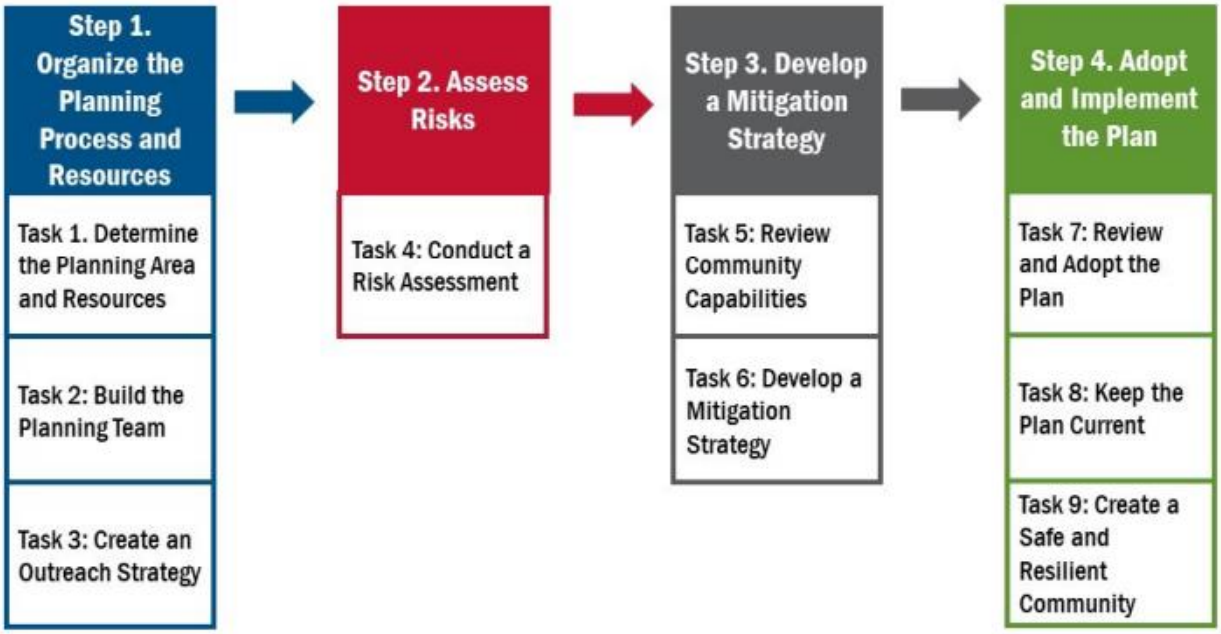
Figure 3-1: FEMA Four-Step Planning Process (FEMA)



3.1 Planning Process Summary

The four HMP planning steps and their constituent tasks are described in more detail below:

Figure 3-2: Nine Tasks within the Four-Step Framework (FEMA)



- **Organize the Planning Process and Resources:** creating a project team, developing a vision of the planning process and outcomes, creating an outreach strategy.
    - Acton staff worked with SLR International (SLR) to determine an overall approach to the HMP update. The overarching goal of the process was to update the plan to secure FEMA approval; however, engagement with a diverse array of municipal staff, stakeholders, and members of the public was also a priority. The Town also identified as a priority the incorporation of recent and ongoing climate change vulnerability and resilience planning efforts, such as the Massachusetts Municipal Vulnerability Preparedness (MVP) 2.0 process underway at the same time as the HMP update process.
- **Assess Risks:** evaluating the potential for damage or loss when natural hazards interact with people and assets.
    - Acton relied on data from federal, state, and local sources to map areas with the potential to experience natural hazards. Knowledge drawn from municipal staff and the public were also particularly important sources of information. These maps are presented throughout the plan within appropriate hazard sections.
    - Acton mapped critical facilities, infrastructure, vulnerable populations, and other features and compared those to the mapped hazard data to identify vulnerabilities. Land use data and development trends are also incorporated into the risk analysis. In addition, Acton developed estimates of the potential annualized economic impacts of every hazard event on the community.

- Many local, regional, state, and federal resources were reviewed to complete the plan. These include, but are not limited to:
  - General Bylaws of the Town of Acton
  - Town of Acton, Zoning Bylaw
  - Town of Acton Open Space and Recreation Plan 2014-2021
  - Town of Acton Draft Open Space and Recreation Plan 2024-2031
  - Town of Acton Community Resilience Building Workshop Summary of Findings, June 2018
  - ActOn Climate: The Road to a Resilient Net Zero Future, July 2022
  - 2022 Massachusetts Climate Change Assessment
  - Acton 2020 Comprehensive Community Plan
  - Massachusetts State Hazard Mitigation and Climate Adaptation Plan, September 2018
  - ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan
  - ResilientMass Maps and Data Center
  - FEMA, Local Mitigation Planning Handbook, May 2023
  - MassGIS (Bureau of Geographic Information)
  - FEMA, Flood Insurance Rate Maps for Middlesex County, MA, 2014
  - FEMA Flood Insurance Study, Middlesex County, MA (All Jurisdictions), July 6, 2016
  - New England Seismic Network, Boston College Weston Observatory, http://aki.bc.edu/index.htm
  - USGS, Earthquake Catalog, https://earthquake.usgs.gov/earthquakes/search/
  - NOAA National Centers for Environmental Information (NCEI), https://www.ncei.noaa.gov/
  - Northeast States Emergency Consortium, http://www.nesec.org/
  - Guides for Equitable and Actionable Resilience (GEAR), Resilient Mass
  - US Census, 2020 and American Community Survey 2022 5-Year Estimates
- **Develop a Mitigation Strategy:** review existing community capabilities and develop a mitigation strategy consisting of a suite of mitigation actions.
  - Acton has an active history in hazard mitigation, and these current mitigation measures were documented.
  - Acton identified new mitigation measures based on the risk assessments, existing mitigation efforts, and public and stakeholder engagement.
- **Adopt and Implement the Plan:** facilitate public review, provide to MEMA and FEMA to review and approve, and locally adopt the final HMP.

- A draft of the completed plan was provided for public review on _____. Feedback was then incorporated to produce a Final Draft.
- The Final Draft of the plan was sent to MEMA for state level review on _____.
- Following MEMA approval, the Final Draft was sent to FEMA for approval on _____.
- FEMA issued an Approval Pending Adoption on _____
- Acton Town Council formally adopted the plan on _____.
- Implementation is the final and most important part of any planning process. Hazard Mitigation Plans must also be updated on a five-year basis making preparation for the next plan update an important on-going activity.

This process attempts to focus on local problem areas and identify needed mitigation measures based on gaps in the existing mitigation efforts of the municipality. In plan updates, the process allows staff to bring the most recent hazard information into the plan, including new hazard occurrence data, changes to a municipality's existing mitigation measures, and progress made on actions identified in previous plans.

3.2 The Local Hazard Mitigation Plan Team

Acton organized a Local Hazard Mitigation Planning Team (LHMPT) for Acton. SLR briefed the local representatives as to the desired composition and responsibilities of that team, as well as the need for public participation in the local planning process.

The Local Hazard Mitigation Planning Team is central to the planning process as it is the primary body tasked with developing a mitigation strategy for the community. The local team was tasked with working with SLR to update plan goals, provide information on the hazards that impact the town, existing mitigation measures, and helping to develop new mitigation measures for this plan update. The team was responsible for understanding what hazard mitigation means for the Town of Acton. Local Hazard Mitigation Planning Team members are listed below.

Name	Representing	Name	Representing
Corey York	Public Works	Lauren West	Sustainability Office
Andrea Becerra	Sustainability Office	Kristen Guichard	Planning Director and Zoning Enforcement Officer
Mike Gendron	Conservation Manager	Douglas Sturniolo	Deputy Chief for Police Department
Alex Wahlstrom	Acton Water District	KJ Herther	Economic and Community Development
Matthew Mostoller	Acton Water District	Julie Pierce	Economic and Community Development
Kim Kastens	Green Acton	Anita Arnum	Fire Chief
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Peter Barry	Acton Housing Authority Committee	Laura Ducharme	Community Services Director
Ed Mullen	Building Commissioner	Wanjiku Gachugi	Director of Diversity, Equity, and Inclusion
Kristen Alexander	GIS Officer	Mary Smith	Green Advisory Board

The LHMPT met on February 27, 2024. The purpose of that meeting was to introduce an overview of the Hazard Mitigation planning program, as well as specifically define hazards and mitigation to create a foundation of knowledge and understanding for the planning process. The meeting included additional activities and discussions to verify information related to critical facilities and development listed in the previous document, understand existing or new mitigation practices, share impacts of recent events, and brainstorm the goals and objectives that should guide the planning process and mitigation measures. Additional engagement focused on the status of mitigation measures identified in the 2018 hazard mitigation plan and potential new or revised strategies and actions. Materials from this LHMPT meeting are included in Appendix A.

The LHMPT continued to participate in HMP development by being provided with interim draft materials, and conducting a review of the full draft HMP document. Feedback from the LHMPT was incorporated into the final draft plan made available for public comment.

3.3 Public Outreach

Public participation in the hazard mitigation planning process is important, both for plan development and for later implementation of the plan. Residents, business owners, and other community members are an excellent source for information on the historic and potential impacts of natural hazard events and particular vulnerabilities the community may face from these hazards. Their participation in this planning process also builds understanding of the concept of hazard mitigation, potentially creating support for mitigation actions taken in the future to implement the plan.

To gather this information and educate residents on hazard mitigation, the Town pursued multiple engagement strategies throughout the planning process.

Hazard Mitigation Plan Open House

An Open House was held on May 15, 2024 to solicit input into impacts of recent hazard events, hazard mitigation goals, and preferred actions to address priority hazards. Nine (9) attendees signed in, and several additional attendees did not sign in. Participants ranged from residents who have lived in Acton for two years to those who have been a part of the Acton community for more than 25, 30, and 40 years.

Natural hazard challenges identified by participants included:

Storm debris and flood waters disrupting transportation

Flood damage to property and infrastructure

Loss of utility services, especially electricity, during severe storms

Attendees reviewed updated hazard mitigation goals, developed through LHMPT engagement, and provided feedback on both the goals themselves and potential actions aligned with each goal. Attendees proposed hazard mitigation measures targeting flood management and increased reliability of the power grid, in line with the observed impacts noted above.

Some of the comments received at the event are summarized below:

- Acton should help people help themselves to become self-reliant and resilient (for example, by providing First Aid training to residents; or encouraging residents to maintain an emergency store of supplies like food, water, and medication in case of an emergency).
- Electrical power loss creates safety concerns, in particular with regards to communication. It can also impact the ability to charge electric vehicles, impacting transportation.
- The Town needs to address the issue of Sodium in drinking water as a result of increased use of salt-based de-icers.
- Residents are concerned about flooding affecting roads and buildings.
- There is a need for emergency communications to be available in multiple languages.
- Acton should work to create effective incentives for Eversource to improve the reliability of electricity supply.
- The Acton Water District, the Town, and other agencies should work together to plan for an event that may disrupt the Town's water supply.
- Residents of upper floor apartments will have to endure many more 90°F days each summer, due to climate change.
- The Town must plan for an event that would displace a large percent of residents and require them to be sheltered.
- Dam removals can provide improved climate resilience, water quality, and recreational opportunities, and should be pursued.
- Acton regulations can be updated to require sufficient cooling capacity in new construction.
- Heat pumps may provide more reliable and efficient heating and cooling, and help mitigate climate change. Acton should help encourage residents and businesses to install heat pumps, potentially by working to reduce electricity costs.
- Acton must establish a clear Emergency Response Plan and create redundancies for all systems, operations, and procedures so that community is prepared during events

Acton Climate Resilience Festival

Acton held a Climate Resilience Festival on June 8, 2024. Acton prepared a booth at the festival dedicated to engaging event attendees on the HMP. At the booth, Town and SLR staff provided information about the HMP process, shared goals and actions identified so far, and solicited input on hazard mitigation priorities and strategies, which included taking note of local experiences concerning natural hazards. Advertisements promoting the Climate Resilience Festival and pictures of the HMP booth at the event are included in Appendix B.

The Climate Resilience Fair was well attended (over 200 residents) and there were many visitors to the HMP booth. There were several interactive activities at the booth to encourage feedback on the HMP process. This included a map of Acton where attendees could mark the location of their house, their favorite places in Acton, or where they have observed hazard

impacts in the past and are concerned about risks in the future with a blue, green, or red marker respectively.

A poster with all twelve (12) goals developed by the Local Hazard Mitigation Plan Team and an example action for each goal. Attendees were asked to provide thoughts on the goals and actions identified so far, as well as any other concerns related to natural hazards and mitigation efforts in Acton, either by writing feedback on an index card to be collected for review or to discuss with staff at the booth who recorded comments.

The main concern expressed by attendees was minor street flooding issues. Several people mentioned natural gas leaks, which does not apply to the scope of the HMP. In general, it appeared that hazard mitigation planning was not a worry or focus for event attendees. People did not seem overly concerned, which could suggest that the community feels safe, more public education around natural hazards and climate change could be beneficial, or that these attendees have not had personal experiences with natural disasters.

3.4 Local Stakeholder Involvement

The LHMPT was encouraged to reach out to local stakeholders that might have an interest in the HMP including neighboring communities, agencies, businesses, nonprofits, and other interested parties. Notice was sent by Acton staff to the following neighboring municipalities inviting them to review the HMP and submit comments to the Town:

- Town of Westford
- Town of Littleton
- Town of Boxborough
- Town of Carlisle
- Town of Concord
- Town of Sudbury
- Town of Maynard
- Town of Stow

See Appendix B for copies of communication send to neighboring communities. The Towns of Concord and Maynard provided minor input, and the Town of Westford indicated that they had no input.

Additionally, a draft HMP was sent to the Acton MVP Core Team and to additional stakeholders for review. These included:

-

3.5 Draft Document Review

A draft of the completed plan was shared with the public on _____. Note any public comments.

The draft plan update was presented at a Select Board meeting on _____ at Acton Town Hall. Note any public comments.

Public meeting materials, notes, and attendance lists are included in Appendix B.

The draft Acton Hazard Mitigation Plan 2024 Update was posted on the Town's website for the second public meeting. Members of the public could access the draft document and submit comments or questions to the Town. A webinar was also hosted by the Town to provide an additional opportunity for the public to ask questions and provide input. Note any public comments.

4.0 Risk Assessment

The risk assessment analyzes the potential natural hazards that could occur within the Town of Acton as well as the relationship between those hazards and current land uses, potential future development, and critical infrastructure. This section also includes a vulnerability assessment that estimates the potential damages that could result from certain large scale natural hazard events.

The section begins with an overview of the current climate and project climate change impacts in the Town, followed by profiles for each of the identified hazards. Hazard profiles include the following sections and information: hazard overview, location, past events, extent, potential impacts, and probability of future events based on climate change projections

- **Hazard Overview:** description of the hazard, its characteristics, and potential effects.
- **Location:** description of geographic areas within the Town that are affected by the hazard; some hazards, like earthquakes and winter storms, will impact the entire community while other hazards, like floods or landslides, may impact specific locations across the community.
- **Extent:** potential strength or magnitude of a hazard; where possible, extent is described using established scales and narratives about warning times are incorporated.
- **Past Events:** information on the history of previous hazard events in the region, including impacts on people and property where available.
- **Potential Impacts:** describes the potential impact on the community, including loss estimates and other disruptions to the built environment, natural environment, and population.
- **Probability of Future Events and Climate Change Impacts:** describes the probability of future events for the defined hazard, based on climate change projections and best available climate-science.

4.1 Climate and Climate Change

4.1.1 Climate

In Acton, temperatures tend to vary between 18°F in the cold parts of the winter to 83°F at the peak of summer. Temperatures rarely drop below 2°F or rise above 91°F.

The warm season runs over three months, from June 1 to September 14, with an average daily high temperature above 74°F. The hottest month of the year is July with an average high of 83°F and low of 62°F. The cold season lasts over three months from December 1 to March 12, with an average daily high temperature below 44°F. The coldest month of the year is January with an average low of 19°F and high of 35°F. The 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan (SHMCAP) reported the annual average temperature in Middlesex County, from 1901-2000, to be 50.4°F.

Precipitation in Acton varies moderately over the course of the year. The wetter season lasts from March 19 to August 16, with a greater than 28% chance of a given day being a wet day. The month with the most wet days in Acton is June. The drier season lasts from August 16 to March 19. The month with the fewest wet days in Acton is January. Rain falls throughout the year in Acton. The month with the most rain in Acton is October, with an average rainfall of 3.9

inches. The month with the most snow in Acton is January, with an average snowfall of 12.2 inches. According to the 2023 Massachusetts SHMCAP, Middlesex County receives an average annual precipitation of 38.12 inches.

Acton experiences significant seasonal variation in the perceived humidity. The muggier period of the year lasts from June 8 to September 19, during which time the comfort level is muggy, oppressive, or miserable at least 10% of the time. The month with the muggiest days in Acton is July, with 10.6 days that are muggy or worse.

The windier part of the year lasts from November 4 to April 23, with average wind speeds of more than 5.6 miles per hour. The windiest month of the year in Acton is February, with an average hourly wind speed of 7.2 miles per hour.

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

4.1.2 Climate Change

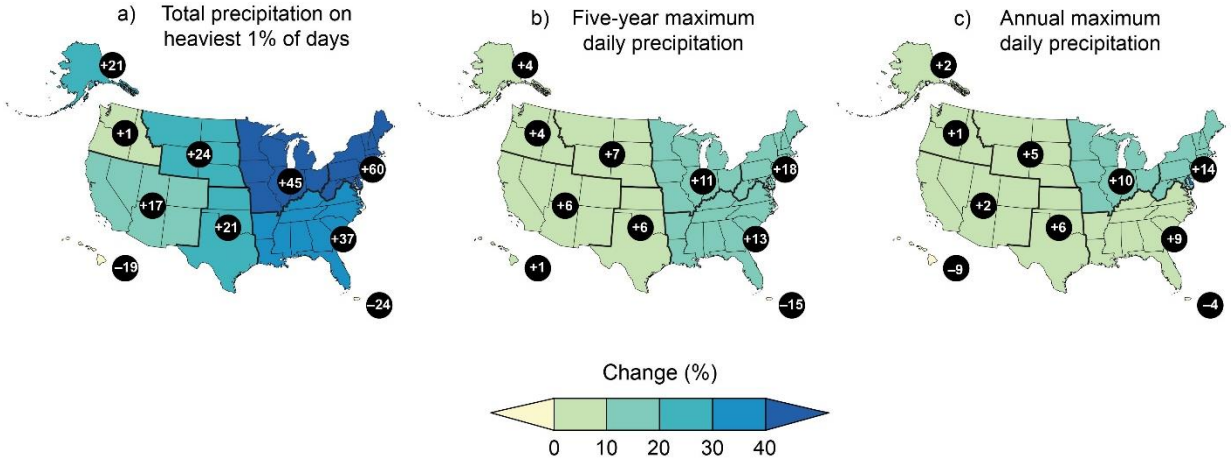
Many of the natural hazards that Acton has historically experienced are likely to be exacerbated by climate change in future years. This is particularly true for extreme heat conditions and flooding caused by extreme precipitation. The following section overviews climate change information and projections for temperature and precipitation.

4.1.2.1 Extreme Precipitation

Observed Climate Change

According to the Fifth National Climate Assessment, heavy precipitation across the contiguous United States has been increasing since the 1950s. The largest increase in the number of extreme precipitation days, defined as the top 1% of heaviest precipitation events, has been observed in the Northeast; specifically, the 2023 Massachusetts SHMCAP reported that precipitation volume from the heaviest storms in the Northeast has increased by 55% since 1958. Changes in precipitation patterns have exacerbated flooding. The Fifth National Climate Assessment references studies that have identified human-caused warming as a significant contributor to the increase in frequency and severity of the heaviest precipitation events across nearly 70% of the United States. Figure 4-1 displays the observed changes in frequency and severity of heavy precipitation events. In particular, the eastern portion of the country has experienced more intense and frequent precipitation events.

Figure 4-1: Observed Changes in the Frequency and Severity of Heavy Precipitation Events



(a) Total precipitation falling on the heaviest 1% of days, (b) Daily maximum precipitation in a 5-year period, and (c) The annual heaviest daily precipitation amount over 1958-2021.

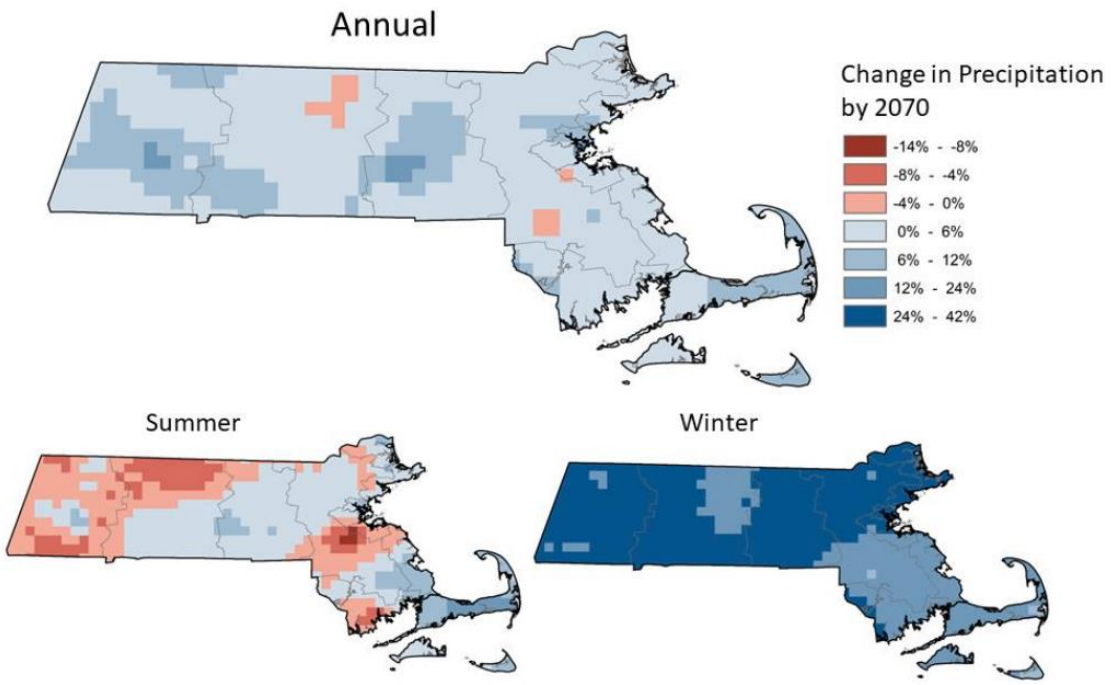
Source: 2023 Ch. 2 Climate Trends. In: *Fifth National Climate Assessment.* U.S. Global Change Research Program, Washington, DC, USA. https://doi.org/10.7930/NCA5.2023.CH2

Climate Change Projections

According to the 2023 SHMCAP, Acton should expect an increase in the intensity of precipitation events, as well as an increase in total annual precipitation.

Figure 4-2 demonstrates the change in annual and seasonal precipitation in 2070 compared to the current climate in Massachusetts. Acton is projected to experience a minimal increase in precipitation during the summer season, and a significant increase in precipitation during winter. Importantly, the proportion of winter precipitation taking the form of rain and ice rather than snow is projected to increase with rising temperatures.

Figure 4-2: Change in Annual, Summer, and Winter Season Precipitation in 2070 Compared to Current Climate (1986-2005 baseline)



Source: 2022 Massachusetts Climate Change Assessment

The following tables present climate projection data for precipitation patterns sourced from the Resilient Mass Climate Data Viewer. The Concord Watershed Climate Hazards and Impacts section outlines anticipated changes and their potential effects on the region. Understanding these projections is vital for Acton's preparedness and response strategies, enabling effective mitigation of climate-related risks, enhancing community resilience, and aiding strategic planning practices.

The projections use data provided by Cornell University and are measured against a baseline set from the average of 50 climate models and using climate data from 1950 to 2013.This approach ensures a comprehensive and reliable assessment of future climate hazards.

Table 4-1: Concord Watershed Total Precipitation
(average total precipitation within a calendar year)

Season	Baseline (Inches)	Percent Change			
		2030	2050	2070	2090
ANNUAL	45.1	6.1 (-5.3-17.3)	8.2 (-4.7-21.4)	10.2 (-4.6-23.2)	12.5 (-1.9-28.2)
SPRING	11.5	8.1 (-1.4-16.6)	9.0 (-0.4-18.6)	13.7 (2.2-23.2)	15.7 (3.3-27.1)
SUMMER	10.4	8.5 (-4.3-22.3)	6.7 (-8.0-23.4)	6.8 (-11.2-21.4)	8.3 (-7.7-22.9)
FALL	11.9	1.0 (-12.1-13.0)	4.5 (-12.0-18.0)	4.2 (-12.9-18.3)	5.1 (-9.2-22.4)
WINTER	11.3	7.2 (-3.1-17.8)	12.7 (1.6-26.0)	16.0 (3.4-30.1)	20.9 (5.9-40.2)

Table 4-2: Concord Watershed Consecutive Dry Days
(average number of days that exist within a model run of 2 or more dry days)

Season	Baseline (Number of Days)	Change in Number of Days			
		2030	2050	2070	2090
ANNUAL	32	0 (0-0)	0 (0-1)	1 (0-2)	1 (1-2)
SPRING	8	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-1)
SUMMER	8	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-1)
FALL	8	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)
WINTER	8	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-1)

Table 4-3: Concord Watershed Consecutive Wet Days
(average number of days that exist within a run of 2 or more wet days)

Season	Baseline (Number of Days)	Change in Number of Days			
		2030	2050	2070	2090
ANNUAL	44	0 (0-0)	0 (0-1)	1 (0-1)	1 (0-1)
SPRING	11	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-1)
SUMMER	11	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)
FALL	11	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-NaN)
WINTER	11	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)

Table 4-4: Concord Watershed Precipitation Depth – 90th Percentile Storm
(90th percentile of non-zero precipitation)

Season	Baseline (Inches)	Percent Change			
		2030	2050	2070	2090
ANNUAL	0.4	0.5 (0.4-0.7)	0.7 (0.5-0.4)	0.4 (0.7--0.3)	0 (0.6--1.2)
SPRING	0.4	0.3 (0.3-0.3)	0.3 (0.3-0.3)	0.3 (0.4--0.1)	0.2 (0.3--0.6)
SUMMER	0.3	-0.4 (-0.5--0.8)	-1.4 (-0.8--1.9)	-1.9 (-1.2--4.0)	-3.4 (-1.6--5.5)
FALL	0.4	0.8 (0.7-1.0)	1.0 (0.9-1.3)	1.2 (1.1-0.9)	1.0 (1.2-0.5)
WINTER	0.4	1.0 (0.8-1.6)	1.7 (1.5-1.7)	1.8 (1.7-1.5)	1.7 (1.7-1.0)

Table 4-5: Concord Watershed Days Above 1 inch
(the number of days with precipitation greater than 1 inch)

Season	Baseline (Number of Days)	Change in Number of Days			
		2030	2050	2070	2090
ANNUAL	5	1 (0-1)	1 (1-2)	2 (1-3)	2 (2-3)
SPRING	1	0 (0-0)	0 (0-0)	0 (0-1)	1 (0-1)
SUMMER	1	0 (0-0)	0 (0-0)	0 (0-1)	1 (0-1)
FALL	2	0 (0-0)	0 (0-0)	1 (0-1)	1 (1-1)

Season	Baseline (Number of Days)	Change in Number of Days			
		2030	2050	2070	2090
WINTER	1	0 (0-0)	0 (0-1)	1 (0-1)	1 (0-1)

4.1.2.2 Extreme Heat

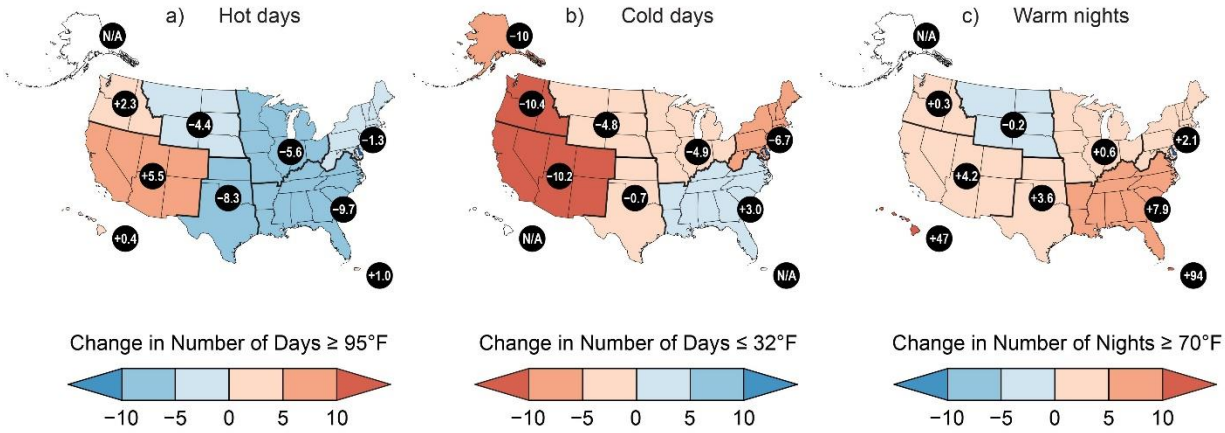
Observed Climate Change

Climate change is already contributing to extreme heatwave conditions and an increase in average temperatures in the Commonwealth and across the globe. The Fifth National Climate Assessment reported global trends of more frequent heatwaves. According to the 2023 SHMCAP, 2022 was the hottest and driest summer on record in Massachusetts, and over the last century, annual air temperatures have increased at an average rate of 0.5°F per decade.

While the number of very hot days has decreased in the central and eastern regions of the United States, as reported by the Fifth National Climate Assessment, the impact of extreme heat is more severe if the conditions persist for several days. In recent decades, multiday heatwaves, which are a greater concern, have become hotter, longer, and more frequent; in fact, the Fifth National Climate Assessment reports that the length of heatwave season has increased from 40 days to about 70 days since the 1980s.

Figure 4-3 captures the observed changes in extreme temperatures across the United States, demonstrating an overall decrease in cold days and increase in hot nights in nearly all regions. The changes in nighttime temperature are significant from an ecological and public health perspective. Lower nighttime temperatures allow crops, built infrastructure, and people, as well as wildlife, to cool down.

Figure 4-3: Observed Changes in Hot and Cold Extremes



(a) Hot day (days at or above 95°F), (b) Cold days (days at or below 32°F), and (c) Warm nights (night at or above 70°F) over the period 2002-2021 relative to 1902-1960 (1951-1980 for Alaska and Hawai'i and 1956-1980 for Puerto Rico)

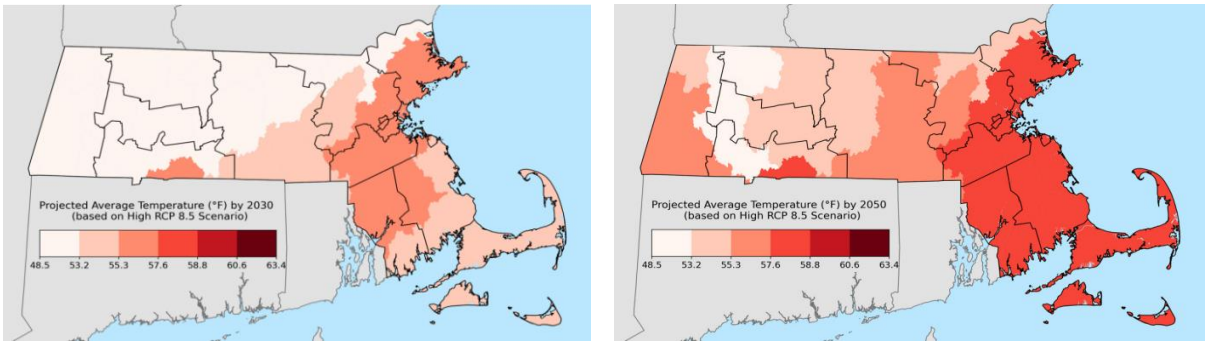
Source: 2023 Ch. 2 Climate Trends. In: Fifth National Climate Assessment. U.S. Global Change Research Program, Washington, DC, USA. https://doi.org/10.7930/NCA5.2023.CH2 Climate Change Projections

Extreme temperature trends can have significant impacts on public health, particularly for those individuals with asthma and other respiratory system conditions, which typically affect the young and the old more severely.

Climate Change Projections

Between 1971 and 2000, the Commonwealth experienced four days with temperatures over 90°F, as reported by the 2023 SHMCAP, and by 2050, this is expected to increase to between 10 and 28 days. Under the High representative concentration pathway (RCP) of 8.5, the Commonwealth is projected to observe rising average temperatures, as captured in Figure 4-4: Projected annual temperature: 2030 and 2050.

Figure 4-4: Projected annual temperature: 2030 and 2050



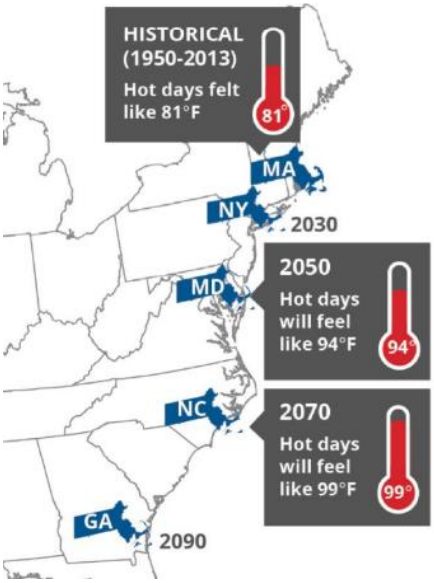
Source: ResilientMass Plan: 2023 Massachusetts State Hazard Mitigation and Climate Adaptation Plan

Average temperatures during the winter are expected to increase more than average summer temperatures, which may result in decrease snow and ice, shifts in ecosystem patterns, increased invasive species, and issues related to hazard frequency and intensity.

The 2023 SHMCAP reported that Massachusetts has experienced a recorded 3.5°F increase in average temperatures since 1900. According to the 2022 Massachusetts Climate Change Assessment, summer temperatures are expected to change over the next century. Summers are projected to be warmer, reflected in Figure 4-5. By 2090, the average summertime temperature will may feel like summer in Georgia under the current climate. The assessment also emphasizes that humidity will change, which may cause temperatures to feel hotter.

The following tables present climate projection data sourced from the Resilient Mass Climate Data Viewer. The Concord Watershed Climate Hazards and Impacts section outlines anticipated changes and their potential effects on the region. Understanding these projections is vital for Acton's preparedness and response strategies, enabling effective mitigation of climate-related risks, enhancing community resilience, and aiding strategic planning practices.

Figure 4-5: Change in Average Summertime Temperatures for Massachusetts



Source: 2022 Massachusetts Climate Change Assessment

The projections use data provided by Cornell University and are measured against a baseline set from the average of 50 climate models and using climate data from 1950 to 2013.This methodological approach ensures a comprehensive and reliable assessment of future climate hazards.

Table 4-6: Concord Watershed Average Annual Temperature Projections

Season	Baseline (°F)	Change in Daily Average Temperature (°F)		
		2030	2050	2070
ANNUAL	49.4	3.6 (1.8-5.4)	5.4 (3.6-8.1)	8.1 (5.4-10.8)
SPRING	46.9	2.7 (1.8-5.4)	5.4 (3.6-8.1)	7.2 (4.5-10.8)
SUMMER	69.4	3.6 (2.7-4.5)	6.3 (4.5-8.1)	8.1 (5.4-10.8)
FALL	52.4	3.6 (2.7-5.4)	5.4 (4.5-7.2)	8.1 (6.3-10.8)
WINTER	28.6	3.6 (2.7-5.4)	6.3 (4.5-8.1)	9.0 (6.3-11.7)

Table 4-7: Concord Watershed Annual Days Above 90°F

Season	Baseline (Number of Days)	Number of Days		
		2030	2050	2070
ANNUAL	9	14 (6-25)	25 (14-46)	46 (25-67)
SPRING	1	1 (1-2)	2 (1-4)	3 (1-6)
SUMMER	7	12 (8-16)	26 (16-36)	36 (20-50)
FALL	1	1 (1-3)	3 (2-4)	6 (3-10)
WINTER	0	0 (0-0)	0 (0-0)	0 (0-0)

Table 4-8: Concord Watershed Annual Days Above 95°F

Season	Baseline (Number of Days)	Number of Days		
		2030	2050	2070
ANNUAL	1	5 (2-9)	9 (5-20)	20 (9-35)
SPRING	0	0 (0-1)	1 (0-2)	1 (0-2)
SUMMER	1	4 (3-6)	10 (6-16)	16 (8-29)
FALL	0	0 (0-1)	1 (0-1)	2 (1-4)
WINTER	0	0 (0-0)	0 (0-0)	0 (0-0)

Table 4-9: Concord Watershed Annual Days below 0°F

Season	Baseline (Number of Days)	Number of Days			
		2030	2050	2070	2090
ANNUAL	5	-3 (-1--3)	-3 (-3--4)	-4 (-3--5)	-5 (-4--5)
SPRING	0	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)
SUMMER	0	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)
FALL	0	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)
WINTER	5	-3 (-2--3)	-4 (-3--4)	-4 (-4--5)	-5 (-4--5)

Table 4-10: Concord Watershed Annual Days below 32°F

Season	Baseline (Number of Days)	Number of Days			
		2030	2050	2070	2090
ANNUAL	138	-28 (-14--41)	-41 (-28--59)	-59 (-41--74)	-69 (-53--87)
SPRING	35	-8 (-5--16)	-16 (-11--21)	-19 (-13--25)	-22 (-18--27)
SUMMER	0	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-0)
FALL	23	-9 (-7--12)	-12 (-11--15)	-17 (-14--19)	-19 (-17--20)
WINTER	81	-8 (-7--14)	-16 (-11--22)	-24 (-16--33)	-30 (-19--39)

Table 4-11: Concord Watershed Cooling Degree Days[1]

Season	Baseline (No. of Degree Days)	Number of Degree Days			
		2030	2050	2070	2090
ANNUAL	610	382 (181-602)	602 (382-971)	971 (602-1386)	1243 (843-1843)
SPRING	31	24 (15-59)	59 (34-107)	90 (46-172)	127 (74-225)
SUMMER	499	275 (203-349)	502 (349-660)	660 (425-903)	822 (581-1149)
FALL	78	69 (49-114)	114 (90-168)	198 (139-302)	265 (198-383)
WINTER	2	2 (2-4)	5 (3-6)	7 (5-11)	10 (5-14)

Table 4-12: Concord Watershed Heating Degree Days[2]

Season	Baseline (No. of Degree Days)	Number of Degree Days			
		2030	2050	2070	2090
ANNUAL	6,306	-935 (-478--1372)	-1,372 (-935--1986)	-1,986 (-1372--2557)	-2,371 (-1786--3088)
SPRING	1,699	-225 (-151--438)	-438 (-297--639)	-574 (-369--824)	-703 (-507--937)
SUMMER	97	-56 (-46--65)	-78 (-65--86)	-86 (-72--92)	-91 (-83--95)
FALL	1,223	-260 (-198--378)	-378 (-320--487)	-539 (-434--681)	-636 (-539--764)
WINTER	3,287	-321 (-241--483)	-563 (-402--724)	-804 (-563--1042)	-963 (-643--1201)

4.2 Overview of Hazards and Impacts

The Massachusetts SHMCAP provides an in-depth overview of natural hazards in Massachusetts. Table 4-13 below summarizes the hazard risks for Acton. This evaluation considers the frequency of the hazard, historical records, and variations in land use. This analysis is based on the risk assessment in the 2023 SHMCAP. An overview of definitions and methodology used in the 2023 SHMCAP is provided in this section. The statewide assessment

[1] Cooling degree-days are the difference between the daily temperature mean and 65°F (cooling degree-days assume that when the outside temperature is below 65°F, we don't need cooling (air-conditioning) to be comfortable.

[2] Heating degree days are the difference between the daily temperature mean and 65°F (heating degree-days assume that when the outside temperature is above 65°F, we don't need heating to be comfortable).

was modified to reflect local conditions in Acton using the definitions for hazard frequency and severity listed below. Based on this, the Town set an overall priority for each hazard.

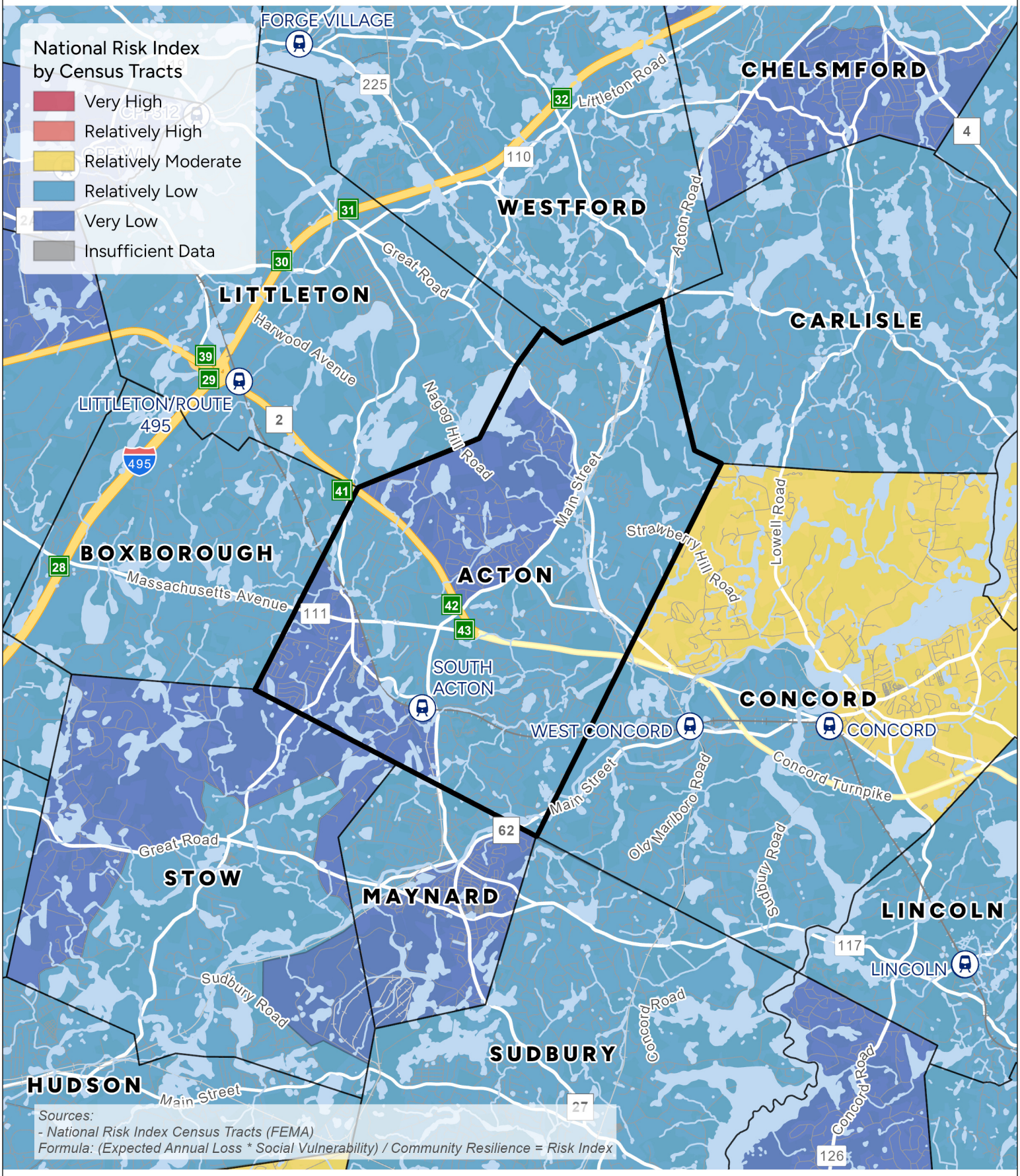
Table 4-13: Hazard Risks Summary

Hazard	Massachusetts Hazard Risk Summary						Acton Hazard Risk Summary
	Geospatial Scale Impacts	Magnitude of Consequences			Likelihood of Hazard	Warning Time	
		Human	Economic	Environment			
Average/Extreme Temperatures	Multi-state	Very High	Medium	Very High	Very High	1-5 days	**Medium**
Drought	Multi-state	High	High	High	Medium	1 week+	**Medium**
Earthquakes	Multi-state	High	Medium	Low	Medium	No warning	**Low**
Flooding from Precipitation	Localized	Very High	High	Medium	Very High	1-5 days	**High**
Dam Overtopping	Localized	High	Medium	Low	Medium	1 week	**Medium**
Hurricanes/Tropical Cyclones	Mult-state	Very High	High	Medium	Medium	1-5 days	**High**
Landslides	Localized	High	Low	Medium	High	No warning	**Low**
Other Severe Weather	Localized	High	Low	Low	Very High	1 day	**High**
Severe Winter Storms	Multi-state	Very High	Low	Low	High	1-5 days	**Medium**
Tornadoes	Multi-state	High	Medium	Medium	High	Hours	**Low**
Wildfires	Regional	High	Medium	Medium	Very High	Hours	**Low**

The map on the following page displays the National Risk Index (NRI) calculated by FEMA for the Town of Acton and surrounding communities for comparison.

NATIONAL RISK INDEX

SLR



Date Saved: 8/1/2024

ACTON HAZARD MITIGATION PLAN

TOWN OF ACTON, MASSACHUSETTS

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Definitions Used in the Commonwealth of Massachusetts State Hazard Mitigation Plan and Climate Adaptation Plan

Geospatial Scale of Hazards

- Multi-state: impacts spanning several states or large regions of states
- State: effects on the entire state without significant overflow to other states
- Regional: an area or division of the state with definable characteristics, such as counties with shared hazard-relevant conditions
- Coastwide: one county or set of counties that experiences pronounced hazard impacted
- Localized: a focused and limited area of impact

Magnitude of Consequences

	Very High	*High*	*Medium*	*Low*	*Very Low*
Human	Loss of human life	Any injuries; disruptions of emergency routes, inability to carry out daily activities	Disruption in ability to work and/or carry out daily life and activities	Limited effects, inconvenience, minor power outages	Minimal injury and/or inconvenience
Economic	National-level disruption to and long-term impacts to the state and possibly at the national economy; severe economic losses across multiple sectors	Significant long-term disruption to the state economy with repercussions across multiple sectors, likely to result in economic decline, with impacts that	Prolonged disruption to economic activity that limits or restricts growth, with risk of mid- or long-term economic decline	Economic consequences to people, state, and business conditions requiring expense and effort to overcome; long-term constraints unlikely	Economic costs and consequences do not affect economic growth; economic costs may be incurred, but they are planned and
		last several years after a disaster			are sustainable expenses
Natural Environment	Irreversible loss of ecosystem and/or key organisms	Extensive damage to ecosystem and/or key organisms; unlikely to recover to pre-disaster state	Damage to ecosystems or organisms, but a likely recovery to a pre-disaster state	Some losses to individual organisms but permanent ecosystem impacts unlikely	Minimal risk of impact to individual organisms or overall ecosystems

Likelihood of Hazards

- Very High: almost certain to occur multiple times in a year
- High: almost certain to occur at least once in a year
- Medium: likely to occur at least once every 50 years (two or more occurrences in the next century)
- Low: likely to occur at least once by the end of the century; some examples of historical occurrences, anticipated every 10 years
- Very Low: very unlikely; minimal examples of historical occurrences

Warning Times

- No Warning: very difficult to predict and anticipate location, severity, and onset; information available does not enable preparation
- Hours: occurs with little warning; a limited number of hours to adjust behavior or prepare
- 1 Day (24 hours): reliable, actionable information on impact available one day (about 24 hours) allowing at least one day to prepare
- 1-5 Days: prediction of impact are accurate within 1-5 days before the hazard occurs
- 1 Week: predictions of impact are accurate enough within one week, enabling several days for preparation
- More than 1 week: reliable, accurate prediction of hazard onset at several weeks (or significantly longer), specific enough to direct action

Source: Massachusetts State Hazard Mitigation Plan, 2023

It should be noted that several of the hazards listed in the 2023 SHMCAP are not applicable to the Town of Acton. Due to its location, coastal hazards including Sea Level Rise, Coastal Flooding, Coastal Erosion, Tsunamis, and Storm Surge are not applicable.

4.3 Flood Related Hazards

Flooding was the most prevalent serious natural hazard identified by local officials in Acton. Flooding is generally caused by hurricanes, nor'easters, severe rainstorms, and thunderstorms. Global climate change has the potential to exacerbate these issues over time with the potential for changing rainfall patterns leading to heavier storms. Based on the 2023 SHMCAP, flooding events in the Commonwealth are of very high likelihood and typically associated with a warning time of 1-5 days.

4.3.1 Hazard Overview

4.3.1.1 Overview of Town-Wide Flooding

As with most of eastern Massachusetts the natural hazard threat that is most prevalent in the town of Acton, and therefore the focus of most of the Town's hazard mitigation efforts, is flooding. Acton is located entirely within the SuAsCo watershed (Sudbury – Assabet – Concord) and all of Acton's water drains to the Assabet River. Major brooks include Fort Pond Brook and Nashoba Brook and there are a number of tributaries. Because of Acton's topography many of the brooks flow very slowly and many historic farming drainage ditches have filled. These and other circumstances can result in flooding. Major water bodies include Nagog Pond (a water supply reservoir for Concord), Grassy Pond and Ice House Pond

Mapping of FEMA-defined flood zones shows that there are extensive areas of 1% annual-chance floodplain throughout the town, but particularly along Fort Pond Brook and Nashoba Brook, along the town's boundary with Boxborough and in the very northern tip of town. This is further described in 4.3.2.1. Flooding in Acton is occasional, usually within or near floodplain areas. Damage may consist of flooding of basements or yards. Today, an increasing amount of impervious surface from new development contributes to flooding issues, but since the 1970's and the issuance of floodplain regulations, no new construction has occurred in flood plains. Flooding issues tend to be related to rising water rather than velocity.

In many areas of town, flooding occurs due to extensive beaver activity. Virtually every brook in town has had some degree of beaver activity in the past few years. Beaver mitigation is an important step in controlling flooding in Acton, and there is a need to strike a balance between allowing beavers to exist and reducing flooding.

Roadways in Acton tend to flood every other year, but this does not lead to many major hazards since usually the roads remain passable. Older pipes in town can pose problems if they are undersized or in poor condition, but the town has an ongoing maintenance program to upgrade drainage infrastructure. Flooding is exacerbated when freezing temperatures are followed by rain, causing catch basin blockage. Since most of the flooding in town tends to occur in the flood plains and not as a result of inadequate drainage infrastructure, structural solutions to flooding have not been the main focus.

With regard to private drainage facilities, one challenge the town faces is with maintenance. It often difficult to enforce maintenance and inspections of private facilities. This issue will become even more important as the town sees more development.

4.3.1.2 Dams and Dam Failure

Dam failure can arise from two types of situations. Dams can fail because of structural problems independent of any storm event. Dam failure can follow an earthquake by causing structural damage. Dams can fail structurally because of flooding arising from a storm or they can overspill due to flooding.

In the event of a dam failure, the energy of the water stored behind even a small dam can cause loss of life and property damage if there are people or buildings downstream. The number of fatalities from a dam failure depends on the amount of warning provided to the population and the number of people in the area in the path of the dam's floodwaters. An issue for dams in Massachusetts is that many were built in the 19th century without the benefits of modern engineering or construction oversight.

Dam failure is a highly infrequent occurrence but a severe incident could result in loss of lives and significant property damage. According to the Association of State Dam Safety Officials, three dams have failed in Massachusetts since 1984, one of which resulted in a death.

According to data provided by the Massachusetts State Dam List, there are nine (9) dams in Acton of various sizes. The Local Hazard Mitigation Plan Team reviewed the dams included in the 2018 HMP and updated their status. In 2023, the Town breached the River Street Dam and is continuing to pursue actions to complete the restoration project at this site.

Robbins Mill Pond Dam

The Robbins Mill Pond Dam impounds the Nashoba Brook at Wheeler Lane in the Nashoba Brook Conservation Area. The town rebuilt this dam in 1990 by replacing an earthen dam with a new dam in 1990. DCR calls this the Bellows Farm Mill dam and classifies it as a low hazard dam. The Town has identified this dam as being seriously degraded, and is actively pursuing dam removal, partial breach, or repair.

Pencil Factory Dam

This dam is located on the Nashoba Brook. This dam is breached, while beaver activity is possible, it is not considered to be at risk for flooding.

Brook Street Dam

This is a small private stone dam located on Nashoba Brook.

Ice House Pond Dam

Also called the Allen Dam, this is a privately-owned stone dam on Nashoba Brook at Ice House Pond. The dam was rebuilt by the town in 1995 and now allows periodic drawdowns. If the dam were to breach, downstream impacts would be of concern. A new culvert has improved the

functioning of the dam. The town draws down water in advance of storms. DCR refers to this as Allen dam and classifies it as a low hazard dam.

Erickson's Grain Mill Dam

This dam, located on Fort Pond Brook, is privately owned, but is important for maintaining the water body as a scenic and recreational resource. It is made of stone masonry and is in poor condition. There are concerns about the downstream impacts if this dam is breached. There is downstream development and the commuter rail is also nearby. An assessment of potential downstream impacts would be warranted for this site. DCR classifies this as a significant hazard dam.

Assabet River Dam

This dam (also known as the Powder Mill Dam, or Old High Street Dam) is located on the Assabet River at Old High Street. It is privately-owned by the Acton Hydro Company. It has a hydro-electric component, is a wood crib dam, has a manual intake and sluice gates, and is partially dismantled. There are concerns about downstream impacts if the dam is breached. Downstream are a number of commercial uses, including at least two sites that may contain hazardous materials. However, work has been done to repair the dam. An Emergency Action Plan was prepared for the dam in 2004 that includes list of downstream properties to be evacuated. Routine measures include daily inspections by the owner, monitoring weather conditions, monitoring flow rates via upstream USGS gaging station, staffed 24-hours during extreme flood conditions, and an annual detailed inspection by the owner. DCR classifies this as a significant hazard dam.

Nagog Pond Dam

This dam is located on Nagog Brook. Nagog Pond is owned by the Town of Concord as part of their water supply water supply. The dam appears to be in good condition and has not caused any concerns. DCR classifies this as a significant hazard dam.

Grassy Pond Brook Dam

This dam is cement with a 24-foot opening on a brook segment between Freedom Farm Road and Arlington Street.

Based on the record of previous occurrences, dam failure in Acton is a low frequency event as defined by the 2013 Massachusetts State Hazard Mitigation Plan. This hazard may occur less frequently than once in 50 years to once in 100 years (1% to 2% per year).

River Street Dam

The River Street Dam was previously located at River Street on Fort Pond Brook. This dam was breached by the Town in 2023.

DCR Dam Hazard Classification

High: Dams located where failure or mis-operation will likely cause loss of life and serious damage to homes(s), industrial or commercial facilities, important public utilities, main highways(s) or railroad(s).

Significant: Dams located where failure or mis-operation may cause loss of life and damage home(s), industrial or commercial facilities, secondary highway(s) or railroad(s)

Low: Dams located where failure or mis-operation may cause minimal property damage to others. Loss of life is not expected.

4.3.1.3 Ice Jams

Ice jams occur in cold weather when normally flowing water begins to freeze effectively damming the waterway and causing localized flooding in the area. There is no recent history of ice jams leading to flooding in Acton and Town staff did not identify this hazard as an issue for the Town.

4.3.2 Location

4.3.2.1 Potential Flood Hazard Areas

Information on potential flood hazard areas was taken from two sources. The first was the National Flood Insurance Rate Maps. The FIRM flood zones are shown in Map 1 on the following page and their definitions are listed below.

Flood Insurance Rate Map Zone Definitions

Zone A (1% annual chance): Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study (FIS) by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no BFEs (base flood elevations) or depths are shown within this zone. Mandatory flood insurance purchase requirements apply.

Zone AE and A1-A30 (1% annual chance): Zones AE and A1-A30 are the flood insurance rate zones that correspond to the 100-year floodplains that are determined in the FIS by detailed methods. In most instances, BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone. Mandatory flood insurance purchase requirements apply.

Zone X (0.2% annual chance)**:** Zone X500 is the flood insurance rate zone that corresponds to the 500- year floodplains that are determined in the Flood Insurance Study (FIS) by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no BFEs (base flood elevations) or depths are shown within this zone.

Zone VE (1% annual chance): Zone VE is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. BFEs derived from the detailed hydraulic analyses are shown at selected intervals within this zone. Mandatory flood insurance purchase requirements apply.

FLOOD ZONES & WATERCOURSES

SLR

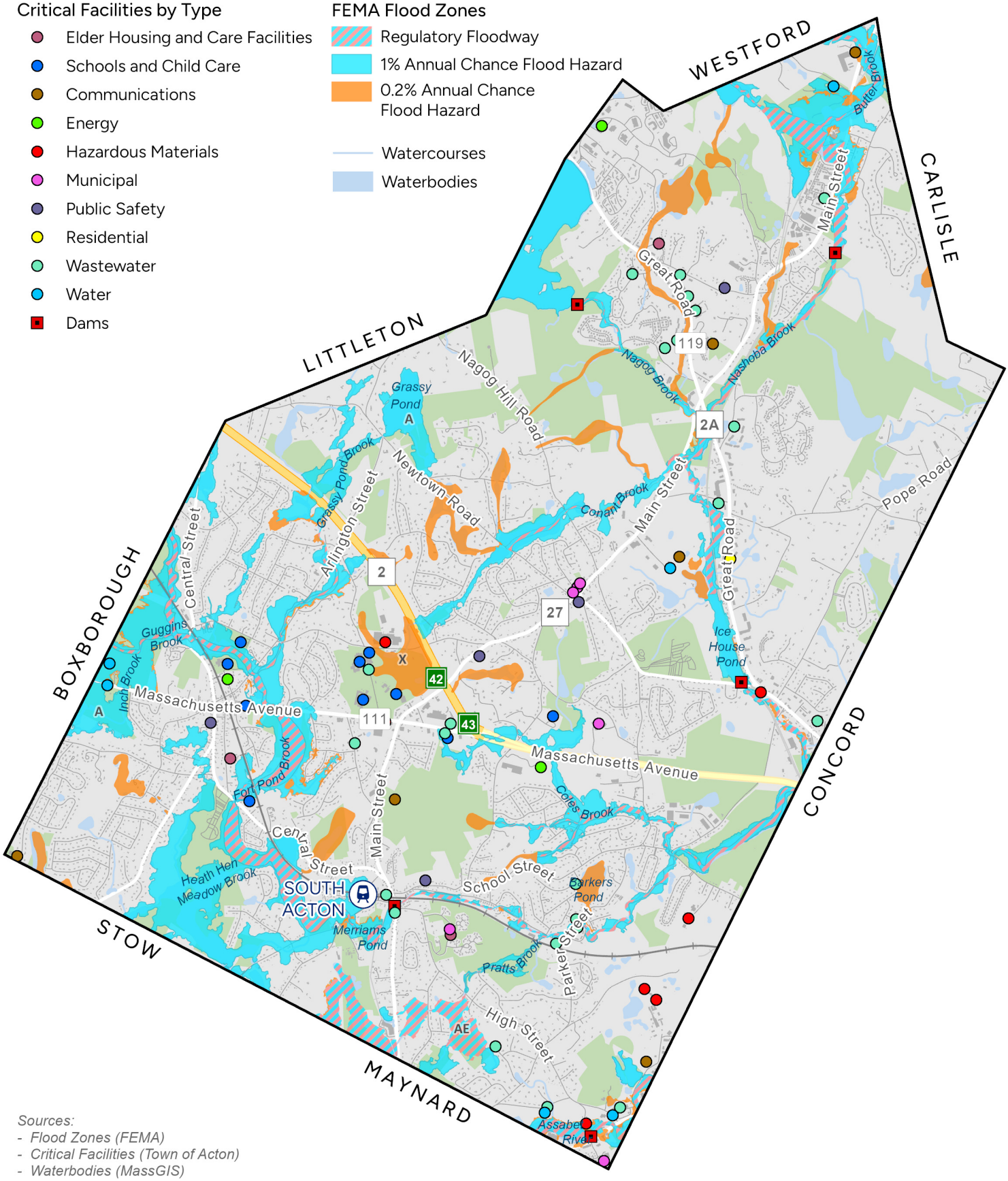
Critical Facilities by Type

- Elder Housing and Care Facilities
- Schools and Child Care
- Communications
- Energy
- Hazardous Materials
- Municipal
- Public Safety
- Residential
- Wastewater
- Water
- Dams

FEMA Flood Zones

- Regulatory Floodway
- 1% Annual Chance Flood Hazard
- 0.2% Annual Chance Flood Hazard

- Watercourses
- Waterbodies



Sources:
- *Flood Zones (FEMA)*
- *Critical Facilities (Town of Acton)*
- *Waterbodies (MassGIS)*

ACTON HAZARD MITIGATION PLAN

TOWN OF ACTON, MASSACHUSETTS

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Date Saved: 8/1/2024

4.3.2.2 Other Locally Identified Areas of Flooding

In addition, information on areas subject to flooding was provided by local officials. The "Locally Identified Areas of Flooding" described in Table 4-14 were identified by Town staff as areas where flooding is known to occur. These areas do not necessarily coincide with the flood zones from the FIRM maps. Some may be areas that flood due to inadequate drainage systems or other local conditions rather than location within a flood zone.

Table 4-14: Other Locally-Identified Areas of Flooding

Name	Description
Water Department Well (Kennedy Wellfield, Route 27)	This town-owned and operated water well located off Route 27 in the northeast part of Acton is vulnerable to flooding due to beaver dams on Butter Brook. In the past, if the water table was high enough, surface water will intrude into the well and potentially impact water quality. A filtration plant has been installed, the risk to water quality has been mitigated.
Great Road	Some properties at Great Road near Wetherbee Street flood occasionally. The parking lot and driveway of a private recreation club can be cut off; a house upstream has flooded as well as a parking lot at an apartment building next to gas station floods. No special action has been taken by Town. A house upstream does flood and the owner thinks the bridge at the club may be restricting flow. In addition, parts of the East Acton village may have pooling water, but this could be due to the associated with Nashoba Brook.
Stow Street/Martin Street	Properties at Stow Street and Martin Street flood once every 3 to 4 years. Beaver dams have been found near this location. Impacts include flooded basements and roads. The road is closed when it floods, but there is an easy detour around it. Emergency management assists residents with pumping out basements.
Flint Road	Homes in the Flint Road area south of Mass. Ave. have seen flooding once every few years due to beaver activity. The town has removed beaver dams at the end of Flint Road.
Water Department Well (Whit-Clapp, Route 111)	This town-owned and operated water well located off of Route 111 in the southwest part of Acton is vulnerable to flooding due to beaver dams near Inch Brook and Guggins Brook. If the water table is high enough, surface water will intrude into well and potentially impact water quality. A beaver deceiver has been installed here, this has reduced the potential for flooding.
Idylwilde Farms	The Idylwilde Farm area is near flood plain, and as a result agricultural fields have experienced flooding. The houses are uphill so they have not been impacted by flooding here. The landowners here have trapped a beaver here.
Condominiums in Boxborough	Flooding at a condominium complex in Boxborough has been caused by beaver activity in Acton. The flooding also impacted the functionality of the condo's septic system. The beaver deceiver installed for (5) (above) has also mitigated issues here.
Nashoba Brook	Flooding has occurred on a stretch from Route 2A to Concord Road along Nashoba Brook, often due to beaver activity, but also due to floodplain. The flooding affects properties, but not houses. A good portion of the land along this brook is town-owned. Beavers have been removed from this area.
Butter Brook at Route 27	Route 7, near route 225 experiences road flooding. There is a new culvert here, but flooding still happens periodically.

4.3.3 Extent

Flooding in the Commonwealth is forecast and classified by the NWS's Northeast River Forecast Center as minor, moderate, or severe based on the types of impacts.

- **Minor:** considered "disruptive" that causes impacts to roadways and transportation access or flooding of recreational areas and farmland.
- **Moderate:** land with structures is inundated.
- **Major:** widespread, life-threatening events.

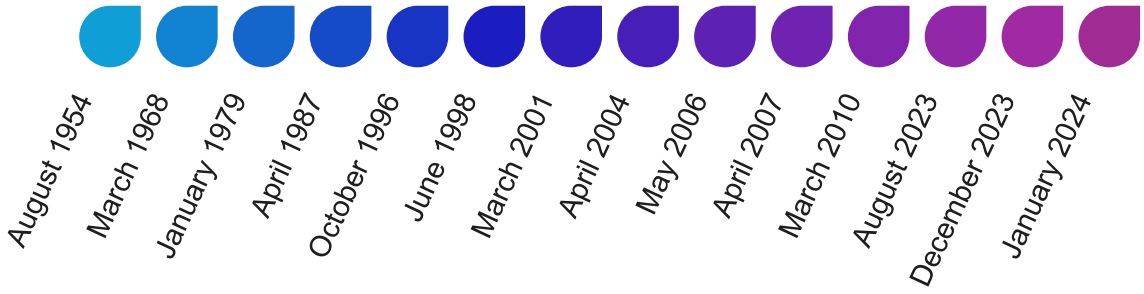
River forecasts are made at many locations in the state containing USGS river gauges with established flood elevations and levels that correspond to varying degrees and extent of flooding.

It is unusual for a flood to occur without warning; however, flash flooding, which occurs when excessive water fills typically dry creeks and riverbeds or dramatically increases water surface elevations on flowing waterbodies, are often less predictable. Flooding is more likely to occur during a rain event when water levels are already running high or soils are wet from previous precipitation, or if infiltration capacity of soil is limited due to prolonged periods of dry weather and drought conditions.

4.3.4 Past Events

4.3.4.1 Regionally Significant Floods

There have been a number of major floods that have affected the Metro Boston region over the last sixty years. Significant flood events that have impacted Acton include:



Local data for previous flooding occurrences are not collected by the Town of Acton. The best available local data is for Middlesex County through the "Storm Events Database" of NOAA's National Centers for Environmental Information (NCEI) (see Table 4-15). Middlesex County, which includes the Town of Acton, experienced 62 flood events from 2010 to May 2024. No deaths or injuries were reported and the total reported property damage in the county was over $36 million dollars. The March 2010 storms account for $35.2 million of total damage during this time. Of the remaining total, $1 million is attributed to one event in 2017, $125,000 due to an event in 2015, and $80,000 is attributed to three events in 2018.

Table 4-15: Middlesex County Flood Events, 2010-May 2024

Date	Deaths	Injuries	Property Damage ($)
3/14/2010	0	0	26,430,000
3/29/2010	0	0	8,810,000
4/1/2010	0	0	0
8/28/2011	0	0	5,000
10/14/2011	0	0	0
6/8/2012	0	0	0

Date	Deaths	Injuries	Property Damage ($)
6/23/2012	0	0	15,000
7/18/2012	0	0	5,000
10/29/2012	0	0	0
6/7/2013	0	0	0
7/1/2013	0	0	0
7/23/2013	0	0	0
9/1/2013	0	0	10,000
3/30/2014	0	0	35,000
7/27/2014	0	0	0
8/31/2014	0	0	0
10/22/2014	0	0	20,000
10/23/2014	0	0	0
12/9/2014	0	0	35,000
5/31/2015	0	0	0
8/4/2015	0	0	0
8/15/2015	0	0	125,000
9/30/2015	0	0	0
4/6/2017	0	0	0
6/27/2017	0	0	1,000
7/12/2017	0	0	1,000,000
7/18/2017	0	0	0
8/2/2017	0	0	5,000
10/25/2017	0	0	0
10/30/2017	0	0	0
1/12/2018	0	0	0
1/13/2018	0	0	0
4/16/2018	0	0	0
6/25/2018	0	0	15,000
8/8/2018	0	0	35,000
8/12/2018	0	0	30,000
8/17/2018	0	0	0
10/29/2018	0	0	0
11/3/2018	0	0	0
11/10/2018	0	0	0
7/6/2019	0	0	0
8/7/2019	0	0	300
9/2/2019	0	0	0
6/21/2020	0	0	0
6/28/2020	0	0	5,000
7/23/2020	0	0	0
9/10/2020	0	0	3,000
7/9/2021	0	0	0

Date	Deaths	Injuries	Property Damage ($)
9/2/2021	0	0	0
11/12/2021	0	0	10,000
8/5/2022	0	0	0
8/7/2022	0	0	0
9/5/2022	0	0	0
5/20/2023	0	0	0
6/26/2023	0	0	500
7/10/2023	0	0	0
7/16/2023	0	0	0
8/8/2023	0	0	0
8/18/2023	0	0	0
9/10/2023	0	0	0
9/11/2023	0	0	0
1/9/2024	0	0	0
Total	**0**	**0**	**$36.595M**

Source: NOAA, Storm Events Database NCEI

4.3.4.2 Repetitive Loss Structures

As defined by the Community Rating System (CRS) of the National Flood Insurance Program (NFIP), a repetitive loss property is any property which the NFIP has paid two or more flood claims of $1,000 or more in any given 10-year period since 1978. There are five (5) repetitive loss structures in Acton; they are all single-family homes located in or near flood zones associated with local brooks and wetlands. These repetitive loss properties have had a total of thirteen (13) losses since 1987, totaling $60,396 in damages. For more information on repetitive losses, see http://www.fema.gov/nfip/replps.shtm.

4.3.5 Potential Impacts

One of the major environmental impacts of flood events is the potential release of hazardous materials and collection of pollutants into runoff, threatening water quality and ecosystem health. Senior and low-income populations in Town may be more vulnerable to hazard events due to physical capabilities, financial limitations, or language barriers that create challenges to adequately react and respond to hazard events. These populations may require additional assistance and support during a flood.

The following loss estimates were calculated based on regional data provided by the NOAA NCEI and FEMA NRI databases, adjusted by recorded population in Middlesex County and the Town of Acton. Additional loss estimates were gathered from the 2022 MA Climate Change Assessment and incorporated the data provided in the assessment for Eastern Inland and Statewide populations.

Hazard	Methodology / Source	Annualized Losses for Acton, MA	Notes
Flood	NCEI	$30,450	Total reported property damage from “Flash Flood,” “Flood,” and “Heavy Rain” events in Middlesex County, prorated to Acton based on population, and divided by the 28-year record. No adjustment for inflation.

Hazard	Methodology / Source	Annualized Losses for Acton, MA	Notes
Flood	NRI	$236,870	Sum of Expected Annual Loss values reported for Census Tracts 363201, 363202, 363103, 363104, 363105, and 363106
Flood	2022 Climate Assessment	$1,517,134	Expected direct and indirect flood damages to commercial properties (structure)
Flood	2022 Climate Assessment	$9,000,293	Expected direct and indirect flood damages to commercial properties (downtime losses)
Dam Failure	2022 Climate Assessment	$5,686	Annual economic impacts are defined by the baseline climate scenario (1986-2005). Overtopping events cost of repairs and damage is estimated at less than $200,000 per event. Economic impact of breaching events varies by location and averages around $2.9 million per event.

Annualized estimated losses from flooding between the NRI estimate of over $200,000 to the 2022 State Climate Assessment of over $1.5 million (structural damage) is reasonable for planning purposes in Acton.

4.3.6 Probability of Future Events and Impacts of Climate Change

Climate change, according to the 2022 MA Climate Change Assessment, is projected to impact precipitation patterns that lead to inland flooding. Research suggests that the Commonwealth should expect more precipitation overall. This is connected to rising temperatures as higher temperatures will increase the moisture-holding capacity of the atmosphere and increase evaporation rates. The 2022 Climate Change Assessment also stated that annual precipitation may be more variable and fall over few days, but the precipitation will be more intense. An increase in the intensity and duration of rainfall will stress the systems within the natural and built environment, impact public health, and exacerbate flood risk.

By 2070, most areas in Massachusetts are projected to have substantial changes in seasonal precipitation patterns with small increases in total annual precipitation.

4.4 Wind Related Hazards

Wind-related hazards include hurricanes, tropical storms, and tornadoes, as well as high winds during nor'easters and thunderstorms. High winds can cause damage; Downed trees and limbs can be a problem due to weather conditions such as strong wind or heavy snow and ice. Tree limbs can down power and communication lines and impact major roadways. The combination of wind and snow caused significant tree damage during the March 2018 blizzards. Recent wind related hazards in Town include severe thunderstorms on September 8th, 2023 and July 16th, 2023. The September event resulted in tree damage across Town, knocking out power for thousands of customers and causing hundreds of trees to fall. The July event triggered a tornado watch and was defined by heavy rain and high winds.

The 2017 Massachusetts State Building Code Ninth Edition requires structures in Acton be designed to withstand a three-second gust of 114 miles per hour (or higher for buildings in higher risk categories). This figure is moderate for the state; many coastal communities have significant higher design standards.

4.4.1 Hurricanes And Tropical Storms

4.4.1.1 Hazard Overview

Topical cyclones, including tropical storms, hurricanes, and tropical depressions, form over warm waters of the Atlantic Ocean, Caribbean Sea, and Gulf of Mexico. These storms are categorized based on sustained wind speed. A hurricane is a violent wind and rainstorm with wind speeds of 74 to 200 miles per hour. There are generally two source regions for storms with the potential to strike New England, which are off the Cape Verde Islands near the west coast of Africa and in the Bahamas.

A hurricane is strongest as it travels over the ocean and is particularly destructive to coastal property as the storm hits land. Given its location not too distant from the coast, the Town of Acton's entire area is vulnerable to hurricanes, which occur between June and November. A tropical storm has similar characteristics, but wind speeds are below 74 miles per hour.

A hurricane or storm track is the line that delineates the path of the eye of a hurricane or tropical storm. The town also experiences the impacts of the wind and rain of hurricanes and tropical storms regardless of whether the storm track passed through the town.

4.4.1.2 Location

Tropical storms and hurricanes can affect the entirety of the Commonwealth, including the geographic extent of the Town of Acton. The SHMCAP defines hurricanes and tropical storms as a multi-state hazard. Hurricanes are a town-wide hazard in Acton.

4.4.1.3 Extent

Hurricane intensity is measured according to the Saffir/Simpson scale (see Table 4-16), which categorizes hurricane intensity linearly based upon maximum sustained winds, barometric pressure, and storm surge potential. These are combined to estimate potential damage. The following gives an overview of the wind speeds, surges, and range of damage caused by different hurricane categories:

Table 4-16: Saffir/Simpson Scale

Scale No. (Category)	Winds (mph)	Surge (ft)	Potential Damage
1	74 – 95	4 - 5	Minimal
2	96 – 110	6 - 8	Moderate
3	111 – 129	9 - 12	Extensive
4	130 – 156	13 - 18	Extreme
5	> 157	>18	Catastrophic

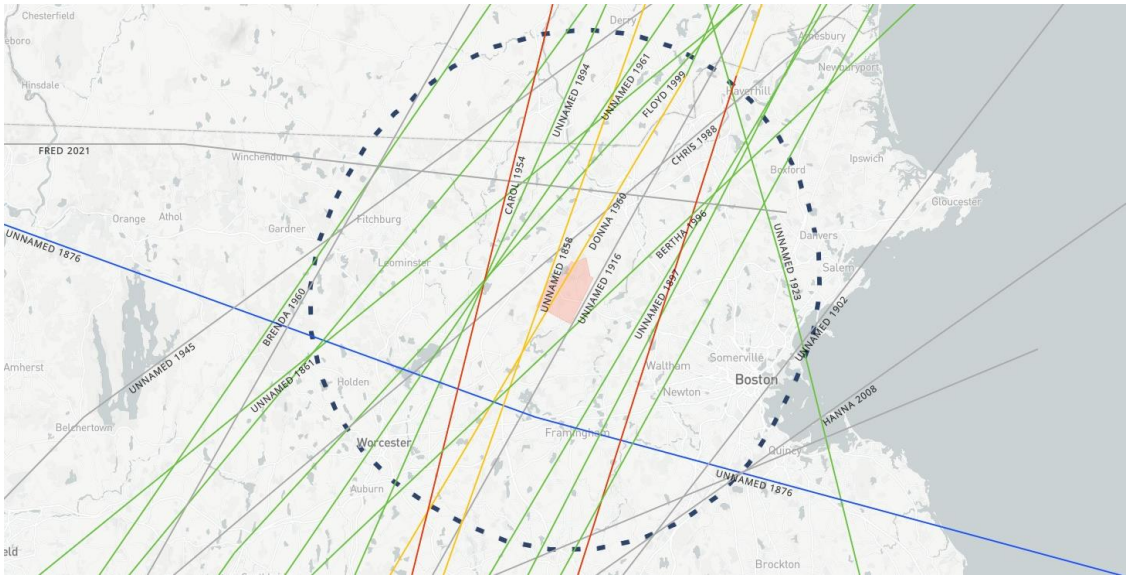
Source: National Oceanic and Atmospheric Administration

4.4.1.4 Past Events

According to the NOAA's Historical Hurricane Tracker (as cited in the 2023 SHMCAP), 97 hurricane or tropical storm events have occurred within 654 nautical miles of Massachusetts from 1842 and 2022. Eight of these hurricanes since 1954 have been strong enough to receive federal emergency or major disaster declarations. Four of these storms have occurred between 2020 and 2022. NOAA estimates that a Category 3 hurricane could occur in the Commonwealth area once every 50-60 years.

Thirty-eight (38) tropical cyclones have passed within 60 miles of Acton, as shown in Figure 4-6 and Table 4-17.

Figure 4-6: Historical Tropical Cyclones within 60 Nautical Miles of Acton



Map Legend:
Red Line: Cat 3 **Yellow Line:** Cat 1 **Green Line:** Trop. Storm **Blue Line:** Trop. Depression
Source: National Hurricane Center

Table 4-17: Historical Tropical Cyclones within 60 Nautical Miles of Acton

Event	Year	Category
UNNAMED	1851	Tropical Storm
UNNAMED	1858	Cat 2
UNNAMED	1861	Cat 1
UNNAMED	1861	Cat 1
UNNAMED	1869	Cat 3
UNNAMED	1869	Cat 2
UNNAMED	1872	Cat 1
UNNAMED	1874	Cat 1
UNNAMED	1876	Cat 3
UNNAMED	1888	Cat 3
UNNAMED	1893	Cat 3
UNNAMED	1894	Cat 3
UNNAMED	1896	Cat 3
UNNAMED	1897	Tropical Storm
UNNAMED	1908	Cat 1
UNNAMED	1916	Cat 2
UNNAMED	1923	Tropical Storm
UNNAMED	1934	Cat 2
UNNAMED	1944	Cat 5
ABLE	1952	Cat 2
CAROL	1954	Cat 3
CINDY	1959	Cat 1
BRENDA	1960	Tropical Storm

Event	Year	Category
DONNA	1960	Cat 4
ESTHER	1961	Cat 5
UNNAMED	1961	Tropical Storm
UNNAMED	1968	Tropical Storm
DORIA	1971	Tropical Storm
BELLE	1976	Cat 3
GLORIA	1985	Cat 4
BOB	1991	Cat 3
BERYL	1994	Tropical Storm
BERTHA	1996	Cat 3
FLOYD	1999	Cat 4
HERMINE	2004	Tropical Storm
HANNA	2008	Cat 1
ELSA	2021	Cat 1
HENRI	2021	Cat 1

Source: National Hurricane Center

4.4.1.5 Potential Impacts

Hurricanes typically have regional impacts beyond their immediate tracks. Falling trees and branches are a significant problem because they can result in power outages when they fall on power lines or block traffic and emergency routes. Transportation, utility, and property damage are typically the primary risks associated with hurricanes, based on the review of local plans for the 2023 SHMCAP.

Potential hurricane damages to Acton have been estimated from damages presented in the 2023 SHMCAP, as well as derived from regional damages reported by the NCEI and FEMA NRI. The loss estimates provided in these datasets are adjusted based on population to calculate potential loss estimates for Acton.

Hazard	Methodology / Source	Annualized Losses for Acton, MA
Hurricanes and Tropical Cyclones	NRI	$1,571,84
Hurricanes and Tropical Cyclones	NCEI	$2,237

The 2023 SHMCAP includes the following annualized loss estimates for Middlesex County based on HAZUS analysis:

County	Capital Stock Losses	Income Losses	Total Loss
Middlesex	$83,017,000	$5,503,000,000	$88,520,000,000
Town of Acton	$1,233,299	$81,759,069	$1,315,157,602

Middlesex County is expected to experience the greatest annualized losses in the state according to this assessment. Capital stock loss includes building damage, inventory loss, and content damage while income loss reflects capital-related loss, wage loss, rental income loss, and relocation loss. Adjusting these estimates to Acton, based on population, would give an annualized loss estimate from hurricanes and tropical storms of $1,315,157,602, including capital stock losses and income losses.

The NRI and SHMCAP Capital Stock Loss estimates both provide a figure around $1.5 million for planning purposes.

4.4.1.6 Probability of Future Events and Impacts of Climate Change

Historic events and projections of future climate conditions suggest that the intensity of hurricanes will increase. Warming ocean temperatures as a result of climate change are causing longer, more intense tropical cyclones. As this trend progresses, infrastructure, property, natural resources, and residents are at increased risk to damage from hurricanes and tropical storms.

4.4.2 Tornados

4.4.2.1 Hazard Overview

A tornado is a violent windstorm characterized by a twisting, funnel-shaped cloud. These events are spawned by thunderstorms and occasionally by hurricanes and may occur singularly or in multiples. They develop when cool air overrides a layer of warm air, causing the warm air to rise rapidly. Most vortices remain suspended in the atmosphere. Should they touch down, they become a force of destruction. Some ingredients for tornado formation include:

- Very strong winds in the mid and upper levels of the atmosphere
- Clockwise turning of the wind with height (from southeast at the surface to west aloft)
- Increasing wind speed with altitude in the lowest 10,000 feet of the atmosphere (i.e., 20 mph at the surface and 50 mph at 7,000 feet)
- Very warm, moist air near the ground with unusually cooler air aloft
- A forcing mechanism such as a cold front or leftover weather boundary from previous shower or thunderstorm activity

4.4.2.2 Location

The Commonwealth experiences fewer tornadoes than other parts of the country, therefore, residents may be less prepared to react and appropriately respond to a tornado event. The SHMCAP notes that the area at greatest risk for a tornado touchdown runs from central to northeastern Massachusetts. Acton is within this area.

Although tornadoes are a potential town-wide hazard in Acton, tornado impacts are relatively localized compared to severe storms and hurricanes. Damages from any tornado in Acton would greatly depend on the track of the tornado.

4.4.2.3 Extent

Tornado damage severity is measured by the Fujita Tornado Scale, in which wind speed is not measured directly but rather estimated from the amount of damage. As of February 1, 2007, the National Weather Service began rating tornados using the Enhanced Fujita-scale (EF-scale), which allows surveyors to create more precise assessments of tornado severity. The EF-scale is summarized below in Table 4-18.

Table 4-18: Enhanced Fujita Scale

Fujita Scale			Derived		Operational EF Scale	
F Number	Fastest ¼ mile (mph)	3-second gust (mph)	EF Number	3-second gust (mph)	EF Number	3-second gust (mph)
0	40 – 72	45 – 78	0	65 – 85	0	65 – 85
1	73 – 112	79 – 117	1	86 – 109	1	86 – 110
2	113 – 157	118 – 161	2	110 – 137	2	111 – 135
3	158 – 207	162 – 209	3	138 – 167	3	136 – 165
4	208 – 260	210 – 261	4	168 – 199	4	166 – 200
5	261– 318	262 – 317	5	200 – 234	5	Over 200

Source: Massachusetts State Hazard Mitigation Plan, 2023

4.4.2.4 Past Events

The frequency of tornadoes in eastern Massachusetts is low; on average, there are six tornadoes that touchdown somewhere in the Northeast region every year and one tornado, on average, in Massachusetts every year. Despite the low frequency of this natural hazard, tornados have the potential to cause extensive damage to property, infrastructure, and public health, and may even result in fatalities if it strikes in densely populated areas. The 2023 SHMCAP states that all the Commonwealth is at potential risk for tornado formation, with portions of Middlesex County being among the most tornado-prone relative to other areas in Massachusetts with limited exposure.

The strongest tornado in Massachusetts history was the Worcester Tornado in 1953 (NESEC). The most recent tornado events in Massachusetts were in Springfield in 2011 and in Revere in 2014. The Springfield tornado caused significant damage and resulted in four deaths in June of 2011. The Revere tornado touched down in Chelsea just south of Route 16, moved north into Revere's business district along Broadway, and ended near the intersection of Routes 1 and 60. The path was approximately two miles long and 3/8 mile wide, with wind speeds up to 120 miles per hour. Approximately 65 homes had substantial damages and 13 homes and businesses were rendered uninhabitable.

There have been no recorded tornadoes in the Town of Acton. Since 1955 there have been 18 tornadoes in surrounding Middlesex County recorded by the NCEI. Two of these were F3 tornados, and four were F2. These 19 tornadoes resulted in a total of one fatality and six injuries and $4.891 million in damages, as summarized in Table 4-19.

Table 4-19: Tornado Records for Middlesex County

Date	Fujita	Fatalities	Injuries	Damage	Date	Fujita	Fatalities	Injuries	Damage
10/24/1955	1	0	0	$2.5K	7/1/1971	1	0	1	$25K
6/19/1957	1	0	0	$25K	11/7/1971	1	0	0	$250
6/19/1957	1	0	0	$250	7/21/1972	2	0	4	$2.5M
7/11/1958	2	0	0	$250K	9/29/1974	3	0	1	$250K
8/25/1958	2	0	0	$2.5K	7/18/1983	0	0	0	$250

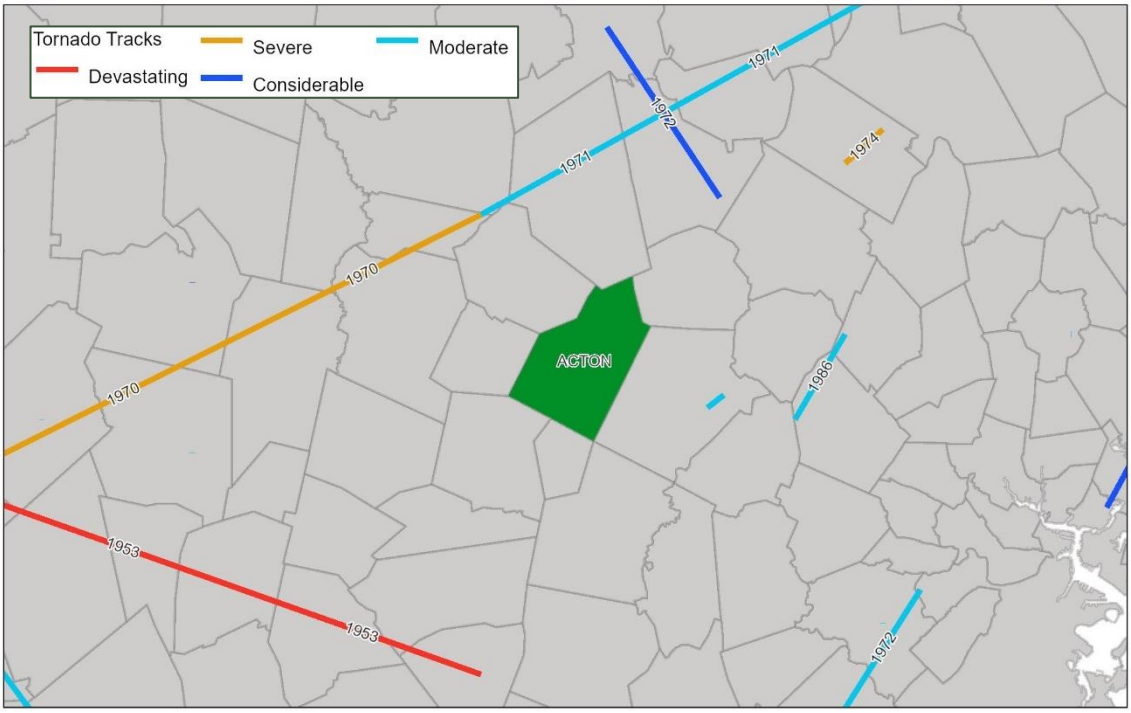
Date	Fujita	Fatalities	Injuries	Damage	Date	Fujita	Fatalities	Injuries	Damage
7/3/1961	0	0	0	$25K	9/27/1985	1	0	0	$250
7/18/1963	1	0	0	$25K	8/7/1986	1	0	0	$250K
8/28/1965	2	0	0	$250K	8/22/2016	1	0	0	$1.0M
7/11/1970	1	0	0	$25K	8/23/2021	0	0	0	$10K
10/3/1970	3	1	0	$250K					

Source: NOAA

Historical tornado tracks near Acton are shown in Figure 4-7.

Based on the record of previous occurrences since 1956, Tornado events in Acton are a low frequency event as defined by the 2023 Massachusetts SHCAP.

Figure 4-7: Tornadoes Near Acton, 1950-2022



Source: NOAA Storm Prediction Center

4.4.2.5 Potential Impacts

Buildings constructed prior to current building codes may be more vulnerable to damages caused by tornadoes. Evacuation of impacted areas may be required on short notice. Sheltering and mass feeding efforts may be required along with debris clearance, search and rescue, and emergency fire and medical services. Key routes may be blocked by downed trees and other debris, and widespread power outages are also typically associated with tornadoes.

The following loss estimates were calculated based on regional data provided by the NOAA NCEI and FEMA NRI databases, adjusted by recorded population in Middlesex County and the Town of Acton.

Hazard	Methodology / Source	Annualized Losses for Acton, MA
Tornado	NCEI	$532
Tornado	NRI	$142,882

The NCEI estimates appear to be unreliably low, and it is reasonable to plan for tornado mitigation based on an annualized loss estimate of nearly $150,000, based on the NRI figure.

4.4.2.6 Probability of Future Events and Impacts of Climate Change

The 2023 SHMCAP reports that tornado intensity and frequency is projected to increase due to climate change. Current climate models predict an increase in severe thunderstorms, which can create potential conditions to produce tornadoes. Overall, based on available research and studies, it is difficult to draw concrete conclusions about the influence of climate change on tornado processes.

4.4.3 Severe Thunderstorms

4.4.3.1 Hazard Overview

While less severe than the other types of storms discussed, thunderstorms can lead to localized damage and represent a hazard risk for communities. A thunderstorm typically features lightning, strong winds, rain, and/or hail. Thunderstorms sometime give rise to tornados. On average, these storms are only around 15 miles in diameter and last for about 30 minutes. A severe thunderstorm can include winds of close to 60 mph and rain sufficient to produce flooding.

4.4.3.2 Location

Severe thunderstorms are a town-wide hazard for Acton. The town's entire area is potentially subject to severe thunderstorms.

4.4.3.3 Extent

The strength of thunderstorms is typically measured in terms of the effects and impacts, such as the wind speed, significant lightning, or size of hail if present. Based on NWS reporting, a thunderstorm is classified as “severe” when it produces damaging wind gusts in excess of 58 mph, hail that is 1 inch in diameter, or a tornado.

4.4.3.4 Past Events

The best available data on previous occurrences of thunderstorms in Acton is for Middlesex County through the NCEI. Between the years 2017 and 2023 the NCEI recorded 53 thunderstorm events in Middlesex County, as shown in Table 4-20 (72 events were recorded between 2006 and 2016).

Table 4-20: Middlesex County Thunderstorm Events, 2017 to 2024

Date	Deaths	Injuries	Damage ($)	Date	Deaths	Injuries	Damage ($)
5/18/2017	0	0	3,000.00	7/23/2020	0	0	40,600.00
6/13/2017	0	0	37,000.00	7/30/2020	0	0	4,400.00
6/23/2017	0	0	29,500.00	8/22/2020	0	0	6,000.00

Date	Deaths	Injuries	Damage ($)	Date	Deaths	Injuries	Damage ($)
6/27/2017	0	0	2,000.00	8/23/2020	0	0	25,600.00
7/12/2017	0	0	19,000.00	8/27/2020	0	0	1,600.00
8/2/2017	0	0	14,000.00	10/7/2020	0	5	6,500.00
9/6/2017	0	0	8,000.00	11/15/2020	0	0	4,500.00
5/15/2018	0	0	12,000.00	5/26/2021	0	0	800.00
6/18/2018	0	0	59,500.00	6/30/2021	0	0	3,000.00
6/25/2018	0	0	12,000.00	7/6/2021	0	0	18,500.00
7/17/2018	0	0	3,000.00	7/7/2021	0	0	9,600.00
7/26/2018	0	0	5,000.00	7/27/2021	0	0	33,800.00
8/7/2018	0	0	3,000.00	8/19/2021	0	0	1,300.00
8/17/2018	0	0	4,000.00	9/13/2021	0	0	400.00
9/6/2018	0	0	2,000.00	3/7/2022	0	0	19,000.00
10/23/2018	0	0	10,000.00	7/2/2022	0	0	800.00
6/30/2019	0	0	800.00	7/21/2022	0	0	500.00
7/17/2019	0	0	7,250.00	8/5/2022	0	0	9,900.00
7/31/2019	0	0	2,500.00	8/7/2022	0	0	30,300.00
8/7/2019	0	0	800.00	8/26/2022	0	0	7,800.00
9/4/2019	0	0	21,700.00	9/13/2022	0	0	3,000.00
5/15/2020	0	0	285,000.00	6/2/2023	0	0	20,000.00
6/6/2020	0	0	7,600.00	7/13/2023	0	0	17,000.00
6/21/2020	0	0	38,200.00	7/21/2023	0	0	1,300.00
6/28/2020	0	0	6,000.00	7/25/2023	0	0	4,000.00
7/2/2020	0	0	15,300.00	9/8/2023	0	0	18,500.00
7/5/2020	0	0	12,800.00				

Source: NOAA

Severe storms in eastern Massachusetts in late August 2022 brought extreme rainfall and precipitation, high winds, and hail. The storm led to severe flooding of roadways and disruption to power. Severe thunderstorms in Acton on September 8th, 2023, and July 16th, 2023, produced heavy rain and high winds, resulting in power disruption and tree damage.

4.4.3.5 Potential Impacts

The town's vulnerability to severe thunderstorms is similar to that of nor'easters. High winds can cause falling trees and power outages, as well as obstruction of key routes and emergency access. Heavy precipitation may also cause localized flooding, both riverine and urban drainage related.

The following loss estimates were calculated based on regional data provided by the NOAA NCEI and FEMA NRI databases, adjusted by recorded population in Middlesex County and the Town of Acton.

Hazard	Methodology / Source	Annualized Losses for Acton, MA
Thunderstorm Wind	NCEI	$5,678
Other Severe Weather	NRI	$37,570

It is reasonable to plan for annualized losses from thunderstorms of about $40,000, based on the NRI estimates.

4.4.3.6 Probability of Future Events and Impacts of Climate Change

Based on the record of previous occurrences and hazard analysis in the 2023 SHMCAP, severe weather is an event with very high likelihood with a warning time of 1 day (24 hours). Massachusetts experiences between nine (9) and 27 thunderstorm days each year, and it is highly likely that the Commonwealth will continue to experience this natural hazard. Widespread flooding, though varying in severity, is a common threat associated with storms in Massachusetts.

The 2023 SHMCAP includes data for Massachusetts from the Localized Constructed Analog's downscaled global climate models. This model aligns with other projections and predictions that thunderstorms are likely to slightly increase in frequency.

4.5 Winter Storms

Winter storms, including heavy snow, blizzards, and ice storms, are the most common and most familiar of the region's hazards that affect large geographic areas. The majority of blizzards and ice storms in the region cause more inconvenience than they do serious property damage, injuries, or deaths. However, periodically, a storm will occur which is a true disaster, and necessitates intense large-scale emergency response. The impacts of winter storms are often related to the weight of snow and ice, which can cause roof collapses and also causes tree limbs to fall. This in turn can cause property damage and potential injuries. Power outages may also result from fallen trees and utility lines.

Winter storms are a potential town-wide hazard in Acton. The average annual snowfall in Acton is between 48-72 inches. Several public safety issues can arise during snowstorms.

Impassible streets are a challenge for emergency vehicles and 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 also block sight lines for drivers, particularly at intersections. Not all residents are able to clear their properties, especially the elderly. Refreezing of melting snow can cause dangerous roadway conditions. In addition, transit operations may be impacted, as they were in the 2015 blizzard which caused the closure of the MBTA system for one day and limited services on several transit lines for several weeks.

4.5.1 Heavy Snow and Blizzards

4.5.1.1 Hazard Overview

A blizzard is a winter snow storm with sustained or frequent wind gusts to 35 mph or more, accompanied by falling or blowing snow which reduces visibility to or below ¼ mile. These conditions must be the predominant condition over a three-hour period. Extremely cold

temperatures are often associated with blizzard conditions but are not a formal part of the definition. The hazard related to the combination of snow, wind, and low visibility significantly increases when temperatures drop below 20 degrees.

Winter storms are a combination hazard because they often involve wind, ice, and heavy snow fall. The National Weather Service defines “heavy snow fall” as an event generating at least four inches of snowfall within a 12-hour period.

Winter Storms are often associated with Nor’easter event, a large counterclockwise wind circulation around a low-pressure center often resulting in heavy snow, high winds, and rain. Featuring strong northeasterly winds blowing in from the ocean over coastal areas, nor’easters are relatively common in the winter months in New England. The storm radius of a nor’easter can be as much as 1,000 miles and these storms feature sustained winds of 10 to 40 mph with gusts of up to 70 mph.

4.5.1.2 Location

Heavy snow storms and blizzards can affect the entirety of the Commonwealth, including the Town of Acton. Winter storms are a potential town-wide hazard in Acton.

4.5.1.3 Extent

The Northeast Snowfall Impact Scale (NESIS), developed by Paul Kocin of The Weather Channel and Louis Uccellini of the National Weather Service (Kocin and Uccellini, 2004), characterizes and ranks high impact northeast snowstorms. These storms have large areas of 10 inch snowfall accumulations and greater. NESIS has five categories: Extreme, Crippling, Major, Significant, and Notable (see Table 4-21). NESIS scores are a function of the area affected by the snowstorm, the amount of snow, and the number of people living in the path of the storm. The largest NESIS values result from storms producing heavy snowfall over large areas that include major metropolitan centers. The NESIS categories are summarized below:

Table 4-21: NESIS Categories

Category	NESIS	Value Description
1	1 – 2.499	Notable
2	2.5 – 3.99	Significant
3	4 – 5.99	Major
4	6 – 9.99	Crippling
5	10+	Extreme

Source: NOAA NCEI

4.5.1.4 Past Events

The most significant winter storm in recent history was the “Blizzard of 1978,” which resulted in over three feet of snowfall and multiple day closures of roadways, businesses, and schools. In Acton, the most blizzards and severe winter storms have occurred in the following dates displayed in Table 4-22.

Table 4-22: Severe Winter Storm Records for Middlesex County (1978-May 2024)

Severe Winter Storm Event	Date
Blizzard of 1978	February 1978
Severe Coastal Storm (“Perfect Storm”)	October 1991
Great Nor’easter of 1992	December 1992
Blizzard	March 1993
Blizzard	January 1996
Severe Snow Storm	March 2001
Severe Snow Storm	December 2003
Severe Snow Storm	January 2004
Blizzard / Nor’easter	January 2005
Coastal Storm/Nor’easter	October 2005
Severe Storms, Inland & Coastal Flooding/Nor’easter	April 2007
Severe Snow Storm	December 2010
Severe Snow Storm / Nor’easter	January 2011
Severe Snow Storm / Nor’easter	October 2011
Blizzard of 2013	February 2013
Blizzard of 2015	January 2015
March 2015 Nor’easters	March 2015
Severe Snow Storm	March 2018
Severe Snow Storm	January 2019
Severe Snow Storm	March 2019
Severe Snow Storm	February 2021
Blizzard	January 2022

Source: National Oceanic and Atmospheric Administration; 2018 Town of Acton Hazard Mitigation Plan

The Town of Acton does not keep local records of winter storms. Data for Middlesex County, which includes Acton, is the best available data to help understand previous occurrences and impacts of heavy snow events. According to National Climate Data Center (NCEI) records, from 2000 to 2024, Middlesex County experienced 81 heavy snowfall events, resulting in no injuries or deaths, and $257,000 in property damage. See Table 4-23 for and heavy snow events and impacts in Middlesex County.

Table 4-23: Heavy Snow Events and Impacts in Middlesex County, 2000 to 2024

Date	Deaths / Injuries	Property Damage ($)	Date	Deaths / Injuries	Property Damage ($)
1/13/2000	0	0	2/23/2013	0	0
1/25/2000	0	0	3/7/2013	0	0
2/18/2000	0	0	3/18/2013	0	0
12/30/2000	0	0	12/14/2013	0	0

Date	Deaths / Injuries	Property Damage ($)	Date	Deaths / Injuries	Property Damage ($)
1/20/2001	0	0	12/17/2013	0	0
2/5/2001	0	0	1/2/2014	0	0
3/5/2001	0	0	1/18/2014	0	0
3/9/2001	0	0	2/5/2014	0	0
3/30/2001	0	0	2/13/2014	0	0
12/8/2001	0	0	2/18/2014	0	0
3/20/2002	0	0	11/26/2014	0	10,000
3/16/2004	0	0	1/24/2015	0	0
2/24/2005	0	0	1/26/2015	0	0
12/13/2007	0	0	2/2/2015	0	0
12/16/2007	0	0	2/8/2015	0	0
12/19/2007	0	0	2/14/2015	0	0
1/14/2008	0	28,000	2/5/2016	0	70,000
1/14/2008	0	20,000	2/5/2016	0	5,000
1/14/2008	0	20,000	3/21/2016	0	0
2/22/2008	0	0	4/4/2016	0	0
3/1/2008	0	0	12/29/2016	0	0
12/19/2008	0	0	3/14/2017	0	0
12/20/2008	0	8,000	11/15/2018	0	0
12/21/2008	0	0	12/1/2019	0	4,000
12/31/2008	0	0	1/18/2020	0	0
1/10/2009	0	0	3/23/2020	0	0
1/11/2009	0	0	10/30/2020	0	500
1/18/2009	0	0	12/5/2020	0	0
3/1/2009	0	0	12/16/2020	0	0
3/2/2009	0	0	2/1/2021	0	0
12/9/2009	0	15,000	2/7/2021	0	0
12/9/2009	0	500	4/16/2021	0	0
12/19/2009	0	0	1/7/2022	0	0
12/20/2009	0	0	1/16/2022	0	0
1/18/2010	0	0	1/28/2022	0	0
2/16/2010	0	15,000	2/25/2022	0	0
2/23/2010	0	8,000	1/20/2023	0	0
1/12/2011	0	0	1/23/2023	0	7,000
1/26/2011	0	0	3/3/2023	0	0
10/29/2011	0	30,000	3/13/2023	0	9,000
12/29/2012	0	0	3/14/2023	0	2,500
2/8/2013	0	0	1/7/2024	0	0
2/8/2013	0	0	1/28/2024	0	0

Source: NOAA, National Centers for Environmental Information

Severe winter weathers, as defined by the 2023 SHMCAP, are a climate event with high likelihood and a warning time of 1-5 days in the Commonwealth. Between 2005 and 2022, there were 61 reported blizzards events over 15 days, based on the National Climate Data Center (NCDC) report in the 2023 SHMCAP. All events occurred between mid-December and mid-March and the majority occurred in January or early February.

4.5.1.5 Potential Impacts

Acton is vulnerable to both the wind and precipitation that accompany winter storms and nor'easters. High winds can cause damage to structures, fallen trees, and downed power lines leading to power outages. Intense snowfall can overwhelm drainage systems when it melts, causing localized flooding of rivers and streams as well as urban stormwater ponding and localized flooding. Fallen tree limbs as well as heavy snow accumulation and intense precipitation can impede local transportation corridors, and block emergency access.

Impassible streets are a challenge for emergency vehicles and 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 also block sight lines for drivers, particularly at intersections. Not all residents are able to clear their properties, especially the elderly. Refreezing of melting snow can cause dangerous roadway conditions. Specific damages associated with severe winter weather include:

- Ice-related damage to trees, buildings, infrastructure, and utilities
- Damage to roads and transportation infrastructure due to freezing
- Stress on local shelters and emergency response infrastructure
- Injuries associated with accidents, low temperatures, power loss, falling objects
- Increase in the frequency of traffic accidents

The following loss estimates were calculated based on regional data provided by the NOAA NCEI and FEMA NRI databases, adjusted by recorded population in Middlesex County and the Town of Acton.

Hazard	Methodology / Source	Annualized Losses for Acton, MA
Severe Winter Storms / Nor'easters	NCEI	$6,562.46
Severe Winter Storms / Nor'easters	NRI	$15,425.00

Both figures likely underestimate the true annual cost of preparing for and responding to winter storms, though it is reasonable to use the NRI figure as an annualized estimate of damages caused by such events.

4.5.2 Ice Storms

4.5.2.1 Hazard Overview

The ice storm category covers a range of different weather phenomena that collectively involve rain or snow being converted to ice in the lower atmosphere leading to potentially hazardous conditions on the ground.

4.5.2.2 Location

Ice storms have the potential to affect the entirety of the Commonwealth, including the Town of Acton.

4.5.2.3 Extent

The National Weather Service defines ice storms as a half inch of ice accretion across any location. Hail size typically refers to the diameter of the hailstones. Warnings and reports may report hail size through comparisons with real-world objects that correspond to certain diameters, as shown in Table 4-24.

Table 4-24: Hail Size Comparisons

Description	Diameter (inches)
Pea	0.25
Marble or mothball	0.50
Penny or dime	0.75
Nickel	0.88
Quarter	1.00
Half dollar	1.25
Walnut or ping pong ball	1.50
Golf ball	1.75
Hen's egg	2.00
Tennis ball	2.50
Baseball	2.75
Tea cup	3.00
Grapefruit	4.00
Softball	4.50

4.5.2.4 Past Events

Ice storms of lesser magnitudes affect the Commonwealth at least annually, according to the 2023 SHMCAP. Town-specific data for previous ice storm occurrences are not collected by the Town of Acton. The best available local data is for Middlesex County through the National Centers for Environmental Information (See Table 4-25). Middlesex County, which includes the Town of Acton, experienced 54 events from 2000 to 2024.

Table 4-25: Middlesex County Ice Storm Events, 2000-2024

Date	Event	Magnitude	Damages	Date	Event	Magnitude	Damages
7/18/2000	Hail	1	0	5/4/2010	Hail	0.75	0
6/20/2001	Hail	1.75	0	5/7/2011	Hail	0.75	0
7/12/2001	Hail	1.5	0	6/1/2011	Hail	0.75	0
5/27/2002	Hail	0.75	0	8/2/2011	Hail	0.75	0
6/2/2002	Hail	0.75	0	8/19/2011	Hail	0.75	0
8/13/2003	Hail	0.75	0	3/13/2012	Hail	1.25	0
7/2/2004	Hail	0.75	0	3/14/2012	Hail	1	0
8/20/2004	Hail	0.88	$75,000	6/23/2012	Hail	0.75	0
5/21/2006	Hail	0.75	0	7/18/2012	Hail	1	0
7/11/2006	Hail	1	0	10/30/2012	Hail	1	0
7/28/2006	Hail	0.75	0	6/17/2013	Hail	0.75	0
6/5/2007	Hail	1.25	0	5/25/2014	Hail	0.75	0
6/22/2007	Hail	0.75	0	7/3/2014	Hail	1	0

Date	Event	Magnitude	Damages	Date	Event	Magnitude	Damages
7/9/2007	Hail	1	0	8/7/2014	Hail	0.75	0
7/28/2007	Hail	0.88	0	9/6/2014	Hail	0.88	0
6/23/2008	Hail	0.75	0	8/4/2015	Hail	1	0
6/24/2008	Hail	0.75	0	8/15/2015	Hail	0.75	0
7/1/2008	Hail	0.88	$250	7/23/2016	Hail	.75	0
7/2/2008	Hail	0.75	0	6/27/2017	Hail	1.00	0
8/3/2008	Hail	0.75	0	8/2/2017	Hail	.75	0
8/7/2008	Hail	1	0	6/22/2019	Hail	0.75	0
8/10/2008	Hail	0.75	0	6/29/2019	Hail	0.75	0
5/24/2009	Hail	1	0	6/6/2020	Hail	1	0
6/27/2009	Hail	0.88	0	6/28/2020	Hail	1	0
7/7/2009	Hail	0.75	0	7/30/2020	Hail	0.75	0
7/8/2009	Hail	1.75	0	8/23/2020	Hail	1	0
				6/2/2023	Hail	0.75	0

*Magnitude refers to diameter of hail stones in inches

Source: NOAA, National Centers for Environmental Information

4.5.2.5 Potential Impacts

While ice pellets and sleet are examples of ice storms, the greatest hazard is created by freezing rain conditions, which is rain that freezes on contact with hard surfaces leading to a layer of ice on roads, walkways, trees, and other surfaces. The conditions created by freezing rain can make driving particularly dangerous and emergency response more difficult. The weight of ice on tree branches can also lead to falling branches damaging electric lines.

4.5.3 Probability of Future Events and Impacts of Climate Change

It is unclear how climate change will influence the frequency of severe winter storms, including heavy snow, blizzards, nor'easters, and ice storms, in Massachusetts. Extreme precipitation events are anticipated to occur more often as the climate changes; however, the rising temperatures driving climate change mean that precipitation is likely to fall as rain rather than snow.

There is limited evidence for the relationship between climate change and frequency of snowstorms, but it is anticipated that climate change will likely increase the intensity of winter storms, according to the 2023 SHMCAP. The rising ocean temperatures will cause fronts moving north over the ocean to hold more moisture, therefore, when the front meets cold air systems, a larger amount of precipitation will be anticipated to fall across the Commonwealth. The warming ocean water and atmosphere will provide fuel for winter storms. The 2023 SHMCAP notes that research suggests warmer weather in the Artic is producing changes in circulation patterns, favoring the development of winter storms in the Northeast. As temperatures rise, nor'easter events may be more concentrated in the winter months when atmospheric temperatures are low enough to produce snowfall rather than rain.

It is anticipated that climate change will increase the intensity of nor'easter events. As temperatures rise, nor'easter events may be more concentrated in the winter months when atmospheric temperatures are low enough to produce snowfall rather than rain.

4.6 Geologic Hazards

Geologic hazards include earthquakes, landslides, sinkholes, subsidence, and unstable soils such as fill, peat, and clay. Town officials did not identify any problems with areas of geologic instability, such as sinkholes or subsidence, but the Local Hazard Mitigation Plan Team noted specific vulnerabilities related to geologic hazards include localized road closures and damage to buildings, transportation systems, and critical infrastructure. Although new construction under the most recent building codes generally will be built to seismic standards, there are still many structures in town which pre-date the most recent building code.

4.6.1 Earthquakes

4.6.1.1 Hazard Overview

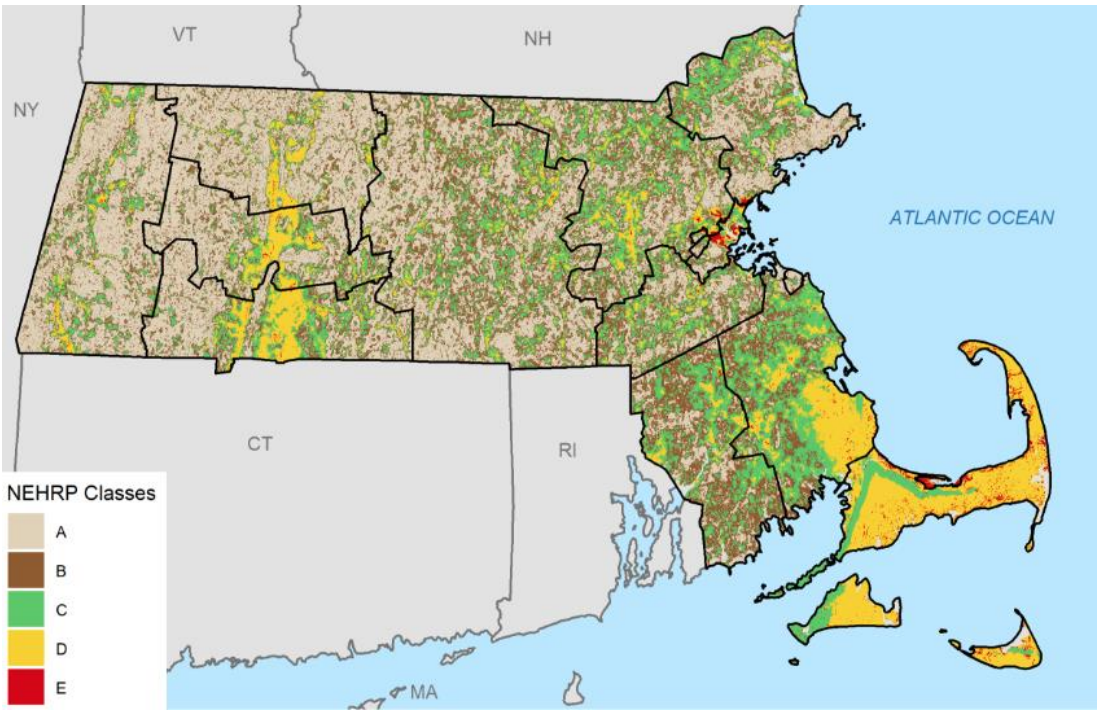
Damages in an earthquake stem from ground motion, surface faulting, and ground failure in which weak or unstable soils, such as those composed primarily of saturated sand or silts, liquefy. Ground shaking and liquefaction resulting from earthquakes are the primary causes of damage. The effects of an earthquake are mitigated by distance and ground materials between the epicenter and a given location.

4.6.1.2 Location

An earthquake in New England affects a much wider area than a similar earthquake in California due to New England's solid bedrock geology (NESEC).

Figure 4-8: below shows a seismic site classification map for Massachusetts included in the 2023 SHMCAP. The map uses the soil types and classification system defined by the National Earthquake Hazards Reduction Program (NEHRP). The system ranges from A to E. A represents hard rock that reduces ground motions from an earthquake. E represents soft soils, which have higher potential to amplify and magnify ground shaking from earthquake events.

Figure 4-8: Massachusetts Seismic Site Classification Map



Source: 2023 SHMCAP

According to the 2023 SHMCAP, USGS seismic hazard maps show that Massachusetts has a low to moderate level of hazard compared to other areas of the country; however, in addition to earthquakes originating within the Commonwealth, earthquakes in other parts of New England can affect widespread areas including Massachusetts.

4.6.1.3 Extent

Seismologists use a magnitude scale known as the Richter scale to express the seismic energy released by each earthquake (See Table 4-26). The typical effects of earthquakes in various ranges are summarized below:

Table 4-26: Richter Scale and Effects

Richter Magnitudes	Earthquake Effects
Less than 3.5	Generally not felt, but recorded
3.5- 5.4	Often felt, but rarely causes damage
Under 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 km. across where people live.
7.0- 7.9	Major earthquake. Can cause serious damage over larger areas.
8 or greater	Great earthquake. Can cause serious damage in areas several hundred meters across.

Source: Nevada Seismological Library (NSL), 2005

4.6.1.4 Past Events

New England experiences an average of five earthquakes per year. From 2007 to 2022, over 1,800 earthquakes have been recorded in New England and adjacent areas during the 15-year observation period (NESEC). Most have originated from the La Malbaie fault in Quebec or from the Cape Anne fault located off the coast of Rockport. On April 22, 2024, an earthquake with a magnitude of 4.8 and an epicenter in Lebanon, New Jersey was felt in many communities across New England. There was no reported damage in Acton.

The region has experienced larger earthquakes in the distant past, including a magnitude 5.0 earthquake in 1727 and a 6.0 earthquake that struck in 1755 off the coast of Cape Anne. More recently, a pair of damaging earthquakes occurred near Ossipee, NH in 1940. A 4.0 earthquake centered in Hollis, Maine in October 2012 was felt in the Boston area.

Historic records of some of the more significant earthquakes in the region are shown below in Table 4-27.

Table 4-27: Earthquakes in Massachusetts or Surrounding Area (1963-2024)

Location	Date	Magnitude
MA – Somerville	10/16/1963	NA
MA – Nantucket	10/25/1965	NA
MA – Nantucket	4/12/2012	4.5
ME – Hollis	10/17/2012	4.0
MA – New Bedford	11/8/2020	3.6
NJ – Lebanon	4/22/2024	4.8

Source: 2023 MA State Hazard Mitigation and Climate Adaptation Plan and recent occurrences

4.6.1.5 Potential Impacts

Although New England has not experienced a damaging earthquake since 1755, seismologists state that a serious earthquake occurrence is possible. There are five seismological faults in Massachusetts, but there is no discernible pattern of previous earthquakes along these fault lines. Earthquakes occur without warning and may be followed by aftershocks. The majority of older buildings and infrastructure were constructed without specific earthquake resistant design features.

Earthquakes are a hazard with multiple impacts beyond the obvious building collapse. Buildings may suffer structural damage which may or may not be readily apparent. Earthquakes can cause major damage to roadways, making emergency response difficult. Water lines and gas lines can break, causing flooding and fires. Another potential vulnerability is equipment within structures. For example, a hospital may be structurally engineered to withstand an earthquake, but if the equipment inside the building is not properly secured, the operations at the hospital could be severely impacted during an earthquake. Earthquakes can also trigger landslides.

According to a 1994 USGS report cited in the 2023 SHMCAP, the estimated probability of a 5.0 or greater earthquake centered somewhere in New England during a 50-year period is 41 to 56 percent. Larger earthquakes in the Commonwealth and New England area have a lower probability of occurrence, however, since the risk of damage from a moderate earthquake is relatively high, the 2023 SHMCAP states that an accurate classification of earthquake risk is “high impact, low probability”. Earthquakes are a potential town-wide hazard in Acton.

Much of the development in town pre-dates the current building code and could be vulnerable in the event of a severe earthquake. Potential earthquake damages to Acton have been estimated based on regional data provided by the FEMA NRI database. The data has been adjusted by recorded populations in Middlesex County and the Town of Acton.

Hazard	Methodology / Source	Annualized Losses for Acton, MA
Earthquake	NRI	$145,085

The following table displays the loss estimates for Middlesex County provided by the 2023 SHMCAP based on various HAZUS-MH Probabilistic Scenarios.

Impact	100-Year MRP	500-Year MRP	1000-Year MRP	2500-Year MRP
Building-Related Economic Loss Estimate	$1,569,000	$356,855,000	$1,264,668,00	$4,946,490,000
Transportation and Utility Loss Estimates	$164,000	$8,099,000	$23,697,000	$70,533,000

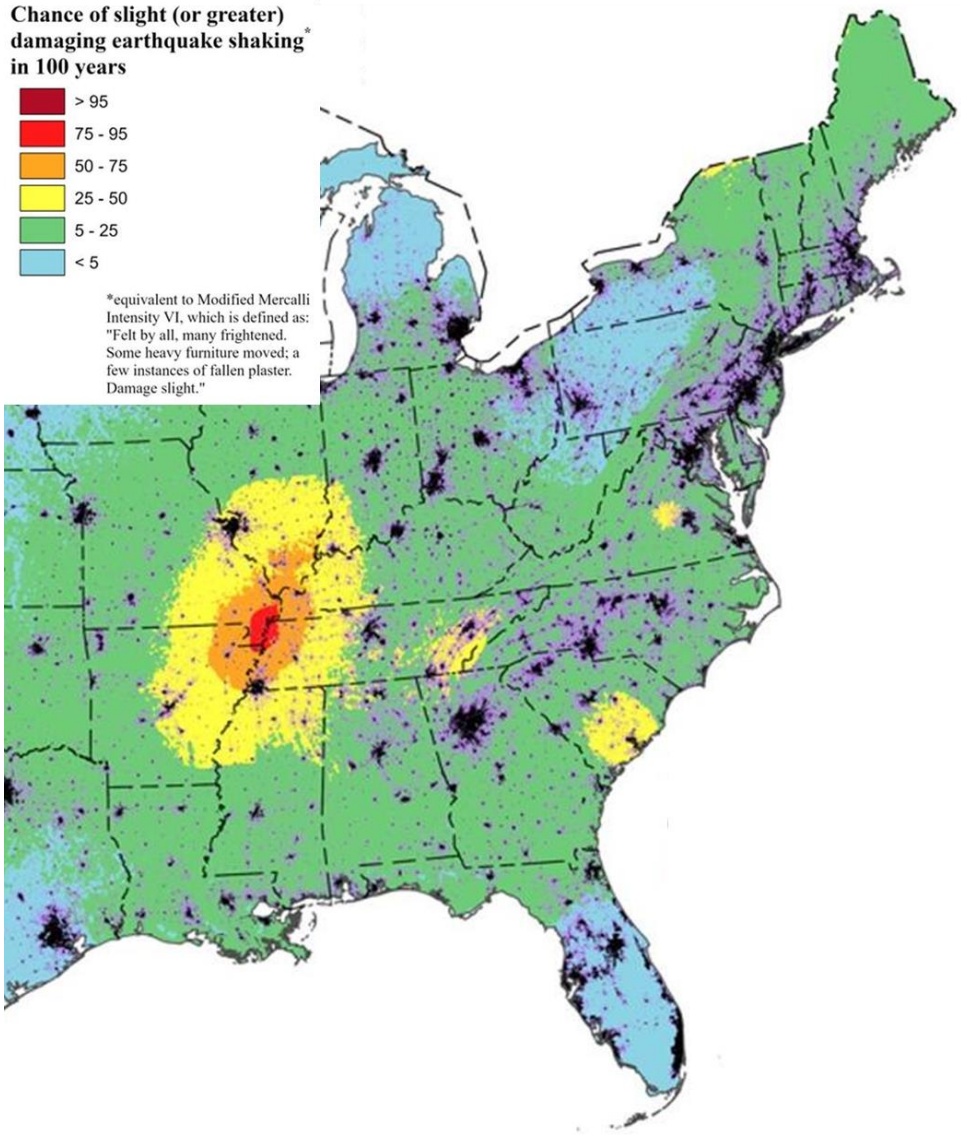
Based on the figures above, it is reasonable to plan around an annualized lost estimate from earthquakes of around $150,000.

4.6.1.6 Probability of Future Events and Impacts of Climate Change

One measure of earthquake risk is ground motion, which is measured as maximum peak horizontal acceleration, expressed as a percentage of gravity (%g). The range of peak ground acceleration in Massachusetts is from 10 %g to 20 %g, with a 2% probability of exceedance in 50 years. Acton is in the middle part of the range for Massachusetts, at 14 %g to 16 %g, making it a relatively moderate area of earthquake risk within the state, although the state is considered to have a low risk of earthquakes compared to the rest of the country.

Figure 4-9: , below, shows the likelihood of a damaging earthquake occurring at any location across the eastern united states. Acton falls within the 5-25% likelihood range.

Figure 4-9: Chance of Damaging Earthquake Shaking in 100 Years



Source: USGS National Seismic Hazard Model (2023)

The 2023 SHMCAP emphasizes that currently there is no consensus on the effects of climate change on the frequency and severity of earthquakes. According to some reports, sea level rise and its associated impact on coastal groundwater levels may increase areas exposed to liquefaction risk. Similar studies have considered the impacts of extreme precipitation.

4.6.2 Landslides

4.6.2.1 Hazard Overview

According to the U.S. Geological Survey, “The term landslide includes a wide range of ground movement, such as rock falls, deep failure of slopes, and shallow debris flows. Although gravity acting on an over steepened slope is the primary reason for a landslide, there are other

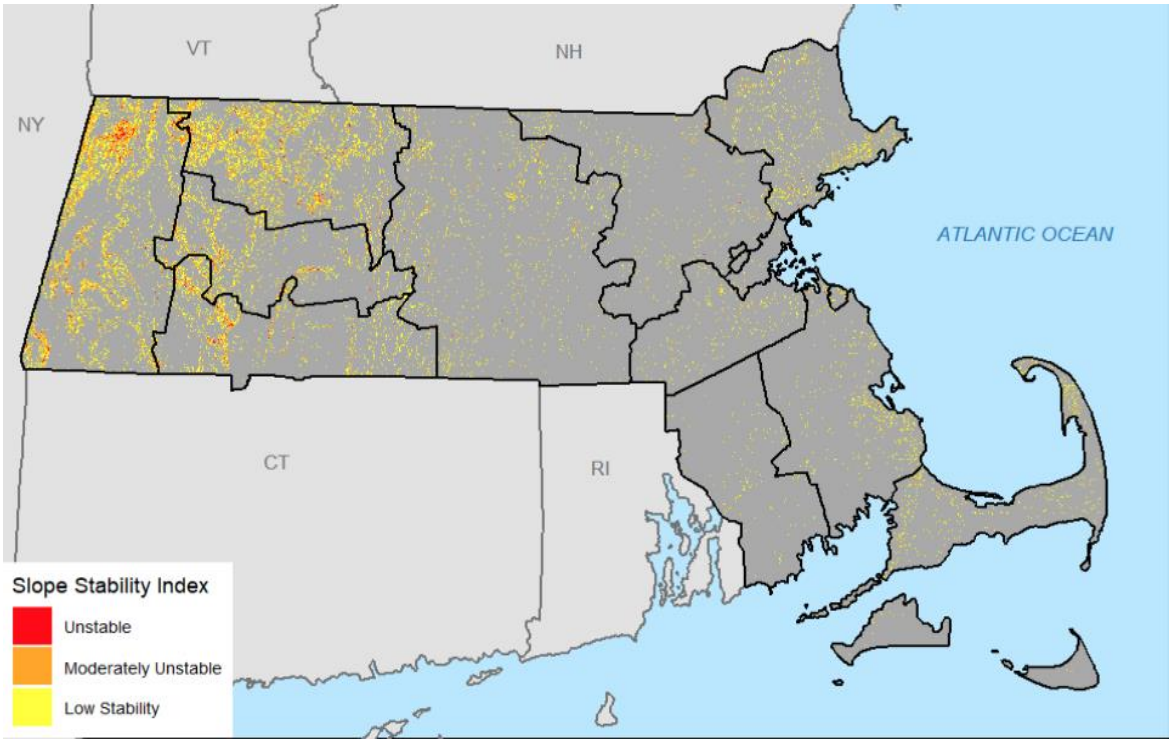
contributing factors." Among the contributing factors are: erosion by rivers or ocean waves over steepened slopes; rock and soil slopes weakened through saturation by snowmelt or heavy rains; earthquake created stresses that make weak slopes fail; excess weight from accumulation of rain or snow; and stockpiling of rock or ore from waste piles or man-made structures. Areas in the Commonwealth with steep sloops, persistent wet conditions, or saturated soils are most at risk.

Landslides can result from human activities that destabilize an area, or as a secondary impact from another natural hazard, such as flooding. In addition to structural damage to buildings and the blockage of transportation corridors, landslides can lead to sedimentation of water bodies. Typically, a landslide occurs when the condition of a slope changes from stable to unstable. Natural precipitation such as heavy snow accumulation, torrential rain, and run-off may saturate soil, creating instability enough to contribute to a landslide. A lack of vegetation and root structure that normally stabilize soil can destabilize hilly terrain.

4.6.2.2 Location

The 2023 SHMCAP includes a thorough landslide and mudflow analysis and presents the 2013 Slope Stability Map of Massachusetts, displayed in Figure 4-10. The data offers the most up-to-date information for the Commonwealth and is intended to guide identification of areas prone to slope instability. Map X displays the slope stability index at the municipal scale for Acton.

Figure 4-10: Slope Stability Map of Massachusetts



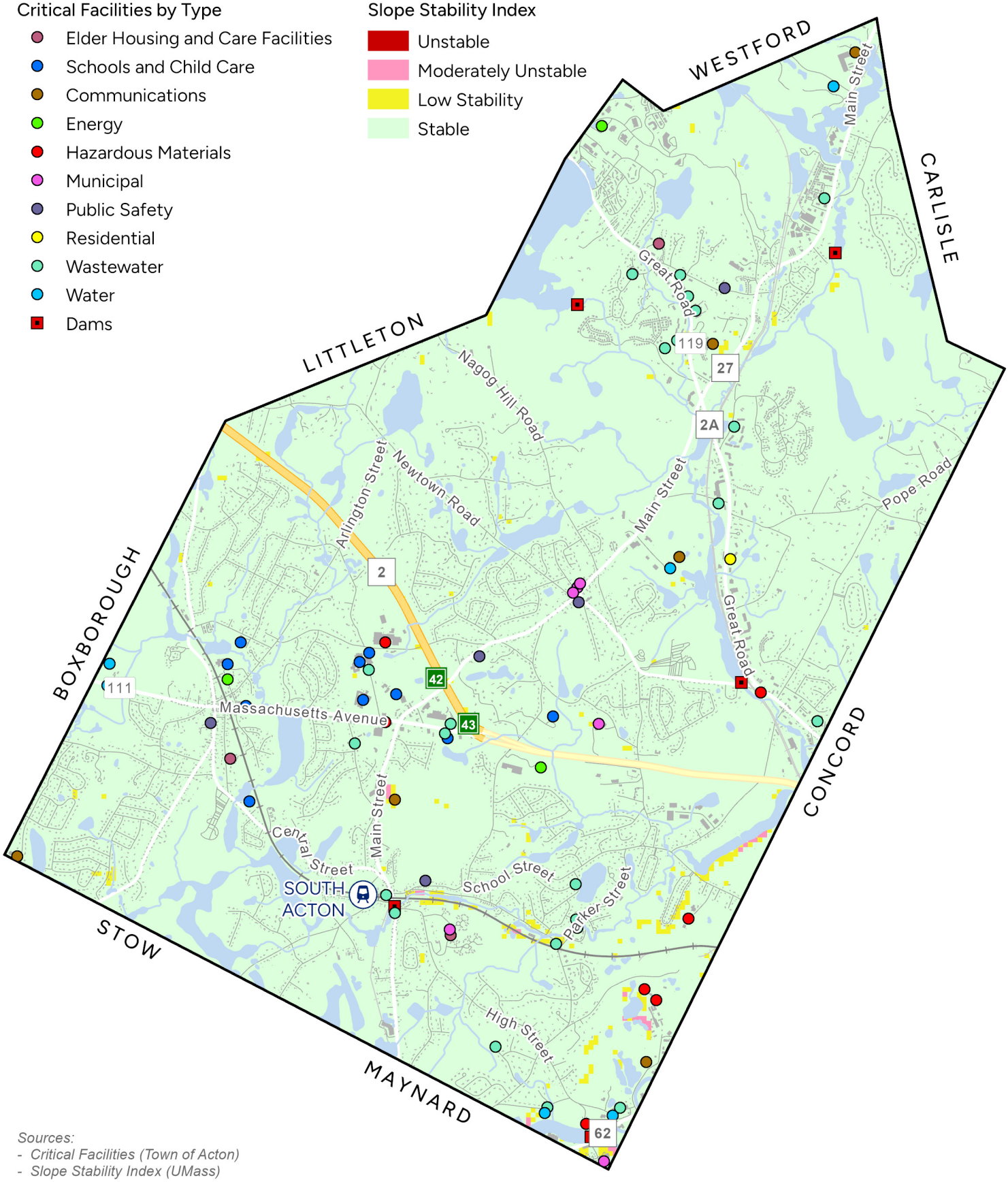
Source: 2023 SHMCAP

LANDSLIDES

SLR

Critical Facilities by Type
- Elder Housing and Care Facilities
- Schools and Child Care
- Communications
- Energy
- Hazardous Materials
- Municipal
- Public Safety
- Residential
- Wastewater
- Water
- Dams

Slope Stability Index
- Unstable
- Moderately Unstable
- Low Stability
- Stable



Sources:
- *Critical Facilities (Town of Acton)*
- *Slope Stability Index (UMass)*

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4.6.2.3 Extent

There is no universally accepted measure of landslide extent, but it has been represented as a measure of the destructiveness. Table 4-28 below summarizes the estimated intensity for a range of landslides. Fast moving rock falls have the highest intensity while slow moving landslides have the lowest intensity.

Table 4-28: Landslide Volume and Velocity

Estimated Volume (m^3)	Expected Landslide Velocity		
	Fast moving (rock fall)	Rapid moving (debris flow)	Slow moving (slide)
<0.001	Slight intensity	--	--
<0.5	Medium intensity	--	--
>0.5	High intensity	---	--
<500	High intensity	Slight intensity	--
500-10,000	High intensity	Medium intensity	Slight intensity
10,000 – 50,000	Very high intensity	High intensity	Medium intensity
>500,000	--	Very high intensity	High intensity
>>500,000	--	--	Very high intensity

Source: A Geomorphological Approach to the Estimation of Landslide Hazards and Risks in Umbria, Central Italy, M. Cardinali et al, 2002

4.6.2.4 Past Events

Acton has been classified as having a low risk for landslides. Local officials did not identify any significant issues related to landslides.

Historical landslide data and hazard description in the 2023 SHMCAP demonstrate that landslides in the Commonwealth tend to be isolated in size and place linear systems and networks, including roadways, utilities, and highways, at risk. Landslides commonly occur shortly after other major natural disasters, such as earthquakes and floods.

4.6.2.5 Potential Impacts

Should a landslide occur in the future, the type and degree of impacts would be highly localized. The town's vulnerabilities could include damage to structures, damage to transportation and other infrastructure, and localized road closures. Injuries and casualties, while possible, would be unlikely given the low extent and impact of landslides in Acton. Based on past occurrences and the 2023 SHMCAP, landslides commonly occur shortly after other major disasters, such as extreme precipitation, earthquakes, or flood events.

4.6.2.6 Probability of Future Events and Impacts of Climate Change

Climate change will have consequences on the duration and intensity of precipitation events, wildfires, and drought. This may increase the frequency of landslide and the areas at risk to landslides.

4.7 Extreme Temperatures

Extreme temperatures occur when either high temperature or low temperatures relative to average local temperatures occur. These can occur for brief periods of time and be acute, or they can occur over long periods of time where there is a long stretch of excessively hot or cold

weather. Extreme temperatures, in addition to being the leading cause of weather-related mortality in the U.S., can affect municipal operations and critical facilities, degrading materials for infrastructure systems.

Acton has four well-defined seasons. The seasons have several defining factors, with temperature one of the most significant. Extreme temperatures can be defined as those that are far outside of the normal seasonal ranges for Massachusetts. The average high and lows of the hottest and coldest months in Massachusetts are displayed in Table 4-29.

Table 4-29: Annual Average High and Low Temperatures in Massachusetts (Fahrenheit)

Metric	July (hottest month)	January (coldest month)
Average High (°F)	81.5°	34.3°
Average Low (°F)	61.1°	16.9°

Source: 2023 SHMCAP (Average 2000-2020 daily gridded temperature records).

Extreme temperatures in the Commonwealth, both cold and hot weather events, are defined by the 2023 SHMCAP as an event with very high likelihood and a warning time of 1-5 days. Extreme temperatures are also considered a town-wide hazard with very high consequences for the human and natural environment sectors and medium consequences in the economic sector.

The following loss estimates due to extreme temperature conditions, both extreme cold and extreme heat, were calculated based on regional data provided by the FEMA NRI databases. The regional annualized loss estimates were adjusted by recorded populations in Middlesex County and the Town of Acton. Loss estimates for drought are calculated separately and presented in 4.7.3.5.

Hazard	Methodology / Source	Annualized Losses for Acton, MA
Extreme Temperature	NRI	$18,557

Additional information about extreme heat and extreme cold is provided below.

4.7.1 Extreme Cold

4.7.1.1 Hazard Overview

Extreme cold is defined as an event where temperatures drop well below normal in a given area. Extremely cold temperatures are often associated with winter storms, which may cause power outages and access challenges due to icy conditions.

4.7.1.2 Location

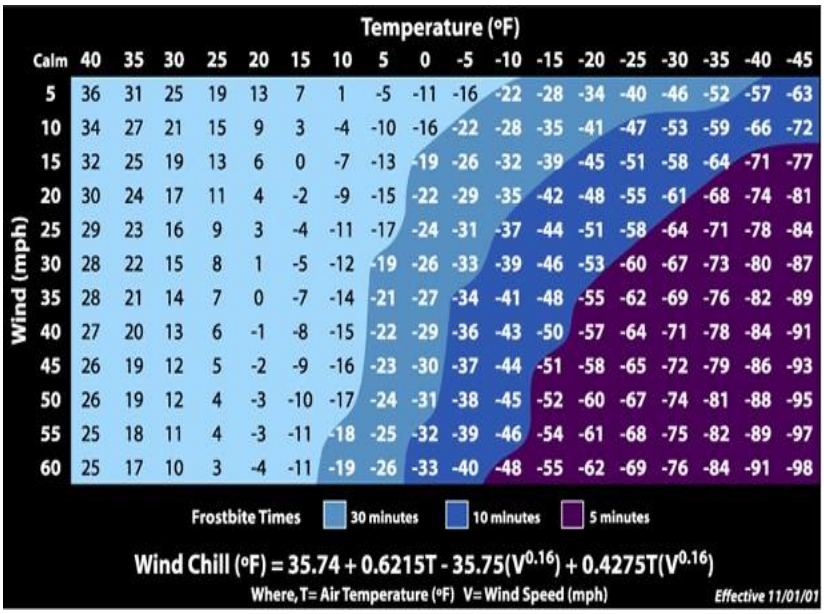
Since extreme temperature event more frequently and vary more in the inland region of the Commonwealth where temperatures are not moderated by the ocean, Acton is believed to be in a location of risk for extreme temperature conditions. The 2023 SHMCAP defines extreme temperatures as a hazard with multi-state geographic impact.

4.7.1.3 Extent

For extreme cold, temperature is typically measured using the Wind Chill Temperature Index, which is provided by the National Weather Service (NWS). The latest version of the index was implemented in 2001 and is meant to show how cold conditions feel on unexposed skin. Extended exposure to low temperatures leads to frostbite, hypothermia, and even death in

severe cases. NWS issues a Wind Chill Advisory if the index is forecast to drop between -15°F to -25°F for at least three hours. The index is provided in Figure 4-11 below.

Figure 4-11: Wind Chill Temperature Index and Frostbite Risk



Source: National Weather Service

4.7.1.4 Past Events

The Town of Acton does not collect data for previous occurrences of extreme cold. The best available data is for Middlesex County, which includes the Town of Acton, through the NCEI (See Table 4-30).There are three extreme cold events on record since 2000 for the county, which caused no deaths, no injuries, or property damage.

Table 4-30: Middlesex County Extreme Cold and Wind Chill Occurrences (2000-2024)

Date	Deaths	Injuries	Damage
2/15/2015	0	0	0
2/16/2015	0	0	0
2/14/2016	0	0	0

Source: NOAA, National Centers for Environmental Information

4.7.1.5 Potential Impacts

The greatest danger from extreme cold is prolonged exposure that may lead to frostbite or hypothermia, and can be life threatening. Extreme cold events pose a significant threat to utilities and built infrastructure. Increased demand for heating places a strain on the heating system and utility services in the area, which may cause power outages. Additionally, extreme cold may result in frozen pipes. Broken pipes may cause flooding in buildings or cause property damage.

4.7.1.6 Probability of Future Events and Climate Change Impacts

Climate change projections display a reduction in extreme cold events in the Commonwealth. As the climate warms, extreme cold events are expected to occur less often and become less severe. Table 4-9 and Table 4-10 in 4.1.2.2 include projections for extreme cold conditions in Massachusetts published in the 2023 ResilientMass database.

4.7.2 Extreme Heat

4.7.2.1 Hazard Overview

Extreme heat is a dangerous situation that can result in health emergencies or susceptible and vulnerable people, including those without shelter or those who live in homes that are poorly insulated or lack adequate cooling.

4.7.2.2 Location

Since extreme temperature event more frequently and vary more in the inland region of the Commonwealth where temperatures are not moderated by the ocean, Acton is believed to be in a location of risk for extreme temperature conditions. The 2023 SHMCAP defines extreme temperatures as a hazard with multi-state geographic impact. Heat impacts can be particularly significant in urban areas as buildings, roads, and other built infrastructure more readily absorb energy from the sun compared to natural resources such as open land and vegetation. Variation in heat vulnerability index across the Town is displayed in Map 2 on the following page.

4.7.2.3 Extent

A heat wave in Massachusetts is defined as three or more consecutive days above 90°F. Another measure used for identifying extreme heat events is through a Heat Advisory from the NWS. These advisories are issued when the heat indices are between 95°F and 99°F for two or more hours over two consecutive days, or indices exceed 100°F for two or more hours over one day; an excessive heat advisory is issued if the forecast predicts the temperature to rise above 105°F for two of more hours. The NWS heat index, shown in

Figure 4-12, is based on temperature and relative humidity. These values are used to describe the temperature equivalent to what someone would feel at baseline humidity levels.

Figure 4-12: Heat Index

Relative Humidity (%) \ Temperature (°F)	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.

Source: National Weather Service

HEAT VULNERABILITY INDEX

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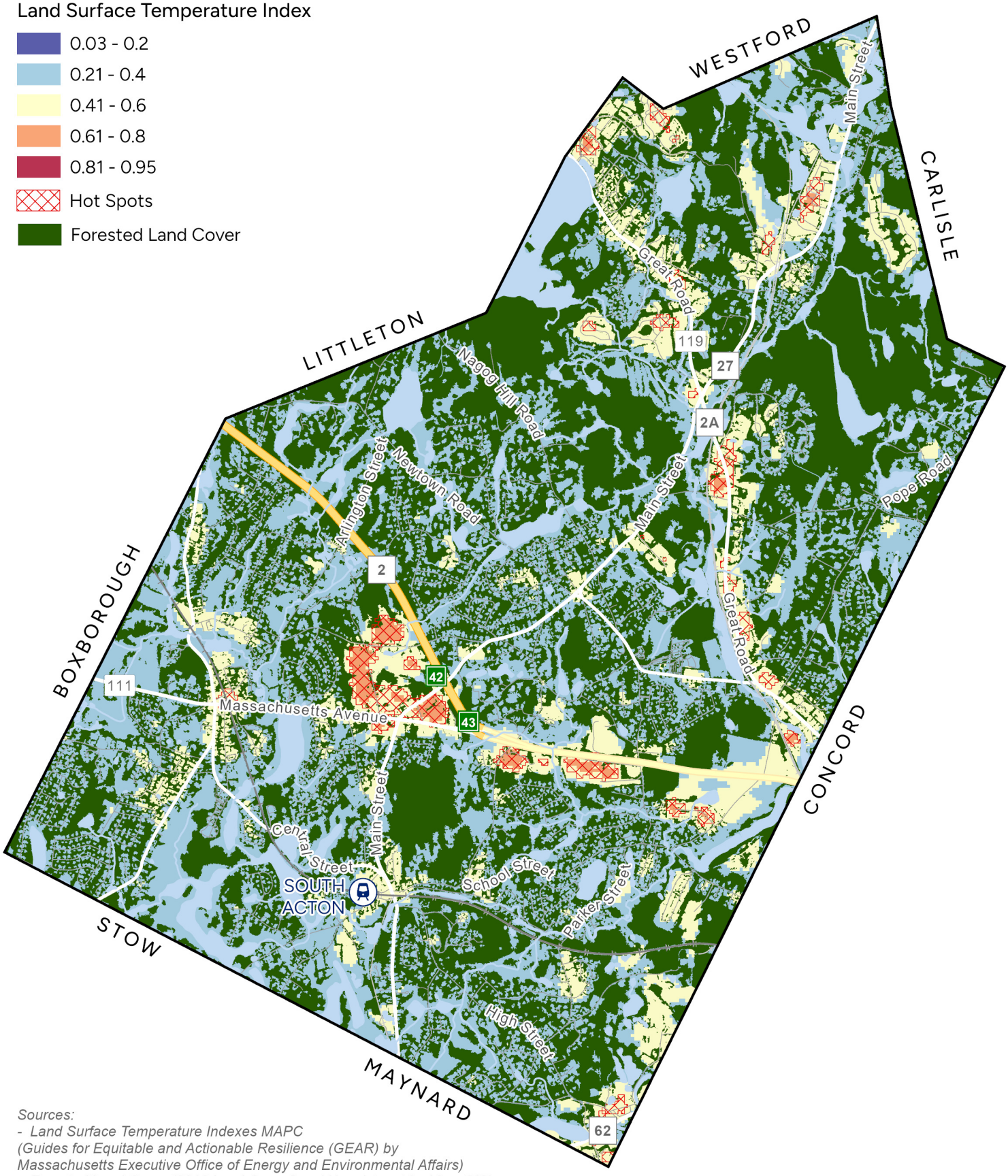

Sources:
- *Land Surface Temperature Indexes MAPC (Guides for Equitable and Actionable Resilience (GEAR) by Massachusetts Executive Office of Energy and Environmental Affairs)*
- *Forested Land Cover (2016 Land Cover/Land Use dataset by MassGIS)*

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4.7.2.4 Past Events

The Town of Acton does not collect data on excessive heat occurrences. The best available local data is for Middlesex County, which includes the Town of Acton, through the NCEI. Since 2000, there has been one excessive heat day, which did not result in injury, death, or property damage (see Table 4-31).

Table 4-31: Middlesex County Extreme Heat Occurrences (2000-2024)

Date	Deaths	Injuries	Damage ($)
7/6/2010	0	0	0
7/05/2013	0	0	0
Total	**0**	**0**	**0**

Source: NOAA, National Climatic Data Center

Given recent extreme heat events, the NCEI dataset is likely missing important heat impacts.

4.7.2.5 Potential Impacts

Exposure to direct sun, as well as strong with very hot, dry air can increase the risk of heat-related impacts. Extreme heat poses a potentially greater risk to the elderly, children, and people with certain medical conditions, such as heart disease. However, even young and healthy individuals can succumb to heat if they participate in strenuous physical activities during hot weather. Hot summer days can also worsen air pollution. High temperatures can increase the formation of ozone from volatile organic compounds and other aerosols. With increased extreme heat, urban areas of the northeast are likely to experience more days that fail to meet air quality standards.

4.7.2.6 Probability of Future Events and Climate Change Impacts

Climate change is projected to increase the number of extreme heat events and shift the annual average temperatures in the Commonwealth higher. As the climate warms, days above 90°F are anticipated to increase and the number of heatwaves, according to the IPCC, will increase.

The 2023 SHMCAP notes that these changes in temperature will likely influence habitat, vegetation, air quality, energy and water resources, and crop production. Increased air temperatures will also contribute to exacerbated extreme weather conditions and frequency, including flooding, drought, and wildfires. As Acton warms, the atmospheric capacity to hold moisture will decrease, resulting in increased precipitation.

Table 4-7 and Table 4-8 in 4.1.2.2 include projections for extreme heat conditions in Massachusetts published in the 2023 ResilientMass database.

4.7.3 Drought

4.7.3.1 Hazard Overview

Drought is a temporary irregularity in precipitation and differs from aridity since the latter is restricted to low rainfall regions and is a permanent feature of climate. Drought is a period characterized by long durations of below normal precipitation. Drought conditions occur in virtually all climatic zones, yet its characteristics vary significantly from one region to another since it is relative to the normal precipitation in that region. Drought can affect agriculture, water

supply, aquatic ecology, wildlife, and plant life. Drought conditions can cause a shortage of water for the public and reduce local firefighting capabilities.

In Massachusetts, droughts are caused by the prevalence of dry northern continental air and a decrease in coastal- and tropical-cyclone activity. During the 1960s, a cool drought occurred because dry air from the north caused lower temperatures in the springs and summers of 1962 through 1965. The northerly winds drove frontal systems to sea along the southeast coast and prevented the northeastern states from receiving moisture (U.S. Geological Survey). This is considered the record drought in Massachusetts modern history.

Average annual precipitation in Massachusetts is 44 inches per year, with approximately three to four-inch average amounts for each month of the year. In the driest calendar year (1965), the statewide precipitation total of 30 inches was only 68% of the average total.

4.7.3.2 Location

Although Massachusetts is relatively small, it has several distinct regions that experience significantly different weather patterns and react differently to the amounts of precipitation they receive. The DCR precipitation index divides the state into seven regions: Western, Central, Connecticut River Valley, Northeast, Southeast, Cape Cod, and Islands. Acton is in the Northeast region. Drought is considered a town-wide hazard in Acton and have the potential to impact the entirety of the community.

4.7.3.3 Extent

Five levels of drought have been developed to characterize drought severity: Normal (Level 0), Mild Drought (Level 1, formerly Advisory), Significant Drought (Level 2, formerly Watch), Critical Drought (Level 3, formerly Warning), and Emergency Drought (Level 4, formerly Emergency). These drought levels are based on the conditions of natural resources and are intended to provide information on the status of water resources. The levels provide a basic framework from which to take actions to assess, communicate, and respond to drought conditions. The drought levels are associated with specific state actions outlined in the Drought Management Plan. Drought levels are declared on a regional basis for each of the seven regions in Massachusetts. County by county or watershed-specific determinations may also be made.

The drought levels begin with a normal situation where data are routinely collected and distributed, move to heightened vigilance with increased data collection during a mild drought, and to increased assessment and proactive education during a significant drought. Water restrictions might be appropriate at the significant or critical drought levels, depending on the capacity of each individual water supply system. Level 3 indicates a severe situation and the possibility that an Emergency Drought may be necessary. An Emergency Drought is one in which mandatory water restrictions or use of emergency supplies become necessary. Drought levels are used to coordinate both state agency and local response to drought situations.

As dry conditions can have a range of different impacts, several drought indices are available to assess various impacts and collectively define drought levels. The state uses indices to determine the onset, end, and severity of droughts. The severity framework provides guidance for actions to assess, communicate, and respond to drought conditions. Massachusetts uses the following indices to determine the severity of a given drought or extended period of dry conditions:

1. Precipitation: Standard Precipitation Index is based on monthly precipitation totals

2. Streamflow: Early indication of impacts to rivers, streams, wetlands, and other riparian habitats
3. Groundwater: Information on drought impacts over longer periods of time
4. Lakes and impounds: Effects of drought on surface-water storage
5. Fire Danger: Keetch-Byram Drought Index indicates fire potential of organic material by assessing amount of precipitation required to saturate the top eight inches of soil
6. Evapotranspiration: Crop Moisture Index assesses short-term and current conditions of dryness or wetness relative to crop water needs

The indices are monitored on a weekly basis. Determinations regarding the end of a drought or reduction of the drought level focus on two key drought indicators: precipitation and groundwater levels. These two factors have the greatest long-term impact on stream flow, water supply, reservoir levels, soil moisture, and potential for forest fires.

4.7.3.4 Past Events

Acton does not collect data relative to drought events. Because drought tends to be a regional natural hazard, this plan references state data as the best available data for drought. The statewide scale is a composite of the seven regions in the state. Acton is located in the Northeast Region. Regional composite precipitation values are based on monthly values from six stations, and three stations in the smaller regions (Cape Cod, Islands, and Western regions).

Drought emergencies have been reached infrequently, with five events occurring in the period between 1850 and 2012: 1883, 1911, 1941, 1957, and 1965 to 1966. The drought period between 1965 and 1966 is viewed as the most severe drought to have occurred in modern times in Massachusetts because of its long duration.

Drought warning levels not associated with drought emergencies have occurred four times, in 1894, 1915, 1930, 1985, and 2016. Acton was under a Drought Warning from July to December 2016 (see Table 4-32). The July 2016 to April 2017 drought was the most significant drought in the Commonwealth since the 1960's, according to the Massachusetts Drought Management Plan. This drought event reached Level 3.

Table 4-32: Major Droughts in Massachusetts (1850-2024)

Date	Area Affected	Remarks
1929 – 1932	Statewide	10 to >50 year recurrence interval. Water-supply sources altered in 13 communities. Multistate.
		15 to >50 year recurrence interval. More severe in eastern and extreme western Massachusetts. Multistate.
1957 – 1959	Statewide	5 to 25 year recurrence interval. Record low water levels in observation wells, northeastern Massachusetts.
1961 – 1969	Statewide	35 to >50 year recurrence interval. Water-supply shortages common. Record drought. Multistate.
1980 – 1983	Statewide	10 to 30 year recurrence interval. Most severe in Ipswich and Taunton River basins; minimal effect in Nashua River basin. Multistate.
1958 – 1988	Housatonic River Basin	25 year recurrence interval. Duration and severity unknown. Streamflow showed mixed trends elsewhere.

Date	Area Affected	Remarks
Dec 2001 – Jan 2003	Statewide	Level 2 drought was reached statewide for several months
Oct 2007 – Mar 2008	CT River Valley, Central, Northeast, Southeast	Level 1 drought
Aug 2010 – Nov 2010	Connecticut River Valley, Central and Northeast	Level 1 drought
July 2016 – Apr 2017	Statewide	Level 3 drought. Drought declaration began in June 2016 with a Drought Watch which was upgraded to a Drought Warning in August 2016. The Central and Northeast regions were the most severely affected.
May 2020 – Oct 2020	Statewide	Level 2 drought in all regions, except the Southeast, Charles basin (Northeast), and Millers basin (Central) at Level 3
Feb 2021 – Oct 2021	Statewide	Level 1 in all affected regions except the Southeast at Level 2
Apr 2022 – Jan 2023	Statewide	Cape Cod, Northeast, Southeast, Central, and Connecticut River Valley

Source: 2023 Massachusetts Drought Management Plan

4.7.3.5 Potential Impacts

Under a severe long-term drought, the Town of Acton could be vulnerable to restrictions on water supply. Potential damages of a severe drought could include losses of landscaped areas if outdoor watering is restricted and potential loss of business revenues if water supplies were severely restricted for a prolonged period. As this hazard has never occurred to such a severe degree in Acton, there are no data or estimates of potential damages, but under a severe long term drought scenario it would be reasonable to expect a range of potential damages from several million to tens of millions of dollars. Another potential vulnerability of droughts could be increased risk of wildfires.

Potential drought damages to Acton have been estimated based on regional data provided by the FEMA NRI database. The data has been adjusted by recorded populations in Middlesex County and the Town of Acton.

Hazard	Methodology / Source	Annualized Losses for Acton, MA
Drought	NRI	$43,019

4.7.3.6 Probability of Future Events and Impacts of Climate Change

The state has experienced emergency droughts five times between 1850 and 2024. Even though regional drought conditions may occur at a different interval than state data indicates, droughts remain primarily regional and state phenomena in Massachusetts. Drought conditions in the Commonwealth are an event with medium likelihood and a warning time of more than 1 week, according to the 2023 SHMCAP.

Droughts are caused by conditions of high evapotranspiration and low precipitation. Rising temperatures and changes in precipitation patterns, which are anticipated consequences of

increasing global GHG emissions and climate change, are expected to increase the length, frequency, and intensity of droughts. The projected values for precipitation and temperatures trends implies reduced snowpack in the Commonwealth. This may affect water availability and groundwater recharge.

According to the 2023 SHMCAP, the likely range of consecutive dry days per year is projected to increase by up to 33 days per year by 2090, compared to reported annual, statewide average baseline of 31 days from 1986 to 2005.

4.7.4 Fire-Related Hazards

4.7.4.1 Hazard Overview

A brush fire is an uncontrolled fire occurring in a forested or grassland area. In the Boston Metro region these fires rarely grow to the size of a wildfire, as seen more typically in the western U.S. As their name implies, brush fires typically burn no more than the underbrush of a forested area.

Wildfire season can begin in March and usually ends in late November. Most wildfires typically occur in April and May, when most vegetation is void of any appreciable moisture, making them highly flammable. Once "green-up" takes place in late May to early June, the fire danger usually is reduced somewhat.

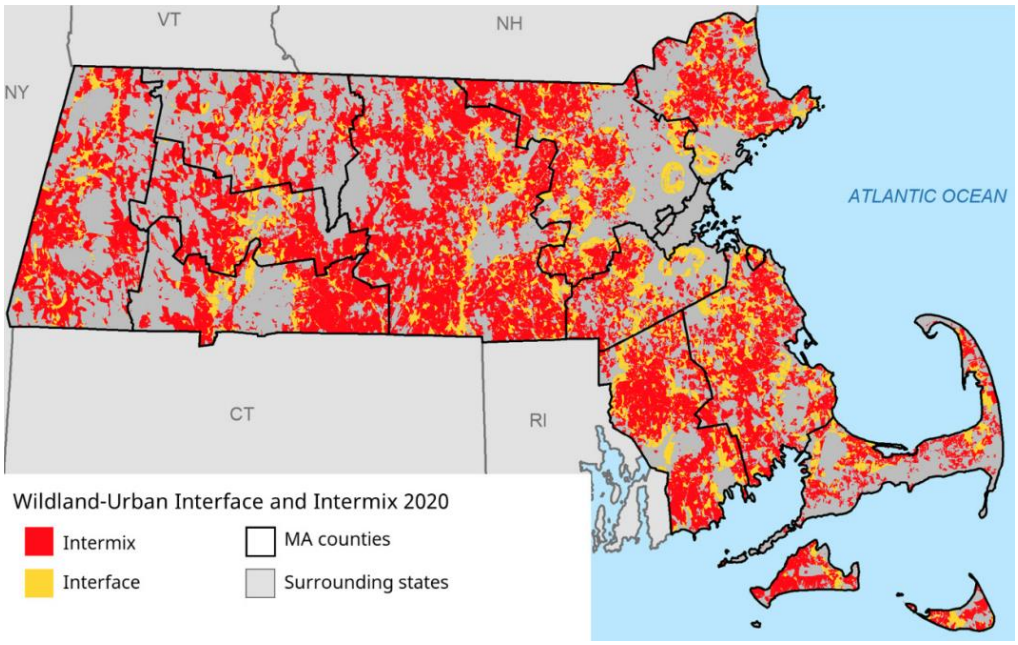
A wildfire differs greatly from other fires by its extensive size, the speed at which it can spread out from its original source, its potential to unexpectedly change direction, and its ability to jump gaps such as roads, rivers, and fire breaks.

These fires can present a hazard where there is the potential for them to spread into developed or inhabited areas, particularly residential areas where sufficient fuel materials might exist to allow the fire the spread into homes. Protecting structures from fire poses special problems and can stretch firefighting resources to the limit. If heavy rains follow a fire, other natural disasters can occur, including landslides, mudflows, and floods. If the wildfire destroys the ground cover, then erosion becomes one of several potential problems.

4.7.4.2 Location

Areas that are susceptible to fire-related hazards are those located at the wildland-urban interface (WUI). Roughly 65-percent of the land base in the Commonwealth is characterized as WUI, displayed in Figure 4-13. WUI, as defined in the 2023 SHMCAP, is the line, area, or zone where structures and other human development meet undeveloped wildland or vegetative fuels. These areas are at an increased risk of wildfire damage. A high percentage of WUI means that small fires pose a significant risk to residents and structures.

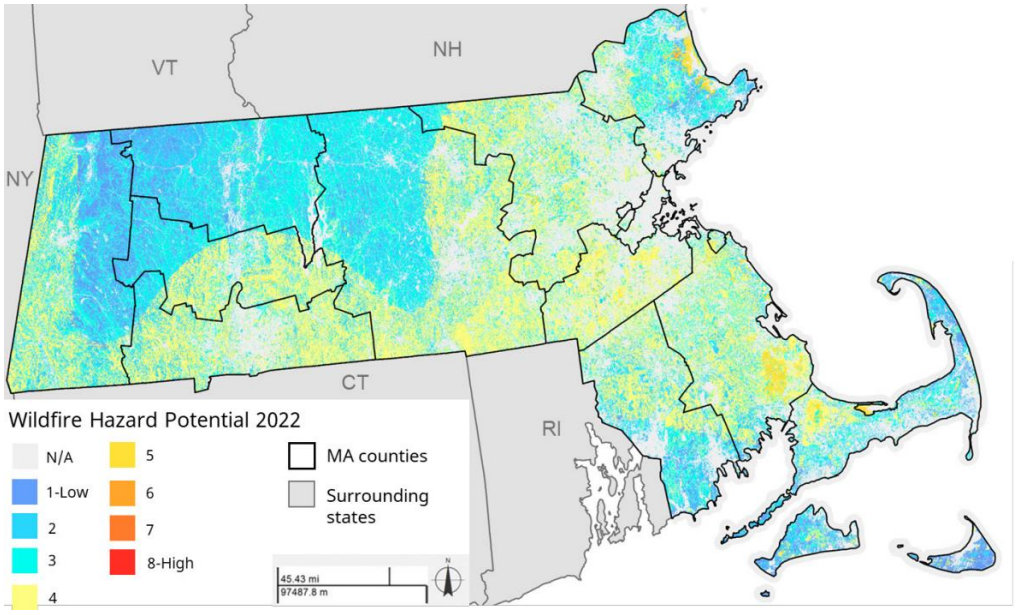
Figure 4-13: Wildland-Urban Interface for the Commonwealth of Massachusetts



Source: 2023 SHMCAP

Town of Acton is located in an area of WUI interface and intermix, and the wildfire potential, displayed in Figure 4-14, ranges from low to medium.

Figure 4-14: Wildfire Hazard Potential for Massachusetts



Source: 2023 SHMCAP

4.7.4.3 Extent

Fires can be classified by physical parameters, including fireline intensity, the rate of energy per unit length of the fire front, or total heat release. Additionally, fires can be described by the following three classes of wildfires:

- Surface fires are the most common type and burn along the floor of a forest, moving slowly and killing or damaging trees
- Ground fires are usually started by lightning and burn on or below the forest floor
- Crown fires spread rapidly by wind, jumping along the tops of trees

Early detection is a key part of effective response to fire hazards and managing the spread.

4.7.4.4 Past Events

No wildfires in Massachusetts have resulted in disaster declaration. Wildfires in the Commonwealth tend to be around five acres in size.

The most accurate and recent wildfire data for the Commonwealth is available starting in 2017 and is reported in the 2023 SHMCAP. Based on this data, 1,027 fires had burned 2,716 acres in 2022. Table 4-33 captures the wildfire occurrence in Middlesex County from 2017-2022.

Table 4-33: Fire Occurrences in MA by County, 2017-2022

County	2017	2018	2019	2020	2021	2022
Middlesex	35	87	69	293	265	96

Source: Massachusetts Department of Conservation and Recreation

Based on past occurrences and the risk assessment included in the 2023 SHMCAP, brushfires are a medium frequency hazard in Massachusetts. According to local officials, natural fires in Acton are not a significant issue. The town sees several brush fires annually, but these fires do not usually cause property damage or injuries. It is important, however, to remember that fire can also be a result of other events such as from the aftermath of an earthquake.

4.7.4.5 Potential Impacts

Potential damages to Acton due to fire-related hazards have been estimated based on regional data provided by the FEMA NRI database. The data has been adjusted by recorded populations in Middlesex County and the Town of Acton.

Hazard	Methodology / Source	Annualized Losses for Acton, MA
Wildfires	NRI	$4,923

4.7.4.6 Probability of Future Events and Impacts of Climate Change

As reported by the 2022 Massachusetts Climate Change Assessment, models project an increase in high heat days and extreme temperature conditions; specifically, inland areas are expected to experience an estimated 25 days above 90°F, which may potentially result in more frequent droughts. Extended periods of drought contribute to ideal fire conditions. More frequent and more severe droughts, combined with rising temperature, may drive an increase in intense fires.

The 2023 SHMCAP cites recent studies that found, under the RCP8.5, wildfire occurrence probability in New England is projected to double by 2100.

4.8 Land Use and Existing Development Trends

4.8.1 Existing Land Use

The most recent land use statistics available for the Town of Acton were developed through the Massachusetts Geographic Information System (MassGIS) based on aerial imagery from 2016. Table 4-34 summarizes the acreage and percentage of total land in town for each land use category. According to this data, residential land makes up the largest percentage of land use in Acton (45.82%). The data is displayed visually and in greater detail in the map on the following page.

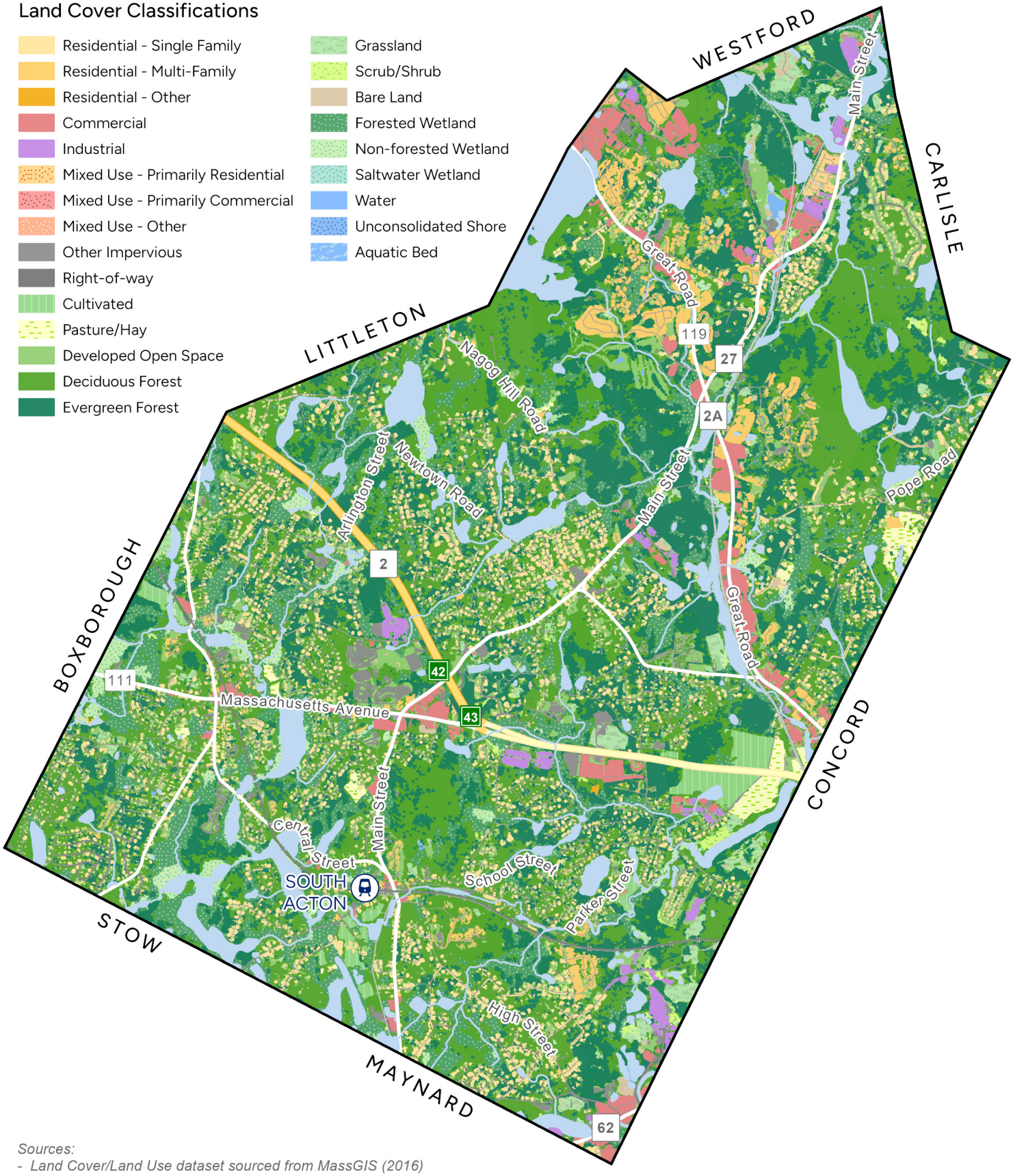
Table 4-34: Town of Acton, MA 2016 Land Use

Land Use Type	Acres	Percent
Agriculture	82.65	0.64%
Commercial	567.75	4.44%
Forest	236.8	1.82%
Industrial	391.89	3.02%
Mixed Use (Other)	6.23	0.05%
Mixed Use (Primarily Residential)	29.11	0.22%
Open Land	1,021.97	7.87%
Recreation	96.96	0.75%
Residential (Multi-family)	872.17	6.72%
Residential (Single family)	5,079.21	39.1%
Right of Way	979.13	7.54%
Tax Exempt	3,318.65	25.55%
Unknown	119.79	0.92%
Water	178.08	1.37%
TOTAL	**12,989.39**	**100%**

Source: MassGIS

LAND COVER

SLR



Sources:
- *Land Cover/Land Use dataset sourced from MassGIS (2016)*

ACTON HAZARD MITIGATION PLAN

TOWN OF ACTON, MASSACHUSETTS

0 2,000 4,000 Feet

N

Date Saved: 7/26/2024

The Acton 2020 Comprehensive Community Plan reports land use statistics from 2008, divided into four categories (See Table 4-35). Residential uses make up 26.7% of the area of town, and according to the 2020 Acton Plan, the dominant residential type is a single-family home on varying lot sizes. Multi-family homes are concentrated along Great Road and Kelley's Corner. Other multi-family homes are dispersed through town, including a multi-family assisted living community in North Acton. Commercial and Industrial uses make up 5.1% of the town. Commercial uses are concentrated around the Assabet River in the southeast corner, along Great Road (Route 2A), Massachusetts Avenue, and Powder Mill Road (Route 2). Industrial uses, mixed with commercial and office uses, are found in North Acton along Massachusetts Avenue east of Kelley's Corner.

Table 4-35: Town of Acton, MA 2008 Land Use

Land Use Type	Percent
Residential	26.7%
Commercial/Industrial	5.1%
Open Land*	63.7%
Water and Wetland	4.8%
Total	100.0%

Source: Acton 2020 Comprehensive Community Plan

*Includes agricultural, recreation, forest, forested wetlands, open wetlands, cemetery, and other relatively undeveloped land

Key centers in Acton include Kelley's Corner and the five villages: Acton Center, West Acton, South Acton, as well as the less defined areas of East Acton and North Acton. Commercial activity is located primarily along Massachusetts Avenue (around Kelley's Corner) and Routes 2, 2A, and 27, as well the village centers.

According to the Acton 2020 plan, Acton serves as a retail and employment hub for neighboring towns. The plan highlights health care, social assistance and computer systems design as the fastest growing employment categories. As of 2010 there were nearly 12,000 people employed in nearly 800 companies in Acton. Insulet Corporation, which manufactures insulin pumps, opened its new headquarters in Acton in 2019, and is a major employer in Acton.

4.8.2 Natural, Cultural, and Historic Resource Areas

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

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

Acton has three Historic Districts located in Acton Center, South Acton, and West Acton. Cultural assets include the Discovery Museum.

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

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

Among its natural resources, Acton possesses over 7,000 acres of forest and forested wetlands, which comprise over 50% of the town's acreage. According to the 2014 Open Space and Recreation Plan, there are 23 certified vernal pools, and 142 potential vernal pools in Acton. The Open Space and Recreation Plan details the many and varied parks and natural areas protected by state, local and private entities. The Natural Heritage and Endangered Species Program identifies 8 rare species in Acton.

4.8.3 Development Trends

SLR consulted with the Local Hazard Mitigation Planning Team to update the status of developments listed in the 2018 HMP and record new developments in progress.

4.8.3.1 Completed Developments

The Local Hazard Mitigation Planning Team provided information for developments completed in Acton between 2017 and 2024.

The completed projects are a mix of commercial, housing, office, and retail; they include 167 housing units and more than 419,000 square feet of commercial space (See Table 4-36). Development in FEMA flood zones is shown in the right-hand column.

Table 4-36: Summary of Acton Developments, 2017- 2024

Name	Status	Units	Notes	Project Type	Flood Exposure
146 Prospect St	Completed	4	Single-family	Residential	
184 Main St	Completed	8	40-B	Residential	
Martin St	Completed	28	40-B	Residential	AE
62-68 Harris St	Completed	0	Fire Station	Critical Infrastructure	
6 Post Office Square	Completed	12	40-B	Residential	0.2% Annual Chance
429 Great Rd	Completed	0	Car Dealership	Retail	0.2% Annual Chance
178 Great Rd	Completed	0	Car Dealership	Retail	AE; Floodway
117 Central St	Completed	40	40-B	Residential	AE
446 Mass Ave	Completed	31	Senior & Disabled Housing	Residential	

Name	Status	Units	Notes	Project Type	Flood Exposure
66 Maple St	Completed	1	New single-family unit and renovation of existing duplex	Residential	AE
100 Nagog Park	Completed	0	300,000 sq feet	Manufacturing	0.2% Annual Chance
96 Newtown Rd	Completed	2	Single-family homes	Residential	
47 Conant St	Completed	3	Standard subdivision, single-family.	Residential	
279 and 285 Main St	Completed	0	Demolition of existing building to construct a new bank.	Commercial	
50 Nagog Park	Completed	0	Demolition of existing building for 119,000 sq feet of warehouse	Warehouse	
74 Main St	Under Construction	7	Hawks Crest. Standard subdivision, single-family homes	Residential	
7-29 Great Rd	Under Construction	12	5 Commercial units	Residential and Commercial	
46 High St	Under Construction	4	Standard subdivision, single-family homes	Residential	
225 Newtown Rd	Under Construction	2	Pond View Way. Standard subdivision, single-family homes	Residential	
484-486 Great Rd	Under Construction	4	Betty Estates Cluster Development. Single-family homes	Residential	14.76 acres in conservation restriction
22 Elm St	Under Construction	5	Cluster Development. Single-family homes. 5.871 acres of open space will remain protected.	Residential	
3 and 11 Fort Pond Rd	Under Construction	2	Standard subdivision, single-family homes	Residential	
247 Pope Rd	Under Construction	2	Timber Way. Standard subdivision, single-family homes	Residential	
1 and 5 Nagog Park	Under Construction	0	Demolition of restaurant to construct ½ of the plaza into car dealership	Commercial	
Kelley's Corner	Under Construction	0	Sump catch basins installed to improved drainage system	Infrastructure	

4.8.3.2 Potential Future Development

The Local Hazard Mitigation Planning Team, based on the Town's comprehensive planning efforts and current trends and projects, identified expected future developments in Acton. These are summarized in Table 4-37. The relationship between potential future development areas and FEMA flood zones is shown in the right-hand column.

Table 4-37: Potential Future Development Projects

Name	Phase	Description	Project Type	Flood Exposure
352 Main Street	Design	Dog Park	Open Space	

Name	Phase	Description	Project Type	Flood Exposure
363 Great Road	Permitted	Grandview 40B – 86 units	Retail	
40 High Street	Permitting	3 additional single family	Residential	
9 Quarry Road	Permitted	PCRC amendment that added 3 additional single-family units (total of 6 units at the development)	Residential	
362 Main St	Approved (pending sewer permitting)	41 units of Senior Affordable Housing 40-B or hotel/restaurant	Commercial	
Powdermill Place (2-4 Powder Mill Road)	Design	230 Affordable Housing Units. Redevelopment to restore riverfront and provide river walk along property.	Residential	AE and Floodway

Members of the planning team were asked to identify any known vulnerabilities at the sites of potential future developments. This includes determining whether development sites are within flood zones mapped in the FEMA Flood Insurance Rate Map.

4.8.3.3 Development and Hazard Exposure

The majority of development in Acton is located outside of flood zones, and along major roadways; this limits new exposure of residents and assets to hazards such as flooding, storm-related power outages or road blockages, and wildfire. A number of recent and planned developments are located within FEMA flood zones; these are redevelopments of existing properties, and through enforcement of floodplain building codes and replacement of degraded and sometimes hazardous buildings in floodplains with actively-used properties, this redevelopment is considered to reduce the overall flood risk of the Town.

One potential concern with ongoing development and growth in Acton is the increasing pressure that development places on Acton's water supply, and the risk that supply faces from severe heat, drought, or hazard-related disruptions.

Overall, continued development and growth may have increased exposure of residents and assets to hazards; however this is balanced by continued efforts by Acton to increase its hazard mitigation capabilities.

4.9 Critical Facilities

Critical facilities and infrastructure include facilities that are important for disaster response and evacuation, such as emergency operations centers, fire stations, and water pump stations, and facilities where additional assistance may be needed during emergency events or severe weather, including nursing homes, housing for senior residents, and day care centers. Critical facilities in Acton are listed in Table 4-38.

Explanation of Columns in Table 4-38

- **Name**: Name of site or facility.
- **Type:** Type or purpose of facility.
- **Address:** Address of the facility.
- **Flood:** Facility is in a flood hazard area. Either presents the class of mapped risk zone on the Flood Insurance Rate Map (FIRM) within which facility falls, or indicates locally-identified area (if applicable):

  AE: Area determined to have a one-percent chance of flooding over the course of one year, and for which a base flood elevation (BFE) has been calculated through hydraulic analyses. Mandatory flood insurance requirements apply.

  Zone X: Areas determined to have a of 0.2-percent chance of flooding over the course of one year.

  Floodway: The channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

  Local: Within area identified by Acton as being of concern with regards to flooding, outside of FEMA mapping.
- **Power:** Describes any emergency power capabilities on-site.
- **Shelter:** Facility is officially designated as an emergency shelter.

Table 4-38: Critical Facilities

Name	Address	Type	Flood	Power	Shelter
Acton Urgent Care	Care Facility	100 Powder Mill Road			
Emerson Hospital	Care Facility	133 Old Rd To 9 Acre Corner, Concord			
Life Care Center of Acton	Care Facility	1 Great Road			
Acton Barn Cooperative Nursery School	Child Care	32 Nagog Park			
Hayward Road Kindercare	Child Care	90 Hayward Rd			

Name	Address	Type	Flood	Power	Shelter
Infant Toddler Children's Center	Child Care	149 Central St			
Ai Ping Bien	Child Care	416 Main Street			
Blossom Station Child Care Center of Acton	Child Care	20 Main Street			
Congregation Beth Elohim Early Learning Center	Child Care	133 Prospect Street			
Fun Learning Plan After School Tutoring	Child Care	12 Concord Road			
Jennifer Gugliotta	Child Care	16 Henley Road			
Kindercare Learning Center	Child Care	5 Post Office Square			
Jaya Laxmi	Child Care	14 Henley Road			
Learn and Play Preschool	Child Care	245 Main Street			
Eleanor Mccullough	Child Care	52 Hayward Road			
Mt. Calvary Christian Preschool	Child Care	472 Mass Ave			
Carol Huebner Preschool	Child Care	75 Spruce Street			
Cell Tower (5)	Communications	100 Discovery Way 211 Main Street 36 Knox Trail 533 Main Street 982 Main Street			
Town Communication Tower (4)	Communications	371 Main Street 20 Adams Street 51 Ethan Allen Drive Rear 12 Wyndcliff Drive			
Brook Street Dam	Dam		Floodway		
Grassy Pond Brook Dam	Dam		Local		
Ice House Pond Dam	Dam		AE		
Nagog Pond Dam	Dam		AE		
Pencil Factory Dam	Dam		Floodway		
Robbins Mill Pond Dam	Dam		Floodway		

Name	Address	Type	Flood	Power	Shelter
Benchmark Senior Living at Robbins Brook	Elder Housing	10 Devon Drive			
Audubon Hill Condominiums	Elder Housing	Audubon Drive			
McCarthy Village	Elder Housing	2-8 Harris St			
Robbins Brook Assisted Living Facility	Elder Housing	10 Devon Dr			
Windsor Green Apartments	Elder Housing	68 Windsor Ave			
100 Discovery Way	Energy	100 Discovery Way			
Battery Storage at Acton-Boxborough Schools For Rooftop Solar	Energy	36 Charter Rd			
Proposed Battery Storage at Twin School	Energy	75 Spruce St			
Solar On Earth	Energy	35 Nagog Park #315			
Baker-Whitney Oil Company	Hazardous Materials	432 Massachusetts Ave			
Boc Gases	Hazardous Materials	37 Laws Brook Rd	Floodway		
Bursaw Gas and Oil	Hazardous Materials	94 Great Rd			
Concord Oil	Hazardous Materials	55 Knox Trail Ste 409			
Grace Superfund Site	Hazardous Materials	47 Independence Rd			
Haartz Auto Fabric	Hazardous Materials	87 Hayward Rd			
Keyspan / Tennessee Gas Regulator Station	Hazardous Materials				
Nmi Superfund Site	Hazardous Materials	2229 Main St, Concord			
Rh Products	Hazardous Materials	308 Old High St			
Department Of Public Works	Municipal	14 Forest Road		Natural Gas	
Acton Town Hall	Municipal	472 Main St		Diesel	
Human Services and Senior Center	Municipal	30 Sudbury Rd Rear			Yes

Name	Address	Type	Flood	Power	Shelter
Library/IT	Municipal	486 Main St		Diesel	
Recreation Department	Municipal	50 Audubon Dr		Yes	Yes
The Red House	Municipal	468 Main St		Diesel	
West Acton Fire Station	Public Safety	258 Central Street		Diesel	
Acton Center Fire Station	Public Safety	3 Concord Road		Diesel	
Acton Public Safety Facility	Public Safety	371 Main Street		Diesel	
South Acton Fire Station	Public Safety	52 School Street		Diesel	
North Acton Fire Station	Public Safety	68 Harris Street			
Massachusetts Correctional Institution at Concord	Public Safety	965 Elm St, Concord			
Pine Hill Condominiums	Residential	201 Great Rd #301			
McCarthy-Towne School	School	11 Charter Road			
Merriam School	School	11 Charter Road			
Parker Damon Building	School	11 Charter Road			
R.J. Grey Junior High School	School	16 Charter Road			
Douglas School	School	75 Spruce Street			
Acton-Boxborough Regional High School	School	36 Charter Road		Yes	Yes
The Victor School	School	380 Massachusetts Avenue			
Gates School	School	75 Spruce Street			
Conant School	School	80 Taylor Road			
Colbrook High School	School	8 Post Office Square			
Pumping Station 09	Wastewater	1 Clover Hill Road			
Pumping Station 11	Wastewater	100 Powder Mill Road			
Pumping Station 02	Wastewater	110 Main Street	AE		
Pumping Station 01	Wastewater	133 River Street			
Pumping Station 03	Wastewater	135 Prospect Street			
Pumping Station 07	Wastewater	16 Adams Street			
Pumping Station 08	Wastewater	19 Hillcrest Drive			

Name	Address	Type	Flood	Power	Shelter
Wastewater Treatment Plant	Wastewater	20 Adams Street			
Pumping Station 10	Wastewater	22 Robert Road			
Private Wastewater Treatment (12)	Wastewater	24 Durkee Lane, Westford 497 Acorn Park Drive 380 Great Road 17 Bayberry Road 68 Parker Street 10 Devon Drive 419 Great Road 405 Great Road 1 Towne House Lane 53 Brook Street 49 Skyline Drive 21 Davis Road 25 Harris Street	X*	Yes*	
Pumping Station 05	Wastewater	27 Charter Road			
Pumping Station 04	Wastewater	386 Massachusetts Avenue			
Pumping Station 06	Wastewater	6 Railroad Street			

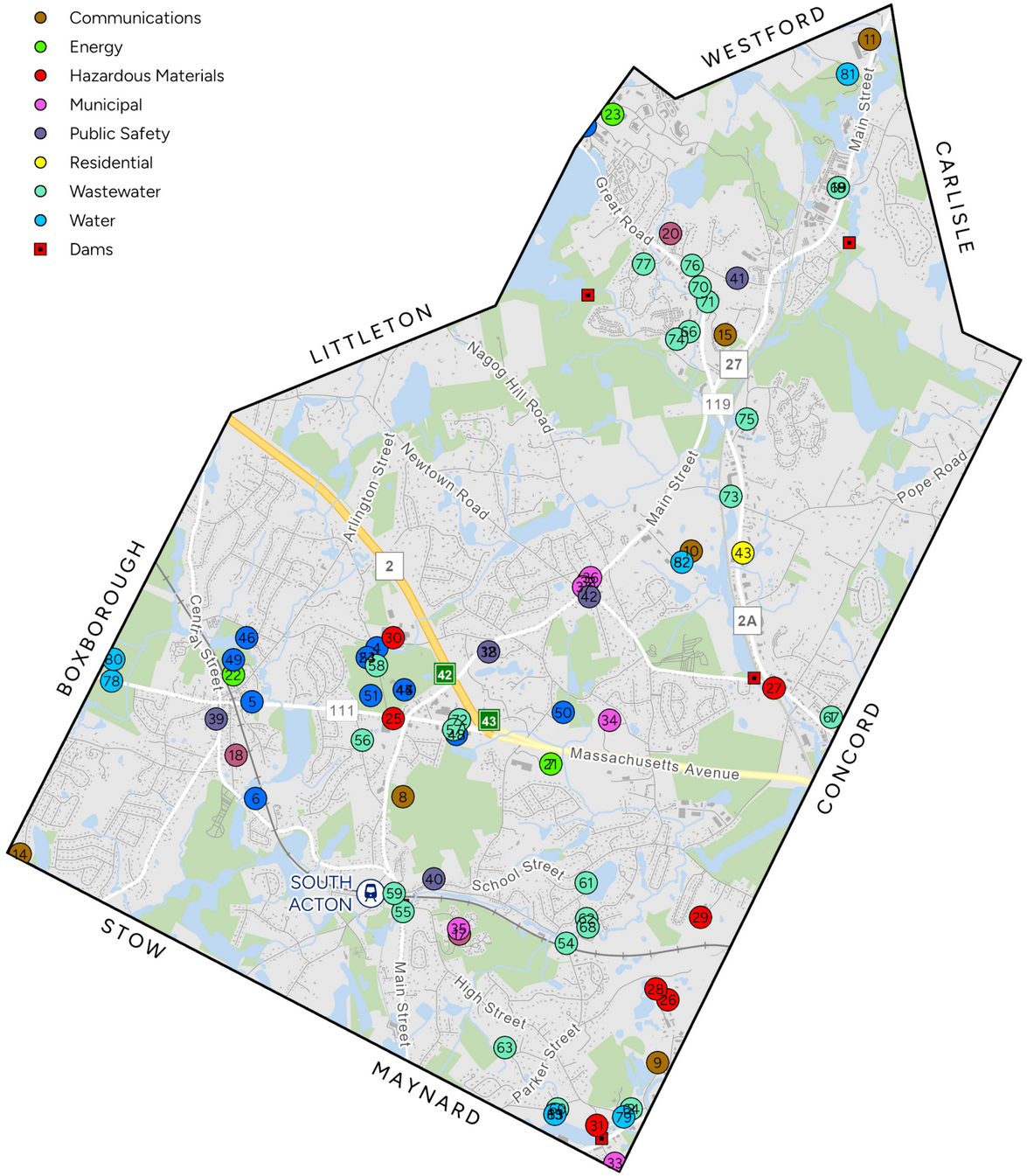
CRITICAL FACILITIES

ID	Facility Name
1	Life Care Center Of Acton
2	Acton Urgent Care
3	Acton Barn Cooperative Nursery School
4	Hayward Road Kindercare
5	Montessori Country Day School
6	Infant Toddler Children'S Center
7	Cell Tower 1
8	Cell Tower 2
9	Cell Tower 3
10	Cell Tower 4
11	Cell Tower 5
12	Town Communication Tower 1
13	Town Communication Tower 2
14	Town Communication Tower 3
15	Town Communication Tower 4
16	Benchmark Senior Living At Robbins Brook
17	Audubon Hill Condominiums
18	Windsor Green Apartments
19	Robbins Brook Assisted Living Facility
20	Mccarthy Village
21	100 Discovery Way
22	Proposed Battery Storage At Twin School
23	Solar On Earth
24	Battery Storage At Acton-Boxborough Schools For Rooftop Solar
25	Baker-Whitney Oil Company
26	Concord Oil
27	Bursaw Gas And Oil
28	Grace Superfund Site
29	Boc Gases
30	Haartz Auto Fabric
31	Rh Products
32	Acton Town Hall
33	Human Services And Senior Center
34	Department Of Public Works
35	Recreation Department
36	Library/It
37	The Red House
38	Acton Public Safety Facility
39	West Acton Fire Station
40	South Acton Fire Station
41	North Acton Fire Station

ID	Facility Name
42	Acton Center Fire Station
43	Pine Hill Condominiums
44	Merriam School
45	Mccarthy-Towne School
46	Douglas School
47	Parker Damon Building
48	The Victor School
49	Gates School
50	Conant School
51	R.J. Grey Junior High School
52	Colbrook High School
53	Acton-Boxborough Regional High School
54	Pumping Station 01
55	Pumping Station 02
56	Pumping Station 03
57	Pumping Station 04
58	Pumping Station 05
59	Pumping Station 06
60	Pumping Station 07
61	Pumping Station 08
62	Pumping Station 09
63	Pumping Station 10
64	Pumping Station 11
65	Wastewater Treatment Plant
66	Private Wastewater Treatment 2
67	Private Wastewater Treatment 3
68	Private Wastewater Treatment 4
69	Private Wastewater Treatment 5
70	Private Wastewater Treatment 6
71	Private Wastewater Treatment 7
72	Private Wastewater Treatment 8
73	Private Wastewater Treatment 9
74	Private Wastewater Treatment 10
75	Private Wastewater Treatment 11
76	Private Wastewater Treatment 12
77	Private Wastewater Treatment 13
78	Clapp/Whitcomb Treatment Plant
79	South Acton Water Treatment Plant
80	Acton Water District Office
81	North Acton Water Treatment Plant
82	Central Acton Water Treatment Plant
83	Assabet Water Treatment Plant

Critical Facilities by Type

- Elder Housing and Care Facilities
- Schools and Child Care
- Communications
- Energy
- Hazardous Materials
- Municipal
- Public Safety
- Residential
- Wastewater
- Water
- Dams



Sources:
- *Critical Facilities (Town of Acton)*

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Date Saved: 8/2/2024

ACTON HAZARD MITIGATION PLAN

TOWN OF ACTON, MASSACHUSETTS

5.0 Hazard Mitigation Goals

The Town of Acton has identified the following goals for its 2024 HMP. All of the goals are considered critical for the Town and they are not listed in order of importance.

GOAL 1

- Prevent and reduce loss of life, injury, public health impacts, and quality of life impacts resulting from natural and human-caused hazards.

GOAL 2

- Prevent disruptions to public services, including utility services, municipal operations, and social services, from natural and human-caused hazards.

GOAL 3

- Promote equity and environmental justice priorities throughout hazard mitigation and resilience efforts, including risk assessment and identification and implementation of mitigation measures.

GOAL 4

- Coordinate between multiple local, state, and federal initiatives, and build public-private partnerships, to secure funding for hazard mitigation projects.

GOAL 5

- Integrate hazard mitigation planning across municipal departments, committees, and boards; the planning documents that guide them; and the budgeting and capital improvement processes of each.

GOAL 6

- Consider the connection of different hazards and stresses to promote activities with co-benefits across hazard mitigation, water and air quality, conservation and preservation, climate and resilience, and other municipal priorities.

GOAL 7

- Prevent and reduce damage to property, infrastructure, and natural, cultural, economic, and social resources from all hazards.

GOAL 8

- Work with stakeholders including Acton residents, businesses, institutions, developers, community-based organizations, land trusts, representatives of vulnerable populations, and non-profits to develop and implement hazard mitigation plan.

GOAL 9

- Work with surrounding communities and state, regional, and federal agencies to promote regional cooperation and solutions for hazards affecting multiple communities.

GOAL 10

- Ensure that future development meets, or exceeds when feasible, federal, state, and local standards for preventing and reducing hazard impacts; explore and advance local development standards that will further reduce hazard risks in the future.

GOAL 11

- Conduct meaningful engagement and education with staff and members of the public about hazard mitigation using a diversity of resources and platforms.

GOAL 12

- Consider the impacts of climate change and incorporate climate and resiliency in hazard mitigation planning.

6.0 Existing Mitigation Capabilities

Acton's hazard mitigation capabilities include zoning, land use, and environmental regulations, infrastructure maintenance, and drainage infrastructure improvement projects. Infrastructure maintenance generally addresses localized drainage clogging problems, while large scale capacity problems may require pipe replacement or invert elevation modifications. These more expensive projects are subject to the capital budget process and lack of funding is one of the biggest obstacles to completion of some of these.

The Town's existing mitigation capabilities are listed by hazard type here and are summarized in Table 6-2 at the end of this chapter. Recent upgrades and improvements to capabilities have been noted.

6.1 Existing Town-Wide Flood Mitigation Capabilities

Acton employs several practices to help minimize potential flooding and impacts from flooding, and to maintain existing drainage infrastructure. Existing town-wide mitigation measures include the following:

Participation in the National Flood Insurance Program (NFIP)

Acton participates in the NFIP with 72 policies in force as of the September 22, 2023. FEMA maintains a database on flood insurance policies and claims. The following information is provided for the Town of Acton:

Flood insurance policies in force (September 22, 2023)	72
Coverage amount of flood insurance policies	$24,384,000
Premiums paid	$48,379
Total losses (all losses submitted regardless of the status)	45
Total payments (total amount paid on losses)	**$219,645**

Ongoing Drainage Improvement Program

The Department of Public Works (DPW) routinely maintains and replaces old and failing pipes and drainage infrastructure (such as disintegrating aluminum pipes up to 70 years old). This program is part of DPW's operating budget.

Wetlands Protection Bylaw and Regulations

The town has a wetlands protection bylaw to protect resource areas in and around wetlands, including land subject to flooding. The Bylaw also has requirements for setbacks ranging from 0-100 feet depending upon the activity. The wetland regulations provide more detail with regards to submittal requirements and performance standards. The Conservation Commission reviews development plans with potential impacts to water resources.

The Massachusetts Stormwater Policy

This Policy is applied to developments within the jurisdiction of the Conservation Commission. New regulations for stormwater in the Acton jurisdictional area are expected to be in place by 2025.

Floodplain Overlay District

The Town has a floodplain overlay district (Zoning Section 4.1) that restricts certain activities and requires a special permit for activities located within a flood zone. Floodplain regulations have been effective at preventing new construction in the flood plains

Subdivision Development Drainage Design Controls

The subdivision regulations require that the proposed drainage system is approved in writing by the appropriate town entity (Section 5.3.17) and the stormwater calculations must be provided by a licensed engineer (Section 5.3.18). The applicant must include provisions for handling drainage that flows off-site (5.3.20). Finally, an Erosion and Sediment Control plan is required (5.3.22). The Board of Health must review and approve or disapprove subdivision plans (5.5). Section 8.2 provides drainage/stormwater standards for subdivisions. The subdivision regulations encourage a preliminary submission to discuss development issues up-front with the Planning Board prior to a significant investment in design efforts. Runoff from subdivision developments may not increase in proposed conditions more than in existing conditions for the 10-year storm, and drainage facilities must be designed for the 10-year storm. The Subdivision Regulations also require the preparation of Development Impact Reports. Applicants must provide information on impacted resources, such as flood plains.

Site Plan Development Drainage Design Controls

For uses requiring site plans special permits, the peak rate of storm water runoff from the development site shall not exceed the rate existing prior to the new construction based on a 10-year design storm. Commercial and industrial developments must treat first inch of rainfall onto impervious surfaces.

Reviews and Inspections of New Developments

Town staff provides drainage reviews, and the Engineering Department inspects streets and drainage once construction is completed of a site.

Cluster Developments

The town residential zoning provides provisions for cluster developments (open space developments in Zoning section 4.2) for all residential zones.

Conservation Residential Community

Acton is in the process of implementing a “Habitat for All” Zoning initiative, which will increase the preservation of natural resources and incentivize the creation of additional open space and affordable housing.

Groundwater Protection Overlay District

The town has a Groundwater Protection District (Zoning section 37 with stringent development controls, including recharge requirements, open space requirements, and maximum allowable impervious areas based upon proximity to the public wells. These regulations are designed to protect the town’s sole drinking water supply.

Land Acquisition Efforts: Community Preservation Act

The town adopted the Community Preservation Act with a 1.5% surcharge in 2002.

Land Acquisition Efforts: Priority list of parcels by Open Space Committee

During the time of the 2024 Hazard Mitigation Plan Update, the Town was in the process of finalizing the update to its Open Space Plan. As part of this planning process, the Conservation Commission has established an Open Space Committee that is tasked with identifying a list of priority parcels for conservation and acquisition. Properties have not been targeted solely based on flood protection purposes, but flood storage may be one of several important environmental features on a piece of conserved land.

Public Education

The town continues to implement its NPDES Phase II stormwater program which includes public education programs. Elements of the public education program include: partnering with SuAsCo for media toolkits, stormwater business flyers, educational signs adjacent to a constructed wetland, teacher lesson plans, traveling stormwater display at town buildings, and storm drain stenciling. In addition, the Acton Stream Team raises community awareness regarding issues facing water resources in the town.

Pilot Project with MIT students on reducing runoff

MIT graduate students developed a low-impact design (LID) for reducing runoff effects at Jones Field consisting of a rain garden. The town expects to focus on municipally owned land and have several pilot projects at other locations.

Beaver Mitigation

The town hires a trapper to mitigate beaver activity as necessary. A permit to do so is required by state law through the local Board of Health per state law. The mitigation includes removal of the dam and beaver and possibly installation of pipes to when property owners call to complain about flooding. The town usually uses its own staff and equipment to address the issue, and the cost can reach $1,000 for each incident. To trap a beaver, the town is usually charged around $150 to $200 per animal. Alternative options for beaver mitigation include water flow devices, such as beaver deceivers or pond levelers, or enhanced mapping capabilities of beaver activity. A permit from the Natural Resources Commission is required for the installation of water flow devices.

Drainage System Maintenance

The town strives to clean all catch basins annually. They no longer use sand, which has made a tremendous impact by allowing less frequent cleaning of the basins. The Public Works and Health Departments track catch basin and outfall cleanings. Maintenance of the storm drain system is scheduled based on known problem areas. The town has mapped its drainage system on paper maps and hopes to eventually set up in GIS if the town obtains GIS. The town owns two street sweepers.

6.2 Existing Dam Failure Mitigation Capabilities

DCR Dam Safety Regulations

All dams are subject to the Division of Conservation and Recreation’s dam safety regulations. Dams are required to be inspected regularly with reports filed to the DCR Office of Dam Safety.

Permits Required For Construction

State law requires a permit for the construction of any dam.

Dam Removal

The Town aggressively and successfully pursues dam removal projects, securing state and federal funding to support. The River Street Dam was removed since adoption of the previous Acton HMP, and removal of the Bellows Farm Dam is actively being explored.

The Comprehensive Emergency Management Plan

The Acton CEMP addresses dam safety.

6.3 Existing Town-Wide Wind Mitigation Capabilities

Tree Trimming and Removal by the Town

The town has a Tree Warden that oversees trimming and tree removal on public properties, and contractors are hired to help with maintenance; the tree warden will also identify hazardous trees on private property and contact the landowner. Approximately 6 times per year the town will removes private trees, but it is up to the landowner to remove the debris.

When a new subdivision is created, the Subdivision Rules and Regulations require that all vegetation be removed from the entire width of the Right of Way, and that new trees be planted as replacements at the edge of the Right of Way. This work is done by the developer, not the Town. Once the street has been accepted, the trees growing within the Right of Way are protected under MGL Chapter 87. Full clearing of the Right of Way is required since the construction impacts of building the roadway condemn the existing trees to failure and death.

Eversource conducts additional tree maintenance.

Hurricane Resistant Glass

The town buildings are robust with hurricane-resistant glass, and most critical facilities are up to the most recent State Building Code; however, the building code does not address tornadoes.

Underground Utilities

The Zoning Bylaws, effective May 2023, require that all utility connections should be placed underground where feasible. Specific exemptions are outlined in the Zoning Bylaws.

6.4 Existing Town-Wide Winter Hazard Mitigation Capabilities

Snow Plowing and Sanding

The town provides standard snow plowing operations and uses outside contractors as necessary. They have moved away from using sand, which helps reduce catch basin clogging. MassDOT clears Routes 2, 2A, and 111.

Tree Maintenance

Both the town and Eversource provide tree trimming and removal to prevent limbs from coming down during heavy and wet snow events. (See more detailed description above under the Wind section)

6.5 Existing Town-Wide Mitigation for Fire-Related Hazards

Burn Permits

Town bylaws allow controlled open burning, in accordance with state regulations, but a permit is required from the Fire Chief for each day of intended burning.

Development Review

The Fire department reviews all subdivision and site plans for compliance with site access, water supply needs, and all other applicable regulations.

6.6 Existing Town-Wide Geologic Hazard Mitigation Capabilities

Police Station is Reinforced

The Police Station is steel-framed, and up to earthquake standards.

Evacuation plan

The town has an evacuation plan as specified in its CEMP.

Tanker Availability

A tanker task force is available through State Fire mobilization. FEMA has 8-12 tankers that can be deployed anywhere in the US within 72 hours.

Gas Line Preparedness

The El Paso gas company provides educational information and training on hazard mitigation for its Tennessee Gas Pipeline located in several communities, including Acton.

Design Standards

Town design standards in the subdivision and site plan regulations address erosion and sediment controls for temporary and permanent slopes.

6.7 Existing Multi-Hazard Mitigation Capabilities

Plans and Studies

Acton has conducted and adopted several plans and studies that provide key information to inform hazard mitigation activities. These are described in the table below:

Plan/Study	Year	Description	Hazard Mitigation Incorporation
Comprehensive Community Plan	2020	Sets the vision and goals for Acton's growth, land use, housing, and economic development.	Includes a chapter on natural hazards, their impacts on development, and strategies for resilient land use and growth.
Open Space and Recreation Plan	2024	Strategizes the preservation and utilization of Acton's open spaces and natural resources.	Highlights areas for flood risk reduction, promotes conservation of critical habitats, and supports green infrastructure.
Massachusetts Municipal Vulnerability Preparedness Planning Phase I	2018	Evaluates Acton's climate vulnerabilities and develops a prioritized action plan for resilience.	Identifies key climate risks, proposes initial mitigation measures, and integrates resilience into municipal planning
Massachusetts Municipal Vulnerability Preparedness Planning Phase II	Expected 2025	Revisits and updates Acton's climate resilience priorities through community engagement, translating those priorities into action projects.	Develops and implements detailed resilience projects addressing climate impacts, equity, and community needs
Climate Action Plan	2022	Details strategies for reducing greenhouse gas emissions and adapting to climate change impacts.	Incorporates climate hazard mitigation measures, such as infrastructure improvements and community preparedness programs.
Acton Water District Master Plan	2021	Provides a comprehensive approach to managing Acton's water resources, focusing on sustainability.	Plans for water supply security, addresses drought risks, and includes flood management strategies to protect water quality.

Acton Stormwater Drainage System Asset Management Plan	2023	Prioritizes recommendations to combat aging infrastructure and climate change vulnerabilities. Assess drainage infrastructure exposure to damage and loss of capacity over time.	Incorporates climate impact and vulnerability into asset management. Identifies future projects to address climate change concerns related to the stormwater system.

Multi-Department Review of Developments

Multiple departments, such as Planning, Zoning, Health, Public Works, Engineering, Fire, Police, Water District, Building and Conservation, review all subdivision and site plans prior to approval.

Comprehensive Emergency Management Plan (CEMP)

Every community in Massachusetts is required to have a Comprehensive Emergency Management Plan. These plans address mitigation, preparedness, response and recovery from a variety of natural and man-made emergencies. These plans contain important information regarding flooding, dam failures and winter storms. Therefore, the CEMP is a mitigation measure that is relevant to many of the hazards discussed in this plan. The CEMP is available online through secure access for town personnel.

Enforcement of the State Building Code

The Massachusetts State Building Code contains many detailed regulations regarding wind loads, earthquake resistant design, flood-proofing and snow loads.

Regional Emergency Management Planning Committee (REPC)

Acton is part of the CrossRoads Regional Emergency Management Planning Committee (REPC) that consists of the towns of Acton, Lincoln, Weston, Wayland, Sudbury and Concord.

Emergency Generators

The town has emergency generators for the public safety building, fire stations, public works facility, town hall, sewer treatment plant, schools, Water District, 468 Main Street, 50 Audubon, Memorial Library, and has portable generators. However, some of the generators used in town and for town buildings rely on natural gas; if the natural gas lines are impacted, the generators will not function. Table 6-1 below shows the status of the town's existing generator inventory:

Table 6-1: Emergency Generator List

Facility Name	Power Type
Department of Public Works Garage	Natural Gas
School Street Water Pump Station	Propane
Acton Water District Operations & Admin Campus	Natural Gas
Assabet Well Field	Diesel
Acton Town Hall	Diesel
Recreation Department	Generator on 55 Audubon Drive

Facility Name	Power Type
Acton Public Safety Building	Diesel
West Acton Fire Station	Diesel
Center Acton Fire Station	Diesel
South Acton Fire Station	Diesel
North Acton Fire Station	Diesel
Library/IT	Diesel
Lawsbrook and Scribner Wells	Hookup Only
Christofferson Well	Propane
Conant I Well	Hookup Only
Conant II Wellfield	Natural Gas
Conant Bedrock Wells	Natural Gas
Kennedy Wellfield	Natural Gas
Marshall Well	Natural Gas
N. Acton Water Treatment	Natural Gas
S. Acton Water Treatment	Diesel
C. Acton Water Treatment Plant	Natural Gas
The Red House	Diesel

Emergency notification

The town has reverse 911 and public announcements in the event of an emergency. The emergency communications system has limited capacity, and communications systems in town are highly dependent on cell phones (cell tower is located on Great Hill). The town looks to have a program to have proper communications facilities and fiber optics.

6.8 Compilation of Existing Mitigation Capabilities

The many existing natural hazard mitigation measures already in place in Acton at the time of the 2024 Hazard Mitigation Plan update are summarized in Table 6-2.

Table 6-2: Existing Natural Hazard Mitigation Measures in Acton

Type of Existing Mitigation Measure	Effectiveness, Recent Improvements, and Changes Needed
Flood Hazards	
The town participates in the NFIP and has adopted the effective FIRM maps. The town actively enforces the floodplain regulations.	Effective, updated in 2022
On-going DPW Drainage Improvement Program	Effective
Wetlands Protection Bylaw and Regulations	Effective, new regulations for stormwater expected to be in place for jurisdictional area

Type of Existing Mitigation Measure	Effectiveness, Recent Improvements, and Changes Needed
Massachusetts Stormwater Policy	Effective, added 2015 SW Mgmt. and Sediment Erosion By-law
Floodplain Overlay District	Effective
Subdivision Development Drainage Design Controls	Effective
Site Plan Development Drainage Design Controls	Effective
Reviews and Inspections of New Developments	Effective
Cluster Developments	Effective. Town has also adopted Planned Conservation Residential Community which encourages open space preservation
Conservation Residential Community	Effective. Town to embark on the Habitat for All Zoning initiative to increase preservation of natural resources and incentivize the creation of more open space and affordable housing
Groundwater Protection Overlay District	Effective
Land Acquisition Efforts: Community Preservation Act	Effective, since adoption of the CPA, Acton has made over $5 million in land purchases.
Land Acquisition: Priority List of Parcels	Effective. The Open Space Plan, to be published in 2024, identifies priority parcels for acquisition and open space preservation.
Land Acquisition: Protect Open Space	Effective. District Acquired 549 Main Street which provides some inland flooding mitigation.
Public Education – NPDES Phase II	Effective
Jones Field LID rain garden	Effective, this project was not implemented, but several others have been constructed
Beaver Mitigation	Effective. Town is looking at alternative methods to deal with beaver mitigation (beaver deceivers and mapping activity)
Drainage System Maintenance	Effective
Dam Hazards	
DCR Dam Safety Regulations	Effective
Construction permits required	Effective
Dam Removal	Effective. Town pursues dam removal. River Street Dam was removed; removal of Bellows Farm Dam is actively being explored.
Comprehensive Emergency Management Plan	Effective
Wind Hazards	
Tree Maintenance Program by the Town	Effective
Tree Maintenance Program by Eversource	Effective, performance has improved

Type of Existing Mitigation Measure	Effectiveness, Recent Improvements, and Changes Needed
Town buildings have hurricane resistant glass	Effective for the public safety building and the library
Winter Hazards	
Standard snow operations, reduced sand usage	Effective
MassDOT clears state roads 2, 2A, and 111	Effective
Tree maintenance by town and by Eversource	Effective
Fire Hazards	
Open burning permits required	Effective
Fire Department reviews all development plans	Effective
Provide education on outdoor fire regulations and risks utilizing town website	Effective
Earthquake Hazards	
Police station is steel-framed and up to most recent building codes	Effective
Evacuation plan outlined in CEMP	Effective
Tanker task force available through state fire mobilization	Effective
El Paso gas company provides training and education on hazard mitigation for its Tennessee Gas pipeline	Effective
Landslide Hazards	
Slope stabilization requirements in subdivision and site plan regulations	Effective
Multi-Hazards	
Multi-department review of developments	Effective
Comprehensive Emergency Management Plan (CEMP)	Effective
Enforcement of State Building Code	Effective
Regional Emergency Management Planning Committee (REPC)	Not functioning optimally currently
Emergency generators available for municipal facilities	Effective
Reverse 911 and public announcements in the event of an emergency	Effective
Emergency communications system, but highly dependent on cell phone service	Now have radios and radio station, have started installing fiber optic
Emergency communications with vulnerable populations (non-English speakers, isolated individuals)	Effective

6.9 Mitigation Capabilities and Local Capacity for Implementation

Under the Massachusetts system of “Home Rule,” the Town of Acton is authorized to adopt and from time to time amend several local bylaws and regulations that support the town’s capabilities to mitigate natural hazards. These include Zoning Bylaws, Subdivision and Site Plan Review Regulations, Wetlands Bylaws, Health Regulations, Public Works regulations, and local enforcement of the State Building Code.

Local Bylaws may be amended each year at the annual Town Meeting to improve the town’s capabilities, and changes to most regulations simply require a public hearing and a vote of the authorized board or commission. The Town of Acton has recognized several existing mitigation measures that require implementation or improvements, and has the capacity based on these Home Rule powers within its local boards and departments to address these.

Several departments including Engineering, Public Works, Municipal Properties, Land Use and Fire will address planned infrastructure projects. Natural Resources and DPW will collaborate on dam assessments and potential upgrades or breaches. Several measures will require bylaw changes; Engineering, Land Use and Health will lead those efforts. Finally, efforts to improve emergency communications to vulnerable populations will likely be a collaborative effort across many departments.

7.0 Mitigation Measures from Previous Plan

7.1 Implementation Progress on the Previous Plan

The Acton Local Hazard Mitigation Planning Team reviewed mitigation measures identified in the 2018 Acton Hazard Mitigation Plan and determined whether each measure had been implemented or deferred. Of those measures that had been deferred, the committee evaluated whether the measure should be deleted or carried forward into this Hazard Mitigation Plan 2024 Update. The decision on whether to delete or retain a particular measure was based on the committee's assessment of the continued relevance or effectiveness of the measure and whether the deferral of action on the measure was due to the inability of the Town to act on the measure. This information was used to determine if actions should now be considered capabilities in the Town or if they should be moved forward into this new plan update. The current mitigation action list, displayed in Section 8.0, represents the present and future needs of the Town of Acton. Table 7-1 summarizes the status of mitigation measures, and mitigation projects completed are described in more detail below.

Table 7-1: Mitigation Measures from the 2018 Plan

Mitigation Action	Status	Notes
Flood		
Land Acquisition / Protect Open Space	Capability	Town acquires property when appropriate, and is preparing an updated Open Space Plan with goals to acquire open space in flood zones. The Water District Acquired 549 Main Street, which provides some inland flooding mitigation. The Town acquired a Conservation Restriction on a property.
More frequent maintenance of town-owned drainage facilities	Capability	Town maintenance protocols are considered sufficient.
Ongoing culvert and drainage upgrades	Capability	Town conducts regular culvert and drainage upgrades. Specific projects will be listed as actions as appropriate.
Complete GIS stormwater mapping, prepare for MS4 compliance	Carry Forward	Town has prepared an inventory in line with MS4 compliance, but has not yet been able to conduct a comprehensive mapping project.
Assess River Street dam, consider partial breach for safety	Completed	Dam was removed in 2023
Complete town-wide dam study – gain information from DCR	Carry Forward	Public Works has reached out to state agencies to get access to relevant dam data; more work is needed to determine hazard status and environmental implications as well as ownership and parties responsible for mitigating concerns.

Mitigation Action	Status	Notes
Assess Erickson's Grain Mill Dam, facilitate consideration of wider breach to reduce risk	Carry Forward	Not yet completed as other dam mitigation priorities have been advanced.
Amend Stormwater Bylaw to reflect updated 10-year 24-hour rain data	Completed	
Brushfire		
Provide education on outdoor fire regulations and risks utilizing town website	Completed	Outdoor fire regulations and risk information have been shared on Town Website. https://www.acton-ma.gov/215/Burn-Permit-and-Regulations https://acton.firepermits.com/
Drought		
Adopt a bylaw with guidelines for drought tolerant landscaping and site design	Carry Forward with Revision	Acton Water District promotes drought-tolerant landscaping (installed a Water Wise Demonstration Garden). Carry forward to focus on education and incentives, and using the UMass Amherst Drought Tolerant Plants for the Landscape guide.
Establish drought regulations for private well users	Carry Forward with Revision	Barriers to regulatory approach have limited action. Revising to focus on education and incentives.
Provide public education on water conservation and on the potential for water contamination due to large storms	Capability	Public education provided through Acton Water District.
Extreme Temperatures		
Promote green and cool roofs and cooler paving products.	Carry Forward with Revision	Action is too vague for meaningful implementation. Action revised to be more detailed and measurable.
Winter Storms		
Adopt a bylaw that requires snow removal from fire hydrants on private ways	Carry Forward with Revision	Town is not able to take on enforcement of this bylaw. Action is revised.
Wind		
Continue to fund tree maintenance program	Capability	This is a capability
Earthquake		
Construct new fire station	Completed	New fire station has been constructed using latest building code.

Mitigation Action	Status	Notes
Multi-hazards		
Upgrade communications for flexibility – finish fiber optics, explore GETS card	Carry Forward	Progress on action has been stalled.
Upgrade Arlington Street bridge – weight restriction affects emergency response time	Carry Forward	Action not progressed due to funding limitations.
Upgrade Laws Brook Road bridge	Carry Forward	Action not progressed due to funding limitations.
Improve emergency communication, particularly with difficult to reach populations (non-English speakers, isolated individuals)	Capability	Town has strong emergency communications capabilities. Additional action targeting isolated individuals has been added.

7.1.1 Changes in Priority Since the Previous HMP

The plan was revised to reflect changes in priorities since the Previous HMP. The Town consulted the public and municipal departments, specifically those participating in the LHMPT, throughout the planning process to capture interests and concerns related to natural hazards. A significant change in priority since the 2018 Hazard Mitigation Plan is how the Town understands the current and potential impacts of climate change in the community. In 2022, the Town of Acton launched the Climate Action Plan, establishing defined goals and guiding efforts towards net-zero emissions. The Town of Acton has completed the initial Municipal Vulnerability Preparedness Plan and is continuing work in this program through participation in the MVP 2.0 planning process, focusing on climate change impacts, identifying climate change adaptation actions, enhancing community resilience, and advancing priorities related to environmental justice. The MVP 2.0 program strengthens the Town's commitment to equity and citizen participation, especially promoting outreach to the most vulnerable members of the community.

The goals defined in the Hazard Mitigation Strategy of this HMP Update reflect the updated priorities and interests of the public and municipal staff. As described in 3.3 and 3.4, engagement with residents, local stakeholders, and representatives from various municipal departments guided the process to define the HMP goals and mitigation strategies described in this plan.

7.1.2 Capability Improvements Since the Previous HMP

As indicated above, Acton made considerable progress implementing mitigation measures identified in the 2018 Hazard Mitigation Plan.

Completed physical projects include the construction of a new Fire Station designed to be earthquake proof and the removal of River Street dam in 2023, which will continue to be an area of focus as the Town works towards completing restoration efforts at the previous dam site. The town has also been active in purchasing land for conservation. The District Acquired 549 Main Street, which will provide inland flood mitigation. Additional efforts related to conservation include the prioritized list of parcels published in the recent update to the Open Space Plan.

The Town strengthened the Stormwater Bylaw to reflect the updated 10-year 24-hour rain data and has enhanced stormwater management through completing asset inventory in line with MS4 compliance. The Town should continue to improve stormwater management efforts by completing GIS mapping, on-going dam assessments, and revisiting maintenance procedures of drainage facilities. The Public Works Department has reached out to state agencies to obtain

access to data related to dams. Additional work and evaluations are required to determine the hazard status of dams in town, as well as environmental implications of potential solutions and ownership or responsible parties for mitigation measures.

Several projects that were not completed will be continued into this plan update. These include upgrading Laws Brook Road bridge and Arlington Street bridge, assessing Erickson's Gain Mill Dam, completion of fiber optic installation, and continuing to identify opportunities for improved emergency communications, especially with difficult to reach populations.

Overall, 14 mitigation measures from the 2018 plan will be continued in the plan update. Most will retain the same priority in this 2024 update, and some will be revised or integrated with other actions to encourage coordinated efforts. All changes and new actions are developed with input and approval from the Local Hazard Mitigation Planning Team. Town success with open space acquisition, public education on outdoor fire regulations and risks, and funding allocated to the tree maintenance program makes moving these actions forward into this 2024 update unnecessary.

Moving forward into the next five-year plan implementation period there will be many more opportunities to incorporate hazard mitigation into the Town's decision-making processes. The challenges the Town faces in implementing these measures are primarily due to limited funding and available staff time. This plan should help the Town prioritize the best use of its limited resources for enhanced mitigation of natural hazards.

8.0 Hazard Mitigation Strategy

8.1 What is Hazard Mitigation

Hazard mitigation means to permanently reduce or alleviate the losses of life, injuries and property resulting from natural hazards through long-term strategies. These long-term strategies include planning, policy changes, education programs, infrastructure projects and other activities. FEMA currently has three mitigation grant programs: the Hazards Mitigation Grant Program (HGMP), the Pre-Disaster Mitigation program (PDM), and the Flood Mitigation Assistance (FMA) program. The three links below provide additional information on these programs.

https://www.fema.gov/hazard-mitigation-grant-program

https://www.fema.gov/pre-disaster-mitigation-grant-program

https://www.fema.gov/flood-mitigation-assistance-grant-program

Hazard Mitigation Measures can generally be sorted into the following groups:

- Prevention: Government administrative or regulatory actions or processes that influence the way land and buildings are developed and built. These actions also include public activities to reduce hazard losses. Examples include planning and zoning, building codes, capital improvement programs, open space preservation, and stormwater management regulations.
- Property Protection: Actions that involve the modification of existing buildings or infrastructure to protect them from a hazard or removal from the hazard area. Examples include acquisition, elevation, relocation, structural retrofits, flood proofing, storm shutters, and shatter resistant glass.
- Public Education & Awareness: Actions to inform and educate citizens, elected officials, and property owners about the potential risks from hazards and potential ways to mitigate them. Such actions include outreach projects, real estate disclosure, hazard information centers, and school-age and adult education programs.
- Natural Resource Protection: Actions that, in addition to minimizing hazard losses also preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and f
- Structural Projects: Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include storm water controls (e.g., culverts), floodwalls, seawalls, retaining walls, and safe rooms.
- Emergency Services Protection: Actions that will protect emergency services before, during, and immediately after an occurrence. Examples of these actions include protection of warning system capability, protection of critical facilities, and protection of emergency response infrastructure.

  (Source: FEMA Local Multi-Hazard Mitigation Planning Guidance)

8.2 Regional and Inter-Community Considerations

Some hazard mitigation issues are strictly local. The problem originates primarily within the municipality and can be solved at the municipal level. Other issues are inter-community and require cooperation between two or more municipalities. There is a third level of mitigation

which is regional and may involve a state, regional or federal agency, or three or more municipalities.

8.2.1 Regional Partners

In many communities, mitigating natural hazards, particularly flooding, is more than a local issue. The drainage systems that serve these communities are complex systems of storm drains, roadway drainage structures, pump stations and other facilities owned and operated by a wide array of agencies including the Town, Massachusetts Department of Transportation (MassDOT) and the Massachusetts Bay Transportation Authority (MBTA). The planning, construction, operation and maintenance of these structures are integral to the flood hazard mitigation efforts of communities. These agencies must be considered the communities' regional partners in hazard mitigation. These agencies also operate under the same constraints as communities do including budgetary and staffing constraints and they must make decisions about numerous competing priorities. In the sections that follow, the plan includes recommendations for activities where cooperation with these other agencies may be necessary. Implementation of these recommendations will require that all parties work together to develop solutions.

Major facilities owned, operated and maintained by state or regional entities include state Routes 2, 2A, 27, and 111 (MassDOT), and Commuter Rail (MBTA).

8.2.2 Inter-Community Considerations

Mitigation measures for the following regional issues should be considered as Acton develops its own local plan:

A) Coordinate and Review Developments on a Regional Basis

As Acton and the surrounding communities are undergoing development, it is vital that these communities communicate and provide input during the review processes. When addressing housing, transportation, and economic development projects, the impacts to neighbors must be addressed.

B) Regional Management Plan to Control Beaver Activity

One regional issue of significance is the widespread effects of beaver dams in the area. Most streams, wetland areas, and ponds in the region have had some degree of beaver activity in the past several years. Much of the localized flooding that occurs is due to beaver activity. The Town will mitigate the problem temporarily by hiring trappers, removing dams, or installing pipes, but regional cooperation could be considered.

8.2.3 New Development and Infrastructure

As part of the process of developing recommendations for new mitigation measures for this plan update, the Town considered the issues related to new development, redevelopment, and infrastructure needs in order limit future risks. Taking into consideration the Zoning and By-law changes adopted in recent years, priorities for the future include bylaw updates for stormwater management, drought management, and snow removal on private ways.

8.3 Hazard Mitigation Measures

Hazard mitigation measures identified through the planning process are presented in Table 8-1 on the following pages.

The table includes the following information:

Benefit – The extent to which the action is expected to result in a reduction of hazard risk to people and/or property.

Costs – Preliminary, estimated, "order of magnitude" costs to implement the action.

High: estimated costs greater than $500,000

Medium: estimated costs greater than $100,000

Low: estimated costs less than $100,000

Priority – priority of the action, considering potential benefits and estimated project costs, as well as other factors in the FEMA "STAPLEE" analysis. High-priority actions are likely to have political and public support, necessary maintenance can occur following the project, and the costs seem reasonable considering likely benefits from the measure. Prioritization was based on the LHMPT's local knowledge and understanding of existing and potential hazard impacts, alignment of mitigation measures to overarching Town priorities, and estimated costs associated with pursuing given mitigation measures.

Implementation Responsibility – The designation of implementation responsibility was done based on a general knowledge of what each municipal department is responsible for. It is likely that most mitigation measures will require that several departments work together and assigning staff is the sole responsibility of the governing body of each community.

Time Frame – The time frame was based on a combination of the priority for that measure, the complexity of the measure and whether the measure is conceptual, in design, or already designed and awaiting funding. Because the time frame for this plan is five years, the timing for all mitigation measures has been kept within this framework. The identification of a likely time frame is not meant to constrain a community from taking advantage of funding opportunities as they arise.

Potential Funding Sources – This column attempts to identify the most likely sources of funding for a specific measure. The information on potential funding sources in this table is preliminary and varies depending on several factors. These factors include whether a mitigation measure has been studied, evaluated or designed, or if it is still in the conceptual stages. Each grant program and agency have specific eligibility requirements that would need to be taken into consideration. In most instances, the measure will require several different funding sources. Identification of a potential funding source in this table does not guarantee that a project will be eligible for or selected for funding. Upon adoption of this plan, the local team responsible for its implementation should begin to explore the funding sources in more detail.

Table 8-1: Potential Mitigation Measures for a Hazard Mitigation Strategy

Mitigation Action	Source	Lead	Timeframe	Benefit	Cost	Priority	Funding
Flood							
Explore opportunities to increase the frequency of drainage structure maintenance. Options may include increasing maintenance frequency at known-problem structures, establishing an "Adopt a Drain" program, or acquiring more efficient and effective maintenance equipment.	Revised	DPW	1-2 years	Medium	Low	**High**	Local
Complete GIS stormwater mapping and prepare for GIS work needed to comply with EPA stormwater regulations (MS4)	Carried Forward	DPW, GIS	2-3 years	Medium	Low	**High**	Local
Update drainage design standards and culvert/bridge replacement designs to incorporate the most recent Northeast Regional Climate Censer rainfall statistics and/or the projected future extreme precipitation depths from the ResilientMass dataset.	New	Plan, DPW	4-5 years	High	Medium	**Medium**	Local State (DOT, EEA)
Assess Erickson's Grain Mill Dam, facilitate consideration of wider breach to reduce risk	Carry Forward	DPW	4-5 years	Medium	Low	**Medium**	State (EEA, DER) Fed (FEMA)
Develop a comprehensive program for stormwater management, including culvert and drainage upgrades	New	DPW	1-2 years	High	Low	**Very High**	Local
Conduct a town-wide flood study to identify flood vulnerabilities and identify resilience measures.	New	Plan, DPW	4-5 years	High	Medium	**Medium**	State (EEA) Fed (FEMA)
Identify an appropriate site and implement a pilot beaver dam best management practice such as installing water level control devices or a "beaver deceiver"	New	DPW, CC	5+ years	Low	Low	**Low**	Local
Complete the River Street Dam removal and channel restoration project	New	DPW	1-2 years	High	Low	**High**	State (EEA, DER) Fed (FEMA)
Brushfire							
Conduct public outreach and education to increase responsible land management practices and minimize risk of brushfires	Revised	Fire	2-3 years	Low	Low	**Medium**	Local
Drought							
Establish an annual water conservation campaign to educate residents about conservation measures, encourage best practices to minimize water demand, and facilitate discussions around drought risk.	Revised	Water	1-2 years	Medium	Low	**High**	Local Fed (EPA)

Mitigation Action	Source	Lead	Timeframe	Benefit	Cost	Priority	Funding
Establish programs to promote the use of green infrastructure and sustainable landscaping in private properties that supports groundwater recharge and/or demands less water (rain gardens, drought-tolerant plants, etc.)	Revised	Water	2-3 years	Low	Low	**Medium**	Local State (DER, EEA)
Conduct workshops and tabletop exercises with Acton Water District and town departments to develop a clear plan during water resource emergencies, including droughts, contamination, or generally strained water supply.	New	Water	1-2 years	High	Low	**Very High**	Local
Extreme Temperatures							
Incorporate incentives and/or requirements into Zoning Regulations to promote the use of green or cool roofs, cooler paving products, Low Impact Development (LID), green infrastructure, and other cooling capacities and/or heat mitigation measures into new construction and development. Align with recommendation from 2022 Climate Action Plan to advocate for sustainable land management to protect local natural resources.	Revised	Plan	1-2 years	Medium	Low	**High**	Local
Establish an annual public outreach program, targeting vulnerable populations including senior residents, residents with health complications, renters, low-income residents, or those living with no air conditioning, to increase awareness of the dangers of extreme heat and promote the use of and access to cooling centers.	New	Health	1-2 years	Medium	Low	**High**	Local
Earthquake							
Review impacts of the 2024 Earthquake (Tewksbury Township, New Jersey). Research New England communities impacted by the event and determine how Acton can adjust and prepare so that future earthquakes may not impact the community in the same manner.	New	DPW	2-3 years	Low	Low	**Medium**	Local
Multi-hazards							
Upgrade communications for flexibility and reliability, including finishing fiber optics and exploring GETS cards.	Carried Forward	EM	1-2 years	High	Low	**Very High**	State (MEMA) Fed (FEMA)
Upgrade Arlington Street bridge as weight restriction affects emergency response time	Carry Forward	DPW	4-5 years	High	High	**Medium**	State (DOT) Fed (FHWA)
Upgrade Laws Brook Road bridge	Carry Forward	DPW	4-5 years	High	High	**Medium**	State (DOT) Fed (FHWA)

Mitigation Action	Source	Lead	Timeframe	Benefit	Cost	Priority	Funding
Improve emergency communication, particularly related to power outages and with a focus on difficult to reach populations (isolated individuals, vulnerable populations, non-English speakers). Conduct engagement and workshops with vulnerable populations to address communication challenges.	Revised	EM	1-2 years	High	Low	**Very High**	State (MEMA) Fed (FEMA)
Develop programs for residents to improve individual hazard mitigation preparedness and knowledge of local climate hazards, including but not limited to First Aid Training, Climate Resilience Crash Courses, Heat and Stormwater Mitigation on private property, etc.	New	EM	3-4 years	Low	Low	**Medium**	Local
Assess emergency shelter capabilities during extreme heat, winter storms, and other severe weather events and evaluate opportunities to improve capacities to better serve the community, specifically the most vulnerable populations.	New	EM	2-3 years	Medium	Low	**High**	State (MEMA) Fed (FEMA)
Pursue specific land acquisition or open space protection projects identified in the 2024 Open Space and Recreation Plan that advance hazard mitigation priorities.	New	DPW, CC	5+ years	Medium	Medium	**Low**	Local State (EEA) Fed (FEMA
Prioritize water resource protection from contamination and other natural hazards and support protection of green spaces near water table recharging areas as recommended in the 2022 Climate Action Plan.	New	Water, Plan	1-2 years	Medium	Low	**High**	Local Fed (EPA)
Update Subdivision Regulations to allow Cluster Development "as-of-right"	New	Plan	2-3 years	Medium	Low	**High**	Local
Pursue partnering with solar developers to create community solar program options for Acton residents and provide a participation pathway for low-income residents, as recommended in the 2022 Climate Action Plan	New	Sustainability	1-2 years	Medium	Low	**High**	State (EEA)
Identify ideal sites and buildings to maximize the installation of renewable energy and energy storage systems where feasible on municipal buildings, properties, and Acton-Boxborough Regional School district buildings, as recommended in the 2022 Climate Action Plan.	New	Sustainability	5+ years	Low	Medium	**Low**	State (EEA)
Coordinate with Eversource and the Department of Energy Resources to identify opportunities to increase grid resilience and reliability, encourage clean energy, alter utility electric rate structures, and monitor and advocate for policy changes needed to the Public Utilities Commissions, as recommended in the 2022 Climate Action Plan.	New	Sustainability	2-3 years	Medium	Low	**High**	State (DER)

Mitigation Action	Source	Lead	Timeframe	Benefit	Cost	Priority	Funding
Establish an Emergency Response Protocol that includes wellness checks for senior residents, those relying on oxygen, and other vulnerable populations at an increased health risk during the event of a power outage.	New	EM, Health	1-2 years	High	Low	**Very High**	Local State (MEMA)
Complete development of new groundwater sources, including new sources at the Central Acton Water Treatment Plant, and installation of PFAS treatment systems to increase resilience of Acton Water District services in the face of new PFAS limits.	New	Water	5+ years	High	High	**Low**	Fed (EPA)
Explore methods of reducing salt use in roadway treatment to balance winter driving safety with habitat protection and groundwater quality; this may include reduced treatment, increased use of sand instead of salt, or other best practices.	New	DPW	2-3 years	Low	Low	**Medium**	Local State (DER) Fed (EPA)
Identify and pursue regional MVP Action Grant opportunities with nearby MVP 2.0 communities.	New	Plan	1-2 years	Medium	Low	**High**	State (EEA)

Community Resilience

Concurrent with the Hazard Mitigation Planning process the Town of Acton received a grant to participate in the MVP 2.0 pilot planning process. The Town should consider opportunities to align identified hazard mitigation measures with the resilience priorities defined by community members during the MVP 2.0 engagement activities. Several of the mitigation measures proposed in this plan support important goals related to climate resilience, environmental justice, and community engagement. These include integrating best available climate projections for precipitation, community resources available to residents during drought, extreme temperature, and other severe weather events, and a focus on strengthening communication and relationships with vulnerable and isolated populations.

9.0 Plan Adoption and Maintenance

9.1 Plan Adoption

The Acton Hazard Mitigation Plan 2024 Update was adopted by the Board of Selectmen on [ADD DATE]. See Appendix D for documentation. The plan was approved by FEMA on [ADD DATE] for a five-year period that will expire on [ADD DATE].

9.2 Plan Maintenance

Although several of the mitigation measures from the Town's previous Hazard Mitigation Plan have been implemented, since that plan was adopted there has not been an ongoing local process to guide implementation of the plan. Such a process is needed over the next five years for the implementation of this plan update, and will be structured as described below.

SLR worked with the Acton Hazard Mitigation Planning Team to prepare this plan. After approval of the plan by FEMA, this group will meet to function as the Hazard Mitigation Implementation Team, with the Director of Public Works designated as the coordinator. Additional members could be added to the local implementation team from businesses, non-profits and institutions. Equitable engagement is a priority for the Town and the Hazard Mitigation Implementation Team will consider a suite of education and outreach approaches designed to engage the public.

The Town intends to involve the public throughout the implementation of the plan, as well in the reviewing and update process, encouraging public participation during the next 5-year planning cycle. Participation will take multiple form, including those outlined in the Planning Process and Public Participation Chapter of this plan. Efforts may include, but are not limited to, posting plan updates and mitigation action status updates on the Town’s web site. As updates and a review of the plan are conducted by the Hazard Mitigation Implementation Team, these will be placed on the Town’s web site, and any meetings of the Hazard Mitigation Implementation Team will be publicly noticed in accordance with town and state open meeting laws.

9.3 Implementation and Evaluation Schedule

Process to Track Actions - The coordinator of the Hazard Mitigation Implementation Team will maintain a Mitigation Action Tracker, an excel tool to record the status of each mitigation action. The list of actions has been provided to the Town in the format of an Excel workbook. The Hazard Mitigation Implementation Team will update the “status” column of the tool to identify actions that have been completed or are in need of funding, additional capacity, or facing other barriers. The coordinator of the Hazard Mitigation Implementation Team may collaborate with Department Heads and other responsible entities to accurately reflect mitigation action status. By defining the lead department for each mitigation action in Table 8-1, it will support the Town in maintaining the status of mitigation actions and ideally lead to greater success in tracking hazard mitigation efforts.

If the Town experiences a significant natural disaster or disruption, the Hazard Mitigation Implementation Team should meet to review the list of outstanding mitigation actions and update priorities as needed

Mid-Term Survey on Progress – The coordinator of the Hazard Mitigation Implementation Team will prepare and distribute a survey in year three of the plan. The survey will be distributed to all of the local implementation group members and other interested local stakeholders. The survey

will poll the members on any changes or revisions to the plan that may be needed, progress and accomplishments for implementation, and any new hazards or problem areas that have been identified.

This information will be used to prepare a report or addendum to the local hazard mitigation plan in order to evaluate its effectiveness in meeting the plan's goals and identify areas that need to be updated in the next plan. The Hazard Mitigation Implementation Team, coordinated by the Town Engineer, will have primary responsibility for tracking progress, evaluating, and updating the plan.

Begin to Prepare for the next Plan Update – FEMA's approval of this plan is valid for five years, by which time an updated plan must be approved by FEMA in order to maintain the town's approved plan status and its eligibility for FEMA mitigation grants. Given the lead time needed to secure funding and conduct the planning process, the Hazard Mitigation Implementation Team will begin to prepare for an update of the plan in year three. This will help the Town avoid a lapse in its approved plan status and grant eligibility when the current plan expires.

The Hazard Mitigation Implementation Team will use the information from the Mid-Term progress review to identify the needs and priorities for the plan update and seek funding for the plan update process.

Potential sources of funding may include FEMA Pre-Disaster Mitigation grants and the Hazard Mitigation Grant Program. Both grant programs can pay for 75% of a planning project, with a 25% local cost share required.

Prepare and Adopt an Updated Local Hazard Mitigation Plan – Once the resources have been secured to update the plan, the Hazard Mitigation Implementation Team may decide to undertake the update themselves, contract with the Metropolitan Area Planning Council to update the plan or to hire another consultant. However the Hazard Mitigation Implementation Team decides to update the plan, the group will need to review the current FEMA hazard mitigation plan guidelines for any changes. The Acton Hazard Mitigation Plan Update will be forwarded to MEMA and DCR for review and to FEMA for approval.

Integration of the Plans

9.4 Integration of the Plans with Other Planning Initiatives

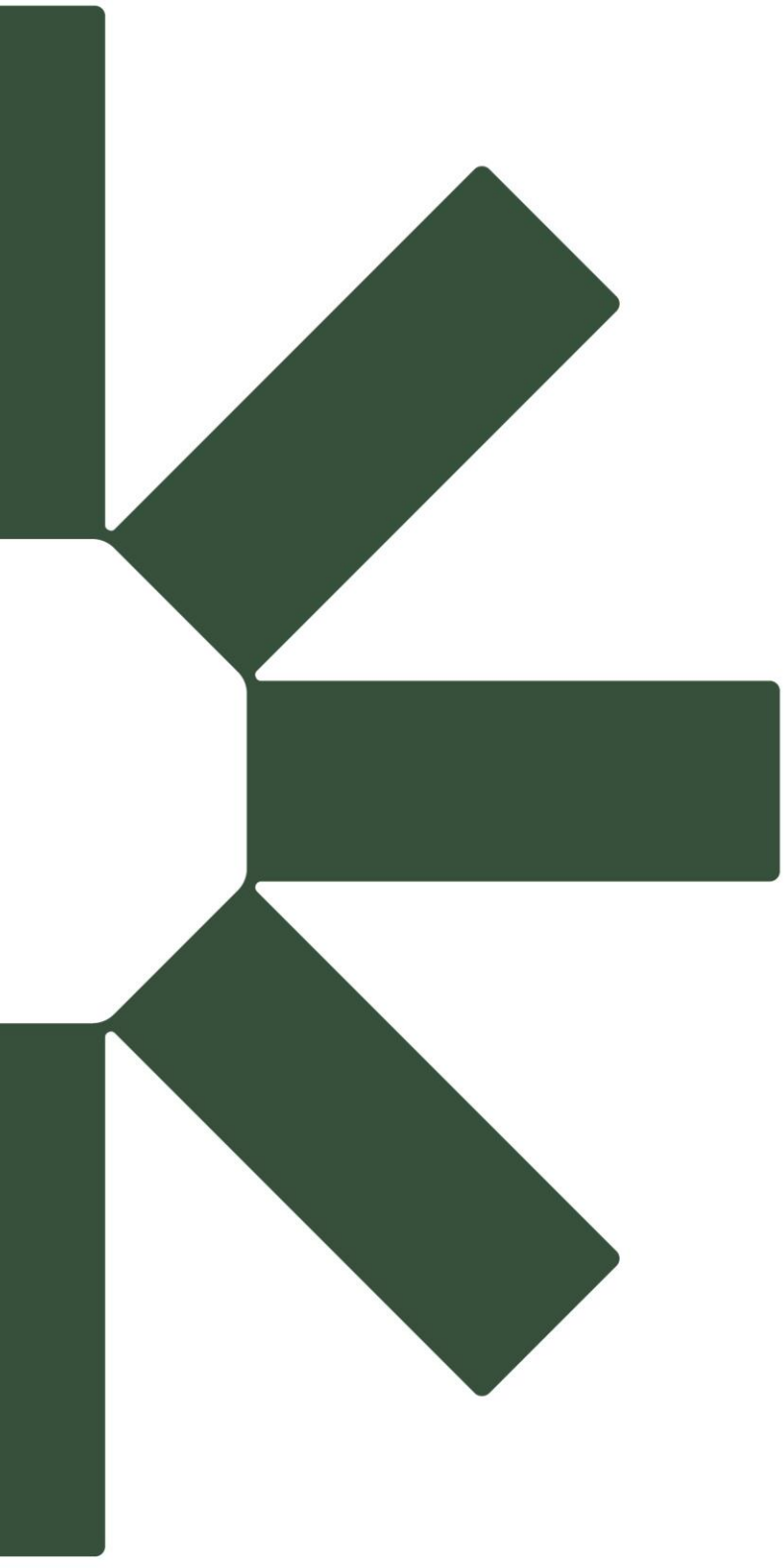
Upon approval of the Acton Hazard Mitigation Plan 2024 Update by FEMA, the Local Hazard Mitigation Team will provide all interested parties and implementing departments with a copy of the plan and will initiate a discussion regarding how the plan can be integrated into that department's ongoing work. At a minimum, the Department of Public Works and Sustainability Office will work together to organize the review and discussion of the plan with the following departments:

- Fire/Emergency Management
- Police
- Public Works/Highway
- Planning
- Economic Development Office
- Diversity Equity & Inclusion Office
- Engineering

- Land Use
- Conservation
- Parks and Recreation
- Health and Human Services
- Building
- Municipal Properties
- IT/GIS
- Natural Resources

Other groups that will be coordinated with include large institutions, Water District, Chamber of Commerce, land conservation organizations and watershed groups. The plans will also be posted on a community's website with the caveat that a local team coordinator will review the plan for sensitive information that would be inappropriate for public posting. The posting of the plan on a web site will include a mechanism for citizen feedback such as an e-mail address to send comments.

The Hazard Mitigation Plan will be integrated into other town plans and policies as they are updated and renewed, including the Climate Action Plan, Open Space and Recreation Plan, Comprehensive Emergency Management Plan, and Capital Investment Program. In additional, the Hazard Mitigation Implementation Team should consider aligning hazard vulnerabilities and mitigation measures with the ongoing efforts of the MVP 2.0 planning and implementation process.



Making Sustainability Happen

Appendix A

Local Hazard Mitigation Plan Team

Appendix B

Public Input and Engagement

Appendix C

Plan Adoption